APPENDIX E.9.1

2017 CREMP MONITORING REPORT

(Part 3)

Mary River Project 2017
Core Receiving Environment Monitoring Program Report

Part 3 of 3
(Appendices A - G)

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March 2018

APPENDIX A

DATA QUALITY REVIEW

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A1 INTRODUCTION

Data Quality Review (DQR) was conducted on data collected as part of the Mary River Project 2017 CREMP to define the overall quality of the data collected for the program, and by extension, the confidence with which the data can be used to derive conclusions. A variety of factors can influence the physical, chemical and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Depending on the magnitude of these influences, inaccuracy or imprecision have the potential to affect the reliability of conclusions drawn from the available data. Therefore, it is important to ensure that programs incorporate appropriate steps to control the non-natural sources of data variability (i.e., minimize the variability that does not reflect natural spatial and temporal variability in the environment) and thus assure the quality of the data.

The Mary River Project 2017 CREMP DQR involved comparison of field performance to generic environmental study data quality objectives (DQO) for the evaluation of sample blanks, data precision and data accuracy. DQO were established *a priori* to reflect reasonable and achievable performance expectations. Overall, the intent of comparing data to DQO was not to reject any measurement that did not meet the DQO, but rather to evaluate whether, based on the available data and using a weight-of-evidence approach, whether the field and/or analytical sample data adequately reflected actual conditions and thus could be used with confidence to derive study conclusions. Using this approach, questionable data received more scrutiny to determine what effect, if any, this had on interpretation of results within the context of this project. Quality Control (QC) samples assessed for the Mary River Project CREMP included water sample trip blanks, field blanks, equipment blanks and field duplicates, sediment sample field duplicates and the verification of the accuracy of sub-sampling and organism recovery for the benthic invertebrate component, defined as follows:

- Blanks (water quality samples) are samples of de-ionized water and/or appropriate reagent(s) that are handled and analyzed the same way as regular samples. These samples reflect any contamination that occurred from the equipment (in the case of equipment blanks), in the field (in the case of trip or field blanks), or in the laboratory (in the case of laboratory or method blanks). Analyte concentrations should be non-detectable, although a data quality objective of five times the laboratory reportable detection limit (RDL) allows for slight “noise” around the detection limit.
- Trip blanks are meant to detect any widespread contamination resulting from the container (including caps) and preservative during transport and storage. A trip blank is a bottle set full of de-ionized water that is prepared prior to the field sample

collections, is transported with the regular sample bottles in the field, and remains unopened throughout the trip.

- Field blanks mimic the sampling and preservative process but do not come in contact with ambient water. Field blanks are exposed to the sampling environment at the sample site. Consequently, they provide information on contamination resulting from the handling technique and through exposure to the atmosphere. They are processed in the same manner as the associated field samples (i.e., they are exposed to all the same potential sources of contamination as the field sample), including handling and, in some cases, filtration and/or preservation.

- Equipment blanks are samples of de-ionized water collected from the sampling equipment following decontamination (i.e., rinsing of the sampling device using de-ionized water) in the field between sampling stations and/or events. These blanks are useful in identifying cross contamination of samples in the field as a result of the sampling device.

- Field Duplicates (water quality and sediment quality samples) are sub-sample pairs collected from a randomly selected field station using identical collection and handling methods that are then analyzed separately in the laboratory. The duplicate samples are handled and analyzed in an identical manner in the laboratory. The data from field duplicate samples reflect natural variability, as well as the variability associated with sample collection methods, and therefore provide a measure of field precision.

- Sub-Sampling Checks (benthic invertebrate community samples) are used when excessive sample volume and/or organism density results in only a fraction of the original sample being analyzed. By comparing the numbers of benthic invertebrates recovered between at least two sub-samples, this measure provides an evaluation of how effective the sub-sampling method was in evenly dividing the original sample. Therefore, sub-sampling error provides a measure of analytical precision. The processing of entire samples in representative sample fractions also allows an evaluation of sub-sampling accuracy.

- Organism Recovery Checks (benthic invertebrate community samples) involve the re-processing of previously sorted material from a randomly selected sample to determine the number of invertebrates that were not recovered during the original sample processing. The reprocessing is conducted by an analyst not involved during the original processing to reduce any bias. This check allows the determination of accuracy through assessment of recovery efficiency.

A2 RESULTS

A2.1 Water Quality

A2.1.1 Sample Blanks

Trip blank samples were taken on field sampling campaigns a total of six times during the 2017 CREMP, including two during the winter lake monitoring event (April-May), two during the summer lake/stream monitoring event (July), and two during the fall lake/stream monitoring event (August). Of the 512 total number of analyses conducted on the trip blank samples, 36 (7.0%) resulted in analyte detection above the trip blank DQO of less than five-times the laboratory RDL (Appendix Table A.1). Aluminum, barium, calcium, silicon, sodium, and strontium were the parameters most often detected in trip blanks at concentrations that were above the DQO. Bottle contamination or contaminated deionized source water were the most likely sources of contamination.

Field blank samples were assessed a total of seven times during the 2017 CREMP, including three during the winter lake monitoring event, one during the spring stream monitoring event, one during the summer lake monitoring event, and two during the fall lake/stream monitoring event. Of the 604 determinations made, 38 (6.3%) resulted in analyte detections above the DQO of less than five-times the laboratory RDL (Appendix Table A.2). Similar to the trip blanks, aluminum, barium, calcium, silicon, sodium, and strontium were the parameters most often detected at concentrations above DQO in the 2017 field blank samples. A similar frequency of detected concentrations over respective RDL occurred between the trip and field blanks, which suggested that a similar source of contamination was common to both QC sample types.

Equipment blank samples were collected a total of six times during the 2017 CREMP, including two during the winter lake monitoring event, three during the summer lake monitoring event, and one during the fall lake monitoring event. Of the 504 determinations conducted, 10 (2.0%) resulted in analyte detection above the DQO of less than five-times the laboratory RDL (Appendix Table A.3). Tin was most frequently detected at concentrations above RDL in the equipment blank samples, suggesting that the sampling device may have been a source of this metal. In addition to tin, total barium, total phosphorus, dissolved aluminum, and phenols were each detected at concentrations above the RDL at a magnitude greater than the DQO in a single equipment blank sample. Notably, a lower frequency of analyte detection above the DQO was observed in the equipment blank samples compared to the trip and field blank samples.

A2.1.2 Precision – Field Duplicates

A total of 18 field duplicates were collected over the course of the 2017 Mary River Project CREMP water sampling, including two during the winter lake monitoring event, one during the spring stream monitoring event, seven during the summer stream/lake monitoring event, and eight during the fall stream/lake monitoring event. In general, close agreement in parameter concentrations was observed between duplicate samples, with 97% of field duplicate analyte pairs meeting the water quality field duplicate DQO of ≤25% Relative Percent Difference (RPD) in parameter concentrations of the 1,521 duplicate analyses conducted (Table A.4). Total dissolved solids, total phosphorus, phenols and turbidity were the key parameters which most frequently did not meet the DQO between the duplicate samples (Table A.4). In some cases in which DQO were not met, measured concentrations in one or both duplicate samples were close to the RDL (i.e., two- to three-times the RDL) such that small differences in concentrations between duplicate samples resulted in relatively high RPD. In other cases, the relatively high RPD between duplicate samples likely reflected variability in actual concentrations in the field or field sampling related influences. Because metals can be associated with materials reflected by turbidity (e.g., suspended inorganic minerals), the relatively high frequency in which turbidity differed between replicate samples may often have accounted for various metals not meeting the field duplicate DQO between replicated samples. Nevertheless, in the majority of cases, and for key parameters of concern, the RPD in analyte concentrations was sufficiently low as to not affect interpretation of the data.

A2.2 Sediment Quality

Field duplicate sediment samples were collected at each of Reference Lake 3 (REF03-10), Camp Lake (Station JLO-01), Sheardown Lake NW (Station DLO-01-2), Sheardown Lake SE (Station DLO-02-4), and Mary Lake (BLO-04), which represented 12% of the total number of sediment quality monitoring stations sampled for the 2017 CREMP. Excellent agreement in parameter concentrations were observed between duplicate samples, with none of the duplicate samples exhibiting greater than 40% RPD in parameter concentrations between split samples collected in the field (Table A.5). Therefore, data precision was very high and considered acceptable for providing reliable interpretation of the sediment quality data.

A2.3 Benthic Invertebrate Community Samples

A2.3.1 Subsampling Accuracy

Sub-sampling of benthic invertebrate community samples was conducted on 15 of 63 stream samples (24%) and 20 of 50 lake samples (40%; total of 32%) with the sorted fraction for these samples ranging between 12.5% (1/8) to 50% (1/2) of the sample material (average of 40%;

Table A.8). Sub-sampling error estimates indicated that, on average, precision and accuracy of the sub-sampled benthic invertebrate community samples met the DQO of ≤ 20% (Table A.6). Only two of the six paired sub-sample comparisons resulted in precision or accuracy outside of the DQO for the quartered sample (Table A.6), but on average for this sample, and all others, precision and accuracy achieved the DQO of ≤ 20%. Overall, this indicated that precision and accuracy for sub-sampling of the benthic invertebrate community samples was acceptable.

A2.3.2 Organism Recovery

Sorting efficiency (i.e., percent recovery) of benthic invertebrate samples was high, averaging 97% for eight lotic samples evaluated and 98% for the five lentic samples evaluated (Table A.7a,b). Sorting efficiency for these samples achieved the DQO of ≥ 90% recovery, and therefore the benthic invertebrate community sample recovery was considered acceptable.

A3 DATA QUALITY STATEMENT

The DQR results generally indicated that water, sediment and benthic invertebrate community data were of acceptable quality. Few water quality and sediment quality parameters did not meet acceptable DQO. In general, most parameters that did not meet respective DQO typically showed very low margins of error relative to respective criteria and/or were observed at low concentrations often near RDL which led to relatively small incremental differences in concentrations between replicates resulting in failure to meet DQO. However, key exceptions to this occurred for total and/or dissolved aluminum, barium, calcium, silicon, sodium, and strontium concentrations in water, which routinely did not meet DQO in trip, field and equipment blank analyses suggesting that the results for these parameters should be interpreted with caution. In field equipment blanks, tin was the parameter that most often did not achieve DQO. Although it was unclear as to the source of these metals in the various blank samples, because the parameters that did not meet DQO in trip and field blanks differed slightly from those that did not meet field equipment blanks, the water bottles/water bottle caps themselves were most likely sources of contamination in the blank samples. Notably, the deionized water used to create blanks was suggested as the most likely source of blank contamination in previous CREMP (KP 2015). The trip, field and equipment blank analyses indicated that aluminum, barium, calcium, silicon, sodium, strontium, and tin results for water samples should be interpreted with caution, but otherwise analyses of these blanks suggested limited sample contamination for the majority of parameters. The benthic invertebrate community data quality was also acceptable, meeting most precision, accuracy and percent recovery benchmarks. Overall, the data associated with the 2017 CREMP were considered defensible and acceptable for interpretation and derivation of conclusions with a reasonable level of confidence.

Table A.1: Trip Blank Results Indicating, in Highlight, Parameters Not Meeting the Data Quality Objective of ≤ Five-Times the Laboratory Reportable Detection Limit (RDL)

			Client Sample ID	Lowest RDL[1]	BL0-01-B	DL0-01-4	GO-03	BL0-05-A	BLO-01-B	G0-03
			Date Sampled		12-Apr-2017	16-Apr-2017	8-Jul-2017	1-Aug-2017	30-Aug-2017	29-Aug-2017
			ALS Sample ID		L1913377-4	L1914228-7	L1790501-30	L1969603-8	L1985596-6	L1984383-6
Physical Tests	Conductivity	umhos/cm		3.0	<3.0	<3.0	<3.0	<3.0	<3.0	4.8
	Hardness (as $CaCO_3$)	mg/L		10	<10	<10	<10	<10	<10	<10
	Total Suspended Solids	mg/L		2.0	<2.0	<2.0	5.5	<2.0	<2.0	<2.0
	Total Dissolved Solids	mg/L		10	<10	<10	11	<20	<10	<10
	Turbidity	NTU		0.10	<0.10	<0.10	1.76	1.66	<0.10	0.72
Anions and Nutrients	Alkalinity, Total (as $CaCO_3$)	mg/L		10	<10	<10	<10	<10	<10	<10
	Ammonia, Total (as N)	mg/L		0.020	<0.020	0.02	<0.020	<0.020	<0.020	<0.020
	Bromide (Br)	mg/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Nitrate and Nitrite as N	mg/L		0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
	Nitrate (as N)	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite (as N)	mg/L		0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen	mg/L		0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Phosphorus, Total	mg/L		0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Sulfate (SO4)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Carbon	Dissolved Organic Carbon	mg/L		0.5	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
	Total Organic Carbon	mg/L		0.5	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Total Metals	Aluminum (Al)	mg/L		0.0030	<0.0030	<0.0030	0.0394	0.0377	<0.0030	0.036
	Antimony (Sb)	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L		0.000050	0.00037	0.000361	0.000532	0.0005	<0.000050	0.000608
	Beryllium (Be)	mg/L		0.00010	<0.00050	<0.00050	<0.00050	<0.00010	<0.00050	<0.00050
	Bismuth (Bi)	mg/L		0.000050	<0.00050	<0.00050	<0.00050	<0.000050	<0.00050	<0.00050
	Boron (B)	mg/L		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L		0.050	0.153	0.142	0.472	<0.50	<0.050	0.584
	Chromium (Cr)	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	0.00064
	Iron (Fe)	mg/L		0.030	<0.030	<0.030	<0.030	<0.050	<0.030	<0.030
	Lead (Pb)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L		0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L		0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Manganese (Mn)	mg/L		0.000070	<0.000070	<0.000070	<0.000070	<0.00050	<0.000070	<0.000070
	Mercury (Hg)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L		0.050	<0.20	<0.20	<0.20	<0.050	<0.20	<0.20
	Selenium (Se)	mg/L		0.000050	<0.0010	<0.0010	<0.0010	<0.000050	<0.0010	<0.0010
	Silicon (Si)	mg/L		0.050	0.17	0.17	2.31	2.26	<0.10	2.72
	Silver (Ag)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000010
	Sodium (Na)	mg/L		0.050	0.068	0.087	0.537	0.520	0.054	0.736
	Strontium (Sr)	mg/L		0.00010	<0.00010	0.00011	0.00061	<0.0010	<0.00010	0.00086
	Thallium (Tl)	mg/L		0.000010	<0.00010	<0.00010	<0.00010	<0.000010	<0.00010	<0.00010
	Tin (Sn)	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L		0.00030	<0.010	<0.010	<0.010	<0.00030	<0.010	<0.010
	Uranium (U)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)	mg/L		0.00050	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.0010
	Zinc (Zn)	mg/L		0.0030	<0.0030	0.0042	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)	mg/L		0.00300	<0.0030	<0.0030	0.0403	0.039	<0.0030	0.0339
	Antimony (Sb)	mg/L		0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L		0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L		0.000050	0.001010	0.000329	0.000499	0.000546	<0.000050	0.000609
	Beryllium (Be)	mg/L		0.000010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L		0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L		0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L		0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L		0.050	0.173	0.133	0.464	0.466	<0.050	0.582
	Chromium (Cr)	mg/L		0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L		0.0000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)	mg/L		0.0010	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L		0.0000090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L		0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L		0.0050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Manganese (Mn)	mg/L		0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070
	Mercury (Hg)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)	mg/L		0.000090	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L		0.050	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Selenium (Se)	mg/L		0.000040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L		0.100	<0.10	0.17	2.28	2.26	<0.10	2.67
	Silver (Ag)	mg/L		0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L		0.020 - 0.50	0.054	0.094	0.577	0.548	0.053	0.71
	Strontium (Sr)	mg/L		0.000100	<0.00010	0.0001	0.00064	0.00068	<0.00010	0.00085
	Thallium (Tl)	mg/L		0.0001000	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L		0.000030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L		0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L		0.0000070	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)	mg/L		0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L		0.00300	0.0071	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)	mg/L		0.00010						
Other	Phenols (4AAP)	mg/L		0.0010	<0.0010	<0.0010	0.0022	<0.0010	<0.0010	<0.0010
	Chlorophyll a	µg/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Phaeophytin a	µg/L		0.10	0.13	0.10	0.14	0.14	0.12	0.14

[1] For some analytes, a range of RDLs were achieved in different laboratory reports. Each blank is compared to the RDL applicable to that sample.

Table A.2: Field Blank Results Indicating, in Highlight, Parameters Not Meeting the Data Quality Objective of ≤ Five-Times the Laboratory Reportable Detection Limit (RDL)

			Client Sample ID	Lowest RDL[1]	JL0-02	DL0-02-3	BL0-05-B	G0-01	BL0-06	BL0-05-A-B	D1-05
			Date Sampled		11-Apr-2017	13-Apr-2017	15-Apr-2017	8-Jul-2017	1-Aug-2017	28-Aug-2017	28-Aug-2017
			ALS Sample ID		L1913378-1	L1913376-7	L1914231-5	L1957899-19	L1969603-17	L1984366-2	L1984351-17
Physical Tests	Conductivity	umhos/cm		3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Hardness (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10	<10
	pH	pH units		-	8.69	6.72	6.24	6.07	5.74	6.17	5.87
	Total Suspended Solids	mg/L		2.0	<2.0	2.1	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids	mg/L		10	<10	<10	<10	<10	20	<10	<10
	Turbidity	NTU		0.10	0.70	<0.10	<0.10	4.07	1.7	0.18	0.16
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10	<10
	Ammonia, Total (as N)	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Bromide (Br)	mg/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Nitrate and Nitrite as N	mg/L		0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
	Nitrate (as N)	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite (as N)	mg/L		0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen	mg/L		0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Phosphorus, Total	mg/L		0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Sulfate (SO4)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Carbon	Dissolved Organic Carbon	mg/L		1.0	<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
	Total Organic Carbon	mg/L		1.0	<1.0	<1.0	<1.0	<0.50	<1.0	<1.0	<1.0
Total Metals	Aluminum (Al)	mg/L		0.0030	0.0265	<0.0030	<0.0030	0.0447	0.0374	<0.0030	<0.0050
	Antimony (Sb)	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L		0.000050	0.000322	<0.000050	<0.000050	0.000567	0.000500	<0.000050	<0.00020
	Beryllium (Be)	mg/L		0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00050	<0.00010
	Bismuth (Bi)	mg/L		0.000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<0.00050	<0.000050
	Boron (B)	mg/L		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L		0.050	0.265	<0.050	<0.050	0.459	<0.50	<0.050	<0.50
	Chromium (Cr)	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0010
	Iron (Fe)	mg/L		0.030	<0.030	<0.030	<0.030	<0.030	<0.050	<0.030	<0.050
	Lead (Pb)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L		0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L		0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Manganese (Mn)	mg/L		0.000070	0.00008	<0.000070	<0.000070	<0.000070	<0.00050	<0.000070	<0.00050
	Mercury (Hg)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L		0.050	<0.20	<0.20	<0.20	<0.20	<0.050	<0.20	<0.050
	Selenium (Se)	mg/L		0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.0010	<0.000050
	Silicon (Si)	mg/L		0.050	1.53	<0.10	<0.10	2.3	2.25	<0.10	<0.10
	Silver (Ag)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000050
	Sodium (Na)	mg/L		0.050	0.457	<0.050	0.05	0.608	0.52	<0.050	<0.50
	Strontium (Sr)	mg/L		0.00010	0.00037	<0.00010	<0.00010	0.0006	<0.0010	<0.00010	<0.0010
	Thallium (Tl)	mg/L		0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010	<0.00010	<0.000010
	Tin (Sn)	mg/L		0.00010	0.00406	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L		0.00030	<0.010	<0.010	<0.010	<0.010	<0.00030	<0.010	<0.00030
	Uranium (U)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)	mg/L		0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.0010	<0.00050
	Zinc (Zn)	mg/L		0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)	mg/L		0.00060	0.02570	<0.0030	<0.0030	0.0399	0.0395	<0.0030	<0.0050
	Antimony (Sb)	mg/L		0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L		0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L		0.00003 - 0.00005	0.000281	0.000229	0.000511	0.000563	0.000565	<0.000050	<0.00010
	Beryllium (Be)	mg/L		0.000010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010
	Bismuth (Bi)	mg/L		0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050
	Boron (B)	mg/L		0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L		0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L		0.020 - 0.050	0.261	<0.050	<0.050	0.465	0.479	<0.050	<0.050
	Chromium (Cr)	mg/L		0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L		0.0000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L		0.00050	0.00076	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00020
	Iron (Fe)	mg/L		0.0010	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.010
	Lead (Pb)	mg/L		0.0000090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L		0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L		0.0050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Manganese (Mn)	mg/L		0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.00050
	Mercury (Hg)	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)	mg/L		0.000090	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)	mg/L		0.050							
	Potassium (K)	mg/L		0.050	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.050
	Selenium (Se)	mg/L		0.000040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050
	Silicon (Si)	mg/L		0.050	1.53	<0.10	<0.10	2.28	2.31	<0.10	<0.050
	Silver (Ag)	mg/L		0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050
	Sodium (Na)	mg/L		0.020	0.458	0.068	0.063	0.556	0.556	<0.050	<0.50
	Strontium (Sr)	mg/L		0.000050	0.00037	<0.00010	<0.00010	0.00063	0.0007	<0.00010	<0.0010
	Thallium (Tl)	mg/L		0.0000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010
	Tin (Sn)	mg/L		0.000030	0.00448	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L		0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00030
	Uranium (U)	mg/L		0.0000070	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)	mg/L		0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
	Zinc (Zn)	mg/L		0.00050	<0.0030	0.174	0.0295	<0.0030	<0.0030	<0.0030	<0.0010
	Zirconium (Zr)	mg/L		0.00010							<0.00030
Other	Phenols (4AAP)	mg/L		0.0010	<0.0010	<0.0010	<0.0010	0.0024	<0.0010	<0.0010	<0.0010
	Chlorophyll a	ug/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Phaeophytin a	ug/L		0.10	<0.10	<0.10	<0.10	0.23	0.21	0.17	0.14

Table A.3: Equipment Blank Results Indicating, in Highlight, Parameters Not Meeting the Data Quality Objective of ≤ Five-Times the Laboratory Reportable Detection Limit (RDL)

			Client Sample ID	Lowest RDL[1]	BL0-01	DL0-01-5	JL0-09	REF3-01	REF3-03	REF3-02-S
			Date Sampled		12-Apr-2017	17-Apr-2017	24-Jul-2017	12-Aug-2017	12-Aug-2017	2-Sep-2017
			ALS Sample ID		L1913377-1	L1914230-7	L1964421-7	L1974112-10	L1974112-9	L1987563-8
Physical Tests	Conductivity	umhos/cm		3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Hardness (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10
	Total Suspended Solids	mg/L		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids	mg/L		10	<10	<10	<10	<10	<10	<10
	Turbidity	NTU		0.10	<0.10	<0.10	0.33	0.21	0.18	0.33
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L		10	<10	<10	<10	<10	<10	<10
	Ammonia, Total (as N)	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.028
	Bromide (Br)	mg/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Nitrate and Nitrite as N	mg/L		0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
	Nitrate (as N)	mg/L		0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite (as N)	mg/L		0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen	mg/L		0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Phosphorus, Total	mg/L		0.0030	<0.0030	<0.0030	0.361	<0.0030	<0.0030	<0.0030
	Sulfate (SO4)	mg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Carbon	Dissolved Organic Carbon	mg/L		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Organic Carbon	mg/L		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Metals	Aluminum (Al)-Total	mg/L		0.0030	<0.0030	<0.0030	0.0045	<0.0030	<0.0030	0.0032
	Antimony (Sb)-Total	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total	mg/L		0.000050	0.000434	<0.000050	0.000082	<0.000050	<0.000050	0.000054
	Beryllium (Be)-Total	mg/L		0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Total	mg/L		0.000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Total	mg/L		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)-Total	mg/L		0.050	0.16	<0.050	0.067	<0.050	<0.050	<0.050
	Chromium (Cr)-Total	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Total	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total	mg/L		0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Total	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total	mg/L		0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total	mg/L		0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Manganese (Mn)-Total	mg/L		0.000070	<0.000070	<0.000070	0.000106	0.000077	<0.000070	<0.000070
	Mercury (Hg)-Total	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Total	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)-Total	mg/L		0.050	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Selenium (Se)-Total	mg/L		0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)-Total	mg/L		0.050	0.16	<0.10	<0.10	<0.10	<0.10	<0.10
	Silver (Ag)-Total	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L		0.050	0.078	<0.050	<0.050	<0.050	<0.050	<0.050
	Strontium (Sr)-Total	mg/L		0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Thallium (Tl)-Total	mg/L		0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total	mg/L		0.00010	0.0026	0.00062	<0.00010	0.00091	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L		0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)-Total	mg/L		0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Total	mg/L		0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)-Dissolved	mg/L		0.00060	<0.0030	0.0089	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)-Dissolved	mg/L		0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved	mg/L		0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Dissolved	mg/L		0.00003 - 0.00005	0.000119	0.000165	<0.000050	0.000121	0.000094	0.000099
	Beryllium (Be)-Dissolved	mg/L		0.000010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Dissolved	mg/L		0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Dissolved	mg/L		0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved	mg/L		0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)-Dissolved	mg/L		0.020 - 0.050	0.052	<0.050	<0.050	<0.050	<0.050	<0.050
	Chromium (Cr)-Dissolved	mg/L		0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved	mg/L		0.0000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved	mg/L		0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved	mg/L		0.0010	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Dissolved	mg/L		0.0000090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved	mg/L		0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Dissolved	mg/L		0.0050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Manganese (Mn)-Dissolved	mg/L		0.000070	<0.000070	0.000213	<0.000070	0.000137	<0.000070	<0.000070
	Mercury (Hg)-Dissolved	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Dissolved	mg/L		0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Nickel (Ni)-Dissolved	mg/L		0.000090	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)-Dissolved	mg/L		0.050	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Selenium (Se)-Dissolved	mg/L		0.000040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)-Dissolved	mg/L		0.050	0.16	<0.10	<0.10	<0.10	<0.10	<0.10
	Silver (Ag)-Dissolved	mg/L		0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved	mg/L		0.020 - 0.050	0.07	<0.050	<0.050	0.069	0.06	<0.050
	Strontium (Sr)-Dissolved	mg/L		0.000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Thallium (Tl)-Dissolved	mg/L		0.0000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved	mg/L		0.00003 - 0.0001	0.00363	0.00178	<0.00010	0.00214	<0.00010	<0.00010
	Titanium (Ti)-Dissolved	mg/L		0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved	mg/L		0.0000070	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Vanadium (V)-Dissolved	mg/L		0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Dissolved	mg/L		0.00050 - 0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Other	Phenols (4AAP)	mg/L		0.0010	<0.0010	<0.0010	0.0061	<0.0010	<0.0010	<0.0010
	Chlorophyll a	ug/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10
	Phaeophytin a	ug/L		0.10	0.11	<0.10	0.12	0.11	<0.20	0.12

[1] For some analytes, a range of RDLs were achieved in different laboratory reports. Each blank is compared to the RDL applicable to that sample.

Figure A.4: Water Sample Field Duplicate Results Indicating, in Highlight, Parameter Values Not Meeting the DQO of ≤ 25% RPD.

	Sample ID	Lowest Detection Limit	D1-00	D1-0001	RPD	E0-10	E0-1001	RPD	EO-10	EO-1001	RPD
	Date Sampled		28-Jul-17	28-Jul-17		10-Aug-17	10-Aug-17		1-Sep-17	1-Sep-17	
	ALS Sample ID		L1967373-5	L1967373-6		L1973877-17	L1973877-8		L1987577-5	L1987577-6	
Physical	Conductivity	3.0	304.0	306.0	0.7	100.0	118.0	17	157.0	158.0	0.6
	pH	10	8.06	8.04	0.2	7.94	7.94	0	8.1	8.09	0.1
	Total Suspended Solids	2.0	3.1	2.1	38	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids	10	172	180	4.5	54	43	23	75	77	**2.6**
	Turbidity	0.10	1.72	1.37	23	6.10	6.10	0	1.87	2.00	6.7
Anions and Nutrients	Alkalinity, Total (as $CaCO_3$)	0.020	101	97.000	4.0	42	40	4.9	67	71	5.8
	Ammonia, Total (as N)	0.020	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	<0.020	0
	Bromide (Br)	0.0050	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.15	7.61	7.7	1.2	2.25	2.15	4.5	4.62	4.68	1.3
	Nitrate and Nitrite as N	0.021	0.591	0.594	0.5	<0.021	<0.021	0	0.03	0.04	29
	Nitrate (as N)	1.0	0.6	0.6	0.5	<0.020	<0.020	0	0.03	0.04	29
	Nitrite (as N)	1.0	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen	0.0030	0.2100	0.1700	21	<0.15	<0.15	0	IP	IP	
	Phosphorus, Total	0.0010	0.0037	0.0549	175	0.005	0.0054	7.7	<0.0030	0.0046	42
	Sulfate (SO4)	0.10	43.4	44.1	1.6	3.59	3.4	5.4	4.32	4.36	0.9
	Dissolved Organic Carbon	0.30	2.70	2.70	0	<1.0	1.20	18	1.00	1.10	9.5
	Total Organic Carbon	0.0030	2.9000	2.7000	7.1	<1.0	<1.0	**0**	1.2	1.1	8.7
Total Metals	Aluminum (Al)	0.00010	0.0454	0.0601	28	0.0844	0.0822	2.6	0.0599	0.0818	31
	Antimony (Sb)	0.000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000050	0.0157	0.0162	3.1	0.00685	0.00681	0.6	0.00925	0.00944	2.0
	Beryllium (Be)	0.010	<0.00010	<0.00010	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000010	<0.000050	<0.000050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.050	0.01	0.01	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.000010	0.00	0.00	6.9	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.00050	27	25.9	4.2	9.28	9.19	1.0	15.00000	14.8	1.3
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.030	0.00011	0.00012	8.7	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.000050	0.0028	0.0024	15	0.000850	0.000770	9.9	0.00081	0.00081	0
	Iron (Fe)	0.0010	0.12	0.136	13	0.081	0.076	6.4	0.046	0.059	25
	Lead (Pb)	0.050	0.00	0.00	33	0.00	0.00	0	0.00	0.00	5.3
	Lithium (Li)	0.000070	0.001200	0.001100	8.7	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.000010	18.9	18.3	3.2	5.41	5.49	1.5	8.81	8.93	1.4
	Manganese (Mn)	0.000050	0.00453	0.00519	14	0.001170	0.001060	9.9	0.000940	0.001030	9.1
	Mercury (Hg)	0.00050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00286	0.00278	2.8	0.000176	0.000173	1.7	0.000268	0.000242	10
	Nickel (Ni)	0.050	0.00	0.00	33	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000050	2.37	2.36	0.4	0.76	0.76	0	0.96	0.97	1.0
	Selenium (Se)	0.000010	0.000076	0.000072	5.4	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	1.290	1.340	3.8	0.800	0.790	1.3	1.000	1.040	3.9
	Silver (Ag)	0.00010	<0.000050	<0.000050	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	4.14000	4.12000	0.5	1.34000	1.35000	0.7	2.25000	2.31000	2.6
	Strontium (Sr)	0.00020	0.01770	0.01740	1.7	0.00872	0.00897	2.8	0.01360	0.01320	3.0
	Thallium (Tl)	0.00010	0.000011	0.000012	8.7	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.000010	0.002830	0.003620	24	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0030	0.0052	0.00515	1.0	0.00103	0.00102	1.0	0.00273	0.00279	2.2
	Vanadium (V)	0.00030	<0.00050	<0.00050	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.00050	0.0032	< 0.0038	17	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.000020	<0.00030	<0.00030	0						
Dissolved Metals	Aluminum (Al)	0.000030	0.00530	0.00510	3.8	0.01140	0.00960	17	0.00550	0.00560	1.8
	Antimony (Sb)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.0050	0.0159	0.0163	2.5	0.00607	0.00601	1.0	0.00912	0.00899	1.4
	Beryllium (Be)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.020	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.000010	0.011	0.011	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.00010	< 0.000015	0.0000	**0**	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.0000050	26.5	25.90000	2.3	9.55	9.25	3.2	15.2	15.6	2.6
	Chromium (Cr)	0.0010	<0.00050	<0.00050	**0**	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000090	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00209	0.00208	0.5	0.00093	0.00061	42	0.00076	0.00078	2.6
	Iron (Fe)	0.0050	0.04	0.04	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.00007	<0.000050	<0.000050	**0**	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00001	0.0015	0.0013	14	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.00005	18.500000	18.500000	0	5.540000	5.490000	0.9	8.480000	8.660000	2.1
	Manganese (Mn)	0.00009	< 0.00339	0.00352	3.8	0.000133	0.000126	5.4	0.000221	0.000212	4.2
	Mercury (Hg)	0.00001	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.003	0.003	1.1	0.00	0.00	2.8	0.00	0.00	35
	Nickel (Ni)	0.00020	0.00133	0.00125	6.2	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000040	2.41	2.42	0.4	0.75	0.74	1.3	0.93	0.94	1.1
	Selenium (Se)	0.0000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.020	1.25	1.23	1.6	0.660	0.660	0	0.890	0.900	1.1
	Silver (Ag)	0.000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	4.01	3.97	1.0	1.38000	1.37000	0.7	2.24000	2.29000	2.2
	Strontium (Sr)	0.00020	0.0172	0.0165	4.2	0.00874	0.00853	2.4	0.01390	0.01370	1.4
	Thallium (Tl)	0.000030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.0003	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0005	0.00481	0.00477	0.8	0.000964	0.000965	0.1	0.00278	0.00274	1.4
	Vanadium (V)	0.0005	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.003	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
Other	Phenols (4AAP)	0.00100	<0.0010	0.0011	9.5	<0.0010	<0.0010	0	<0.0010	0.0013	26
	Chlorophyll a	0.01000	0.23	0.25	8.3	0.16	0.13	21	IP	IP	
	Phaeophytin a	0.01000	0.3	0.44	38	<1.0	0.23	125	IP	IP	

Figure A.4: Water Sample Field Duplicate Results Indicating, in Highlight, Parameter Values Not Meeting the DQO of ≤ 25% RPD.

	Sample ID	Lowest Detection Limit	G0-09	G0-0901	RPD	I0-01	I0-0101	RPD	K0-01	K0-0101	RPD
	Date Sampled		29-Aug-17	29-Aug-17		27-Aug-17	27-Aug-17		7-Jul-17	7-Jul-17	
	ALS Sample ID		L1984383-2	L1984383-3		L1984351-7	L1984351-16		L1957862-2	L1957862-3	
Physical	Conductivity	3.0	159.0	157.0	1.3	184	185	0.5	98	98	0.1
	pH	10	8.09	8.09	0	8.15	8.16	0.1	7.84	7.84	0
	Total Suspended Solids	2.0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids	10	86	87	1.2	98	108	9.7	48	50	4.1
	Turbidity	0.10	2.58	3.08	18	1.55	1.32	16	0.69	0.32	73
Anions and Nutrients	Alkalinity, Total (as $CaCO_3$)	0.020	77	77	0	88	83.000	5.8	36	38.000	5.4
	Ammonia, Total (as N)	0.020	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	<0.020	0
	Bromide (Br)	0.0050	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.15	2.93	2.96	1.0	5.84	5.56	4.9	1.28	1.27	0.8
	Nitrate and Nitrite as N	0.021	<0.021	<0.021	0	0.063	0.056	12	0.046	0.055	18
	Nitrate (as N)	1.0	<0.020	<0.020	0	0.063	0.056	12	0.046	0.055	18
	Nitrite (as N)	1.0	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen	0.0030	<0.15	<0.15	0	0.1700	<0.15	13	<0.15	<0.15	0
	Phosphorus, Total	0.0010	0.0042	0.0047	11	0.0031	<0.0030	3.3	0.0062	0.0033	61
	Sulfate (SO4)	0.10	2.51	2.5	0.4	2.69	2.62	2.6	6.82	6.81	0.1
	Dissolved Organic Carbon	0.30	1.30	1.10	17	1.70	1.80	5.7	0.91	0.83	9.2
	Total Organic Carbon	0.0030	1.2000	1.2000	0	1.8000	1.9	5.4	1.2200	0.8600	35
Total Metals	Aluminum (Al)	0.00010	0.0884	0.0847	4.3	0.0388	0.039	0.5	0.0106	0.0128	19
	Antimony (Sb)	0.000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000050	0.00855	0.00883	3.2	0.00864	0.00858	0.7	0.00525	0.00521	0.8
	Beryllium (Be)	0.010	<0.00050	<0.00050	0	<0.00010	<0.00010	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000010	<0.00050	<0.00050	0	<0.000050	<0.000050	0	<0.00050	<0.00050	0
	Boron (B)	0.050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.00050	16	16.3	1.9	17	18	5.7	8.6	8.63000	0.3
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.000050	0.00073	0.00074	1.4	<0.0010	<0.0010	0	0.00069	0.0007	1.4
	Iron (Fe)	0.0010	0.051	0.053	3.8	<0.050	<0.050	0	<0.030	<0.030	0
	Lead (Pb)	0.050	0.00	0.00	9.0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.000070	<0.0010	<0.0010	0	<0.0010	0.001100	9.5	<0.0010	<0.0010	0
	Magnesium (Mg)	0.000010	8.92	9.06	1.6	10.8	10.5	2.8	5.7	5.82	2.1
	Manganese (Mn)	0.000050	0.000637	0.000701	9.6	0.001610	0.001450	10	0.000725	0.000674	7.3
	Mercury (Hg)	0.00050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.000182	0.000171	6.2	0.00021	0.00025	17	0.00017	0.00017	0.6
	Nickel (Ni)	0.050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000050	0.92	0.95	3.2	0.965	0.977	1.2	0.78	0.8	2.5
	Selenium (Se)	0.000010	<0.0010	<0.0010	0	<0.000050	<0.000050	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	1.200	1.170	2.5	0.89	0.93	4.4	0.43	0.44	2.3
	Silver (Ag)	0.00010	<0.000010	<0.000010	0	<0.000050	<0.000050	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	1.83000	1.91000	4.3	3.1400	3.2000	1.9	0.99400	1.05000	5.5
	Strontium (Sr)	0.00020	0.01290	0.01330	3.1	0.0122	0.0125	2.4	0.00525	0.00515	1.9
	Thallium (Tl)	0.00010	<0.00010	<0.00010	0	<0.000010	<0.000010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.000010	<0.010	<0.010	0	0.001870	0.002000	6.7	<0.010	<0.010	0
	Uranium (U)	0.0030	0.00268	0.00271	1.1	0.00202	0.00211	4.4	0.000296	0.000286	3.4
	Vanadium (V)	0.00030	<0.0010	<0.0010	0	<0.00050	<0.00050	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.00050	<0.0030	<0.0030	0	<0.0030	<0.0030	0	0.0037	0.0041	10
	Zirconium (Zr)	0.000020				<0.00030	<0.00030	0			
Dissolved Metals	Aluminum (Al)	0.000030	0.00650	0.00560	15	<0.0050	<0.0050	0	0.00630	0.00340	60
	Antimony (Sb)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.0050	0.00804	0.00807	0.4	0.00892	0.00858	3.9	0.00518	0.00525	1.3
	Beryllium (Be)	0.0000050	<0.00050	<0.00050	0	<0.00010	<0.00010	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.020	<0.00050	<0.00050	0	<0.000050	<0.000050	0	<0.00050	<0.00050	0
	Boron (B)	0.000010	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.00010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.0000050	15.9	16	0.6	17.80000	17.8	0	8.43	8.91	5.5
	Chromium (Cr)	0.0010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000090	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00066	0.00063	4.7	0.0008	0.0011	31	0.0008	0.0007	13
	Iron (Fe)	0.0050	<0.030	<0.030	0	<0.010	<0.010	0	<0.030	<0.030	0
	Lead (Pb)	0.00007	<0.000050	<0.000050	0	<0.000050	<0.000050	**0**	<0.000050	<0.000050	0
	Lithium (Li)	0.00001	<0.0010	<0.0010	0	0.0015	0.0015	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.00005	8.700000	8.700000	0	11.000000	10.700000	2.8	5.720000	5.580000	2.5
	Manganese (Mn)	0.00009	0.000078	0.000096	21	0.0008	0.00072	**13**	0.00039	0.00032	19
	Mercury (Hg)	0.00001	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00	0.00	15	0.00	0.00	35	0.00	0.00	1.1
	Nickel (Ni)	0.00020	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000040	0.91	0.9	1.1	0.959	0.957	0.2	0.79	0.78	1.3
	Selenium (Se)	0.0000050	<0.0010	<0.0010	0	<0.000050	<0.000050	0	<0.0010	<0.0010	0
	Silicon (Si)	0.020	0.980	0.960	2.1	0.82	0.84	2.2	0.43	0.41	4.8
	Silver (Ag)	0.000050	<0.000010	<0.000010	0	<0.000050	<0.000050	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	1.83000	1.81000	1.1	3.1100	3.1200	0.3	1.03000	0.99200	3.8
	Strontium (Sr)	0.00020	0.01270	0.01290	1.6	0.0116	0.0118	1.7	0.00510	0.00522	2.3
	Thallium (Tl)	0.000030	<0.00010	<0.00010	0	<0.000010	<0.000010	**0**	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.0003	<0.010	<0.010	0	<0.00030	<0.00030	0	<0.010	<0.010	0
	Uranium (U)	0.0005	0.00258	0.00249	3.6	0.00194	0.00195	0.5	0.000288	0.000278	3.5
	Vanadium (V)	0.0005	<0.0010	<0.0010	0	<0.00050	<0.00050	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.003	<0.0030	<0.0030	0	<0.0010	<0.0010	0	0.0039	0.0037	5.3
Other	Phenols (4AAP)	0.00100	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.0026	0.0015	54
	Chlorophyll a	0.01000	0.25	0.21	17	0.86	1.01	16	0.11	0.11	0
	Phaeophytin a	0.01000	0.31	0.24	25	0.43	0.49	13	0.19	0.22	15

Figure A.4: Water Sample Field Duplicate Results Indicating, in Highlight, Parameter Values Not Meeting the DQO of ≤ 25% RPD.

	Sample ID	Lowest Detection Limit	BL0-01-B	BL0-01-B01	RPD	BLO-01-B-B	BLO-01-B-B01	RPD	BL0-03-S	BL0-03-S01	RPD
	Date Sampled		30-Jul-17	30-Jul-17		30-Aug-17	30-Aug-17		1-Aug-17	1-Aug-17	
	ALS Sample ID		L1969320-1	L1969320-2		L1985596-4	L1985596-5		L1969603-2	L1969603-3	
Physical	Conductivity	3.0	73.7	73.3	0.5	149.0	148.0	0.7	58	59	0.2
	pH	10	7.76	7.77	0.1	8.06	8.06	0	7.54	7.56	0.3
	Total Suspended Solids	2.0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids	10	51	47	8.2	51	67	27	43	30	36
	Turbidity	0.10	1.74	2.28	27	0.83	0.85	2.4	1.31	1.39	5.9
Anions and Nutrients	Alkalinity, Total (as $CaCO_3$)	0.020	33	35	5.9	67	66	1.5	26	25	3.9
	Ammonia, Total (as N)	0.020	<0.020	<0.020	0	<0.020	<0.020	0	0.024	<0.020	18
	Bromide (Br)	0.0050	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.15	1.12	1.25	11	3.96	3.89	1.8	1.31	1.31	0
	Nitrate and Nitrite as N	0.021	<0.021	<0.021	0	0.028	0.027	3.6	<0.021	<0.021	0
	Nitrate (as N)	1.0	<0.020	<0.020	0	0.028	0.027	3.6	<0.020	<0.020	0
	Nitrite (as N)	1.0	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen	0.0030	<0.15	<0.15	0	<0.15	<0.15	0	<0.15	<0.15	0
	Phosphorus, Total	0.0010	0.0059	0.0061	3.3	<0.0030	0.0035	15	0.0056	0.0056	0
	Sulfate (SO4)	0.10	0.57	0.59	3.4	2.64	2.65	0.4	0.48	0.43	11
	Dissolved Organic Carbon	0.30	<1.0	<1.0	0	1.60	1.60	0	1.30	1.20	8.0
	Total Organic Carbon	0.0030	1.3000	1.2000	8.0	1.7000	1.8000	5.7	1.3000	1.4000	7.4
Total Metals	Aluminum (Al)	0.00010	0.0501	0.0454	9.8	0.0193	0.0238	21	0.031	0.034	9.2
	Antimony (Sb)	0.000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000050	0.00357	0.00357	0	0.00725	0.00714	1.5	0.00317	0.00312	1.6
	Beryllium (Be)	0.010	<0.00010	<0.00010	0	<0.00050	<0.00050	0	<0.00010	<0.00010	0
	Bismuth (Bi)	0.000010	<0.000050	<0.000050	0	<0.00050	<0.00050	0	<0.000050	<0.000050	0
	Boron (B)	0.050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.00050	7	6.77	3.3	13.9	14.7	5.6	5.38	5.3	1.5
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.000050	<0.0010	<0.0010	0	0.000840	0.000830	1.2	<0.0010	<0.0010	0
	Iron (Fe)	0.0010	<0.050	<0.050	0	<0.030	<0.030	0	<0.050	<0.050	0
	Lead (Pb)	0.050	0.00	0.00	1.7	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.000070	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.000010	4.11	4.13	0.5	8.61	8.85	2.7	3.21	3.22	0.3
	Manganese (Mn)	0.000050	0.001400	0.001170	18	0.0034	0.0034	0	0.001980	0.001880	5.2
	Mercury (Hg)	0.00050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.000076	0.00008	5.1	0.000156	0.000164	5.0	0.00009	0.00008	7.3
	Nickel (Ni)	0.050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000050	0.42	0.405	3.6	0.81	0.82	1.2	0.443	0.432	2.5
	Selenium (Se)	0.000010	0.000052	<0.000050	3.9	<0.0010	<0.0010	0	<0.000050	<0.000050	0
	Silicon (Si)	0.050	0.60	0.58	3.4	0.750	0.760	1.3	0.41	0.44	7.1
	Silver (Ag)	0.00010	0.00017	0.00017	5.3	<0.000010	<0.000010	0	<0.000050	<0.000050	0
	Sodium (Na)	0.50	0.76000	0.73000	4.0	1.99000	2.00000	0.5	0.75000	0.74000	1.3
	Strontium (Sr)	0.00020	0.00460	0.00450	2.2	0.00952	0.00975	2.4	0.00400	0.00390	2.5
	Thallium (Tl)	0.00010	<0.000010	<0.000010	0	<0.00010	<0.00010	0	<0.000010	<0.000010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.000010	0.002240	0.001870	18	<0.010	<0.010	0	0.001360	0.001440	5.7
	Uranium (U)	0.0030	0.000396	0.00041	3.5	0.00132	0.00135	2.2	0.000314	0.000315	0.3
	Vanadium (V)	0.00030	<0.00050	<0.00050	0	<0.0010	<0.0010	0	<0.00050	<0.00050	0
	Zinc (Zn)	0.00050	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.000020	<0.00030	<0.00030	0				<0.00030	<0.00030	0
Dissolved Metals	Aluminum (Al)	0.000030	0.00660	0.00590	11	0.00490	0.00450	8.5	0.00610	0.00580	5.0
	Antimony (Sb)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.0050	0.00359	0.00356	0.8	0.00721	0.00714	1.0	0.00298	0.0031	3.9
	Beryllium (Be)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.020	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.000010	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.00010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.0000050	7.15	6.85	4.3	14.4	14.4	0	5.51	5.5	0.2
	Chromium (Cr)	0.0010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000090	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00051	0.00051	0	0.00082	0.00082	0	<0.00050	0.00055	9.5
	Iron (Fe)	0.0050	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.00007	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00001	<0.0010	<0.0010	0	<0.0010	0.001	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.00005	4.240000	4.240000	0	8.69	8.75	0.7	3.180000	3.290000	3.4
	Manganese (Mn)	0.00009	0.00043	0.000421	2.6	0.00202	0.00206	2.0	0.00063	0.00068	7.5
	Mercury (Hg)	0.00001	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00	0.00	5.8	0.000	0.000	1.8	0.00	0.00	5.1
	Nickel (Ni)	0.00020	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000040	0.43	0.42	2.4	0.82	0.81	1.2	0.43	0.44	2.3
	Selenium (Se)	0.0000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.020	0.49	0.49	0	0.74	0.74	0	0.37	0.37	0
	Silver (Ag)	0.000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	0.74300	0.73400	1.2	2.04	2.05	0.5	0.74600	0.76000	1.9
	Strontium (Sr)	0.00020	0.00467	0.00449	3.9	0.00962	0.00968	0.6	0.00393	0.00391	0.5
	Thallium (Tl)	0.000030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.0003	<0.010	<0.010	**0**	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0005	0.000379	0.000382	0.8	0.00133	0.00138	3.7	0.00029	0.000294	1.4
	Vanadium (V)	0.0005	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.003	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
Other	Phenols (4AAP)	0.00100	<0.0010	<0.0010	0	<0.0010	0.0018	57	<0.0010	<0.0010	0
	Chlorophyll a	0.01000	0.25	0.24	4.1	1.05	1.11	5.6	0.84	0.67	23
	Phaeophytin a	0.01000	0.37	0.33	11	0.53	0.57	7.3	1.2	<1.0	18

Figure A.4: Water Sample Field Duplicate Results Indicating, in Highlight, Parameter Values Not Meeting the DQO of ≤ 25% RPD.

	Sample ID	Lowest Detection Limit	BL0-06-S	BL0-06-S01	RPD	DL0-01-1-S	DL0-01-1-S01	RPD	DL0-01-1-S	DL0-01-1-S01	RPD
	Date Sampled		29-Aug-17	29-Aug-17		22-Jul-17	22-Jul-17		26-Aug-17	26-Aug-17	
	ALS Sample ID		L1984252-10	L1984252-13		L1963242-4	L1963242-5		L1984374-6	L1984374-7	
Physical	Conductivity	3.0	65.3	65.5	0.3	131.0	133.0	1.5	132.0	132.0	0
	pH	10	7.72	7.73	0.1	7.87	7.83	0.5	8	8	0
	Total Suspended Solids	2.0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids	10	22	34	43	67	63	6.2	72	57	23
	Turbidity	0.10	1.30	1.28	1.6	1.33	1.28	**3.8**	0.74	0.20	115
Anions and Nutrients	Alkalinity, Total (as $CaCO_3$)	0.020	28	27.000	3.6	56	56	0	60	61	1.7
	Ammonia, Total (as N)	0.020	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	0.055	93
	Bromide (Br)	0.0050	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.15	1.53	1.74	13	3.19	3.1	2.9	2.99	3.02	1.0
	Nitrate and Nitrite as N	0.021	<0.021	<0.021	0	0.032	0.032	0	0.025	0.024	4.1
	Nitrate (as N)	1.0	<0.020	<0.020	0	0.032	0.032	0	0.025	0.024	4.1
	Nitrite (as N)	1.0	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen	0.0030	<0.15	<0.15	0	<0.15	<0.15	0	0.1700	0.2200	26
	Phosphorus, Total	0.0010	0.0035	0.0040	13	0.0088	0.0042	71	0.0051	0.0032	46
	Sulfate (SO4)	0.10	1.03	1.03	0	4.53	4.51	0.4	5.1	5.15	1.0
	Dissolved Organic Carbon	0.30	1.20	1.20	0	1.70	1.70	0	1.60	1.70	6.1
	Total Organic Carbon	0.0030	1.200	1.300	8.0	1.7000	1.7000	**0**	1.600	1.600	0
Total Metals	Aluminum (Al)	0.00010	0.0467	0.0503	7.4	0.0148	0.0145	2.0	0.0092	0.0087	5.6
	Antimony (Sb)	0.000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000050	0.00416	0.00398	4.4	0.00629	0.00618	1.8	0.0064	0.00629	1.7
	Beryllium (Be)	0.010	<0.00050	<0.00050	0	<0.00010	<0.00010	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000010	<0.00050	<0.00050	0	<0.000050	<0.000050	0	<0.00050	<0.00050	0
	Boron (B)	0.050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.00050	6.16	6.08	1.3	11.9	11.9	0	12.4	12.4	0
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.000050	0.000600	0.000530	12	0.0018	<0.0010	57	0.000790	0.000820	3.7
	Iron (Fe)	0.0010	0.036	0.033	8.7	<0.050	<0.050	0	<0.030	<0.030	0
	Lead (Pb)	0.050	<0.000050	<0.000050	0	0.00	0.00	16	<0.000050	<0.000050	0
	Lithium (Li)	0.000070	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.00120	0.00130	8.0
	Magnesium (Mg)	0.000010	3.8	3.67	3.5	7.28	7.32	0.5	7.95	8.04	1.1
	Manganese (Mn)	0.000050	0.001170	0.001210	3.4	0.004450	0.004460	0.2	0.001510	0.001570	3.9
	Mercury (Hg)	0.00050	<0.000010	<0.000010	0	0.000022	<0.000010	75	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00012	0.00010	13	0.000775	0.000779	0.5	0.000744	0.000751	0.9
	Nickel (Ni)	0.050	<0.00050	<0.00050	0	0.00	0.00	22	0.00	0.00	0
	Potassium (K)	0.000050	0.53	0.53	0	1.09	1.08	0.9	1.14	1.14	0
	Selenium (Se)	0.000010	<0.0010	<0.0010	0	<0.000050	<0.000050	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.500	0.490	2.0	0.550	0.540	1.8	0.430	0.420	2.4
	Silver (Ag)	0.00010	<0.000010	<0.000010	0	<0.000050	<0.000050	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	0.83900	0.82700	1.4	1.34000	1.38000	2.9	1.33000	1.33000	0
	Strontium (Sr)	0.00020	0.00502	0.00498	0.8	0.00820	0.00830	1.2	0.00808	0.00809	0.1
	Thallium (Tl)	0.00010	<0.00010	<0.00010	0	<0.000010	<0.000010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	0.0009	0.001	11	<0.00010	<0.00010	0
	Titanium (Ti)	0.000010	<0.010	<0.010	0	0.000650	0.000750	14	<0.010	<0.010	0
	Uranium (U)	0.0030	0.000377	0.000372	1.3	0.000921	0.000895	2.9	0.000829	0.000812	2.1
	Vanadium (V)	0.00030	<0.0010	<0.0010	0	<0.00050	<0.00050	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.00050	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.000020				<0.00030	<0.00030	0			
Dissolved Metals	Aluminum (Al)	0.000030	0.00840	0.00880	4.7	0.00350	0.00320	9.0	<0.0030	<0.0030	0
	Antimony (Sb)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.0050	0.00376	0.00374	0.5	0.006	0.00619	3.1	0.00637	0.00632	0.8
	Beryllium (Be)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.020	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.000010	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.00010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.0000050	6.07	5.96	1.8	12.2	12.2	0	12	12	0
	Chromium (Cr)	0.0010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000090	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	<0.00050	0.00051	2.0	0.00077	0.00076	1.3	0.00075	0.00078	3.9
	Iron (Fe)	0.0050	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.00007	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00001	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.0011	0.0011	0
	Magnesium (Mg)	0.00005	3.650000	3.690000	1.1	7.840000	7.680000	2.1	7.600000	7.890000	3.7
	Manganese (Mn)	0.00009	0.000249	0.000271	8.5	0.000202	0.000215	6.2	0.000106	0.000099	6.8
	Mercury (Hg)	0.00001	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00	0.00	8.9	0.00	0.00	3.0	0.00	0.00	0.4
	Nickel (Ni)	0.00020	<0.00050	<0.00050	0	0.00	0.00	4.6	0.00	0.00	5.5
	Potassium (K)	0.000040	0.5	0.51	2.0	1.16	1.12	3.5	1.14	1.15	0.9
	Selenium (Se)	0.0000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.020	0.390	0.400	2.5	0.530	0.510	3.8	0.390	0.380	2.6
	Silver (Ag)	0.000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	0.81400	0.82700	1.6	1.48000	1.41000	4.8	1.30000	1.31000	0.8
	Strontium (Sr)	0.00020	0.00491	0.00483	1.6	0.00799	0.00799	0	0.00790	0.00784	0.8
	Thallium (Tl)	0.000030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	0.00069	0.00022	103	<0.00010	<0.00010	0
	Titanium (Ti)	0.0003	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0005	0.000357	0.0004	0.8	0.000866	0.000865	0.1	0.000831	0.000836	0.6
	Vanadium (V)	0.0005	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.003	<0.0030	<0.0030	0	<0.0030	<0.0030	0	0.0075	<0.0030	86
Other	Phenols (4AAP)	0.00100	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.0017	0.0029	52
	Chlorophyll a	0.01000	0.75	0.6200	19	0.99	1.2	19	1.42	1.58	11
	Phaeophytin a	0.01000	0.72	0.6400	12	0.77	0.87	12	0.6	0.67	11

Figure A.4: Water Sample Field Duplicate Results Indicating, in Highlight, Parameter Values Not Meeting the DQO of ≤ 25% RPD.

	Sample ID	Lowest Detection Limit	REF3-02-B	REF3-02-B01	RPD	DL0-02-4-S	DL0-02-401	RPD	JL0-01-B	JL0-0101	RPD
	Date Sampled		12-Aug-17	12-Aug-17		13-Apr-17	13-Apr-17		14-Apr-17	14-Apr-17	
	ALS Sample ID		L1974112-2	L1974112-3		L1913376-1	L1913376-2		L1914229-9	L1914229-10	
Physical	Conductivity	3.0	76	76	0	160	159	0.6	153	156	1.9
	pH	10	7.66	7.71	0.7	7.57	7.59	0.3	7.71	7.69	0.3
	Total Suspended Solids	2.0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids	10	42	32	27	74	71	4.1	84	84	0
	Turbidity	0.10	0.39	0.43	9.8	0.24	0.30	22	0.12	0.13	8.0
Anions and Nutrients	Alkalinity, Total (as $CaCO_3$)	0.020	35.000	35.000	0	76	76	0	68	72.000	5.7
	Ammonia, Total (as N)	0.020	0.049	0.077	44	<0.020	<0.020	0	<0.020	<0.020	0
	Bromide (Br)	0.0050	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.15	1.26	1.25	0.8	3.32	3.32	0	4.21	4.21	0
	Nitrate and Nitrite as N	0.021	<0.021	<0.021	0	<0.021	<0.021	0	0.023	0.023	0
	Nitrate (as N)	1.0	<0.020	<0.020	0	<0.020	<0.020	0	0.023	0.023	0
	Nitrite (as N)	1.0	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen	0.0030	<0.15	<0.15	0	0.3000	0.16	61	<0.15	<0.15	0
	Phosphorus, Total	0.0010	0.0046	0.0034	30	0.0040	0.0034	16	0.0030	0.0030	0
	Sulfate (SO4)	0.10	3.93	3.87	1.5	3.6	3.62	0.6	2.5	2.5	0
	Dissolved Organic Carbon	0.30	3.10	3.00	3.3	1.70	1.90	11	1.90	1.90	0
	Total Organic Carbon	0.0030	3.0000	2.9000	3.4	1.9000	1.9000	0	1.800	1.800	0
Total Metals	Aluminum (Al)	0.00010	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Antimony (Sb)	0.000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000050	0.00648	0.00602	7.4	0.00778	0.00805	3.4	0.00778	0.0074	5.0
	Beryllium (Be)	0.010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.00050	6.99	6.86	1.9	16.2	15.7	3.1	15.9	15.8	0.6
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.000050	0.0009	0.00082	9.3	0.00086	0.00093	7.8	0.00096	0.00097	1.0
	Iron (Fe)	0.0010	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.050	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.000070	<0.0010	<0.0010	0	0.00100	<0.0010	**0**	0.00110	0.00110	0
	Magnesium (Mg)	0.000010	4.33	4.26	1.6	9.94	10.4	4.5	9.79	9.32	4.9
	Manganese (Mn)	0.000050	0.000613	0.000565	8.1	0.001500	0.001460	2.7	0.000457	0.000474	3.7
	Mercury (Hg)	0.00050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00014	0.00014	2.9	0.00064	0.00063	1.7	0.000321	0.000309	3.8
	Nickel (Ni)	0.050	<0.00050	<0.00050	0	0.00	0.00	5.6	0.001	0.001	2.8
	Potassium (K)	0.000050	0.91	0.85	6.8	1.32	1.32	0	1.34	1.33	0.7
	Selenium (Se)	0.000010	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.43	0.42	2.4	0.63	0.64	1.6	0.47	0.46	2.2
	Silver (Ag)	0.00010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	0.89300	0.81900	8.6	1.74000	1.78000	2.3	1.85	1.80	2.7
	Strontium (Sr)	0.00020	0.00798	0.00786	1.5	0.01110	0.01070	3.7	0.0125	0.0118	5.8
	Thallium (Tl)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	0.00029	0.00045	43	0.00018	<0.00010	57
	Titanium (Ti)	0.000010	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0030	0.000258	0.000257	0.4	0.00097	0.000967	0.3	0.0009	0.000897	4.9
	Vanadium (V)	0.00030	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.00050	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.000020									
Dissolved Metals	Aluminum (Al)	0.000030	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Antimony (Sb)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.0050	0.00642	0.00644	0.3	0.0079	0.00793	0.4	0.00727	0.00744	2.3
	Beryllium (Be)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.020	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.000010	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.00010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.0000050	6.9	7.06	2.3	15.7	15.2	3.2	15.5	15	3.3
	Chromium (Cr)	0.0010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000090	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.0008	0.0009	11	0.0009	0.0008	11	0.00084	0.00085	1.2
	Iron (Fe)	0.0050	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.00007	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00001	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.0012	0.0013	8.0
	Magnesium (Mg)	0.00005	4.340000	4.480000	3.2	9.640000	9.710000	0.7	9.680000	9.580000	1.0
	Manganese (Mn)	0.00009	0.00015	0.00012	20	0.00048	0.00047	2.7	0.000205	0.000179	14
	Mercury (Hg)	0.00001	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00	0.00	0.7	0.00	0.00	1.6	0.00	0.00	1.6
	Nickel (Ni)	0.00020	<0.00050	<0.00050	0	0.00	0.00	1.4	0.00	0.00	2.9
	Potassium (K)	0.000040	0.92	0.92	0	1.24	1.29	4.0	1.3	1.31	0.8
	Selenium (Se)	0.0000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.020	0.42	0.43	2.4	0.61	0.63	3.2	0.47	0.48	2.1
	Silver (Ag)	0.000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	0.88800	0.89400	0.7	1.68000	1.71000	1.8	1.80000	1.77000	1.7
	Strontium (Sr)	0.00020	0.00788	0.00802	1.8	0.01030	0.01080	4.7	0.01180	0.01170	0.9
	Thallium (Tl)	0.000030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	0.00158	0.00114	32	<0.00010	0.00132	172
	Titanium (Ti)	0.0003	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0005	0.000257	0.000257	0	0.00097	0.000992	2.2	0.000891	0.000914	2.5
	Vanadium (V)	0.0005	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.003	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
Other	Phenols (4AAP)	0.00100	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.0012	0.001	18
	Chlorophyll a	0.01000	0.88	0.88	0	1.12	1.04	7.4	0.16	0.14	13
	Phaeophytin a	0.01000	0.64	0.6	6.5	0.85	0.64	28	0.17	0.21	21

Figure A.4: Water Sample Field Duplicate Results Indicating, in Highlight, Parameter Values Not Meeting the DQO of ≤ 25% RPD.

	Sample ID	Lowest Detection Limit	JL0-01-B	JL0-01-B01	RPD	REF3-01-S	REF3-01-S01	RPD	REF3-01-S	REF3-01-S01	RPD
	Date Sampled		26-Aug-17	26-Aug-17		12-Aug-17	12-Aug-17		2-Sep-17	2-Sep-17	
	ALS Sample ID		L1984374-10	L1984374-11		L1974112-4	L1974112-5		L1987563-1	L1987563-7	
Physical	Conductivity	3.0	140	140	0	76	76	0	76.3	76.6	0.4
	pH	10	8.05	8.05	0	7.84	7.75	1.2	7.81	7.75	0.8
	Total Suspended Solids	2.0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids	10	59	69	16	27	46	52	39	29	29
	Turbidity	0.10	0.6	0.5	20	0.4	0.3	41	0.36	2.07	141
Anions and Nutrients	Alkalinity, Total (as $CaCO_3$)	0.020	66	66	0	34	32	6.1	29	29	0
	Ammonia, Total (as N)	0.020	<0.020	<0.020	0	<0.020	0.055	93	<0.020	<0.020	0
	Bromide (Br)	0.0050	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.15	3.04	3.59	17	1.25	1.22	2.4	1.28	1.3	1.6
	Nitrate and Nitrite as N	0.021	<0.021	<0.021	0	<0.021	<0.021	0	<0.021	<0.021	0
	Nitrate (as N)	1.0	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrite (as N)	1.0	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen	0.0030	<0.15	<0.15	0	<0.15	<0.15	0	<0.15	<0.15	0
	Phosphorus, Total	0.0010	0.0094	0.0048	65	0.0051	0.0224	126	0.0036	<0.0030	18
	Sulfate (SO4)	0.10	2.29	2.84	21	3.9	3.74	4.2	3.97	4	0.8
	Dissolved Organic Carbon	0.30	1.70	1.90	11	3.20	3.00	6.5	2.60	2.70	3.8
	Total Organic Carbon	0.0030	1.700	1.700	0	3.100	3.000	3.3	2.8000	2.8000	0
Total Metals	Aluminum (Al)	0.00010	0.00470	0.00470	0	0.00330	<0.0030	9.5	0.0048	<0.0030	46
	Antimony (Sb)	0.000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.00010	<0.00010	<0.00010	0	0.00012	<0.00010	18	<0.00010	<0.00010	0
	Barium (Ba)	0.000050	0.0064	0.00656	2.5	0.00642	0.00626	2.5	0.00636	0.00632	0.6
	Beryllium (Be)	0.010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.00050	13.30000	13.40000	0.7	7.13000	7.04000	1.3	6.88	6.97	1.3
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.000050	0.00086	0.00083	3.6	0.00099	0.00081	20	0.000860	0.00073	16
	Iron (Fe)	0.0010	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.050	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.000070	0.00130	0.00140	7.4	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.000010	8.48	8.35	1.5	4.47	4.39	1.8	4.43	4.28	3.4
	Manganese (Mn)	0.000050	0.001590	0.001570	1.3	0.000599	0.000641	6.8	0.000739	0.000593	22
	Mercury (Hg)	0.00050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.000305	0.000292	4.4	0.000147	0.000145	1.4	0.000129	0.000117	9.8
	Nickel (Ni)	0.050	0.00	0.00	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000050	1.11	1.12	0.9	0.94	0.92	2.2	0.9	0.84	6.9
	Selenium (Se)	0.000010	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.32	0.32	0	0.40	0.40	0	0.41	0.40	2.5
	Silver (Ag)	0.00010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	1.38	1.40	1.4	0.92	0.86	6.3	0.86800	0.85700	1.3
	Strontium (Sr)	0.00020	0.0101	0.0101	0	0.00806	0.00796	1.2	0.00768	0.00795	3.5
	Thallium (Tl)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.000010	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0030	0.000694	0.000696	0.3	0.000267	0.000272	1.9	0.000255	0.00025	2.0
	Vanadium (V)	0.00030	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.00050	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.000020									
Dissolved Metals	Aluminum (Al)	0.000030	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Antimony (Sb)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.0050	0.00636	0.00653	2.6	0.00642	0.00633	1.4	0.00651	0.00625	4.1
	Beryllium (Be)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.020	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.000010	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.00010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.0000050	13.2	13.3	0.8	7.06	7.01	0.7	6.89	6.87	0.3
	Chromium (Cr)	0.0010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000090	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00076	0.00078	2.6	0.00079	0.0008	1.3	0.00089	0.00081	9.4
	Iron (Fe)	0.0050	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.00007	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00001	0.0013	0.0013	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.00005	8.220000	8.290000	0.8	4.390000	4.390000	0	4.200000	4.230000	0.7
	Manganese (Mn)	0.00009	0.000169	0.000158	6.7	0.000258	0.000245	5.2	0.000269	0.000207	26
	Mercury (Hg)	0.00001	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.050	0.00	0.00	4.1	0.00	0.00	2.8	0.00	0.00	5.4
	Nickel (Ni)	0.00020	0.00	0.00	14	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Potassium (K)	0.000040	1.11	1.11	0	0.93	0.93	0	0.86	0.85	1.2
	Selenium (Se)	0.0000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.020	0.32	0.31	3.2	0.40	0.40	0	0.40	0.40	0
	Silver (Ag)	0.000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.50	1.3800	1.3900	0.7	0.8890	0.8890	0	0.88000	0.86900	1.3
	Strontium (Sr)	0.00020	0.0099	0.0100	1.0	0.0079	0.0080	0.1	0.00786	0.00781	0.6
	Thallium (Tl)	0.000030	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.0003	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Uranium (U)	0.0005	0.000705	0.000706	0.1	0.000262	0.000273	4.1	0.000255	0.00025	2.0
	Vanadium (V)	0.0005	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.003	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
Other	Phenols (4AAP)	0.00100	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.0024	0.0017	34
	Chlorophyll a	0.01000	1.4	1.49	6.2	0.61	0.54	12	0.93	0.89	4.4
	Phaeophytin a	0.01000	0.66	0.64	3.1	0.52	0.47	10	0.44	0.7	46

Figure A.5: Sediment Sample Field Duplicate Comparisons Indicating, in Highlight, Values Mot Meeting the DQO of≤ 40% Relative Percent Difference (RPD)

Parameter	Lowest Detection Limit	Units	REF-03-10	REF-03-DUP	% RPD	JLO-01	JLO-DUP	% RPD	DLO-01-02	DLO-01-DUP	% RPD	BLO-04	BLO-DUP	% RPD
			24-Aug-2017	24-Aug-2017		20-Aug-2017	20-Aug-2017		25-Aug-2017	25-Aug-2017		26-Aug-2017	26-Aug-2017	
Total Organic Carbon	0.10	%	4.20	4.39	4	1.28	1.41	10	1.23	1.29	4	0.67	0.64	5
Aluminum (Al)	50	µg/g	21,900	22,450	2	16,400	17,100	4	19,000	19,600	3	18,400	18,800	2
Antimony (Sb)	0.10	µg/g	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
Arsenic (As)	0.10	µg/g	4.56	4.69	3	4.6	4.8	5	3.95	4.25	7	2.47	2.50	1
Barium (Ba)	0.50	µg/g	137	140	2	72.0	75	5	127.0	139.0	9	78.3	79.5	1
Beryllium (Be)	0.10	µg/g	0.86	0.87	1	0.89	0.93	4	0.91	0.94	3	0.85	0.87	2
Bismuth (Bi)	0.20	µg/g	<0.20	<0.20	0	0.24	0.26	6	0.21	0.22	2	<0.20	<0.20	0
Boron (B)	5.0	µg/g	17.1	17.8	4	21.7	22.1	2	24.6	26.2	6	23.8	25.2	6
Cadmium (Cd)	0.020	µg/g	0.165	0.161	3	0.141	0.155	9	0.247	0.261	6	0.108	0.114	5
Calcium (Ca)	50	µg/g	5,470	5,555	2	3,820	4,005	5	4,880	4,950	1	4,130	4,165	1
Chromium (Cr)	0.50	µg/g	70.6	72.2	2	69.4	73.0	5	77.4	78.9	2	70.0	71.2	2
Cobalt (Co)	0.10	µg/g	16.0	16.2	1	17.7	18.3	3	15.9	16.6	4	13.0	13.2	1
Copper (Cu)	0.50	µg/g	88.7	89.5	1	44.1	45.5	3	41.0	42.4	3	25.3	25.7	2
Iron (Fe)	50	µg/g	46,600	47,100	1	31,900	33,200	4	39,300	41,950	7	32,300	33,000	2
Lead (Pb)	0.50	µg/g	16.9	17.3	2	19.4	20.1	3	19.2	19.6	2	16.7	16.9	1
Lithium (Li)	2.0	µg/g	34.5	35.4	2	29.8	30.9	4	32.4	33.3	3	32.9	33.8	3
Magnesium (Mg)	20	µg/g	14,700	14,900	1	12,700	13,350	5	13,300	13,550	2	12,900	13,200	2
Manganese (Mn)	1.0	µg/g	1,130	1,130	0	928	984	6	10,200	9,805	4	603	559	8
Mercury (Hg)	0.0050	µg/g	0.0562	0.0599	6	0.0302	0.0326	7	0.0319	0.0342	7	0.0362	0.0347	4
Molybdenum (Mo)	0.10	µg/g	2.37	2.41	1	0.73	0.78	6	7.53	8.67	14	0.63	0.62	2
Nickel (Ni)	0.50	µg/g	48.5	49.3	2	62.2	66	6	67.3	69.3	3	47.2	47.7	1
Phosphorus (P)	50	µg/g	1,020	1,060	4	944	972	3	873	934	7	746	759	2
Potassium (K)	100	µg/g	5,640	5,750	2	4,490	4,630	3	4,890	5,105	4	4,890	4,995	2
Selenium (Se)	0.20	µg/g	0.66	0.71	7	0.23	0.27	14	0.28	0.34	19	<0.20	<0.20	0
Silver (Ag)	0.10	µg/g	0.21	0.22	5	0.11	0.12	4	0.14	0.14	0	0.12	0.12	0
Sodium (Na)	50	µg/g	415	431	4	188	198	5	276	287	4	319	332	4
Strontium (Sr)	0.50	µg/g	12.6	13.1	4	11.1	11.2	1	10.8	11.1	3	11.4	11.7	2
Sulfur (S)	5000	µg/g	1000	1050	0	<1000	<1,000	0	<1000	<1,000	0	<1000	<1,000	0
Thallium (Tl)	0.050	µg/g	0.665	0.676	2	0.462	0.490	6	0.553	0.581	5	0.406	0.412	1
Tin (Sn)	2.0	µg/g	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
Titanium (Ti)	1.0	µg/g	1,220	1,265	4	829	868	5	1,170	1,220	4	1,390	1,405	1
Uranium (U)	0.050	µg/g	24.3	24.1	1	4.51	4.77	5	6.30	6.50	3	6.49	6.50	0
Vanadium (V)	0.20	µg/g	65.9	67.2	2	59.5	61.8	4	56.9	59.0	4	54.4	55.0	1
Zinc (Zn)	2.0	µg/g	90.6	92.1	2	54.3	56.4	4	65.9	67.6	3	60.7	61.4	1
Zirconium (Zr)	1.0	µg/g	3.2	3.2	2	4.9	5.0	2	7.0	6.8	4	19.8	20.1	1

Table A.6: Subsampling Error for Benthic Invertebrate Community Samples, 2017 CREMP

a) Lotic (creek and river) samples

Station	Whole Organisms	No. of Organisms in Fraction 1	No. of Organisms in Fraction 2	No. of Organisms in Fraction 3	No. of Organisms in Fraction 4	Actual Density*	Precision		Accuracy	
							% range		min	max
CLT1-US-B2	22	151	178	-	-	329	15.2	-	8.2	-
CLT1-US-B5	11	165	178	-	-	343	7.3	-	3.8	-
SDLT9-B1	-	174	204	-	-	378	14.7	-	7.9	-

b) Lentic (lake) samples

Station	Whole Organisms	Number of Organisms in Fraction 1	Number of Organisms in Fraction 2	Number of Organisms in Fraction 3	Number of Organisms in Fraction 4	Actual Density*	Precision		Accuracy	
							% range		min	max
DLO-02-9	-	111	111	140	142	504	0.0	21.8	11.9	12.7
DL0-02-12	-	215	249			464	13.7	-	7.3	-
DL0-02-03	-	91	93	102	134	420	2.2	32.1	2.9	27.6

* whole large organisms excluded in calculations.
min = minimum absolute % error. max = maximum absolute % error.

Table A.7: Percent Recovery from Benthic Invertebrate Samples, Mary River Project CREMP, 2017

(a) Lotic (creek and river) samples

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
CLT2-US-B4	67	70	95.7%
CLT2-DS-B2	114	122	93.4%
REF-CRK-B5	263	274	96.0%
SDLT9-B3	405	418	96.9%
SDLT12-B1	196	197	99.5%
CO-05-B1	96	100	96.0%
EO-01-B4	33	33	100.0%
GO-03-B3	115	116	99.1%
		Average % Recovery	**97.1%**

b) Lentic (lake) samples

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
REF-03-2	149	152	98.0%
BLO-11	84	84	100.0%
DLO-01-14	168	169	99.4%
DLO-02-10	328	329	99.7%
JLO-16	70	74	94.6%
		Average % Recovery	**98.3%**

Table A.8: Proportion of Benthic Invertebrates Samples Sorted for the 2017 CREMP

(a) Lotic (creek and river) samples **b) Lentic (lake) samples**

Station	Fraction Sorted (500 um)	Station	Fraction Sorted (500 um)	Station	Fraction Sorted (500 um)	Station	Fraction Sorted (500 um)	Station	Fraction Sorted (500 um)
CLT1-US-B3	1/2	SDLT1-B1	1/8	SDLT12-B1	1/2	DLO-01-9	1/ 4	DLO-02-13	1/ 2
CLT1-US-B4	1/2	SDLT1-B3	1/2	REF-03-2	1/2	DLO-01-10	1/ 2	JLO-2	1/ 4
CLT1-DS-B2	1/4	SDLT1-B4	1/2	BLO-1	1/2	DLO-01-11	1/ 2	JLO-11	1/ 2
CLT1-DS-B3	1/2	SDLT9-B2	1/4	BLO-5	1/4	DLO-02-2	1/ 2	JLO-16	1/ 4
CLT1-DS-B5	1/4	SDLT9-B3	1/4	BLO-11	1/4	DLO-02-4	1/ 2	JLO-18	1/ 4
REF-CRK-B2	1/4	SDLT9-B4	1/2	DLO-01-3	1/4	DLO-02-10	1/ 2	JLO-20	1/ 4
REF-CRK-B3	1/2	SDLT9-B5	1/2	DLO-01-4	1/4	DLO-02-11	1/ 2	JLO-21	1/ 2

Notes: Any samples not listed were sorted in their entirety (total of 68 lotic samples and 50 lenthc samples for the program)

QA/QC Notes: Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group. Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group.

APPENDIX B

REFERENCE AREA DESCRIPTIVE OVERVIEW

APPENDIX B OVERVIEW OF REFERENCE CONDITIONS

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B1 INTRODUCTION

The initial review of background (reference) data collected from lotic (i.e., creeks and rivers) and lentic (i.e., lakes) study areas as part of the 2015 Mary River Project CREMP revealed naturally elevated metal concentrations above guidelines and significant differences in benthic community endpoints between reference lake littoral and profundal stations (Minnow 2016a). Therefore, this overview of reference conditions is included to provide context and perspective regarding water quality, sediment quality, phytoplankton (chlorophyll-a), benthic invertebrate community, and fish population characteristics at the CREMP reference study areas. Key implications of reference area features towards the evaluation of potential mine-related effects at mine-exposed water bodies as part of the CREMP are also identified as part of this reference area overview.

B2 HABITAT

B2.1 Creek/Tributary Environments

Four reference creek/tributary (reference creek) stations were established among two unnamed tributaries to Angajurjualuk Lake (Stations CLT-REF4, MRY-REF2 and MRY-REF3) and one unnamed tributary to the Mary River (Station CLT-REF3) during the Mary River Project CREMP in 2014 (see Figure 2.2). These stations were intended to provide reference information for the creek water quality and phytoplankton monitoring components of the CREMP, and have been used as such in the three studies conducted since commercial mine operations commenced at the Mary River Project (i.e., 2015, 2016, and 2017; see Table 2.1). In 2016 and 2017, habitat conditions at the western tributary to Angajurjualuk Lake that is used for Baffinland CREMP water quality monitoring (Stations CLT-REF4 and MRY-REF) were deemed comparable to habitat conditions at the Camp Lake and Sheardown Lake tributaries. Therefore, this tributary served as a benthic reference creek (REF-CRK) for comparisons involving the various mine-exposed tributaries as part of the 2016 and 2017 CREMP (see Figure 2.4), and herein has been referred to as Unnamed Reference Creek.

The reference creeks/tributaries are moderate gradient lotic systems characterized predominantly by riffle-run and riffle-rapid stream morphology, with pools occurring rarely as dictated by localized topography and associated gradient. The wetted width and depth of the benthic reference tributary averaged 11.1 m and 0.09 m, respectively, during the August survey in 2017 (Appendix Table F.1). The corresponding water velocities across a representative riffle area of the benthic reference tributary ranged from 0.02 – 0.52 m/s in August 2017 (average of 0.28 m/s; Appendix Table F.1). As for most small lotic systems in the region, surface flow at all of the CREMP reference tributaries is limited to months in which average ambient air temperatures are near or above freezing (i.e., June – September). The substrate at the reference tributaries is composed mainly of cobble and large pebble (i.e., 50 – 256 mm diameter), with surficial areas of sand generally limited to less than 10% of stream area (Appendix Table F.1). In-stream vegetation at the reference tributaries is sparse, and generally includes a relatively thin layer of algae/periphyton attached surficially to relatively stable substrate.

B2.2 River Environments

The area of Mary River located upstream of the mine lease property is only minimally influenced by Mary River Project mining activity (i.e., low amounts of dust deposition; see Baffinland 2014). Therefore, this area has been considered representative of background (reference) conditions for the mine-exposed stations/study areas situated farther downstream

on the Mary River under the CREMP (Baffinland 2014; KP 2014a,b, 2015; NSC 2014). Water quality, phytoplankton productivity and benthic invertebrate community (benthic) data collected at the Mary River reference area, referred to as GO-09 (including water quality stations GO-09A, GO-09 and GO-09B), has been used for comparison to data from areas of the Mary River that are potentially influenced by mine activity. Although area GO-03 can also currently serve as a reference area, potential advancement of the Mary River Project to include the Deposit 2 ore body would result in this area becoming a near-field mine-exposed area in the future.

The Mary River reference area is a moderate gradient erosional environment characterized mainly by riffle and run stream morphology (Appendix Table F.50). Depending on flow conditions, average wetted width and average depth of the Mary River reference area has ranged from 30 – 55 m and 0.20 - 0.36 m, respectively, in studies conducted by Minnow during the month of August. On average, the corresponding water velocities across representative riffle areas of the GO-09 benthic study area has ranged from 0.20 – 0.47 m/s during these studies. The substrate at the GO-09 reference area is composed mainly of boulder and cobble, with roughly equal proportion of pebble, gravel, and sand composing the surficial substrate at much of the remaining area (Appendix Table F.50). In-stream vegetation at the Mary River GO-09 reference area is sparse, and generally includes a relatively thin layer of periphyton and/or scarce bryophytes (moss) growth on the upper surface of physically stable substrate.

B2.3 Lake Environments

A geographically expansive reconnaissance survey of local study area (LSA) lakes was conducted in 2014 to identify a waterbody that could potentially serve as a suitable reference area for the mine-exposed lakes (i.e., Camp, Sheardown NW, Sheardown SE, and Mary lakes; NSC 2015b). The key criteria for the selection of the suitable reference lake included a waterbody with similar surface area, maximum water depth, substrate features, and fish species composition as the mine-exposed lakes, in addition to also being uninfluenced by current or past mining activity. Based on the results of this survey, Reference Lake 3 was selected to represent reference conditions for the mine-exposed lakes as part of the 2015 and 2016 Mary River Project CREMP studies (Appendix Table B.1).

Reference Lake 3 is an unnamed lake located approximately 62 km south of the Mary Lake Project (see Figures 2.1 and 2.3), well outside the area of mine influence. Reference Lake 3 is a headwater lake that is characterized by a relatively complex morphology that includes three basins and connection to a separate lake by a short, shallow channel (see Figure 2.3). The three basins reach approximately 15 m, 30 m and 36 m in depth with progression from east to west, and the average depth of Reference Lake 3 is approximately 11.8 m (Appendix Table B.1). The outlet of Reference Lake 3, located off the south-central portion of the lake,

Table B.1: Physical Characteristics for Mine-Exposed Lakes and Reference Lake 3

Lake Feature	Mine-Exposed Lakes				Reference Lake
	Camp	Sheardown NW	Sheardown SE	Mary	Reference Lake 3
Drainage Basin Area (km^2)	26.5	6.6	8.9	663.4	23.2
Lake Area (km^2)	2.21	0.68	0.25	13.6	2.05
Drainage Basin: Lake Area Ratio	11.98	9.66	35.6	48.8	11.32
Mean Depth (m)	13.0	12.1	7.4	-	11.8
Maximum Depth (m)	35.1	30.1	14.8	40.0	38.3
Volume (1,000,000 m^3)	27.5	8.18	1.8	156.4	22.6
Hydraulic Retention Time (days)	416 ± 184	511 ± 213	83 ± 35	75 ± 29	-

drains into a large boulder field through which flow can occur largely as sub-surface drainage. Substrate along the shoreline and shallow littoral areas of Reference Lake 3 is composed mainly of large boulder and cobble that is commonly interrupted by areas of bedrock. Substrate of the deeper littoral and profundal areas of Reference Lake 3 is almost exclusively represented by silt loam containing approximately 15 - 35% fine sand (by dry weight) and a moderate organic carbon content of approximately 5%. No substantial aquatic plant beds have been observed at Reference Lake 3, with fish cover provided predominantly by rocky substrates along the shoreline and shallow littoral zone of the lake.

B3 WATER QUALITY

B3.1 Creek/Tributary Environments

Water chemistry at the reference creek stations met all applicable WQG and AEMP benchmarks for lotic environments in 2017 with the exceptions of total phosphorus and metals including aluminum and iron (Appendix Table B.2). Concentrations of these parameters were particularly elevated at reference creek station MRY-REF-3 in fall 2017, but appeared to be associated with very high turbidity (Appendix Table B.2). Because similar turbidity was not observed among all reference creek stations on the same collection date in August 2017, higher turbidity in these samples, and total aluminum, iron, and phosphorus concentrations associated with this turbidity, likely reflected compromised samples at the time of collection (see Section 6.2).

Water chemistry at the reference creek stations showed distinct seasonal changes in concentrations for some parameters (Appendix Figure B.1; Appendix Table B.2). In general, conventional parameters, ions and total metals were observed at lowest concentrations in spring, with intermediate concentrations in the summer and highest concentrations observed during the fall sampling event in 2017 (Appendix Figure B.1). This pattern almost certainly reflected dilution from snow melt- and precipitation-related sources, with the lowest parameter concentrations typically associated with the spring freshet conditions, and highest parameter concentrations generally associated with low precipitation/streamflow conditions later in the open water season. Previous baseline, 2015, and 2016 water quality monitoring conducted at reference creek stations showed similar seasonal patterns (KP 2014b; Minnow 2016a, 2017). Temporal comparison of mean water chemistry for the reference creek stations showed no substantial changes in water quality from 2014 to 2017, suggesting that water chemistry at the reference creek stations was relatively consistent year-to-year taking seasonal sampling timing into account (Figure 3.2; Appendix Figure C.2). Therefore, the reference creek stations were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on water chemistry at mine-exposed creek/tributary receiving environments taking seasonality into consideration.

B3.2 River Environments

Water chemistry at the Mary River reference stations (GO-09 series) often showed elevated concentrations of total aluminum, and on a single occasion, total chromium, copper, and iron concentrations, compared to WQG and/or applicable AEMP benchmarks in 2017 (Appendix Table B.3). Mary River GO-09 reference station total aluminum and iron concentrations showed strong positive correlations with turbidity in 2017 (r_s of 0.71 and 0.94, respectively).

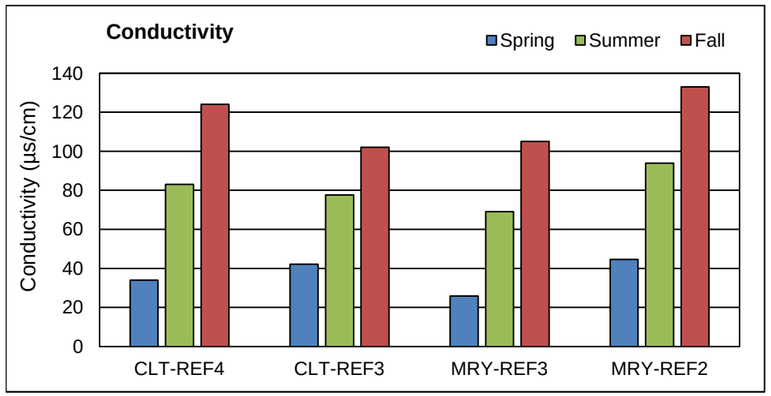
Table B.2: Water Chemistry at Reference Creek Stations, Mary River Project CREMP, 2017

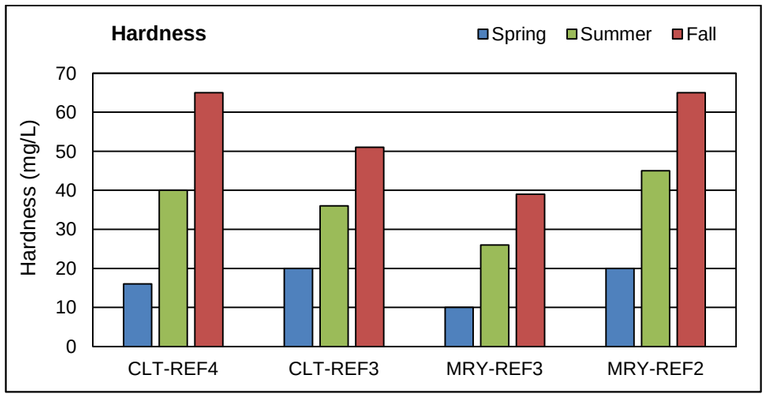
Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark	Spring Sampling Event				Summer Sampling Event				Fall Sampling Event			
					CLT-REF4 8-Jul-2017	CLT-REF3 8-Jul-2017	MRY-REF3 8-Jul-2017	MRY-REF2 8-Jul-2017	CLT-REF4 10-Aug-2017	CLT-REF3 10-Aug-2017	MRY-REF3 10-Aug-2017	MRY-REF2 10-Aug-2017	CLT-REF4 27-Aug-2017	CLT-REF3 27-Aug-2017	MRY-REF3 27-Aug-2017	MRY-REF2 27-Aug-2017
Conventionals[b]	Conductivity (lab)	umho/cm	-	-	34.0	42.2	25.9	44.6	83.0	77.6	69.0	93.9	124	102	105	133
	pH (lab)	pH	6.5 - 9.0	-	7.44	7.53	7.04	7.51	7.90	7.78	7.44	7.90	8.00	7.89	7.69	8.02
	Hardness (as $CaCO_3$)	mg/L	-	-	16	20	<10	20	40	36	26	45	65	51	39	65
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	3.5	2.8	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	10.4	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	16	22	16	23	39	51	35	31	61	44	67	68
	Turbidity	NTU	-	-	1.5	1.0	3.8	1.2	1.2	0.8	5.1	1.1	2.2	1.0	20.1	1.1
	Alkalinity (as $CaCO_3$)	mg/L	-	-	15	19	<10	19	42	41	21	41	64	50	28	67
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.046	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.033	0.095	0.086	0.037
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.16	<0.15	<0.15
	Nitrate and Nitrite (as N)	mg/L	-	-	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	0.033	0.095	0.086	0.037
	Dissolved Organic Carbon	mg/L	-	-	1.29	0.7	1.04	1.3	<1.0	1.5	1	1.5	1.6	1.6	1.4	1.9
	Total Organic Carbon	mg/L	-	-	1.21	1.3	1.2	1.3	<1.0	1.5	<1.0	1.7	1.7	1.7	1.6	1.9
	Total Phosphorus	mg/L	0.020[α]	-	0.0074	0.0042	0.0064	0.0044	0.0040	0.0033	0.0051	<0.0030	0.0044	0.0036	0.0203	<0.0030
	Phenols	mg/L	0.004[α]	-	<0.0010	0.0014	0.0019	0.0018	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	<0.50	<0.50	1.79	0.67	<0.50	<0.50	4.18	1.83	0.57	0.74	6.96	1.78
	Sulphate (SO_4)	mg/L	218[β]	218	<0.30	0.50	2.21	0.41	0.84	1.40	6.75	1.64	1.45	2.27	10.7	2.14
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	0.0434	0.0233	0.1070	0.0186	0.0286	0.0309	0.096	0.0424	0.0688	0.0345	***0.6930***	0.037
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010
	Barium (Ba)	mg/L	-	-	0.00192	0.00273	0.00329	0.00242	0.00348	0.00468	0.00696	0.00574	0.00529	0.00555	0.0129	0.00659
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	-	3.36	4.03	1.99	4.24	8.14	7.30	5.56	9.16	12.9	10.5	8.78	12.5
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00146	<0.00050
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00031	<0.00010
	Copper (Cu)	mg/L	0.002	0.0022	0.0006	0.00076	0.00067	<0.00050	<0.00050	0.00110	0.00124	0.00063	<0.0010	0.00120	0.00190	<0.0010
	Iron (Fe)	mg/L	0.30	0.326	<0.030	<0.030	0.084	<0.030	<0.030	0.030	0.080	<0.030	<0.050	<0.050	***0.739***	<0.050
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	0.000063	0.000094	<0.000050	<0.000050	0.000094	0.000134	<0.000050	0.000066	0.000132	0.000582	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0023	0.0011
	Magnesium (Mg)	mg/L	-	-	1.86	2.44	1.050	2.53	4.61	4.56	2.99	5.43	7.63	6.19	4.67	7.63
	Manganese (Mn)	mg/L	0.935[β]	-	0.000487	0.000410	0.00142	0.000513	0.000185	0.00065	0.00096	0.000589	0.000740	0.00126	0.010400	0.00086
	Mercury (Hg)	mg/L	0.000026	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	<0.000050	0.000181	0.000091	0.000059	0.000147	0.000442	0.000311	0.000161	0.000189	0.000574	0.000407	0.000194
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00058	<0.00050	<0.00050	<0.00050	0.00071	0.00101	<0.00050
	Potassium (K)	mg/L	-	-	0.29	0.36	0.36	0.35	0.45	0.54	0.74	0.64	0.63	0.66	1.17	0.811
	Selenium (Se)	mg/L	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	0.42	0.56	0.55	0.39	0.69	0.83	0.95	0.73	0.94	1.00	2.17	0.930
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	0.261	0.337	0.888	0.487	0.655	0.632	2.31	1.24	0.96	0.860	3.78	1.41
	Strontium (Sr)	mg/L	-	-	0.00253	0.00256	0.00429	0.00311	0.00630	0.00494	0.0124	0.00808	0.0091	0.00660	0.0196	0.0098
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010	<0.000010	0.000018	<0.000010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.00211	0.00061	0.0444	<0.0020
	Tungsten (W)	mg/L	0.030[α]	-									<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)	mg/L	0.015	-	0.000159	0.000229	0.000245	0.000224	0.00179	0.001040	0.000564	0.000947	0.00341	0.00167	0.00143	0.00203
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	0.00148	<0.00050
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)	mg/L	-	-									<0.00030	<0.00030	0.00083	<0.00030

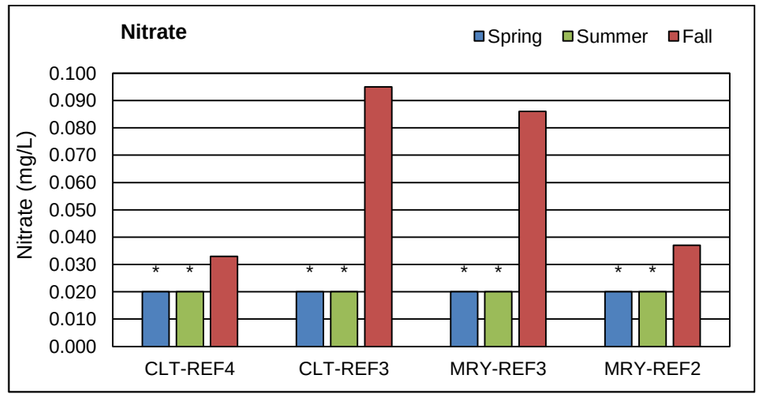
[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

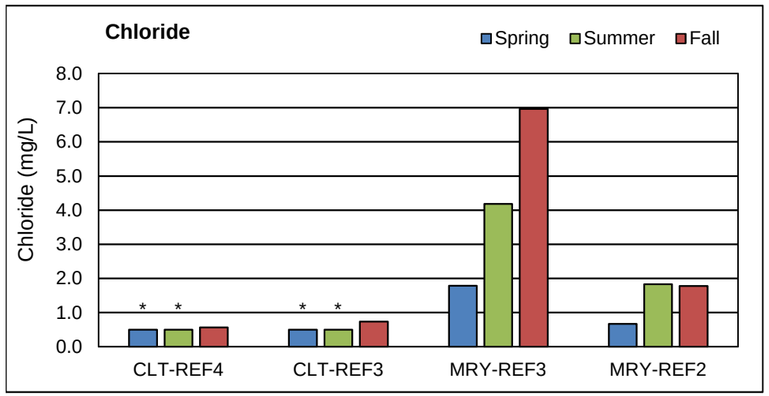
Indicates parameter concentration above applicable Water Qquality Guideline.

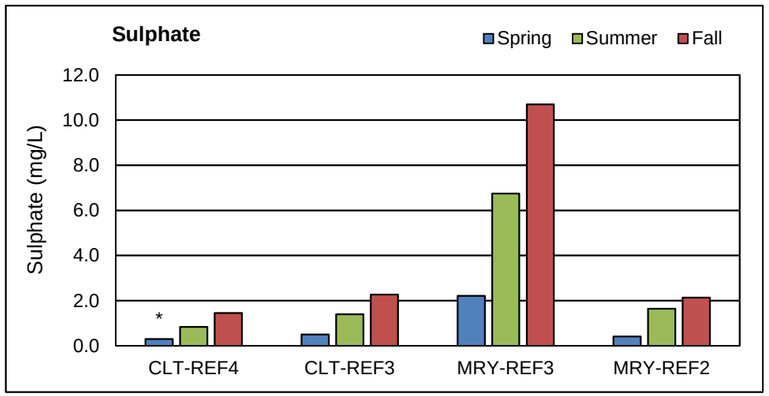
BOLD Indicates parameter concentration above AEMP benchmark applicable to the mine lotic receiving environments.

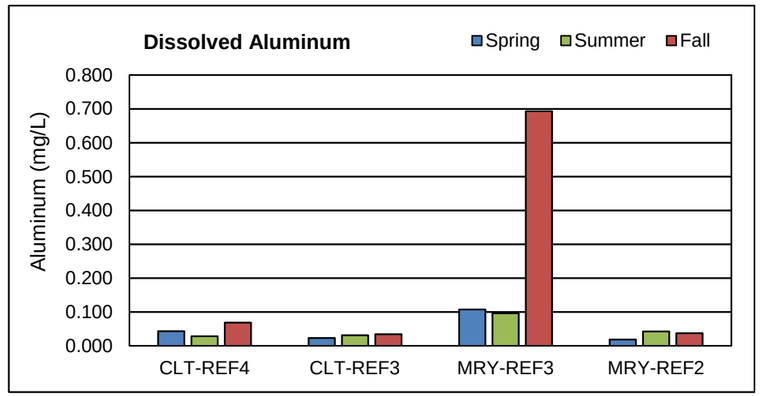


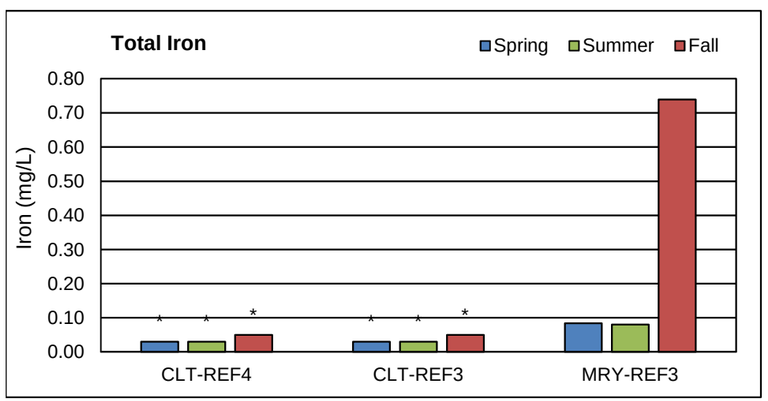


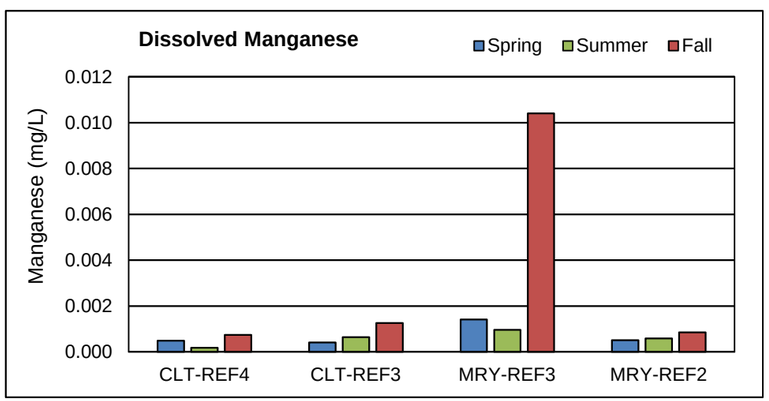












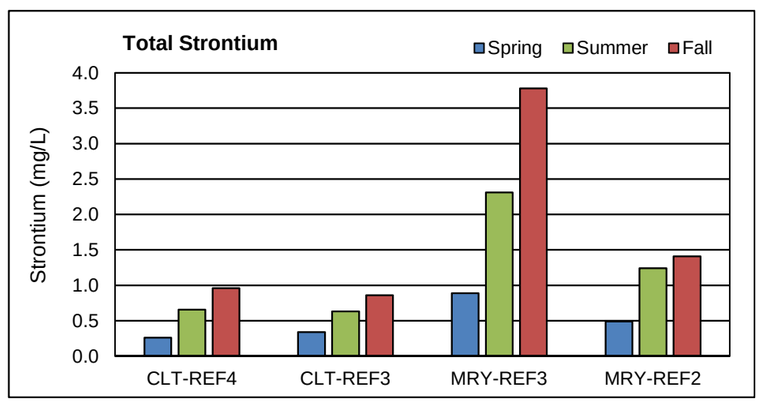


Figure B.1: Seasonal Variation in Water Chemistry at Stream/Tributary Reference Stations, Mary River Project CREMP, 2017.

Note: Asterisk (*) indicates that the parameter concentration was below the laboratory reportable detection limit.

Table B.3: Water Chemistry at Mary River GO-09 Series Reference Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark	Spring Sampling Event			Summer Sampling Event			Fall Sampling Event		
					G0-09-A 8-Jul-2017	G0-09 8-Jul-2017	G0-09-B 8-Jul-2017	G0-09-A 10-Aug-2017	G0-09 10-Aug-2017	G0-09-B 10-Aug-2017	G0-09-A 29-Aug-2017	G0-09 29-Aug-2017	G0-09-B 29-Aug-2017
Conventionals[b]	Conductivity (lab)	umho/cm	-	-	32	29.4	29.2	74.3	77.6	84.6	120	158	138
	pH (lab)	pH	6.5 - 9.0	-	7.41	7.37	7.33	7.81	7.83	7.92	7.93	8.09	8.01
	Hardness (as $CaCO_3$)	mg/L	-	-	15	14	13	33	33	37	52	75.5	62
	Total Suspended Solids (TSS)	mg/L	-	-	4.2	2.5	<2.0	<2.0	<2.0	<2.0	2.3	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	19	14	<10	39	28	40	68	86.5	59
	Turbidity	NTU	-	-	1.74	2.05	3.42	12.5	10.5	8.94	8.29	2.83	5.81
	Alkalinity (as $CaCO_3$)	mg/L	-	-	13	<10	12	34	36	38	48	77	58
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.057	<0.020	0.029
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	0.83	1.41	1.41	<1.0	<1.0	<1.0	1	1.2	1.2
	Total Organic Carbon	mg/L	-	-	1.75	1.35	1.61	<1.0	<1.0	<1.0	<1.0	1.2	1.1
	Total Phosphorus	mg/L	0.020[α]	-	0.0113	0.0092	0.0093	0.0085	0.0082	0.0078	0.0097	0.00445	0.0053
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	0.0012
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	0.51	<0.50	0.55	2.37	2.35	2.49	5.23	2.945	4.6
	Sulphate (SO_4)	mg/L	218[β]	218	<0.30	<0.30	<0.30	1.4	1.3	1.4	3.22	2.505	2.8
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	0.0368	0.0412	0.0838	0.1470	0.163	0.120	***0.186***	0.08655	0.168
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0027	0.00223	0.00287	0.0061	0.0065	0.0065	0.00899	0.00869	0.00901
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	-	3.1	2.96	2.86	7	7	8	10.9	16.15	13.3
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.00050	<0.00050	***0.0209***	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	0.00021	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0022	<0.00050	<0.00050	***0.00673***	0.0009	0.0009	0.0008	0.00142	0.000735	0.00091
	Iron (Fe)	mg/L	0.30	0.326	<0.030	<0.030	***2.16***	0.151	0.153	0.110	0.146	0.052	0.103
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	0.00008	0.00025	0.00020	0.00016	0.000199	0.0000555	0.000119
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	0.0011
	Magnesium (Mg)	mg/L	-	-	1.75	1.55	1.58	4.02	4.06	4.43	6.08	8.99	7.63
	Manganese (Mn)	mg/L	0.935[β]	-	0.00137	0.0017	0.0172	0.00205	0.00192	0.00155	0.0026	0.0007	0.0015
	Mercury (Hg)	mg/L	0.000026	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	<0.000050	<0.000050	0.00369	0.00013	0.00014	0.00014	0.00029	0.00018	0.00024
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	0.00245	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.34	0.28	0.35	0.75	0.75	0.75	1.07	0.935	1.05
	Selenium (Se)	mg/L	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	-	-	0.42	0.35	0.53	0.78	0.89	0.79	1.1	1.185	1.27
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	0.334	0.269	0.364	1.530	1.490	1.560	2.61	1.87	2.46
	Strontium (Sr)	mg/L	-	-	0.00262	0.00214	0.00261	0.008	0.008	0.009	0.0136	0.0131	0.0137
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.015	-	0.000106	0.000085	0.00013	0.0011	0.0011	0.0011	0.00258	0.002695	0.00266
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

Indicates parameter concentration above applicable Water Quality Guideline.

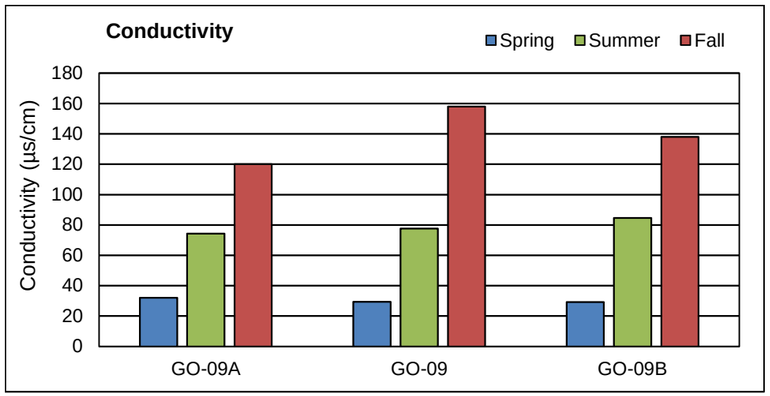
BOLD Indicates parameter concentration above AEMP benchmark applicable to the mine lotic receiving environments.

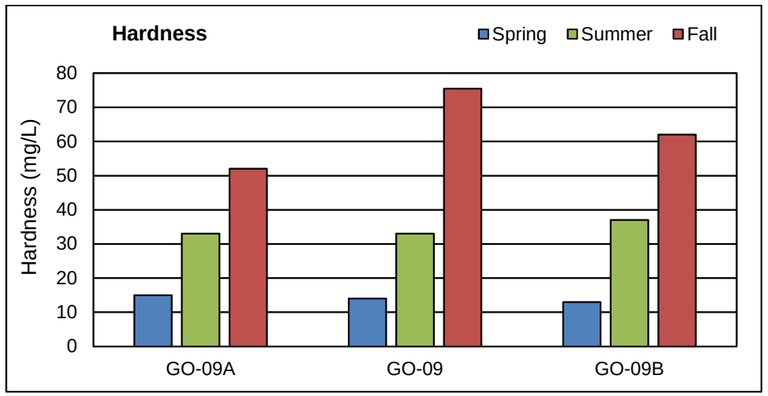
This suggested that total aluminum and iron concentrations were largely associated with suspended particulate matter and that elevation of total aluminum concentrations above WQG reflected naturally turbid conditions. Comparison of the ratio between dissolved and total concentrations of aluminum also indicated a high proportion of these metals was in the total (particulate) fraction in 2017 (i.e., 87%, on average; compare Appendix Tables B.3 and C.64), which can be expected for metals contained in particulate matter.

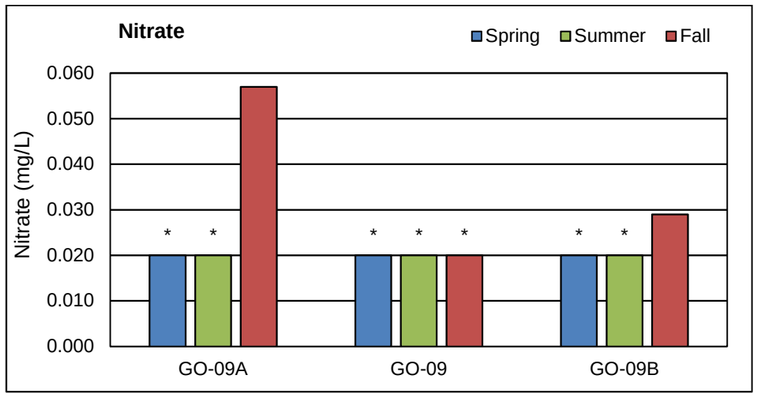
Water chemistry at the Mary River reference stations showed distinct seasonal changes in concentrations of some parameters (Appendix Figure B.2; Appendix Table B.3). These seasonal changes in parameter concentrations were consistent with those observed at the reference creek stations in 2017, and in previous baseline (2005 – 2013), 2015 and 2016 water quality monitoring data collected at the Mary River GO-09 series reference stations (KP 2014b; Minnow 2016a, 2017). The seasonal changes in the Mary River reference station parameter concentrations likely reflected greater dilution during the spring snowmelt period, and consecutively lower precipitation/groundwater inputs during the summer and fall periods. Temporal comparison of the Mary River GO-09 series reference station water chemistry indicated that on average, parameter concentrations in 2017 were within respective ranges observed between the baseline period and previous operating mine conditions based on fall monitoring data (Figure 5.3; Appendix Figure C.22). Therefore, the Mary River reference stations were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on water chemistry at the Mary River mine-exposed study areas.

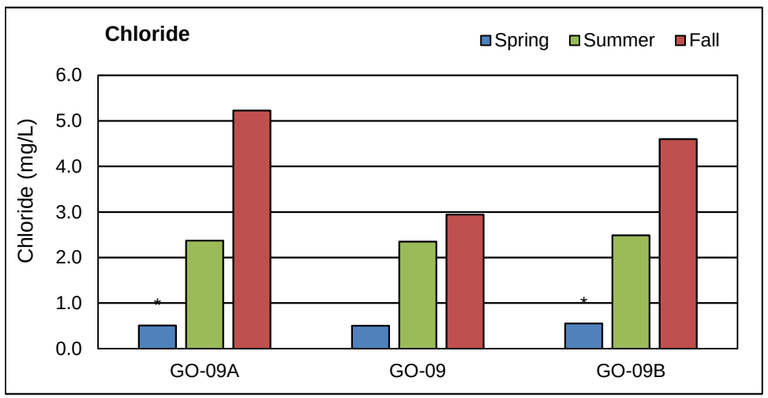
B3.3 Lake Environments (Reference Lake 3)

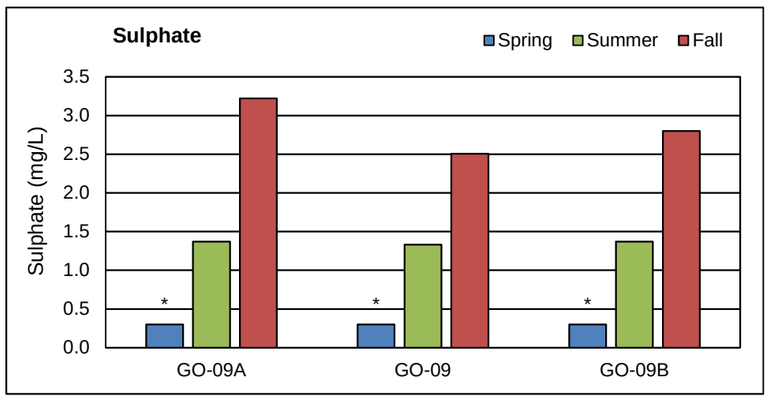
In situ water temperature profiles conducted at Reference Lake 3 indicated a weakly thermally stratified water column in the summer, but no stratification in the fall of 2017 (Appendix Figure B.3). The thermocline was present between depths of approximately 9 and 13 m in the summer (Appendix Figure B.3). Despite the occurrence of thermal stratification in 2017, no marked changes in dissolved oxygen concentration occurred with increased depth at any of the Reference Lake 3 basins, and dissolved oxygen saturation remained high (i.e., ≥ 95%) throughout the entire water column in both the summer and fall profiles (Appendix Figure B.3). The 2017 water quality profiles also showed only minor changes in pH and specific conductance among stations and with depth during each of the summer and fall sampling events (Appendix Figure B.3). Overall, the i*n situ* water quality profiles suggested relatively thorough lateral mixing within Reference Lake 3 and that, despite development of thermal stratification in summer 2017, no substantial influences on dissolved oxygen, pH or conductivity were associated with the changes in temperature with depth.

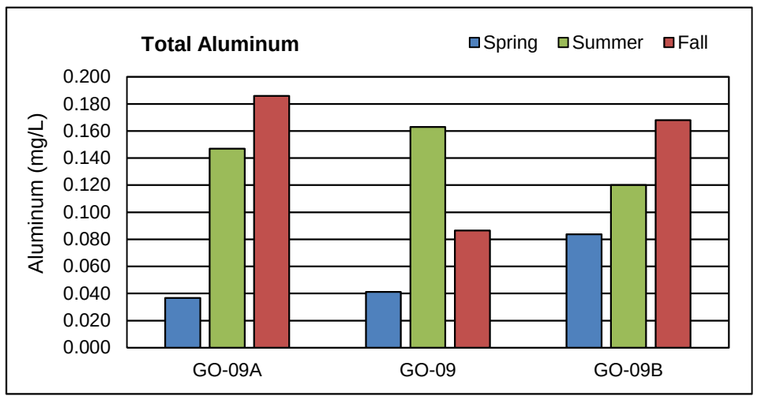


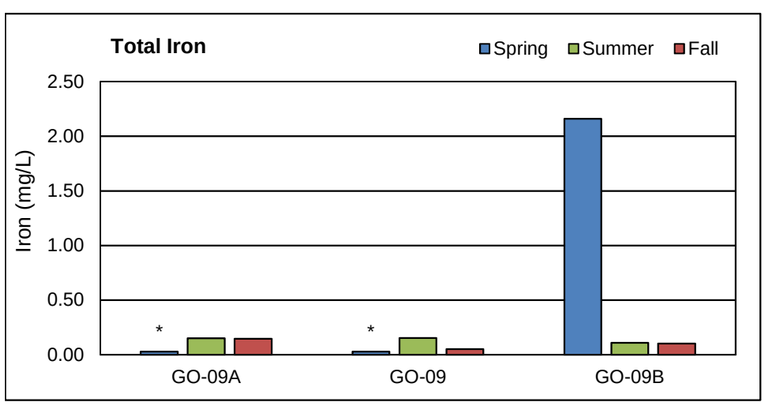


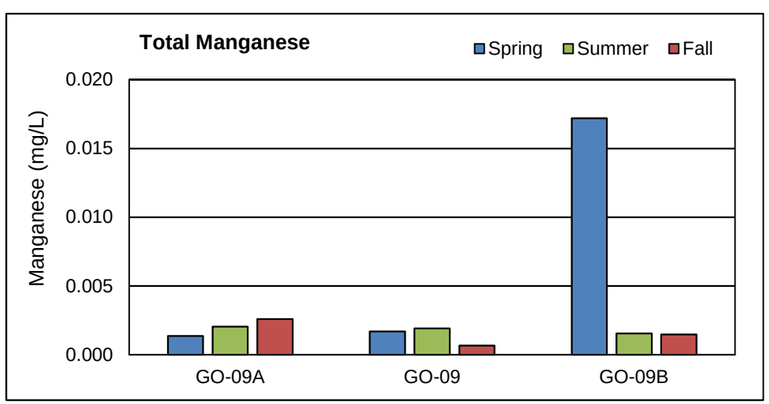












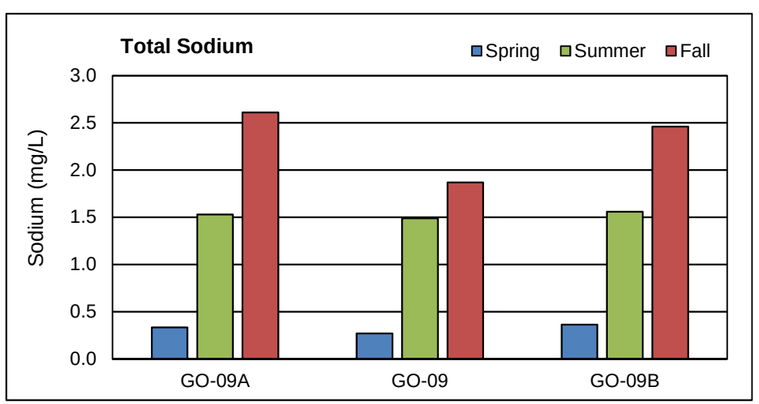
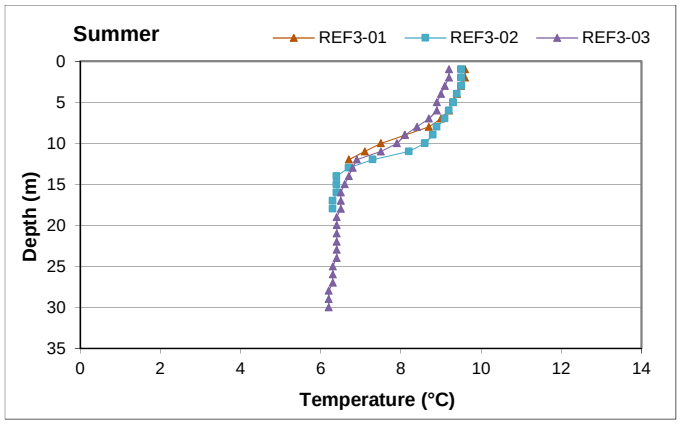
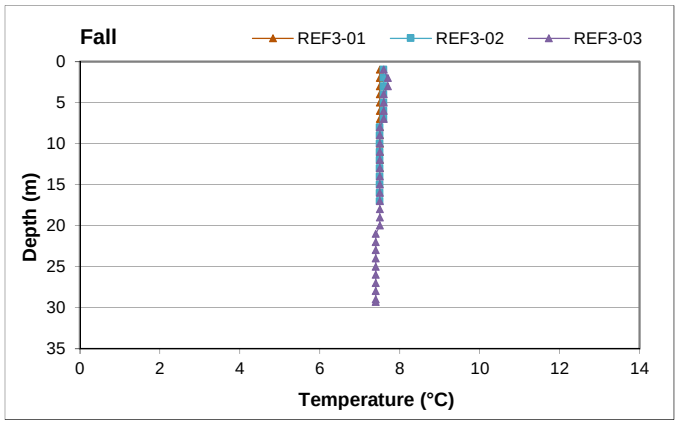
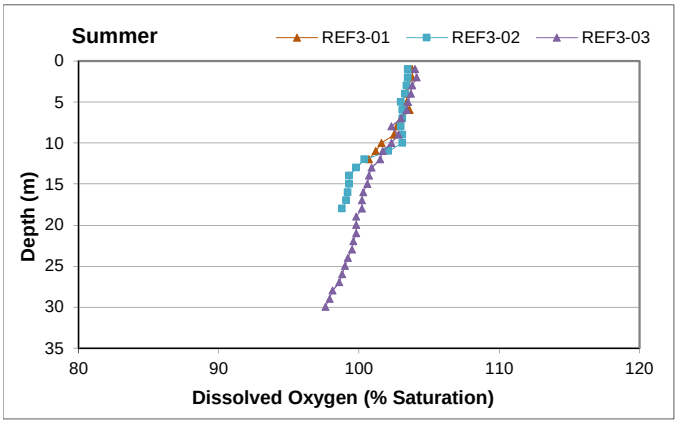


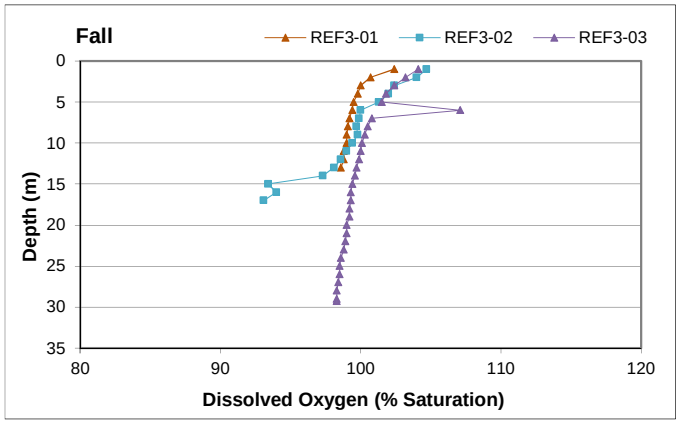
Figure B.2: Seasonal Variation in Water Chemistry at Mary River GO-09 Reference Stations, Mary River Project CREMP, 2017.

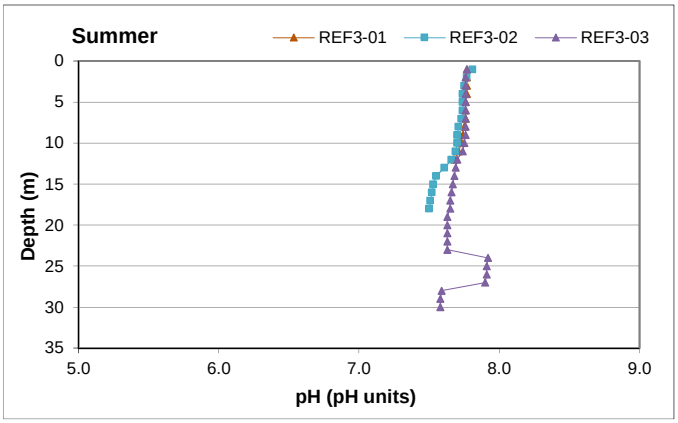
Note: Asterisk (*) indicates that the parameter concentration was below the laboratory reportable detection limit.

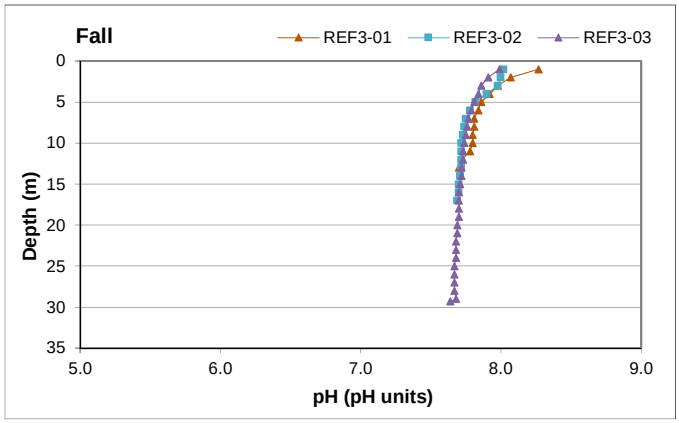


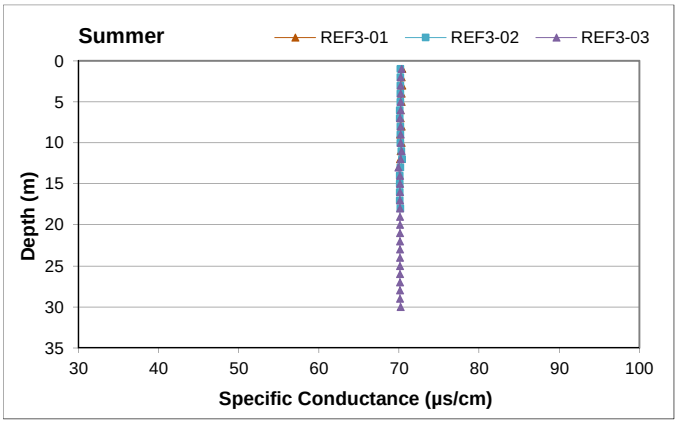












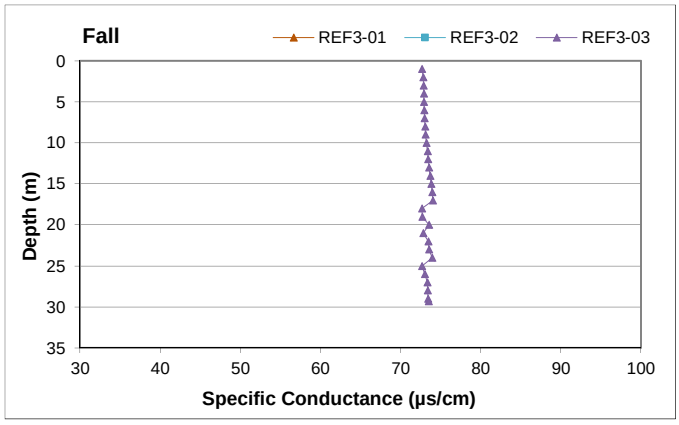
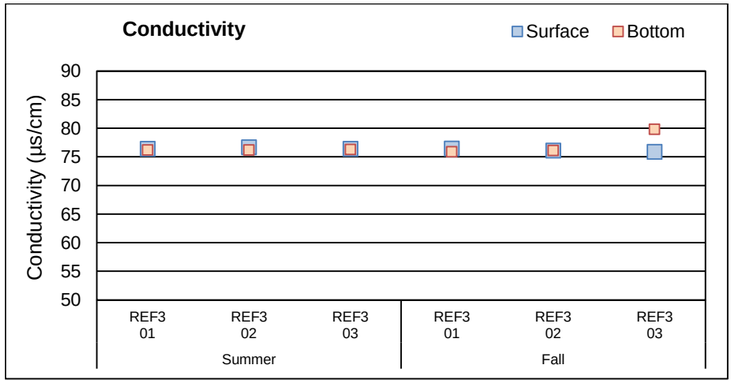
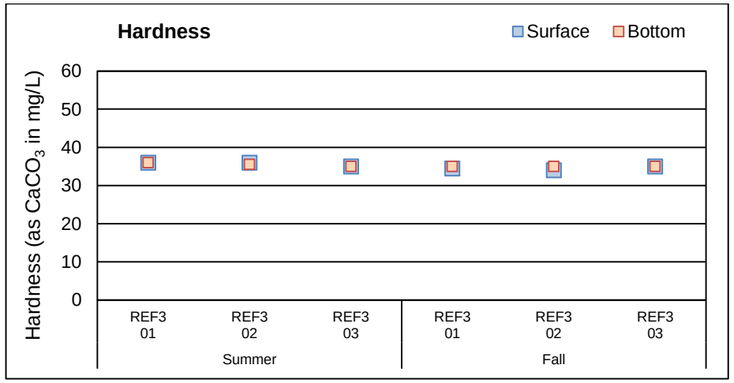


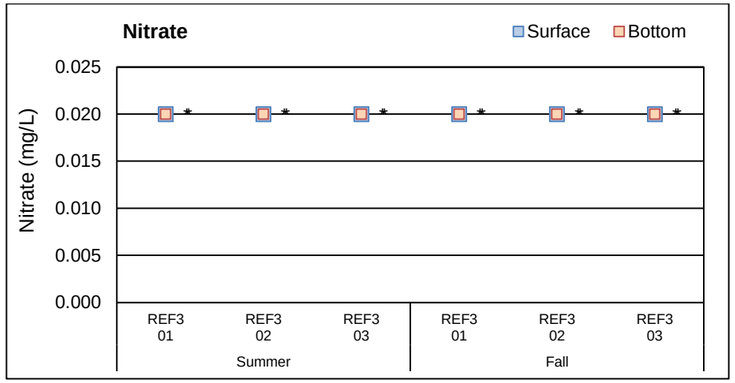
Figure B.3: ***In situ*** **Water Quality with Depth from Surface at Reference Lake 3 during Summer and Fall Sampling Events, Mary River Project CREMP, 2017**

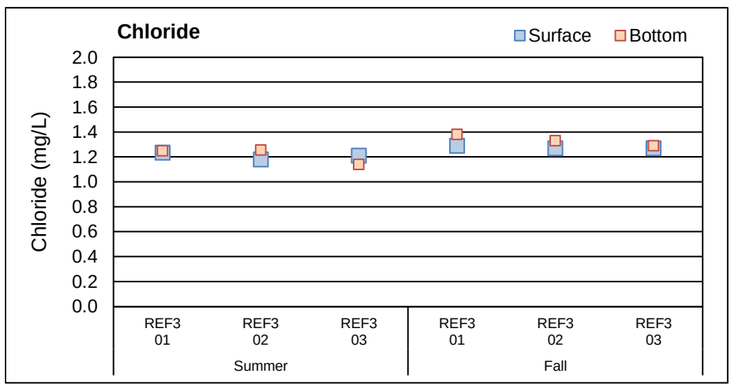
The evaluation of water chemistry at Reference Lake 3 indicated that only phenol was elevated above WQG on a single sampling occasion in 2017 (Appendix Table B.4). In addition, no parameters were observed at concentrations above lentic AEMP benchmarks at Reference Lake 3 (Appendix Table B.4), suggesting that these water quality benchmarks were relevant to the mine LSA lakes. No substantial differences in water chemistry were observed between the summer and fall at Reference Lake 3 in 2017, which was similar to observations among winter, summer and fall at LSA lakes during the mine baseline period and in summer and fall at Reference Lake 3 in 2015 and 2016 (KP 2014a,c; Minnow 2016a, 2017).

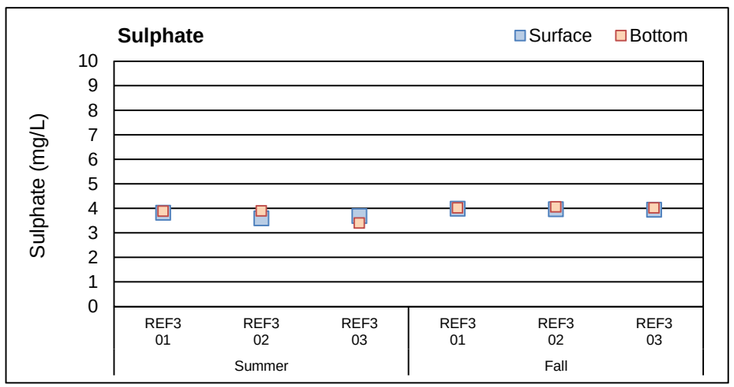
Water chemistry data collected at Reference Lake 3 showed no consistent differences in parameter concentrations between the surface and the bottom of the water column at each individual station in 2017 (Appendix Figure B.4; Appendix Table B.4). The lack of any appreciable depth-related differences in parameter concentrations at each station likely reflected only minor differences in dissolved oxygen saturation, pH and/or specific conductance with increased depth from the surface. Because anoxic conditions do not appear to develop in the summer or fall at Reference Lake 3, reducing conditions conducive to metal mobilization from sediment to the overlying water are less likely to occur near the lake bottom, resulting in relative uniform water chemistry between surface and bottom waters of Reference Lake 3. Accordingly, metal concentrations can naturally be expected to be similar between surface and bottom of LSA lakes provided no substantial gradients in dissolved oxygen saturation, pH and/or specific conductance occur within the water column.

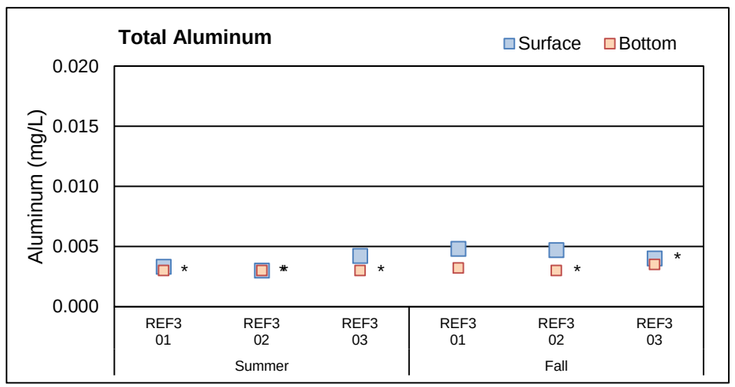


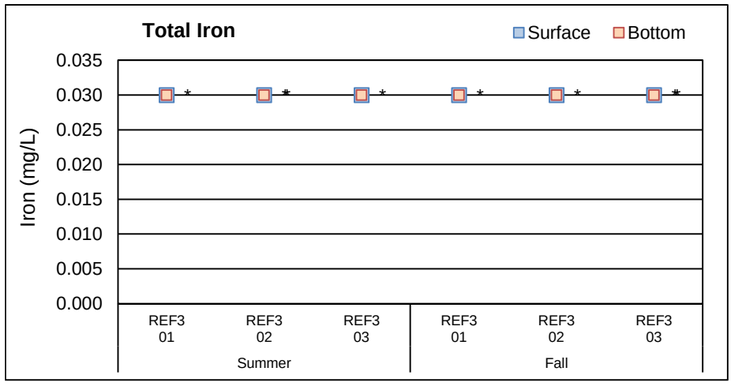


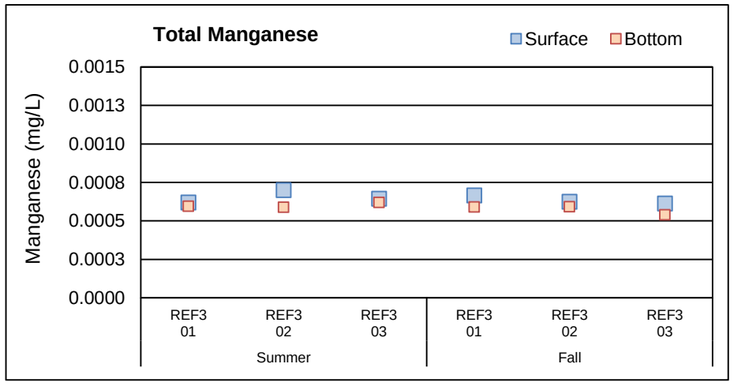












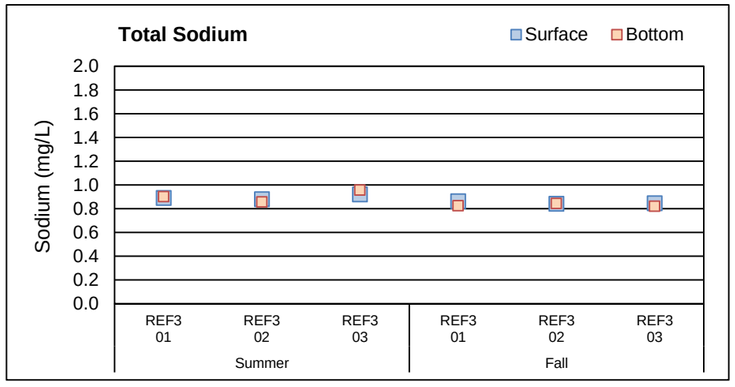


Figure B.4: Water Chemistry Comparison Between the Surface and the Bottom of the Water Column at Reference Lake 3 Routine Monitoring Stations during Summer and Fall, Mary River Project CREMP, 2017

Note: An asterisk (*) indicates that the parameter concentration was below the laboratory reportable detection limit.

Table B.4: Water Chemistry at Reference Lake 3, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Summer Sampling Event						Fall Sampling Event					
					REF3-01 bottom 12-Aug-2017	REF3-01 surface 12-Aug-2017	REF3-02 bottom 12-Aug-2017	REF3-02 surface 12-Aug-2017	REF3-03 bottom 12-Aug-2017	REF3-03 surface 12-Aug-2017	REF3-01 bottom 2-Sep-2017	REF3-01 surface 2-Sep-2017	REF3-02 bottom 2-Sep-2017	REF3-02 surface 2-Sep-2017	REF3-03 bottom 2-Sep-2017	REF3-03 surface 2-Sep-2017
Conventionals[b]	Conductivity (lab)	umho/cm	-	-	76.2	76.4	76.2	76.7	76.3	76.4	75.9	76.5	76.1	76.1	79.8	75.9
	pH (lab)	pH	6.5 - 9.0	-	7.78	7.80	7.69	7.67	7.69	7.79	7.75	7.78	7.74	7.75	7.57	7.75
	Hardness (as $CaCO_3$)	mg/L	-	-	36	36	35.5	36	35	35	35	34.5	35	34	35	35
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	48	37	37	36	36	27	32	34	42	30	42	35
	Turbidity	NTU	-	-	0.38	0.37	0.41	0.43	0.34	0.36	0.24	1.22	0.23	0.45	0.36	0.41
	Alkalinity (as $CaCO_3$)	mg/L	-	-	28	33	35	36	31	27	35	29	31	35	35	30
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	0.055	0.063	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	0.20	<0.15	<0.15	<0.15	0.26	0.19	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Nitrate and Nitrite (as N)	mg/L	-	-	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
	Dissolved Organic Carbon	mg/L	-	-	2.9	3.1	3.1	2.8	3.1	3.0	2.7	2.7	2.7	2.6	2.7	2.7
	Total Organic Carbon	mg/L	-	-	3.0	3.1	3.0	3.2	3.0	3.3	2.8	2.8	2.8	2.9	2.7	2.8
	Total Phosphorus	mg/L	0.030[α]	-	0.0116	0.0138	0.0040	0.0034	0.0042	0.0047	0.0048	0.0036	0.0044	0.0053	<0.0030	<0.0030
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0023	0.0021	0.0054	0.0028	0.0022	0.0012
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	1.25	1.24	1.26	1.18	1.14	1.21	1.38	1.29	1.33	1.27	1.29	1.27
	Sulphate (SO_4)	mg/L	218[β]	218	3.89	3.82	3.90	3.60	3.40	3.69	4.02	3.99	4.06	3.97	4.02	3.95
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	<0.0030	0.0033	<0.0030	<0.0030	<0.0030	0.0042	0.0032	0.0048	<0.0030	0.0047	0.0035	0.004
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	0.00012	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.00646	0.00634	0.00625	0.00664	0.00646	0.00650	0.00626	0.00634	0.00632	0.00651	0.00629	0.00642
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	-	7.01	7.09	6.93	7.05	6.91	6.83	6.73	6.93	6.97	7.02	6.82	6.84
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0022	0.00078	0.00090	0.00086	0.00086	0.00085	0.00081	0.00086	0.00080	0.00086	0.00081	0.00080	0.00075
	Iron (Fe)	mg/L	0.30	0.326	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	4.41	4.43	4.30	4.38	4.48	4.47	4.39	4.36	4.51	4.47	4.31	4.49
	Manganese (Mn)	mg/L	0.935[β]	-	0.000596	0.000620	0.000589	0.000700	0.000620	0.000645	0.000591	0.000666	0.000592	0.000625	0.000540	0.000613
	Mercury (Hg)	mg/L	0.000026	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.000138	0.000146	0.000139	0.000147	0.000138	0.000139	0.000121	0.000123	0.000127	0.000129	0.000115	0.000121
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.91	0.93	0.88	0.91	0.94	0.92	0.86	0.87	0.88	0.88	0.85	0.89
	Selenium (Se)	mg/L	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	-	-	0.40	0.40	0.43	0.42	0.43	0.41	0.40	0.41	0.40	0.41	0.40	0.41
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	0.901	0.891	0.856	0.880	0.956	0.920	0.824	0.863	0.843	0.842	0.819	0.845
	Strontium (Sr)	mg/L	-	-	0.00803	0.00801	0.00792	0.00808	0.00778	0.00763	0.00755	0.00782	0.00779	0.00785	0.00757	0.00759
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.015	-	0.000265	0.000270	0.000258	0.000258	0.000258	0.000264	0.000239	0.000253	0.000258	0.000252	0.000248	0.000244
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using background water quality data. The values are specific to the Camp Lake system.

Indicates parameter concentration above applicable Water Quality Guideline.

B4 SEDIMENT QUALITY

B4.1 Creek/Tributary Environments

Deposited sediment at Unnamed Reference Creek (CLT-REF) was visually characterized as predominantly medium-sized sand (Appendix Table D.1). In-stream substrate of the reference creek was composed mainly of cobble and pebble material (i.e., substrate diameter 6 – 25 cm, and 2 – 6 cm, respectively), with sand constituting only a small amount (i.e., ~7%) of the material observed at the sediment surface (Appendix Table F.1). Deposited sediment suitable for chemical characterization (i.e., sand and finer substrate sizes) was collected mainly from shoreline/streambank areas (Appendix Table D.1). Sediment total organic carbon (TOC) content was very low (i.e., <0.1%) at the reference creek suggesting very limited deposition of fine organic materials (Appendix Table D.2). Metal concentrations in deposited sediment at the reference creek were well below SQG (Appendix Table D.2), and therefore the Unnamed Reference Creek data were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on chemistry of deposited sediment at the mine-exposed creeks.

B4.2 River Environment

Deposited sediment at the Mary River (GO-09) upstream reference area was visually characterized as predominantly coarse sand (Appendix Table D.36). In-stream substrate of the reference creek was composed mainly of boulder and cobble material (i.e., substrate diameter >25 cm, and 6 – 25 cm, respectively), with sand constituting only a minor amount (i.e., ~10%) of the material observed at the sediment surface (Appendix Table F.50). Deposited sediment suitable for chemical characterization (i.e., sand and finer substrate sizes) was collected in-stream from quiescent zones immediately downstream of large boulders (Appendix Table D.36). Sediment total organic carbon (TOC) content was very low (i.e., <0.1%) at the GO-09 reference area, suggesting very limited deposition of fine organic materials (Appendix Table D.37). Metal concentrations in deposited sediment at the reference creek were well below SQG (Appendix Table D.37), and therefore the GO-09 data were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on chemistry of deposited sediment at the Mary River mine-exposed study areas.

B4.3 Lake Environments (Reference Lake 3)

Sediment sampling was conducted at littoral and profundal (i.e., <12 m and >12 m depths, respectively) areas of Reference Lake 3 in 2015, 2016, and 2017 for the analysis of particle size, total organic carbon (TOC) content, and total metal concentrations (see Figure 2.3).

Surficial sediment at Reference Lake 3 littoral and profundal areas was composed of silty to sandy loam material with moderate TOC content. Unlike previous CREMP studies, substrate particle size did not differ significantly between the Reference Lake 3 littoral and profundal habitats in 2017 (Appendix Table F.17), whereas previous studies showed a significantly higher and lower proportion of sand- and clay-sized material, respectively, present at littoral stations compared to profundal stations (Minnow 2016a, 2017). No significant differences in sediment TOC content occurred between the littoral and profundal habitats of the reference lake in 2017 (Appendix Table F.17). A surficial and/or sub-surface layer of oxidized material (likely iron hydroxide or oxy-hydroxides), visible as an orange-brown floc or distinct layer, was commonly observed in the surficial sediment of Reference Lake 3 (Appendix Tables D.3 and D.4). In addition, sub-surface sediment of Reference Lake 3 occasionally contained blackened/dark colouration, which suggested the occurrence of reducing (i.e., anoxic) sediment conditions (Appendix Tables D.3 and D.4). The physical properties of sediment observed at Reference Lake 3 in 2017 were consistent with those of the 2015 and 2016 studies (Minnow 2016a, 2017).

Metal concentrations in sediment at Reference Lake 3 were generally lower at the littoral stations than at the profundal stations, although less than a two-fold difference in concentrations was typically shown for most parameters between the littoral and profundal station depths (Appendix Table B.5; Appendix Figure B.5). The differences in sediment metal concentrations between the littoral and profundal station depths likely reflected a naturally higher proportion of fine silt- and clay-sized particles at the latter, which is consistent with expected depositional patterns in lakes. Among metals with established SQG, mean concentrations of iron were elevated above SQG at littoral and profundal stations, and mean concentrations of manganese were elevated above SQG at profundal stations of Reference Lake 3 in 2017 (Appendix Table B.5). Sediment phosphorus concentrations were also elevated above SQG at a single littoral station of Reference Lake 3 (Appendix Table B.5). Therefore, compared to SQG, high concentrations of iron and manganese, and phosphorus to a lesser extent, appear to occur naturally in sediments of Mary River Project LSA lakes. Mean copper and iron concentrations at littoral stations, and mean copper, iron, and manganese concentrations at profundal stations, were above the most stringent (i.e., lowest) AEMP sediment quality benchmarks at Reference Lake 3 (Appendix Table B.5). This suggested that the AEMP sediment benchmarks for these metals were conservative.

Table B.5: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Reference Lake 3 (REF-03) Sediment Stations, Mary River Project CREMP, August 2017

	Analyte	Units	Sediment Quality Guideline (SQG)[a]	AEMP Benchmark[b]	Littoral Stations							Profundal Stations						
					REF-03-1	REF-03-2	REF-03-3	REF-03-4	REF-03-5	Mean	Standard Error	REF-03-6	REF-03-7	REF-03-8	REF-03-9	REF-03-10	Mean	Standard Error
Non-metals	Sand	%	-	-	46.5	58.0	25.6	59.9	42.0	46.4	6.2	45.3	15.6	39.2	22.4	55.95	35.7	5.23
	Silt	%	-	-	43.7	32.8	62.2	35.4	47.4	44.3	5.20	42.5	62.4	49.6	61.4	35.3	50.2	3.73
	Clay	%	-	-	9.80	9.2	12.20	4.70	10.60	9.3	1.26	12.2	22.0	11.2	16.2	8.8	14.1	1.63
	Moisture	%	-	-	89.1	91.3	68.0	70.7	88.2	81.5	4.99	86.1	54.4	76.6	77.5	85.3	76.0	4.05
	Total Organic Carbon	%	10[α]	-	6.06	7.23	3.59	2.74	4.71	4.87	0.81	4.43	1.81	3.03	4.13	4.39	3.56	0.358
Metals	Aluminum (Al)	mg/kg	-	-	14,400	14,200	16,500	12,400	16,100	14,720	736	26,000	16,400	21,000	24,300	22,450	22,030	1,160
	Antimony (Sb)	mg/kg	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0
	Arsenic (As)	mg/kg	17	5.9 - 6.2[c]	2.34	3.01	3.65	2.08	5.67	3.35	0.64	5.50	4.41	4.41	4.87	4.69	4.78	0.142
	Barium (Ba)	mg/kg	-	-	120	133	105.0	77.4	129.0	113	10	158	115	133	142	140	138	4.93
	Beryllium (Be)	mg/kg	-	-	0.54	0.58	0.65	0.50	0.58	0.57	0.02	1.00	0.66	0.80	0.91	0.87	0.85	0.040
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.0000
	Boron (B)	mg/kg	-	-	10.8	13.8	13.3	9.7	13.1	12.1	0.8	18.8	11.0	16.0	18.7	17.8	16.5	1.03
	Cadmium (Cd)	mg/kg	3.5	1.5	0.152	0.298	0.180	0.105	0.173	0.182	0.032	0.181	0.269	0.131	0.158	0.161	0.180	0.017
	Calcium (Ca)	mg/kg	-	-	5,570	5,260	4,430	3,490	4,530	4,656	362	6,050	3,970	4,880	5,770	5,555	5,245	263.6
	Chromium (Cr)	mg/kg	90	79 - 98[c]	56.5	48.0	53.9	38.2	59.1	51.1	3.7	***84.3***	48.5	65.4	***79.1***	72.2	69.9	4.40
	Cobalt (Co)	mg/kg	-	-	9.03	10.00	12.1	9.1	12.9	10.6	0.8	19.0	12.2	15.1	17.3	16.2	16.0	0.81
	Copper (Cu)	mg/kg	197	50 - 58[c]	***60***	***84***	***62***	***53***	***65***	***65***	5	**107**	**57**	**87**	**97**	**90**	**87**	5.99
	Iron (Fe)	mg/kg	40,000[α]	34,400 - 52,400[c]	23,900	***45,800***	***35,200***	31,100	***73,800***	***41,960***	8,713	***55,400***	***34,600***	***45,700***	***50,400***	***47,100***	***46,640***	2,434
	Lead (Pb)	mg/kg	91.3	35	12.5	11.9	13.4	10.6	13.7	12.4	0.6	19.7	13.6	15.8	18.0	17.3	16.9	0.73
	Lithium (Li)	mg/kg	-	-	23.3	23.7	26.5	21.2	25.2	24.0	0.9	39.8	27.7	33.5	37.8	35.4	34.8	1.47
	Magnesium (Mg)	mg/kg	-	-	11,600	9,450	11,000	7,830	11,400	10,256	714	17,500	11,000	13,500	16,200	14,900	14,620	794
	Manganese (Mn)	mg/kg	1,100[α,β]	657 - 4,370	306	***718***	***1,010***	609	554	639	115	***1,340***	***1,500***	***1,220***	***1,140***	***1,130***	***1,266***	49.2
	Mercury (Hg)	mg/kg	0.486	0.17	0.0613	0.0528	0.0325	0.0182	0.0554	0.0440	0.0081	0.0661	0.0238	0.0407	0.0701	0.0599	0.0521	0.00615
	Molybdenum (Mo)	mg/kg	-	-	1.04	4.08	2.84	2.68	6.85	3.50	0.97	3.08	3.52	2.92	2.53	2.41	2.89	0.141
	Nickel (Ni)	mg/kg	75[α,β]	66 - 77[c]	41.3	38.3	40.9	28.8	41.6	38.2	2.4	57.9	41.0	44.2	53.1	49.3	49.1	2.14
	Phosphorus (P)	mg/kg	2,000[α]	1,278 - 1,958[c]	726	830	859	760	***2,020***	1,039	246	1,200	897	1,010	1,160	1,060	1,065	38.3
	Potassium (K)	mg/kg	-	-	3,380	3,750	4,360	3,210	4,070	3,754	212	6,580	4,470	5,360	6,200	5,750	5,672	257.5
	Selenium (Se)	mg/kg	-	-	0.58	0.92	0.44	0.26	0.86	0.61	0.12	0.79	<0.20	0.41	0.79	0.71	0.58	0.083
	Silver (Ag)	mg/kg	-	-	0.13	0.15	<0.10	<0.10	0.15	0.13	0.01	0.24	0.12	0.16	0.25	0.22	0.20	0.018
	Sodium (Na)	mg/kg	-	-	262	301	300	218	340	284	21	473	290	366	472	431	406	24.8
	Strontium (Sr)	mg/kg	-	-	9.9	10.9	10.2	8.3	10.6	10.0	0.5	14.3	9.9	12.0	13.8	13.1	12.6	0.55
	Sulphur (S)	mg/kg	-	-	1100	1500	<1000	<1000	1000	1,120	97	1400	<1000	<1000	1200	1050	1,130	54
	Thallium (Tl)	mg/kg	-	-	0.334	0.333	0.422	0.226	0.415	0.346	0.036	0.762	0.561	0.579	0.695	0.676	0.655	0.0265
	Tin (Sn)	mg/kg	-	-	2.6	<2.0	<2.0	<2.0	<2.0	2.1	0.1	2.0	<2.0	<2.0	<2.0	<2.0	2.0	0.000
	Titanium (Ti)	mg/kg	-	-	936	903	1,060	917	1,170	997	51	1,380	1,110	1,220	1,420	1,265	1,279	39.5
	Uranium (U)	mg/kg	-	-	9.20	12.1	12.2	8.02	13.6	11.0	1.0	27.1	15.0	27.6	23.8	24.1	23.5	1.60
	Vanadium (V)	mg/kg	-	-	47.1	45.4	52.0	41.8	52.6	47.8	2.0	77.7	54.7	63.9	71.5	67.2	67.0	2.72
	Zinc (Zn)	mg/kg	315	123 - 135[c]	66.9	68.5	69.7	58.2	73.3	67.3	0.5	107	66.8	89.3	99.0	92.1	90.8	4.8
	Zirconium (Zr)	mg/kg	-	-	5.5	3.9	3.1	3.1	3.8	3.8	0.1	3.6	3.8	3.0	3.4	3.2	3.4	0.1

[a] Canadian Sediment Quality Guideline, probable effects level (PEL; CCME 2017) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2017)).

[b] Baffinland Mary River Project Aquatic Effects Monitoring Program (AEMP) sediment quality benckmarks (Baffinland 2014, 2016; Intrinsik 2014, 2015).

[c] The AEMP benchmarks were derived for individual mine-exposed lakes, and therefore a range of values is presented to reflect the AEMP benchmark variation among the mine-exposed lakes. Reference Lake 3 sediment chemistry was screened against the lowest AEMP benchmark for applicable parameters.

Indicates paramter concentration above Sediment Quality Guideline (SQG).

BOLD Indicates parameter concentration above the AEMP Benchmark.

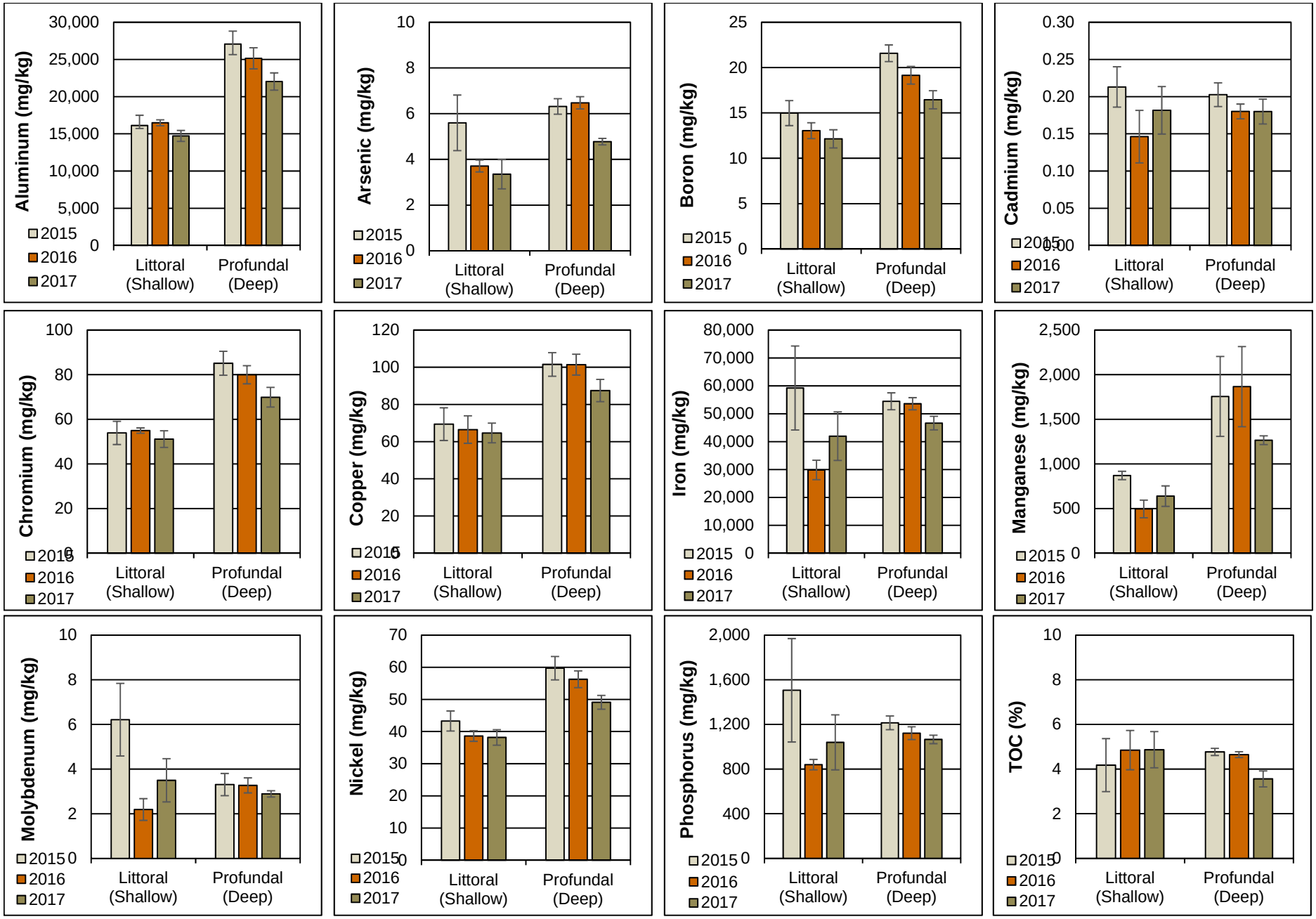


Figure B.5: Sediment Metal Concentrations (mean ± SE) at Littoral (<12m depth) and Profundal (>12m depth) Monitoring Stations of Reference Lake 3 (REF03), Mary River Project CREMP, 2015 - 2017

B5 PHYTOPLANKTON (CHLOROPHYLL-A)

B5.1 Lotic Environments

Chlorophyll-a concentrations, which were used as a surrogate for phytoplankton abundance, ranged from approximately 0.11 – 0.63 µg/L at the reference creek and river stations among spring, summer, and fall sampling events in 2017 (Appendix Table B.6). Therefore, lotic reference station chlorophyll-a concentrations were consistently well below the AEMP benchmark of 3.7 µg/L, and reflected low (i.e., oligotrophic) phytoplankton productivity according to Dodds et al (1998) trophic status classification for stream environments. This trophic status classification was consistent with an 'oligotrophic' CWQG categorization for the stream and river reference stations based on mean aqueous total phosphorus concentrations generally ranging between 4 – 10 µg/L during each respective spring, summer, and fall sampling event in 2017 (Appendix Tables B.2 and B.3). Seasonally, chlorophyll-a concentrations were significantly higher in the fall than during either the spring and summer at the reference creek stations, but no differences in chlorophyll-a concentrations were indicated among seasons at Mary River GO-09 series reference stations in 2017 (Appendix Table B.7).

Comparisons among 2015, 2016, and 2017 for like-season chlorophyll-a concentrations did not indicate any consistent significant differences among years over the spring, summer, and fall sampling events at either the reference creek or the Mary River reference area stations (Appendix Figure B.6). The variability in response shown among seasons and years at the lotic reference areas indicated that significant differences in chlorophyll-a concentrations occurs naturally among years and seasons in watercourses within the Mary River Project mine LSA.

B5.2 Lentic Environments (Reference Lake 3)

Chlorophyll-a concentrations at Reference Lake 3 showed no consistent differences between the surface and the bottom of the water column at each individual station during both the summer and fall sampling events in 2017 (Appendix Figure B.7). Chlorophyll-a concentrations did not differ significantly between the surface and the bottom of the water column among Reference Lake 3 stations for either the summer or fall sampling events, suggesting similar phytoplankton abundance near the surface and bottom of the lake stations regardless of differences in depth.

Reference Lake 3 chlorophyll-a concentrations averaged 0.63 µg/L in summer and 0.91 µg/L in fall 2017, and were consistently well below the AEMP benchmark of 3.7 µg/L (Appendix Table E.3; Appendix Figure B.7). Similar to the lotic reference stations, mean chlorophyll-a

Table B.6: Phytoplankton Monitoring Data Collected at Lotic Reference Stations, Mary River Project CREMP 2017

Station		Reference Creek Stations				Mary River Reference Stations		
		CLT-REF3	CLT-REF4	MRY-REF2	MRY-REF3	G0-09-A	G0-09	G0-09-B
Sample Collection Date	Spring	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17
	Summer	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17
	Fall	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17
Chlorophyll a (µg/L)	Spring	0.15	0.17	0.19	0.11	0.45	0.23	0.21
	Summer	0.17	0.19	0.14	0.13	0.19	0.24	0.12
	Fall	0.39	0.63	0.48	0.56	0.23	0.38	0.27
	Average	0.24	0.33	0.27	0.27	0.29	0.28	0.20
	Standard Deviation	0.13	0.26	0.18	0.25	0.14	0.08	0.08
	Standard Error	0.08	0.15	0.11	0.15	0.08	0.05	0.04
Phaeophytin a (µg/L)	Spring	0.18	0.18	0.28	0.13	0.38	0.17	0.19
	Summer	0.32	0.25	0.38	<1.0	0.23	0.28	0.16
	Fall	0.34	0.32	0.31	0.52	0.28	0.35	0.29
	Average	0.28	0.25	0.32	0.55	0.30	0.27	0.21
	Standard Deviation	0.09	0.07	0.05	0.44	0.08	0.09	0.07
	Standard Error	0.05	0.04	0.03	0.25	0.04	0.05	0.04

Table B.7: Statistical Comparisons of Chlorophyll-a Concentrations among Winter, Spring, Summer, and/or Fall Sampling Events at Reference Lotic and Lentic Study Areas, Mary River Project CREMP, 2017

Study Lake	Overall 3-group Comparison			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	p-value	Statistical Test[b]	(I) Area	(J) Area	Significant Difference Between 2 Areas?	p-value	Statistical Test
Stream Reference Stations	YES	0.00003	ANOVA[c]	Spring	Summer	NO	0.9993	Tamhane's
				Spring	Fall	YES	0.0112	
				Summer	Fall	YES	0.0133	
Mary River GO-09 Reference Stations	NO	0.32438	ANOVA[c]	Spring	Summer	NO	0.3755	Tukey's
				Spring	Fall	NO	0.9990	
				Summer	Fall	NO	0.3943	
Reference Lake 3	-	-	-	Winter	Summer	not applicable	-	ANOVA[c]
				Winter	Fall	not applicable	-	
				Summer	Fall	YES	0.0062	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Statistical tests include Analysis of Variance (ANOVA) and Kruskal Wallis H-test (KW H-test).

[c] Untransformed data normally distributed.

[d] Logged data non-normally distributed.

[e] Kruskal-Wallis H-test used to validate results of ANOVA three-group comparison.

[f] Mann-Whitney U-test used to validate results of post-hoc tests for all pair-wise comparisons.

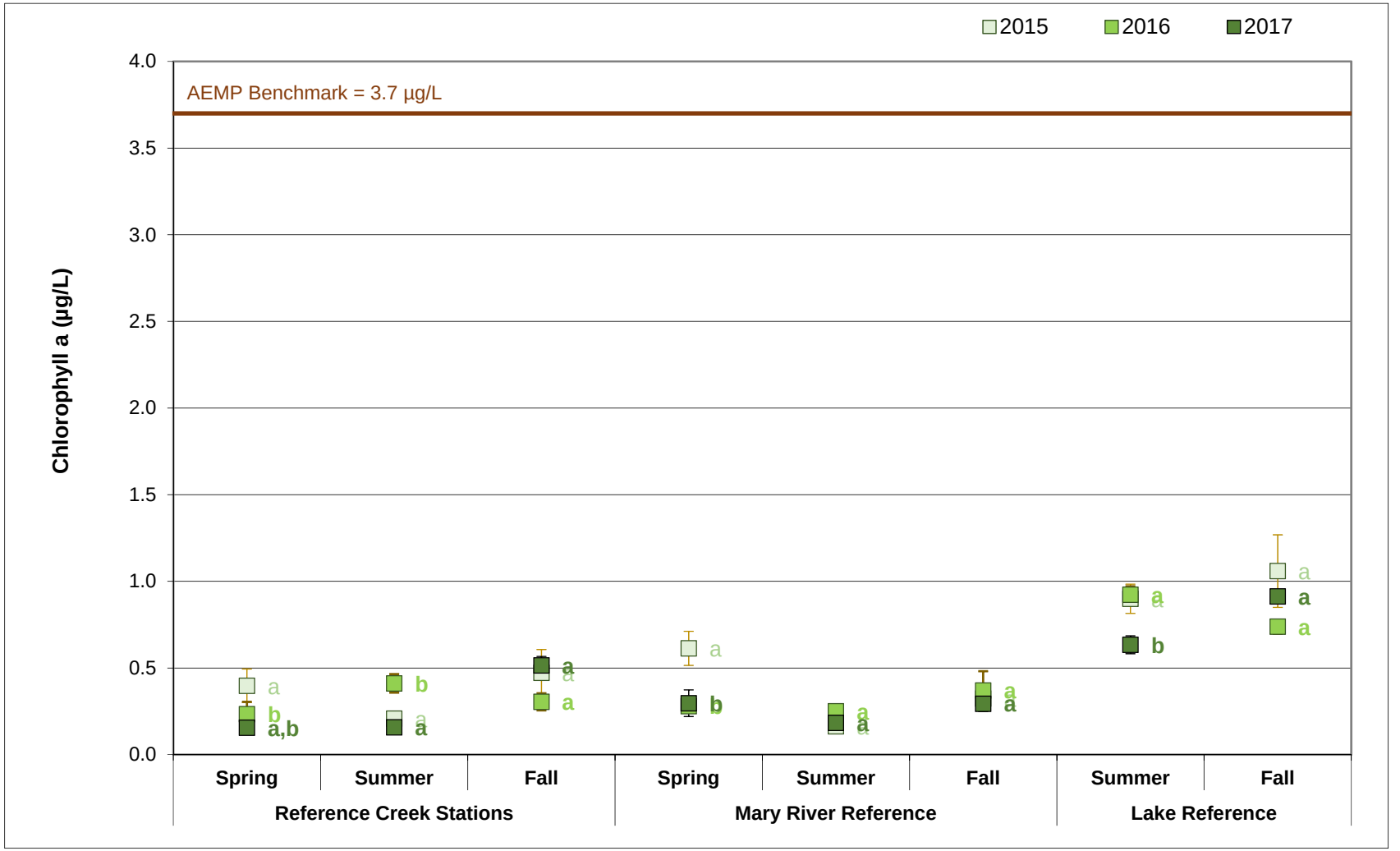


Figure B.6: Chlorophyll-a Concentration Seasonal Comparison between 2015, 2016, and 2017 at Creek, River and Lake Reference Phytoplankton Monitoring Stations, Mary River Project CREMP

The same letters next to data points associated with each individual season/reference area indicates no significant difference between points .

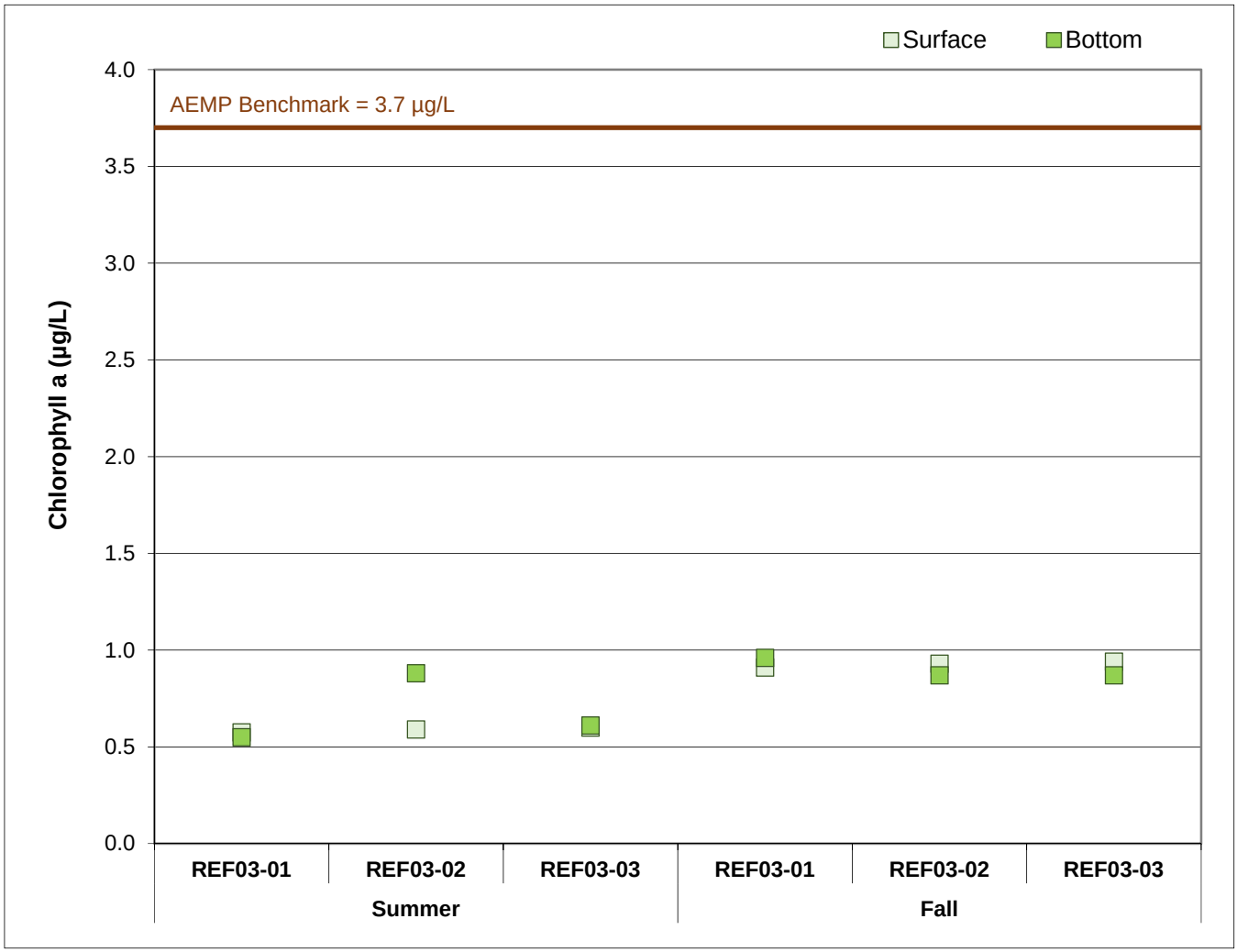


Figure B.7: Chlorophyll-a Concentrations at the Surface and Bottom of the Water Column at Reference Lake 3 Phytoplankton Monitoring Stations during Summer and Fall Sampling Events, Mary River Project CREMP, 2017

concentrations observed at Reference Lake 3 in 2017 indicated low (i.e., oligotrophic) phytoplankton productivity based on the lake trophic status classification presented in Wetzel (2001). This trophic status classification was also consistent with an 'oligotrophic' CWQG categorization for Reference Lake 3 based on mean aqueous total phosphorus concentrations typically ranging between 4 and 10 µg/L during the summer and fall sampling events in 2017 (Appendix Table B.4). Chlorophyll-a concentrations were significantly lower in the summer than in the fall at Reference Lake 3 in 2017 (Appendix Table B.7), which differed from results of the 2015 study when chlorophyll-a concentrations did not differ between seasons, and from the results of the 2016 study when chlorophyll-a concentrations were significantly higher in the summer. Although chlorophyll-a concentrations were generally comparable among the 2015, 2016, and 2017 studies for like-seasons at Reference Lake 3, the relative seasonal changes in chlorophyll-a concentrations among years suggested naturally variable temporal patterns in phytoplankton abundance can expected at Mary River Project mine LSA lakes.

B6 BENTHIC INVERTEBRATE COMMUNITY

B6.1 Creek/Tributary Environments

The original Mary River Project CREMP design had not included/identified a reference creek from which to evaluate potential mine-related effects on benthic invertebrate communities of creek/tributary environments, instead relying solely on a before-after approach to identify potential mine influences on benthic invertebrates over time (see NSC 2014). Stemming from recommendations from the 2015 CREMP (Minnow 2016b), a reference creek was incorporated into the 2016 and 2017 CREMP benthic invertebrate community studies to provide a stronger basis for evaluating potential within-year mine-related effects to biota residing in mine-exposed tributaries of Camp and Sheardown lakes. The benthic invertebrate community (benthic) study area selected for the CREMP was located within at the same unnamed tributary to Angajurjualuk Lake that is used for reference water quality sampling (Stations CLT-REF4 and MRY-REF2; Table 2.5; Figure 2.4). Criteria used for the selection of this creek as a reference area for the CREMP, which is herein referred to as Unnamed Reference Creek, included a watercourse exhibiting similar habitat characteristics (e.g., width, water velocity, substrate size) as the mine-exposed tributaries (see Appendix Tables F.1 and F.25) that is not/has not been influenced by mining or adverse anthropogenic disturbances. The acceptance of Unnamed Reference Creek as a reference area for the evaluation of mine-related influences on tributary water chemistry under the original CREMP (KP 2014a) was also considered an important criterion in the selection of this watercourse as a suitable reference area for the benthic invertebrate community survey.

Benthic invertebrate density at Unnamed Reference Creek ranged from 817 – 5,229 individuals/m^2 in 2017 (mean of 1,972 individuals/m^2) , which is considered moderate to high for Arctic streams (Craig and McCart 1975). Unnamed Reference Creek showed relatively high richness and Simpson's Evenness in 2017, which was unlike the low production that can naturally be expected in Arctic streams as a result of constraints associated with low nutrients and seasonal temperatures, as well as food limitation (Huryn and Wallace 2000). Chironomidae (non-biting midges) and Simuliidae (blackflies) were the dominant taxomonic groups observed at Unnamed Reference Creek benthic stations, collectively accounting for approximately 66% of the community (Appendix Table B.8). Collector-gatherers were the dominant benthic invertebrate functional feeding group (FFG) present at Unnamed Reference Creek (Appendix Table B.8), suggesting greatest reliance upon deposited fine particulate organic matter as a food source for benthic invertebrates. Shredders constituted a low proportion of the Unnamed Reference Creek benthic invertebrate community (Appendix Table B.9), suggesting that live and/or decomposing leaf material was a less important food source.

Table B.8: Benthic Invertebrate Community Summary Statistics for Unnamed Reference Creek and Mary River (GO-09) Reference Areas, Mary River Project CREMP, August 2017

Metric	Area	Sample Size	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
						Lower Bound	Upper Bound		
Density (no. organisms / m^2)	Unnamed Reference Creek	5	1,972	1,861	832	-339	4,282	817	5,229
	Mary River GO-09 Reference	5	410	313	140	21	799	179	958
Richness (Number of Taxa)	Unnamed Reference Creek	5	21.2	1.9	0.9	18.8	23.6	19.0	24.0
	Mary River GO-09 Reference	5	11.2	2.9	1.3	7.5	14.9	6.0	13.0
Simpson's Evenness	Unnamed Reference Creek	5	0.935	0.017	0.008	0.913	0.956	0.909	0.951
	Mary River GO-09 Reference	5	0.770	0.097	0.044	0.649	0.891	0.678	0.892
Bray-Curtis Index	Unnamed Reference Creek	5	0.305	0.205	0.092	0.050	0.560	0.173	0.664
	Mary River GO-09 Reference	5	0.240	0.215	0.096	-0.027	0.507	0.050	0.536
Simuliidae (% of community)	Unnamed Reference Creek	5	28.3%	6.6%	3.0%	20.1%	36.5%	23.0%	39.3%
	Mary River GO-09 Reference	5	18.9%	5.2%	2.3%	12.5%	25.4%	13.1%	25.7%
Hydracarina (% of community)	Unnamed Reference Creek	5	4.8%	2.3%	1.0%	2.0%	7.6%	2.2%	7.7%
	Mary River GO-09 Reference	5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Chironomidae (% of community)	Unnamed Reference Creek	5	37.9%	11.1%	5.0%	24.1%	51.7%	25.3%	55.7%
	Mary River GO-09 Reference	5	79.0%	6.4%	2.9%	71.1%	87.0%	69.8%	86.9%
Metal Sensitive Chironomidae (% of community)	Unnamed Reference Creek	5	5.7%	5.7%	2.5%	-1.3%	12.7%	1.7%	15.7%
	Mary River GO-09 Reference	5	59.7%	13.2%	5.9%	43.2%	76.1%	38.5%	73.9%
Tipulidae (% of community)	Unnamed Reference Creek	5	0.7%	0.4%	0.2%	0.1%	1.2%	0.3%	1.4%
	Mary River GO-09 Reference	5	1.5%	1.3%	0.6%	-0.1%	3.1%	0.0%	3.3%
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	5	58.8%	7.2%	3.2%	49.9%	67.6%	51.8%	69.3%
	Mary River GO-09 Reference	5	74.6%	6.6%	2.9%	66.4%	82.8%	65.4%	82.9%
Filterer FFG (% of community)	Unnamed Reference Creek	5	28.6%	6.5%	2.9%	20.6%	36.7%	23.0%	39.3%
	Mary River GO-09 Reference	5	18.9%	5.2%	2.3%	12.5%	25.4%	13.1%	25.7%
Shredder FFG (% of community)	Unnamed Reference Creek	5	6.7%	5.5%	2.4%	-0.1%	13.5%	2.7%	16.3%
	Mary River GO-09 Reference	5	5.8%	2.2%	1.0%	3.1%	8.6%	4.1%	8.9%
Clinger HPG (% of community)	Unnamed Reference Creek	5	40.1%	7.8%	3.5%	30.4%	49.7%	28.8%	47.8%
	Mary River GO-09 Reference	5	23.3%	6.1%	2.7%	15.6%	30.9%	17.1%	32.4%
Sprawler HPG (% of community)	Unnamed Reference Creek	5	49.0%	9.2%	4.1%	37.6%	60.5%	37.0%	58.8%
	Mary River GO-09 Reference	5	74.0%	7.5%	3.3%	64.8%	83.3%	63.1%	82.9%
Burrower HPG (% of community)	Unnamed Reference Creek	5	10.7%	4.5%	2.0%	5.2%	16.3%	4.0%	15.1%
	Mary River GO-09 Reference	5	2.7%	1.7%	0.7%	0.7%	4.8%	0.0%	4.5%

In terms of benthic invertebrate habitat preference groups (HPG), clingers and sprawlers were co-dominant groups at Unnamed Reference Creek (Appendix Table B.8) suggesting that most invertebrates were associated with substrate surfaces and were not deeply embedded in the substrate (i.e., non-burrowers).

B6.2 River Environments

The area of Mary River located upstream of the mine lease property has been considered representative of reference conditions for the mine-exposed stations/study areas situated farther downstream on the Mary River under the CREMP (Baffinland 2014; KP 2014a,b, 2015; NSC 2014). As in previous CREMP studies, the GO-09 area of Mary River (including water quality stations GO-09A, GO-09 and GO-09B) was used as the benthic reference area for mine-exposed areas of Mary River as part of the 2017 CREMP (see Table 2.5; Figure 2.4).

Benthic invertebrate density at the Mary River reference area in 2017 ranged from 179 – 958 individuals/m^2, which is considered low to moderate for Arctic lotic systems (Craig and McCart 1975). Moderate richness and Simpson's Evenness also characterized the benthic invertebrate community of the Mary River reference area, and reflected naturally low Arctic stream environment productivity as a result of low ambient temperatures and nutrient levels (Huryn and Wallace 2000). Midges of the family Chironomidae were the dominant taxonomic group observed at the Mary River reference area, with the relative abundance of this group ranging from 70 – 86% of individuals (mean of 79%) and taxa considered metal-sensitive constituting 39 – 74% of the community (Appendix Table B.8). Similar to the reference creek, collector-gatherers were the dominant FFG present at the Mary River reference area (Appendix Table B.8), suggesting that fine particulate organic matter was the predominant food source for benthic invertebrates at this area. Sprawlers composed the dominant HPG at the Mary River reference area (Appendix Table B.8), which suggested that most benthic invertebrates were associated with the surface of rocky substrates.

Comparison of the Mary River reference area benthic invertebrate communities among baseline (2006, 2007) and mine-operational (2015, 2016, 2017) studies for key metrics indicated no consistent significant differences in density, richness, and relative abundance of metal-sensitive chironomids between the baseline and mine-operational periods (Figure 5.7; Appendix Table F.59). Although Simpson's Evenness was significantly higher, and relative abundance of chironomids and FFG collector-gatherers significantly lower, for the mine-operational studies compared to the baseline studies, the direction of these differences was not consistent with an adverse change but rather suggested greater diversity and/or more even distribution of invertebrate groups and FFG for the mine-operational period (Figure 5.6; Appendix Table F.59). These changes in benthic invertebrate community metrics between the

mine baseline and operational studies at the Mary River reference area were thus attributable to natural variability in community traits among years and/or to artifacts associated with CREMP sampling among studies.

B6.3 Lentic Environments (Reference Lake 3)

The benthic invertebrate community of Reference Lake 3 differed dramatically between littoral (<12 m depth) and profundal (>12 m depth) stations in 2017. As in the previous 2015 and 2016 studies, significantly higher benthic invertebrate density, richness, and Simpson's Evenness was observed at littoral stations compared to profundal stations in 2017, most at Critical Effect Sizes outside of ± 2 SD (Appendix Table B.9). In addition, differences in benthic invertebrate community structure occurred between sampling depths as indicated by significantly differing Bray-Curtis Index and supported by higher and lower relative abundance of Ostracoda (seed shrimp) and Chironomidae (non-biting midges), respectively, at littoral stations compared to profundal stations (Appendix Table B.9). However, no significant differences in relative abundance of FFG or HPG were indicated between littoral and profundal habitats of Reference Lake 3. The difference in benthic invertebrate community metrics and assemblage features between the littoral and profundal stations observed at Reference Lake 3 in 2015, 2016, and 2017 validated proposed changes to the CREMP benthic invertebrate community survey by Minnow (2016b). Specifically, benthic invertebrate community surveys can focus only on littoral habitat to reflect the fact that natural habitat factors that affect community assemblage at profundal areas limit the ability to interpret potential mine-related biological effects at profundal depths of the LSA lakes.

Littoral habitat of Reference Lake 3 was largely dominated by Ostracoda (seed shrimp) and Chironomid non-biting midge larvae that exhibit collector-gathering feeding habits and inhabit the sediment surface (i.e., sprawler mode of existence) in 2015, 2016, and 2017. Comparison of littoral habitat benthic invertebrate communities at Reference Lake 3 among the 2015, 2016 and 2017 studies for key metrics indicated no significant differences in density, richness, Simpson's Evenness, Bray-Curtis Index, relative abundance of dominant FFG, and the relative abundance of all dominant taxonomic groups except Ostracoda (Appendix Table B.10). Although the relative abundance of Ostracoda differed between studies, the magnitude of difference was within scientifically established Critical Effect Sizes (CES), suggesting that this difference was not ecologically meaningful. Overall, this suggested that littoral habitat benthic invertebrate community features at Reference Lake 3 were relatively consistent among the 2015, 2016, and 2017 studies.

Table B.9: Benthic Invertebrate Community Statistical Comparison Results between Littoral and Profundal Stations at Reference Lake 3, Mary River Project CREMP, August 2017

Metric	Statistical Test Results					Summary Statistics					
	Data Transform-ation	Significant Difference Between Habitats?	p-value	Statistical Analysis[a]	Magnitude of Difference [a] (No. of SD)	Habitat	Mean (n = 5)	Standard Deviation	Standard Error	Minimum	Maximum
Density (Individuals/m^2)	log	YES	< 0.001	ANOVA	-1.6	Lake Littoral	1,489	850	380	372	2,618
						Lake Profundal	149	32	14	113	190
Richness (Number of Taxa)	fourth root	YES	< 0.001	ANOVA	-3.3	Lake Littoral	12.4	2.5	1.1	10.0	15.0
						Lake Profundal	4.2	1.5	0.7	2.0	6.0
Simpson's Evenness (E)	log	YES	0.097	ANOVA	-0.7	Lake Littoral	0.807	0.142	0.063	0.605	0.934
						Lake Profundal	0.704	0.105	0.047	0.597	0.843
Bray-Curtis Index	none	YES	0.086	ANOVA	-1.2	Lake Littoral	0.384	0.120	0.054	0.203	0.536
						Lake Profundal	0.239	0.114	0.051	0.111	0.376
Nemata (%)	fourth root	YES	< 0.001	t-test unequal variance	-1.2	Lake Littoral	3.9	3.3	1.5	0.8	9.1
						Lake Profundal	0.0	0.0	0.0	0.0	0.0
Hydracarina (%)	none	NO	0.340	ANOVA	0.9	Lake Littoral	5.3	3.0	1.4	1.8	8.1
						Lake Profundal	8.2	5.5	2.5	0.0	15.0
Ostracoda (%)	none	YES	0.003	ANOVA	-2.0	Lake Littoral	38.8	18.4	8.2	22.3	63.9
						Lake Profundal	2.8	4.1	1.8	0.0	8.9
Chironomidae (%)	square root	YES	0.005	ANOVA	2.1	Lake Littoral	51.8	17.9	8.0	29.5	67.9
						Lake Profundal	89.0	7.6	3.4	81.6	100.0
Metal-Sensitive Chironomidae (%)	none	NO	0.636	ANOVA	-0.3	Lake Littoral	15.5	13.4	6.0	0.5	37.0
						Lake Profundal	12.0	8.9	4.0	0.0	20.2
Collector-Gatherers (%)	log	NO	0.172	ANOVA	0.7	Lake Littoral	73.9	16.0	7.2	56.0	95.5
						Lake Profundal	84.3	4.1	1.9	79.8	90.5
Filterers (%)	log(X+1)	NO	0.204	ANOVA	-0.6	Lake Littoral	14.7	13.3	5.9	0.5	36.4
						Lake Profundal	6.5	9.3	4.2	0.0	20.2
Shredders (%)	fourth root	NO	0.114	ANOVA	-0.5	Lake Littoral	4.2	6.6	3.0	0.0	15.9
						Lake Profundal	1.0	2.3	1.0	0.0	5.2
Clingers (%)	none	NO	0.419	ANOVA	-0.4	Lake Littoral	19.8	12.8	5.7	2.7	38.1
						Lake Profundal	14.6	4.9	2.2	9.5	20.2
Sprawlers (%)	square root	NO	0.217	ANOVA	0.6	Lake Littoral	72.6	13.9	6.2	55.7	92.9
						Lake Profundal	81.4	6.3	2.8	74.8	90.5
Burrowers (%)	log(X+1)	NO	0.125	ANOVA	-1.2	Lake Littoral	7.5	3.0	1.4	4.5	12.0
						Lake Profundal	3.9	3.7	1.7	0.0	8.0

[a] Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

Gray shading indicates statistically significant difference between habitat types based on p-value ≤ 0.10.

Blue shaded values indicate significant difference (p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD, indicating that the difference was ecologically meaningful.

Table B.10: Benthic Invertebrate Community Metric Statistical Comparison Results among 2015, 2016, and 2017 Studies for Reference Lake 3 Littoral Station Data

Metric	Data Transform-ation	Overall 3-Year Comparison		Pair-wise, post-hoc comparisons[a]				
		Significant Difference Among Yearss?	P-value	Study Year	Mean	Standard Deviation	Magnitude of Difference (SD)	Pairwise Compariso n
Density (No. per m^2)	log	NO	0.3332	2015	1,278	888	-	a
				2016	2,390	1,396	1.3	a
				2017	1,489	850	0.2	a
Richness (No. of Taxa)	none	NO	0.9757	2015	12.6	4.1	-	a
				2016	12.2	1.1	-0.1	a
				2017	12.4	2.5	0.0	a
Simpson's Evenness	log	NO	0.4931	2015	0.865	0.052	-	a
				2016	0.758	0.189	-2.0	a
				2017	0.807	0.142	-1.1	a
Nemata (% of community)	modified probit	NO	0.7212	2015	8.1%	7.4%	-	a
				2016	4.0%	5.6%	-0.6	a
				2017	3.9%	3.3%	-0.6	a
Hydracarina (% of community)	none	NO	0.5870	2015	4.2%	2.7%	-	a
				2016	3.6%	2.0%	-0.2	a
				2017	5.3%	3.0%	0.4	a
Ostracoda (% of community)	modified probit	YES	0.0587	2015	20.9%	18.5%	-	a
				2016	46.9%	17.5%	1.4	b
				2017	38.8%	18.4%	1.0	a,b
Chironomidae (% of community)	none	NO	0.2208	2015	66.5%	18.9%	-	a
				2016	45.4%	18.8%	-1.1	a
				2017	51.8%	17.9%	-0.8	a
Metal Sensitive Chironomids (% of community)	none	NO	0.5767	2015	11.4%	12.6%	-	a
				2016	19.3%	8.3%	0.6	a
				2017	15.5%	13.4%	0.3	a
Collector-Gatherer FFG (% of community)	none	NO	0.7031	2015	81.4%	17.1%	-	a
				2016	75.0%	11.4%	-0.4	a
				2017	73.9%	16.0%	-0.4	a
Filterer FFG (% of community)	none	NO	0.8070	2015	11.4%	12.6%	-	a
				2016	16.1%	8.4%	0.4	a
				2017	14.7%	13.3%	0.3	a

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Blue shaded values indicate significant difference (p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD from 2015 mean data, indicating that the difference relative to 2015 was ecologically meaningful.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

B7 FISH POPULATION

B7.1 Lotic Environments

Fish population sampling of lotic habitats is not required as part of the Mary River Project CREMP (see NSC 2014). In part, this reflects the fact that fish can only inhabit LSA creeks/rivers for a short period each year (i.e., July – September) as a result of complete freezing/desiccation of these lotic habitats over much of the year, and because sampling of juvenile arctic charr within a representative lotic habitat is conducted for the federal Environmental Effects Monitoring (EEM) program to meet Metal Mining Effluent Regulation requirements (Baffinland 2014; Minnow 2018).

B7.2 Lentic Environments (Reference Lake 3)

The Reference Lake 3 fish community was composed of arctic charr and ninespine stickleback. As in 2015 and 2016, the relative abundance of both species appeared to be low at Reference Lake 3 based on low electrofishing and gill netting catches and catch-per-unit-effort (CPUE) for each species in 2017 (Appendix Tables G.1 and G.2). Suitable numbers of arctic charr were captured at nearshore habitat of Reference Lake 3 (i.e., 100 individuals) to allow evaluation of mine-related effects on survival, growth and condition of fish collected at the mine-exposed lake shorelines. For these fish, young-of-the-year (YOY) individuals were generally distinguishable from the 1+ to 5+ age classes at a fork length of 5.0 cm based on the evaluation of length-frequency distributions coupled with supporting age determinations (Appendix Figure B.8). In 2015, YOY arctic charr captured at nearshore habitat were not able to be distinguished from older age classes at Reference Lake 3 (Appendix Figure B.8). However, population comparisons of nearshore arctic charr captured between the mine-exposed and reference lakes in 2016 and 2017 were completed separately for YOY and non-YOY data sets. Temporal comparisons of the 2015, 2016, and 2017 nearshore arctic charr data did indicated significantly larger sized fish were sampled in 2016 compared to both 2015 and 2017 at the reference lake, but the differences in endpoints of fork length and fresh body weight were not outside of accepted CES_G of ±25% (Appendix Table B.11). Similarly, although condition of nearshore arctic charr differed significantly among the 2015, 2016, and 2017 studies at Reference Lake 3, a high degree of overlap in data points suggested that the differences between individual years were not ecologically meaningful (Appendix Figure B.9). This indicated that some year-to-year differences in fish population endpoints can be expected naturally, but because the differences between years were within established CES, the fish population survey CES were relevant to, and can be suitably applied, to the Mary River Project CREMP.

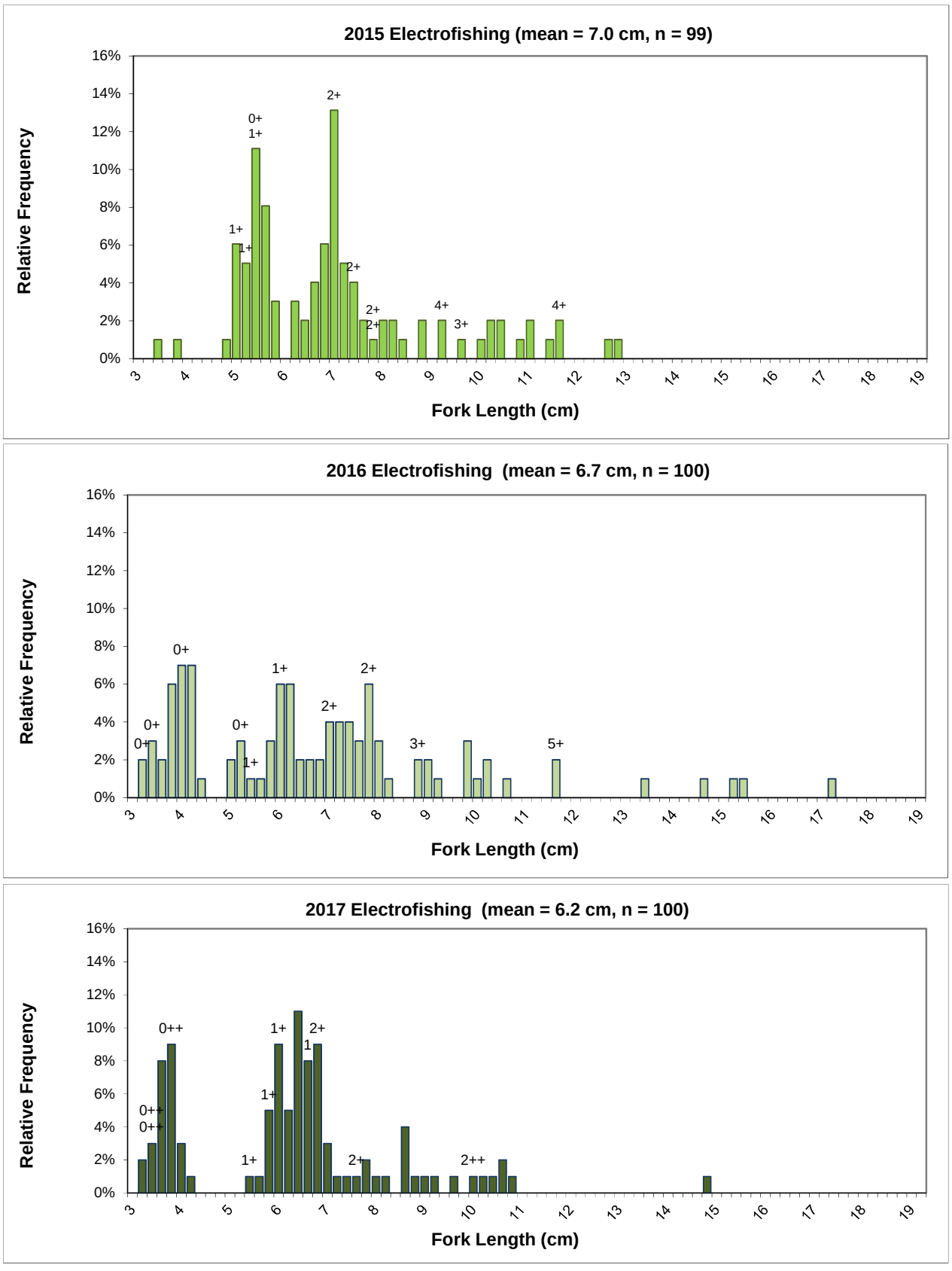


Figure B.8: Length-frequency Distributions for Arctic Charr Captured by Backpack Electrofishing and Gill Netting at Reference Lake 3 (REF3) in August 2015, 2016, and 2017, Mary River Project CREMP

Note: Fish ages are shown above the bars, where available.

Table B.11: Statistical Comparisons For Length, Weight and Condition Endpoints For Arctic Charr, Mary River Project CREMP

Endpoint	Variables		Sample Size			Test	Model Statistics			Summary Statistics[b]				Test P-value (Year)	Post-hoc Contrasts P-value and Magnitude of Difference (%)[c]					
							Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]						2016 (vs 2015)		2017 (vs 2016)		2017 (vs 2015)	
	Response	Covariate	2015	2016	2017		Interaction P-value	Covariate P-value		Statistic	2015	2016	2017		P-value	MOD (%)	P-value	MOD (%)	P-value	MOD (%)
Length	Fork Length (cm)	-	97	68	74	K-W	-	-	-	Median	6.80	7.30	6.60	0.018	0.006	7.4	0.038	-10	0.564	-2.9
Weight	Weight (g)	-	97	68	74	K-W	-	-	-	Median	2.68	3.34	2.49	0.023	0.007	25	0.051	-26	0.522	-7.3
Condition	log[Weight (g)]	log[Fork Length (cm)]	97	68	74	ANCOVA	0.029	<0.001	-	-	-	-	-	-	-	-	-	-	-	-
			97	67[d]	73[d]	ANCOVA	0.035	<0.001	5.30	Predicted Mean	1.26	1.26	1.29	0.065	-	-0.089	-	2.3	-	2.2
									12.6		17.2	18.3	10.4			6.3		-43		-40

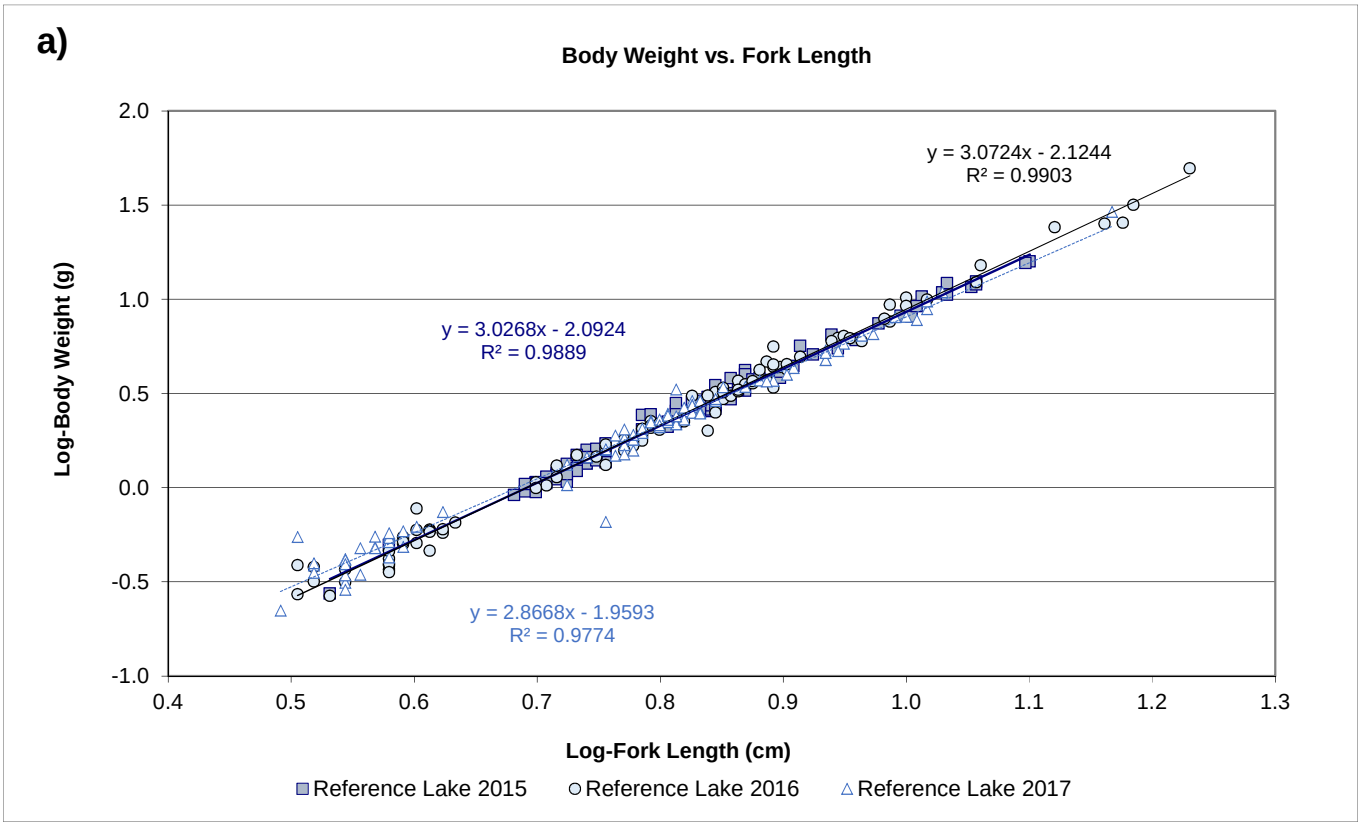
Area P-value < 0.1 or Interaction P-value < 0.05

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median and adjusted mean are reported for Kruskal-Wallis and ANCOVA, respectively, and the predicted means of the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction (i.e., different slopes) occurs.

[c] The magnitude of difference calculated as: [(year mean - earlier year mean) /earlier year mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(year predicted mean - earlier year predicted mean) / earlier year predicted mean] x 100.

[d] Two fish (REF316-ACJ-58 & REF317-ACJ-56) were identified as statiscal outliers (studentized residuals = -4.06 [2016] & 4.12 [2017]) and were removed from the analysis



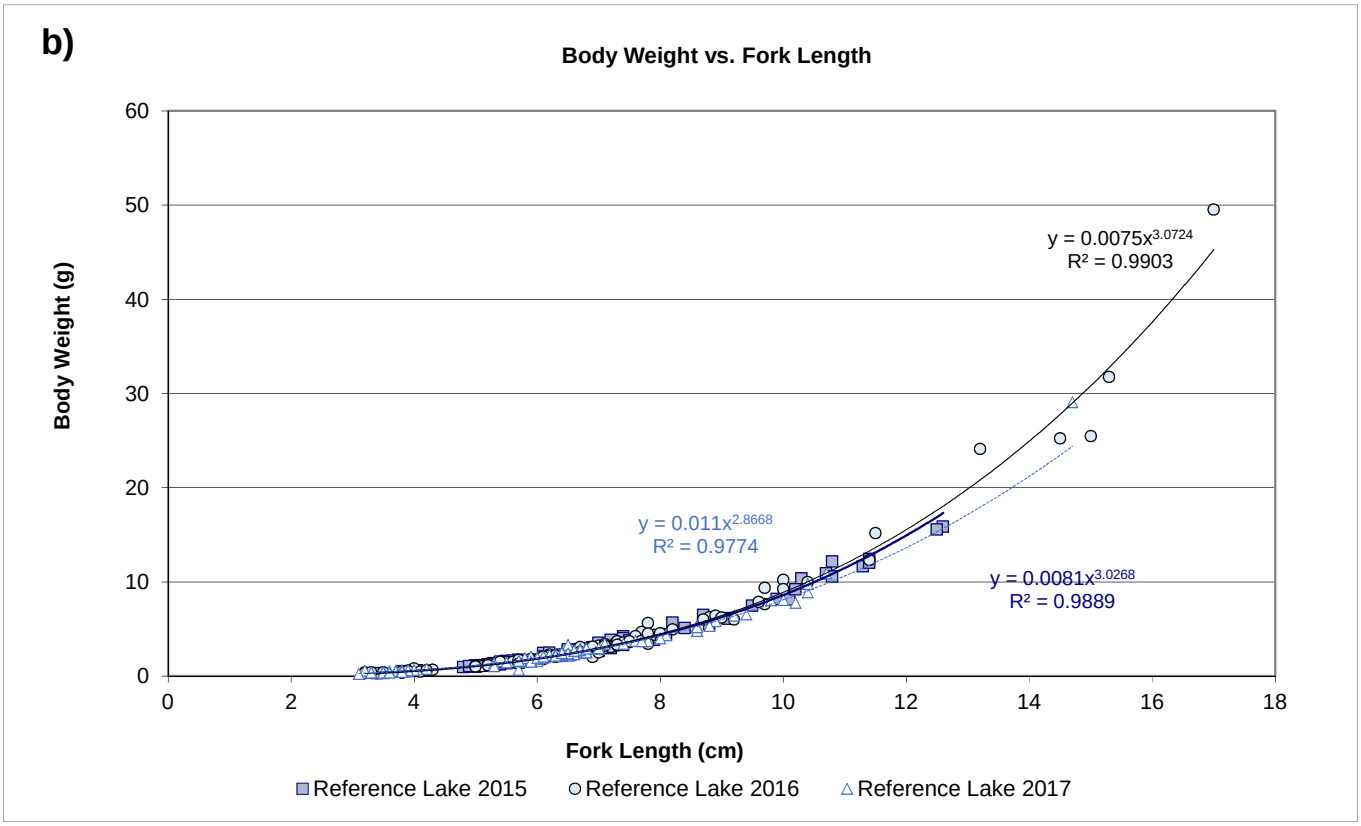


Figure B.9: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at the Nearshore Area of Reference Lake 3 in August 2015, 2016, and 2017 using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP

Very low numbers of arctic charr were captured at littoral/profundal areas of Reference Lake 3 in 2017 (i.e., 1 individual) despite application of similar fishing effort to that used at the mine-exposed study lakes (Appendix Table G.2). Due to the small sample size, no meaningful evaluation of mine-related effects on the population of reproductive-aged arctic charr was possible using data from the mine-exposed lakes and Reference Lake 3 in 2017. Because arctic charr can show differential growth rates between the sexes (females grow faster; Jonsson et al. 1999; Skulason et al. 1996; Gulseth and Nilssen 2001), natural differences in sex ratios between study areas could potentially result in falsely attributing differences in growth and/or condition between mine-exposed and reference areas to mine-related influences. Thus, the inability to definitively determine arctic charr sex using external characteristics when applying a non-lethal sampling approach could confound data interpretation. To determine whether differences in sex ratios could potentially confound the interpretation of the CREMP arctic charr health assessment, growth and condition were compared between male and female Arctic charr collected at Camp, Sheardown and Mary lakes during the baseline period as part of the 2015 CREMP (Minnow 2016a). No significant differences in growth and condition were indicated between males and females based on this analysis, suggesting that a non-lethal study approach is unlikely to bias the evaluation of mine-related effects on fish health as part of the CREMP. Contrary to the published literature, the absence of any differences in arctic charr growth and condition between males and females at Mary River Project LSA lakes may be explained by naturally slow growth rates and low spawning frequency (i.e., once every 2 – 4 years) at high Arctic areas, and also by low gonadosomatic index (GSI) at the time that sampling is normally conducted for the Mary River Project CREMP (i.e., August).

B8 CREMP IMPLICATIONS

This overview of reference conditions was included in the 2016 and 2017 CREMP to provide context and perspective regarding key chemical, physical and biological features of the CREMP reference study areas. Key implications of reference area features affecting the CREMP the evaluation of potential mine-related effects at mine-exposed waterbodies that were identified through this reference area overview in 2016 and/or 2017 include the following:

- Federal Water Quality Guidelines (WQG) not applicable for aqueous phenol concentrations. Aqueous concentrations of phenols were routinely elevated above WQG at the CREMP creek, river and lake reference stations in 2015 and 2016. Correlation analysis indicated a significant, positive relationship between phenol and both nitrate and DOC concentrations in the 2015 and 2016 CREMP, suggesting that high phenol concentrations in waterbodies near the Mary River Project mine were associated with influences from natural organic composition. Therefore, phenol concentration comparisons against applicable WQG did not serve as a focus for discussion as part of the 2016 and 2017 CREMP.

- Greater reliance on the use of dissolved metals concentrations for assessing mine-related influences on aqueous metal concentrations at waterbodies used for the CREMP. Total aluminum concentrations were routinely elevated, and other metals including (total) iron and manganese periodically elevated, above WQG at creek, river and/or lake reference areas used for the CREMP in 2015, 2016, 2017, and historically in baseline studies. Significant positive correlations between total concentrations of these metals and turbidity were identified using the 2015, 2016, and 2017 data sets which suggested that these metals were likely bound to and/or composed suspended particulate materials in water samples. This was supported by a low ratio of dissolved to total metal concentrations for the reference water samples in 2015, 2016 and 2017. Accordingly, greater emphasis was placed on comparison of dissolved metal concentrations for assessing potential mine-related influences on water quality for the 2016 and 2017 CREMP studies.

- Use of fall sampling event water quality data to allow the most conservative evaluation of potential mine-related influences on water chemistry. Water chemistry at lotic reference stations showed distinct seasonal changes in parameter concentrations during the baseline, 2015, 2016, and 2017 studies. In general, conventional parameters, ions and total metals were observed at lowest concentrations in spring, with intermediate concentrations in the summer and highest concentrations observed

during the fall in each year. Therefore, although water chemistry data from winter, spring and summer sampling events were examined, the fall water chemistry data generally served as the focus for the evaluation of potential mine-related influences on water quality at the mine-exposed lakes in 2016 and 2017.

- Use of average water chemistry and chlorophyll-a data for lake water quality/phytoplankton monitoring stations. No consistent differences in water chemistry or chlorophyll-a concentrations were observed between the surface and bottom of the water column at Reference Lake 3 stations in 2015, 2016, or 2017. Therefore, the evaluation of water chemistry and phytoplankton productivity among stations and study areas for the 2016 and 2017 Mary River Project CREMP was based on average water chemistry and chlorophyll-a values, respectively, from the water column surface and bottom for each lake station.

- Consider updating of the AEMP sediment quality benchmarks. Arsenic, chromium, copper, iron, manganese, and phosphorus in have been observed at concentrations above the AEMP sediment quality benchmarks in sediment at Reference Lake 3 in the 2015, 2016, and/or 2017 CREMP studies. This suggested that the AEMP benchmarks for these metals may be overly conservative and therefore, to improve the applicability of the AEMP benchmarks for these metals, consideration should be given to incorporating reference lake data into derivation of updated sediment benchmarks.

- Focus lake benthic invertebrate community survey on littoral zone. Benthic invertebrate community data collected at Reference Lake 3 in 2015, 2016, and 2017 indicated that, similar to most lakes, benthic invertebrate community features can be expected to naturally change with depth. In general, as depth increases, lower benthic invertebrate density and richness typically occurs. The occurrence of naturally low density and/or richness can, in turn, limit the ability to distinguish adverse effects associated with a project. Therefore, in order to maximize the confidence in the benthic invertebrate community analysis results, the littoral zone should serve as the focus for the lake benthic invertebrate community survey analysis for the CREMP.

- Adopting of standard CES for benthic invertebrate community and fish population endpoints into the CREMP. Year-to-year evaluation of reference creek and lake habitat used for the CREMP has indicated that benthic invertebrate and fish populations differences between years can be expected to vary within the CES set out for use under the federal EEM program (Munkittrick et al. 2009). Therefore, the use of established CES for defining effects appears to be applicable to the Mary River Project CREMP.

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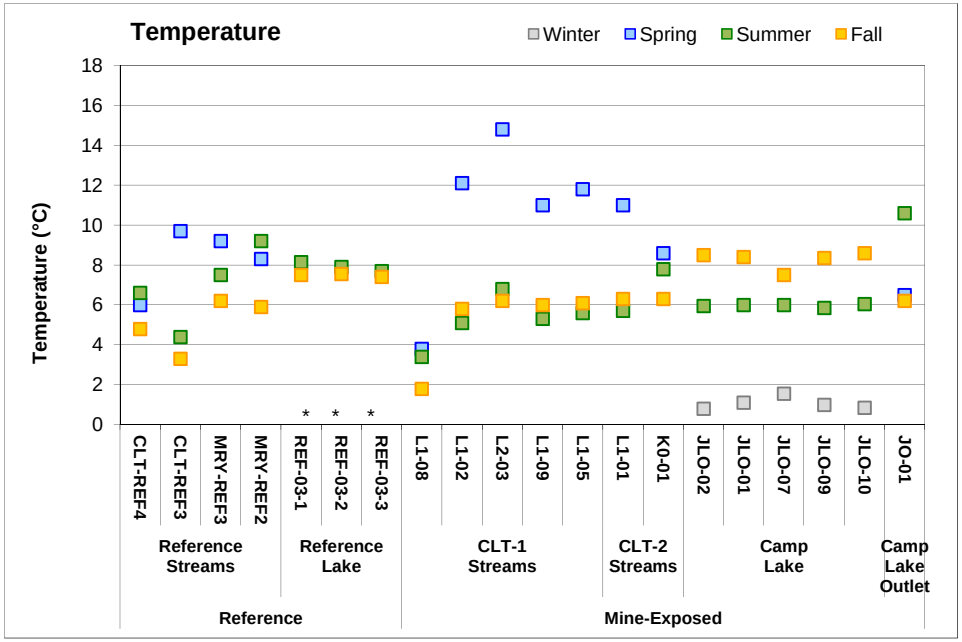
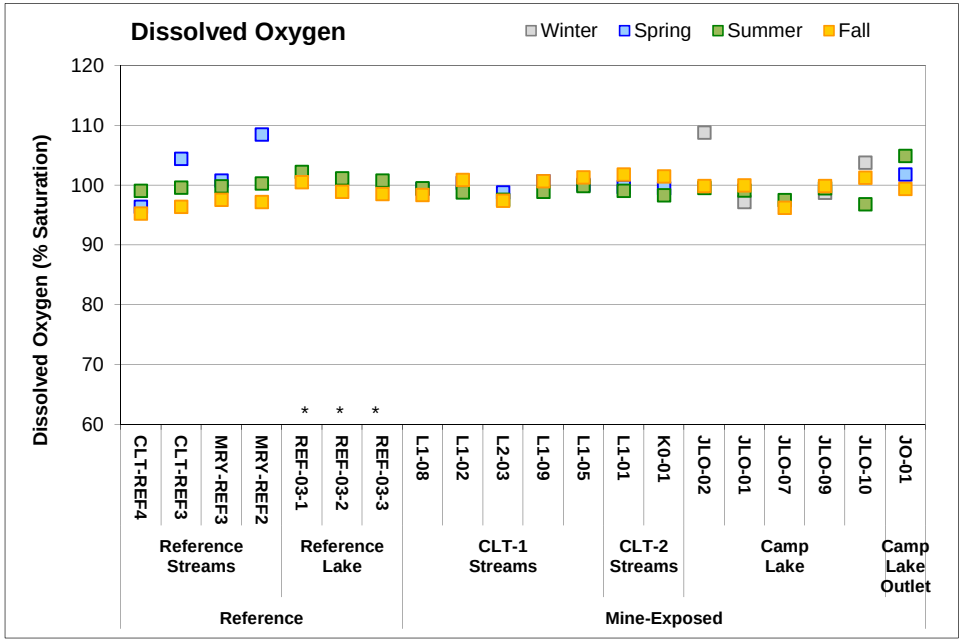
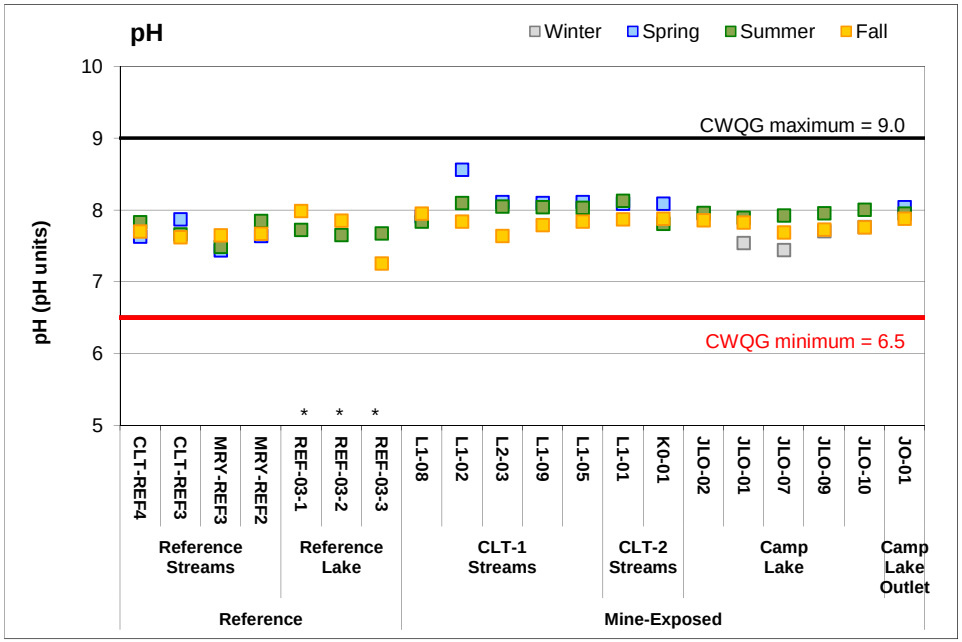
APPENDIX C

WATER QUALITY DATA







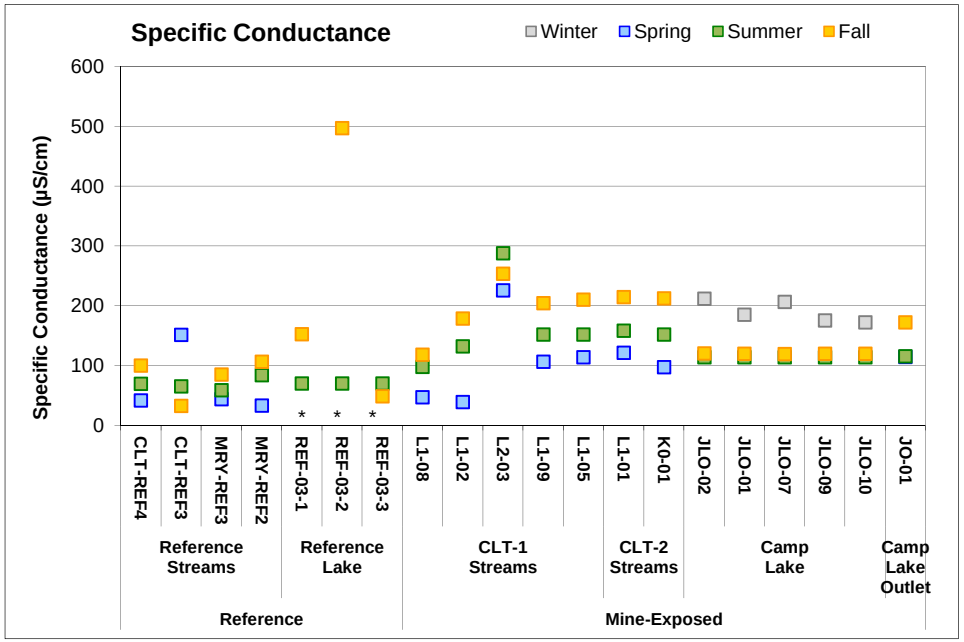
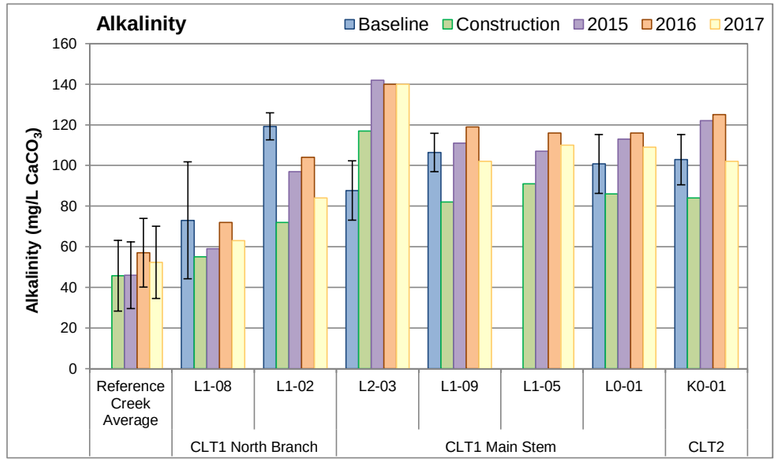
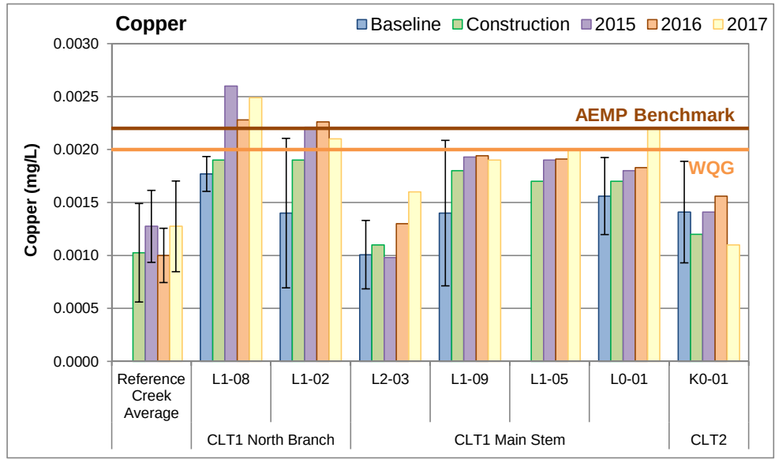
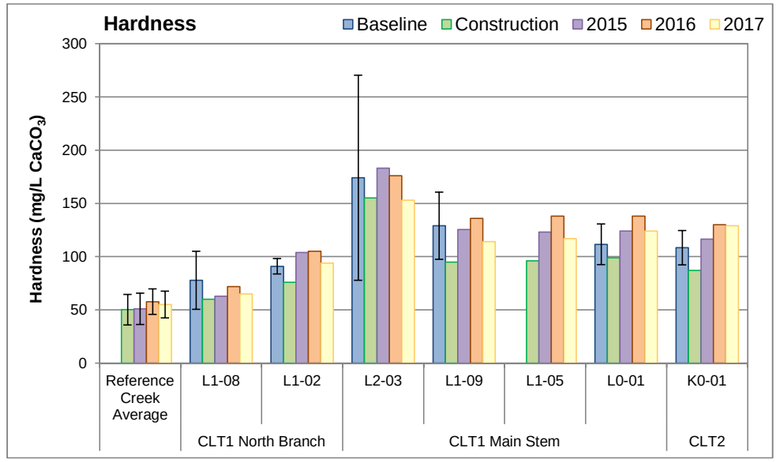


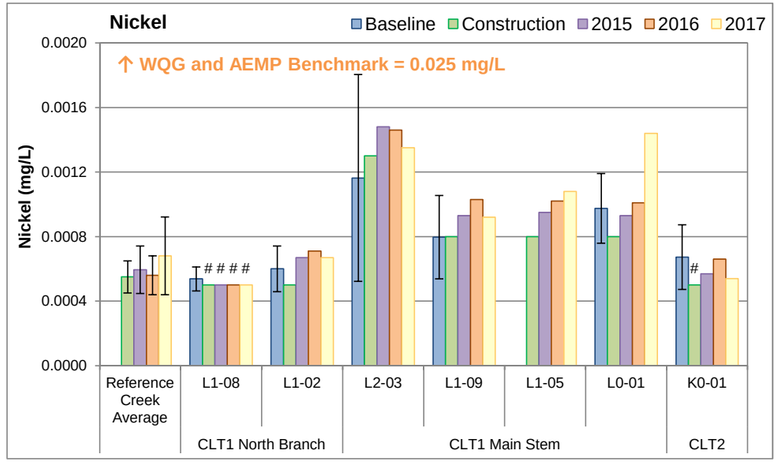
Figure C.1: Comparison of *In Situ* Water Quality Variables Measured at Camp Lake System Water Quality Monitoring Stations in Winter, Spring, Summer, and Fall 2017, Mary River Project CREMP

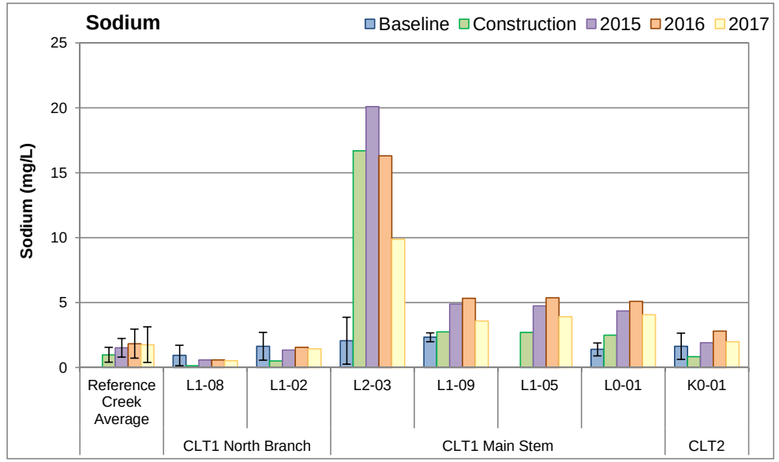
Notes: Lake values represent mean of surface and bottom *in situ* water quality measurements. Streams were not sampled in winter. Lakes were not sampled in spring.
* Reference Lake 3 (REF-03) was not sampled in winter.

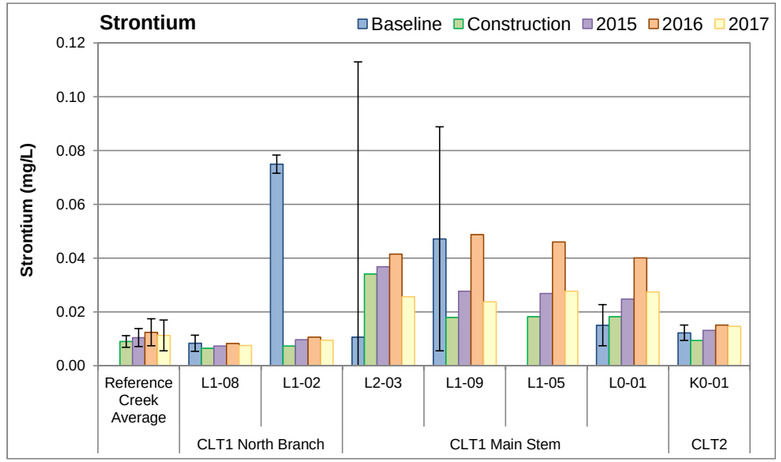


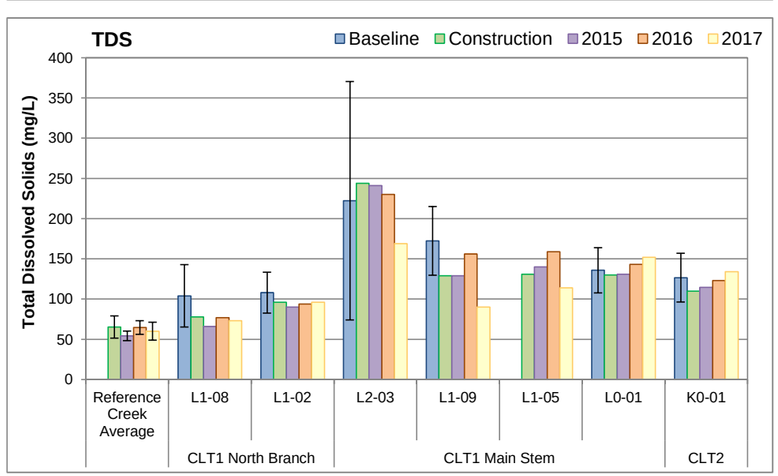


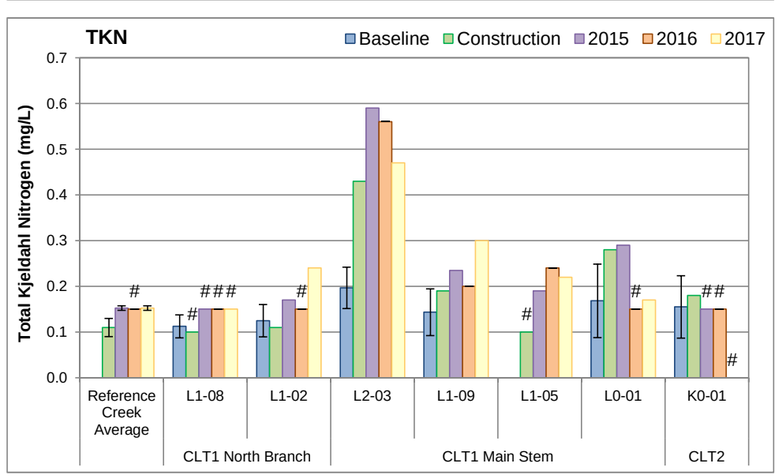












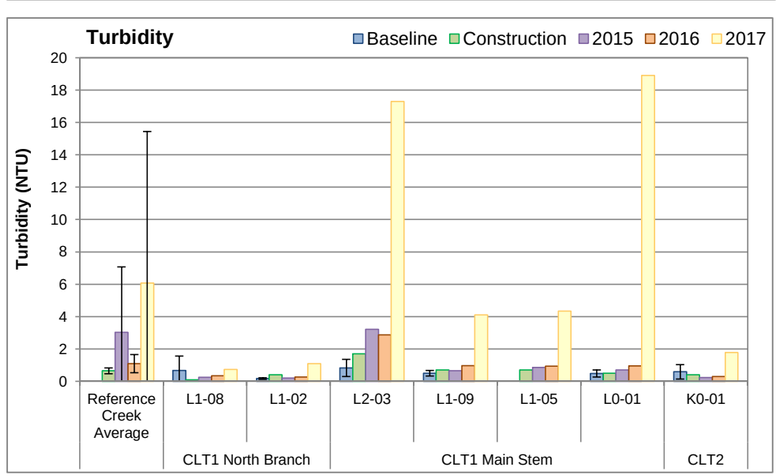


Figure C.2: Temporal Comparison of Water Chemistry at Camp Lake Tributary 1 (CLT-1) and Tributary 2 (CLT-2) for Mine Baseline (2005 - 2013), Construction (2014) and Operational (2015 - 2017) Periods During Fall

Notes: Values represent mean ± SD. Lotic reference stations include the CLT-REF and MRY-REF series (mean ± SD; n = 4). Pound symbol (#) indicates parameter concentration is below the laboratory method detection limit. See Table 2.2 for information regarding Water Quality Guideline (WQG) criteria. AEMP Benchmarks are specific to the Camp Lake Tributaries.

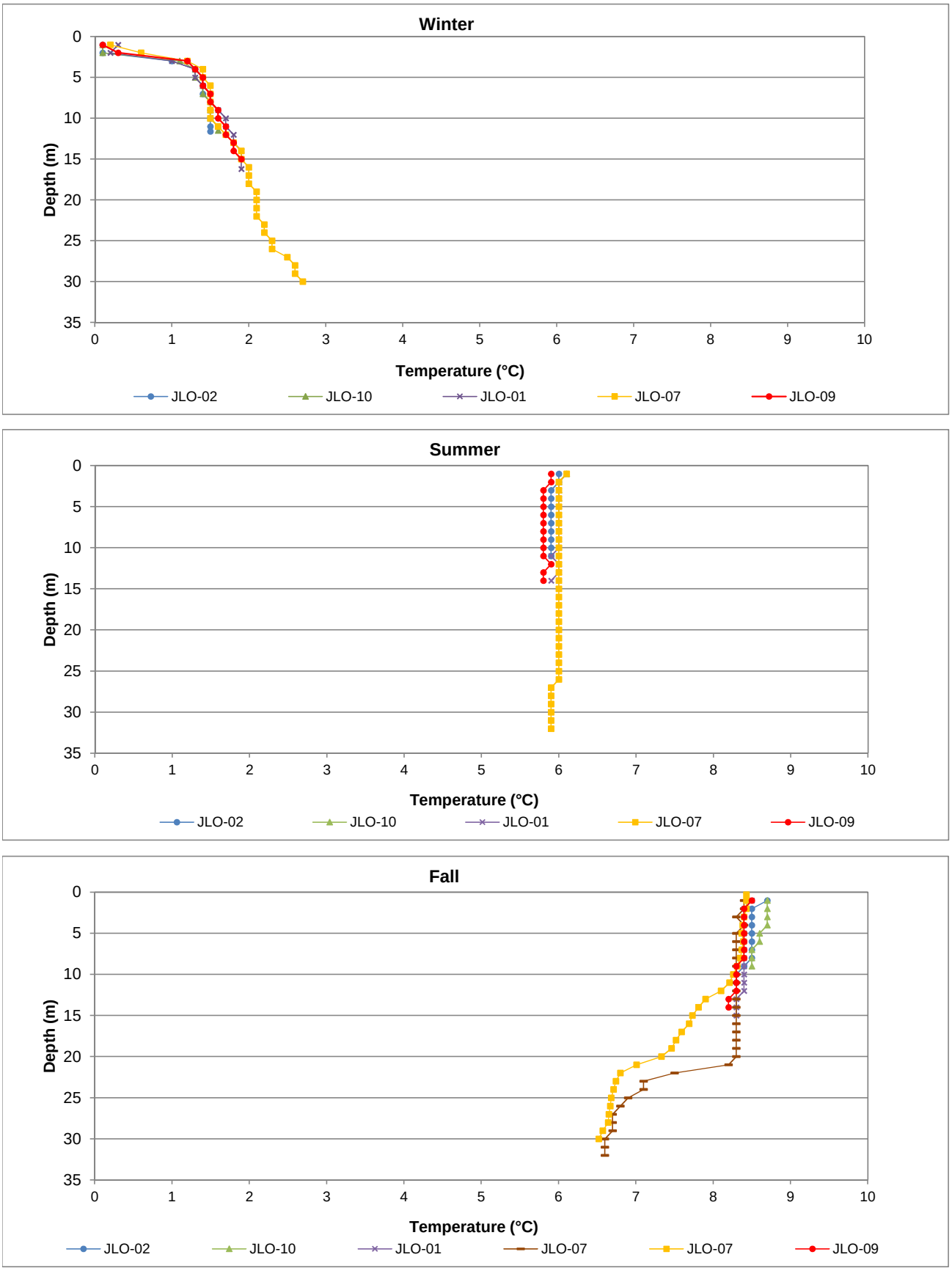


Figure C.3: Vertical Profiles of Temperature Measured at Camp Lake in Winter, Summer, and Fall, 2017

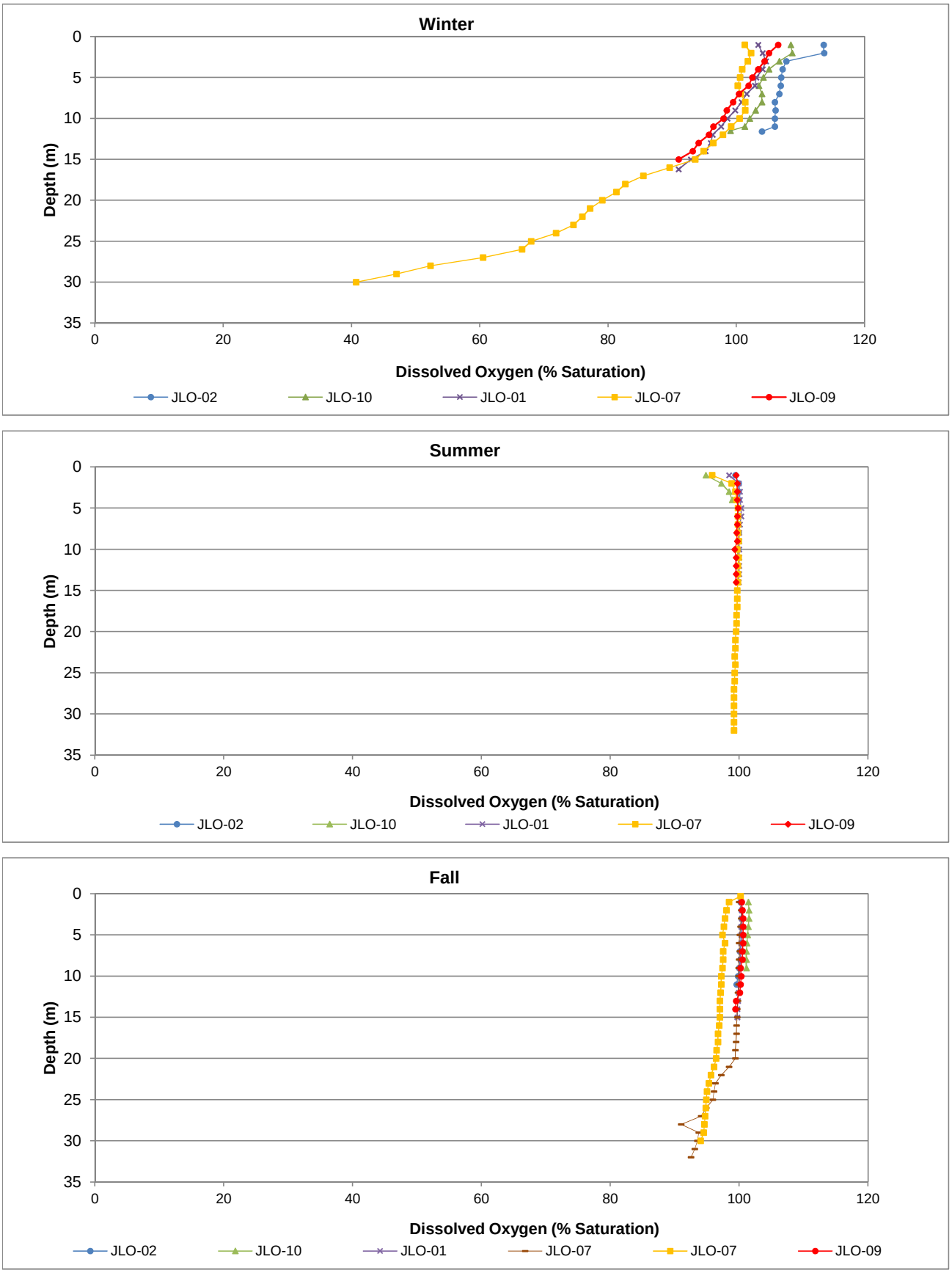


Figure C.4: Vertical Profiles of Dissolved Oxygen Measured at Camp Lake in Winter, Summer, and Fall, 2017

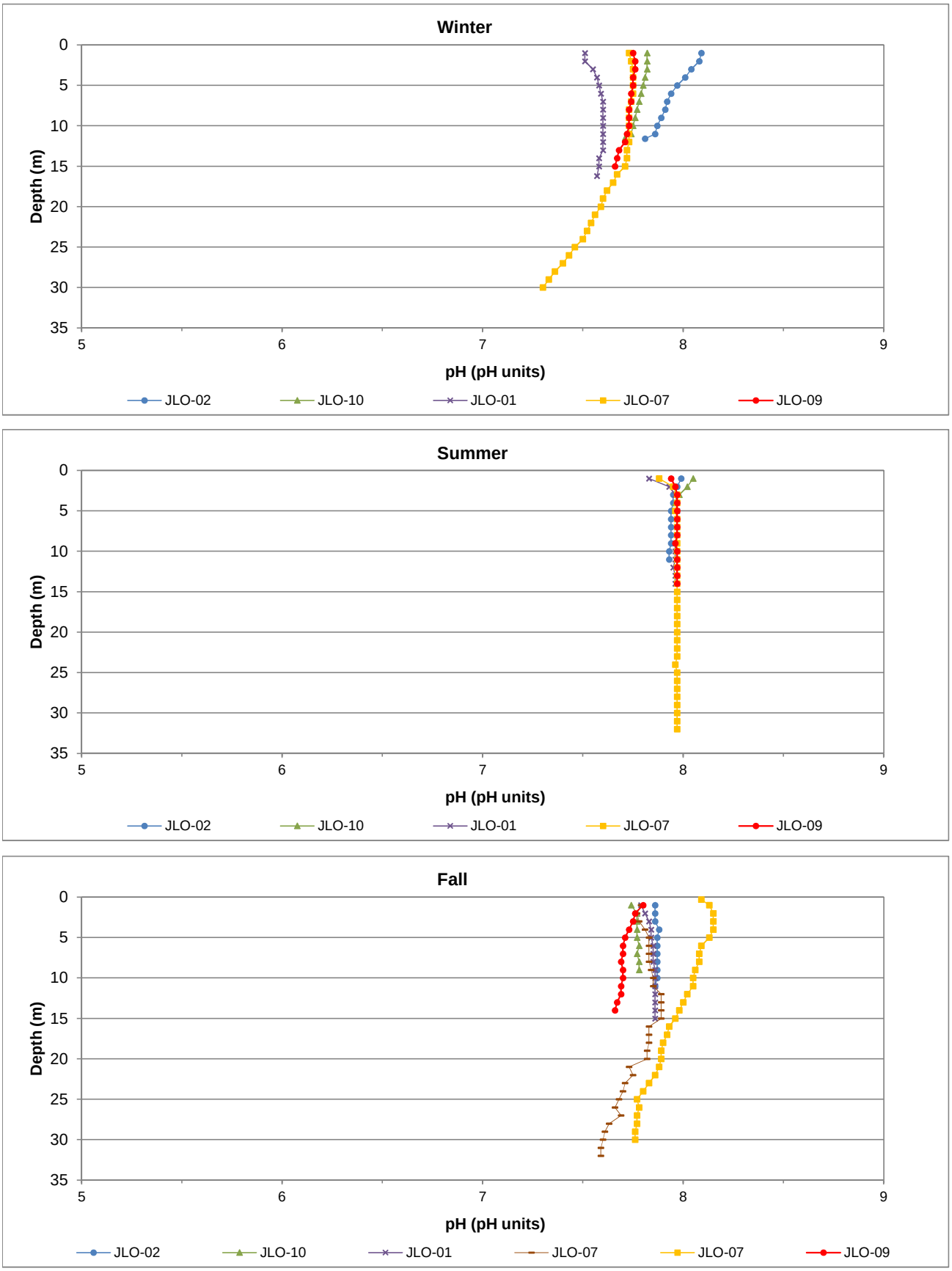


Figure C.5: Vertical Profiles of pH Measured at Camp Lake in Winter, Summer, and Fall, 2017

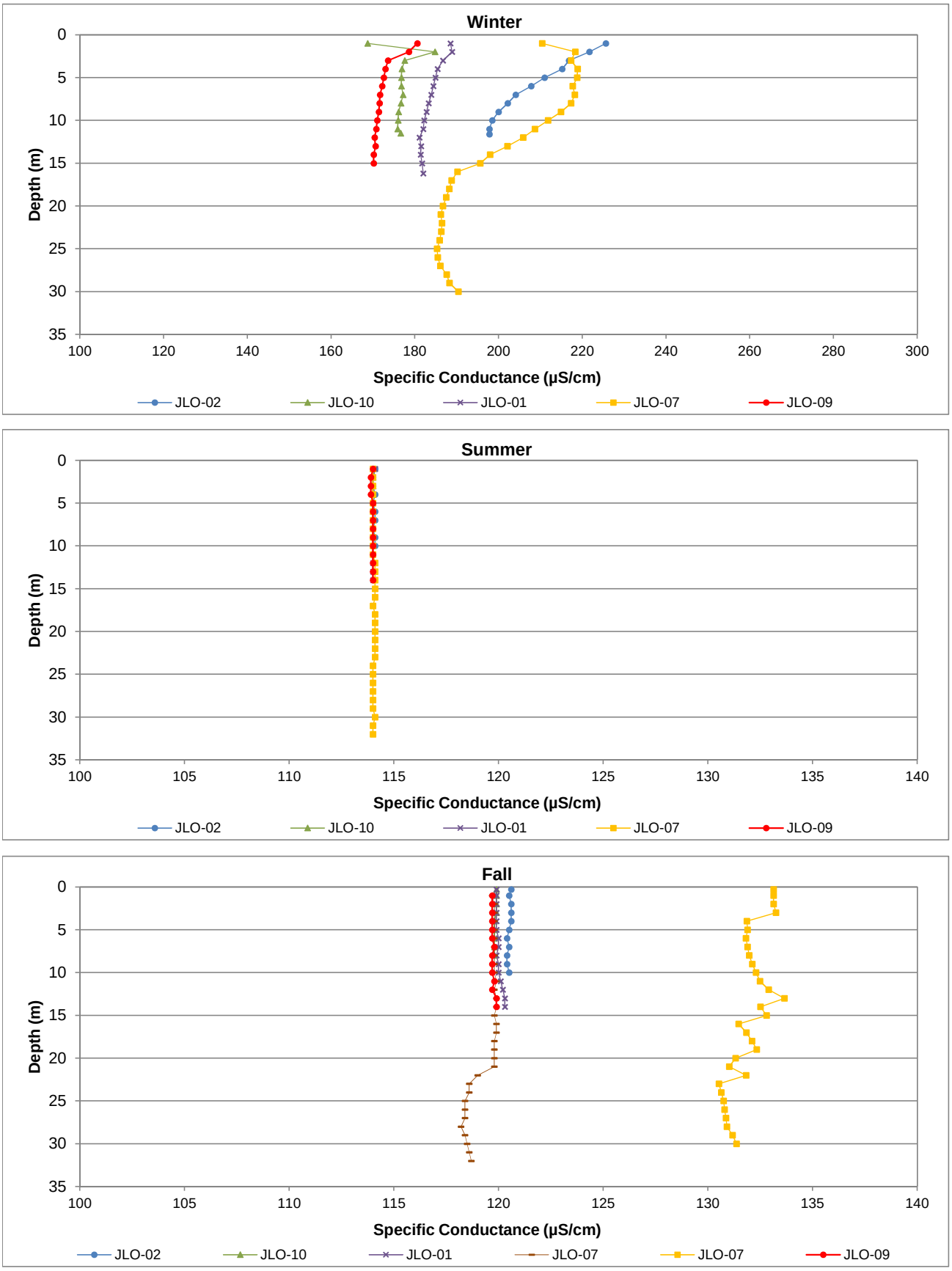


Figure C.6: Vertical Profiles of Specific Conductance Measured at Camp Lake in Winter, Summer, and Fall, 2017

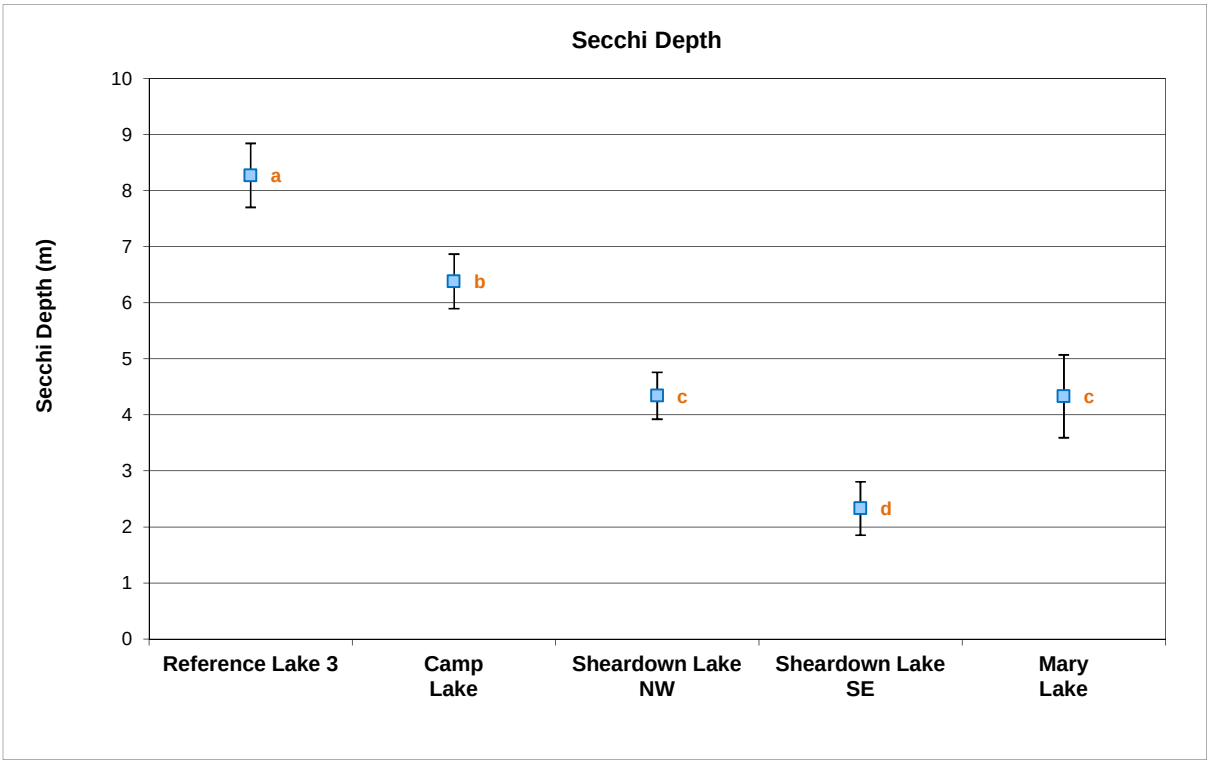


Figure C.7: Comparison of Secchi Depth (mean ± SD) Measured at the Mary River Project Lake Benthic Invertebrate Community Stations (n = 10 for each lake), August 2017

Note: The same letter(s) next to study area data points indicate no significant difference between study areas.

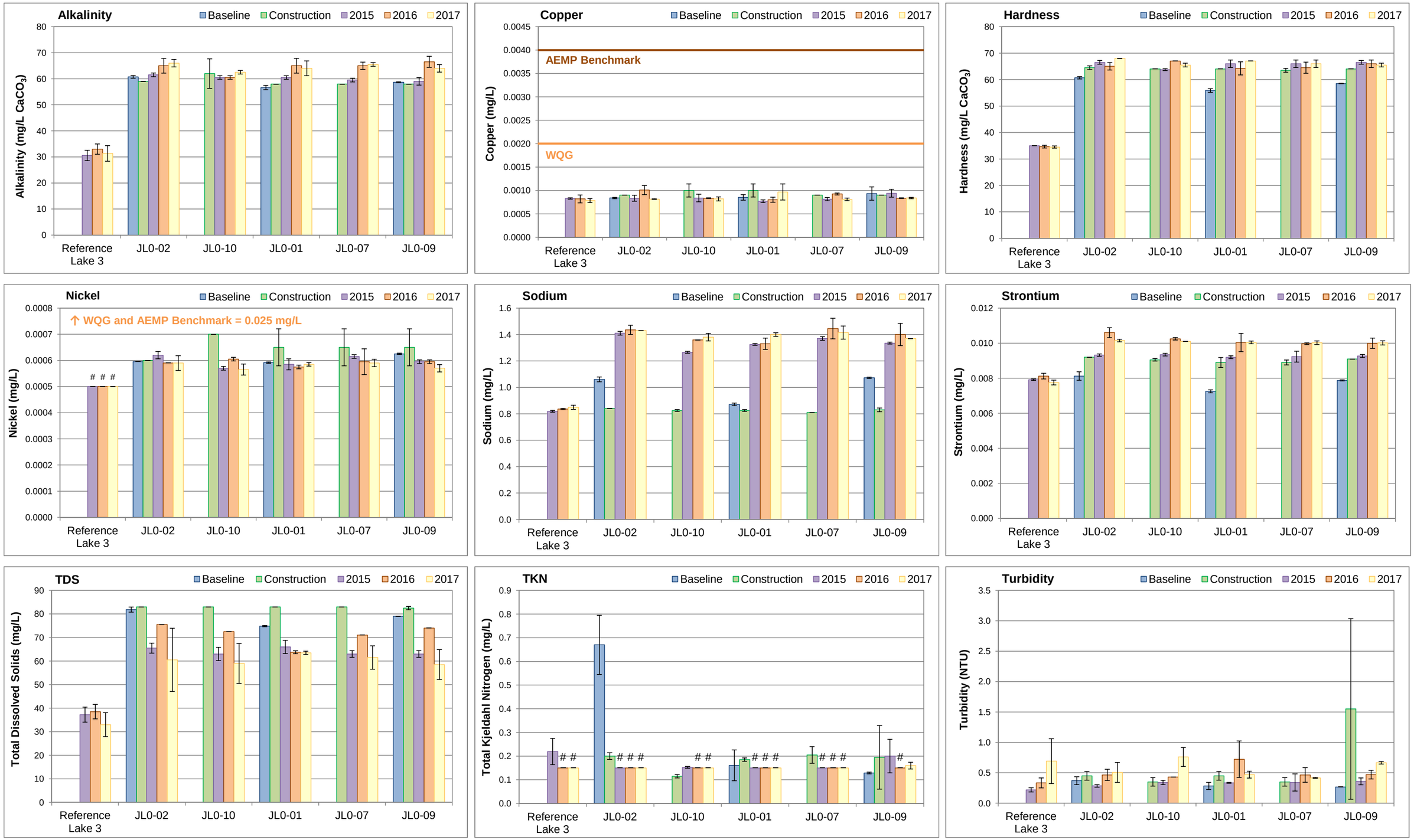


Figure C.8: Temporal Comparison of Water Chemistry at Camp Lake (JLO) for Mine Baseline (2005 - 2013), Construction (2014) and Operational (2015, 2016) Periods during Fall

Notes: Values represent mean ± SD. Pound symbol (#) indicates parameter concentration is below the laboratory method detection limit. See Table 2.2 for information regarding Water Quality Guideline (WQG) criteria. AEMP Benchmarks are specific to Camp Lake.

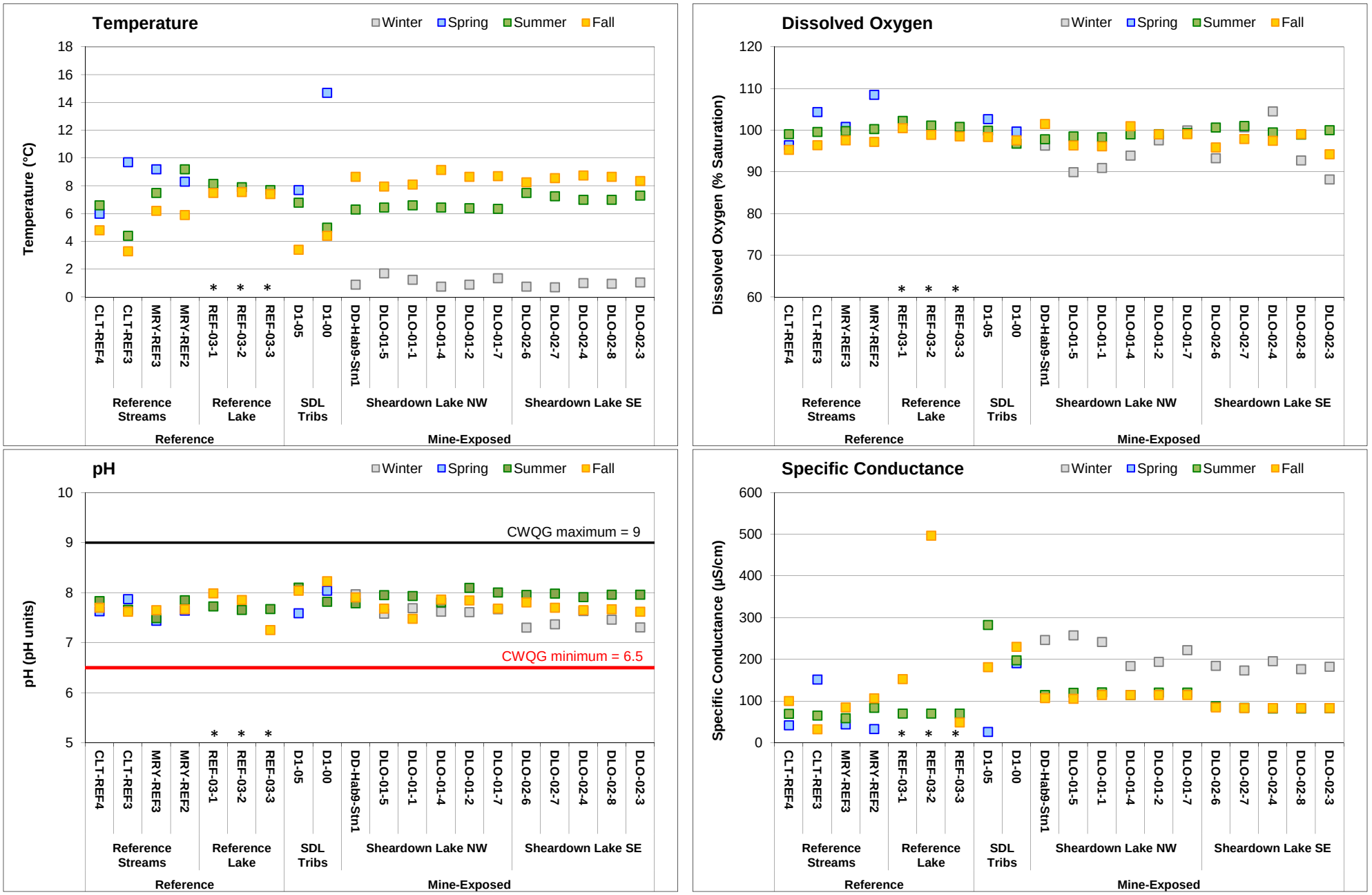


Figure C.9: Comparison of *In Situ* Water Quality Variables Measured at Sheardown Lake System Water Quality Monitoring Stations in Winter, Spring, Summer, and Fall 2017, Mary River Project CREMP

Notes: Lake values represent mean of surface and bottom *in situ* water quality measurements. Streams were not sampled in winter. Lakes were not sampled in spring.

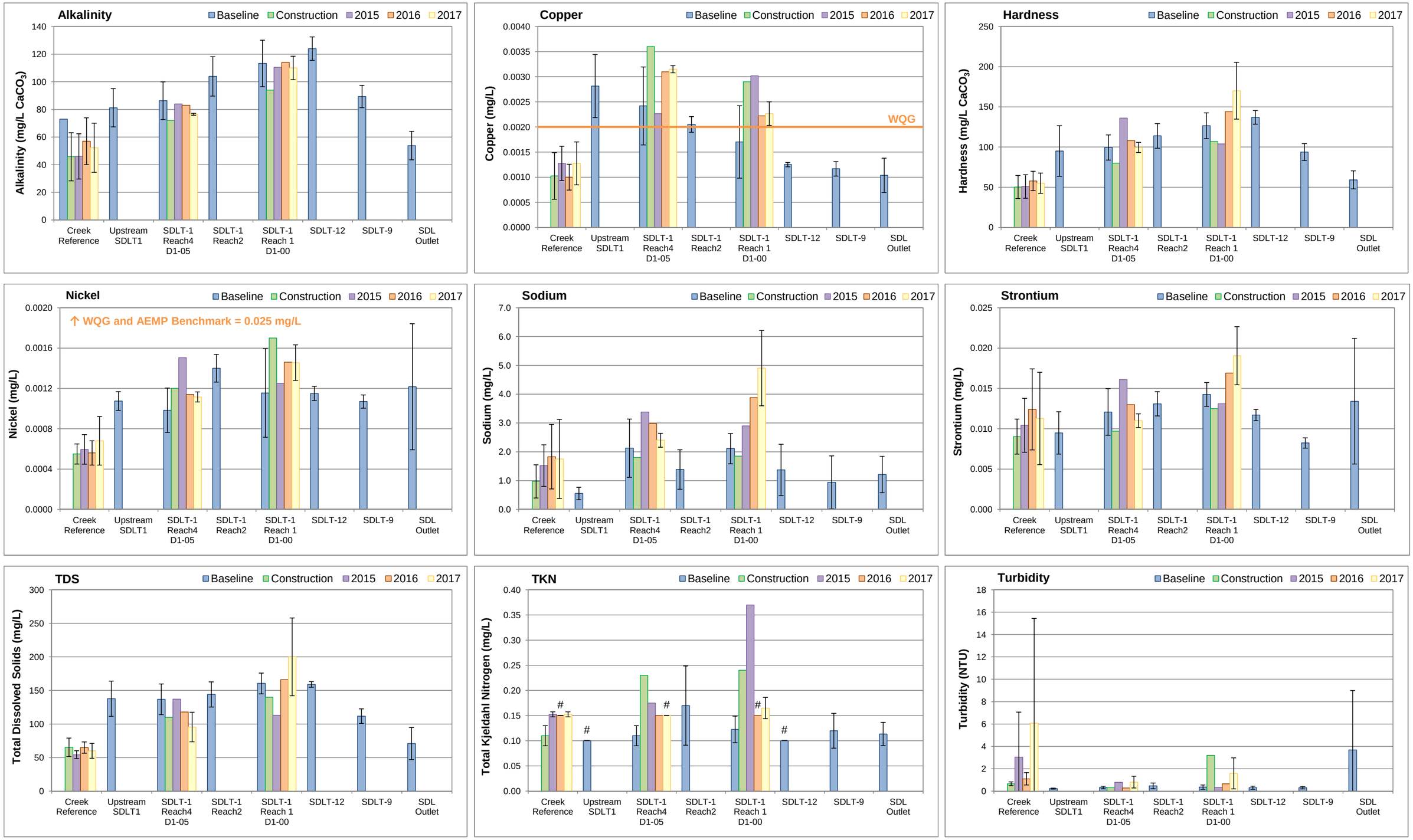


Figure C.10: Temporal Comparison of Water Chemistry at Sheardown Lake Tributaries (SDLT) for Mine Baseline (2005 - 2013), Construction (2014) and Operational (2015, 2016, and 2017) Periods during Fall

Notes: Values represent mean ± SD. Creek reference includes the CLT-REF and MRY-REF series stations (mean ± SD; n = 4). Pound symbol (#) indicates parameter concentration is below the laboratory method detection limit. See Table 2.2 for information regarding Water Quality Guideline (WQG) criteria. AEMP Benchmarks are specific to the Sheardown Lake Tributaries.

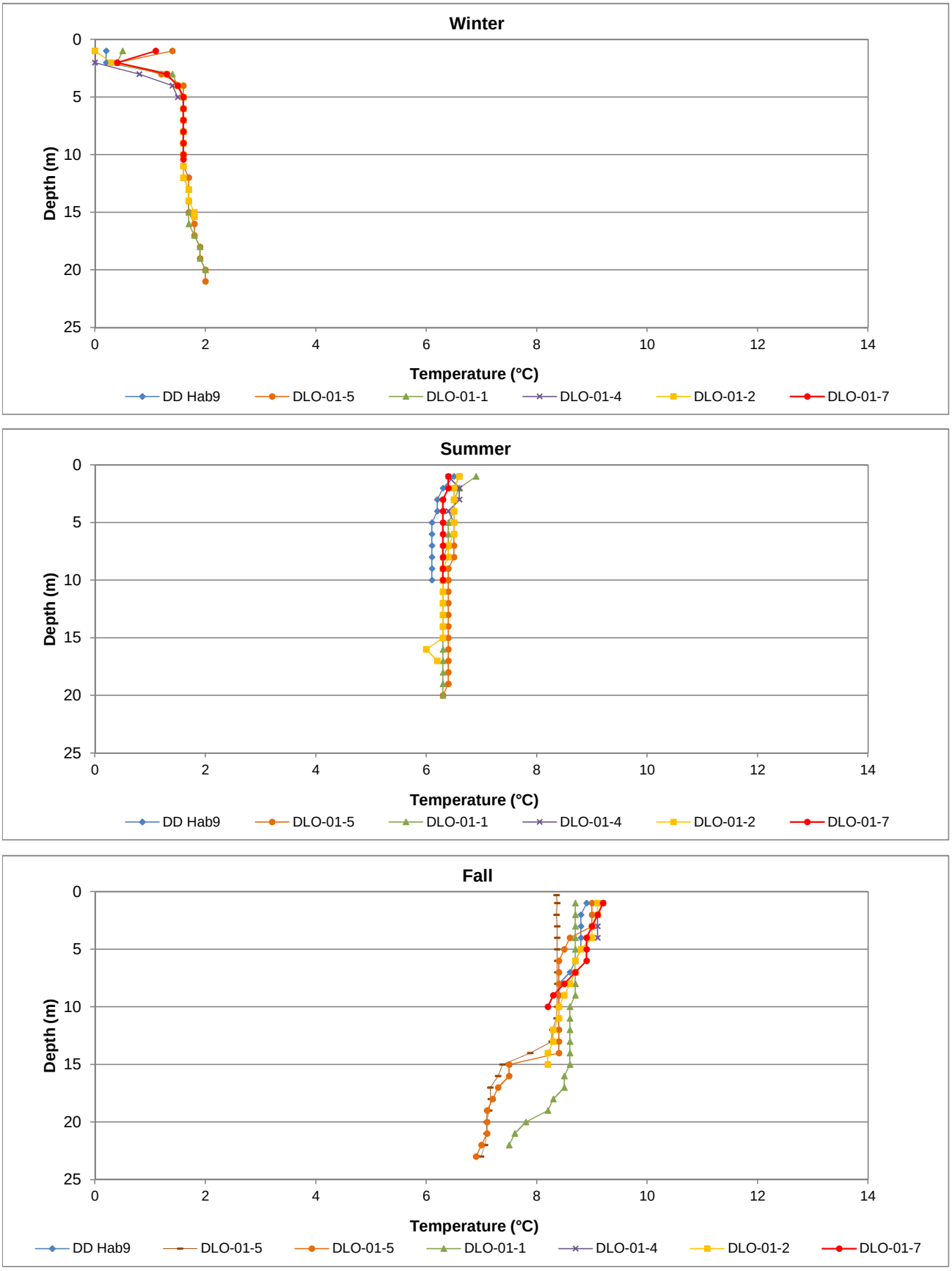


Figure C.11: Vertical Profiles of Temperature Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2017

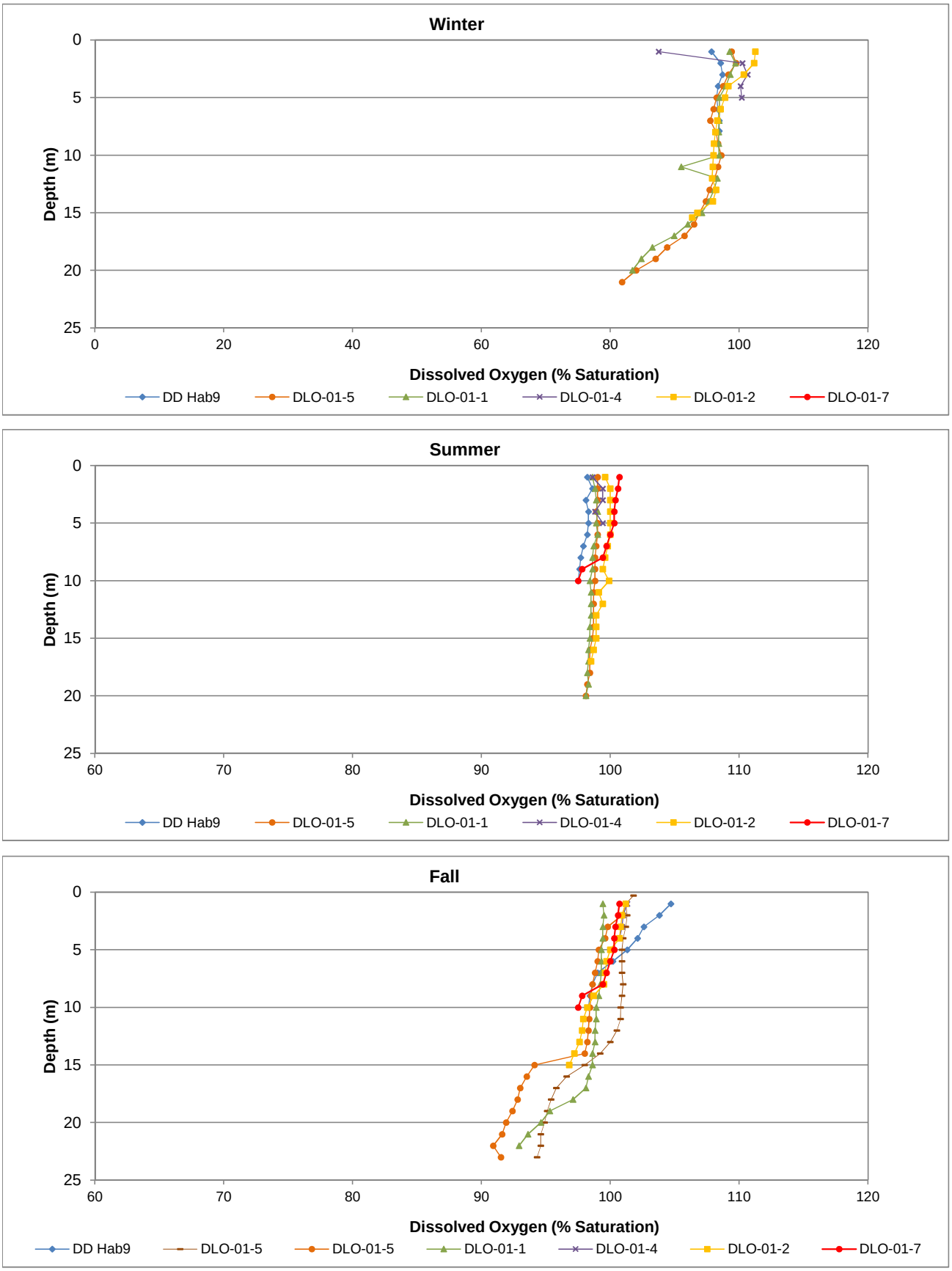


Figure C.12: Vertical Profiles of Dissolved Oxygen Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2017

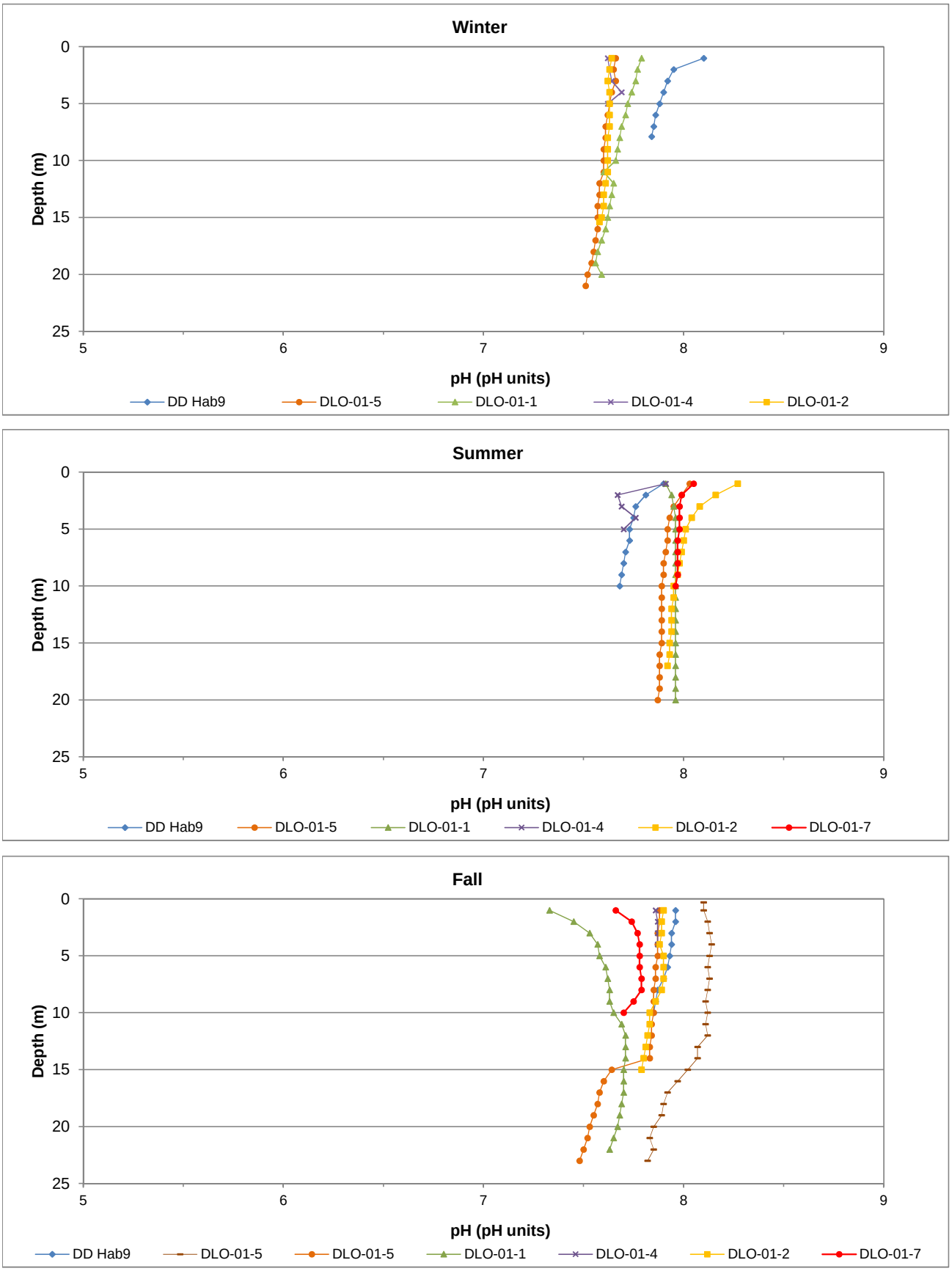


Figure C.13: Vertical Profiles of pH Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2017

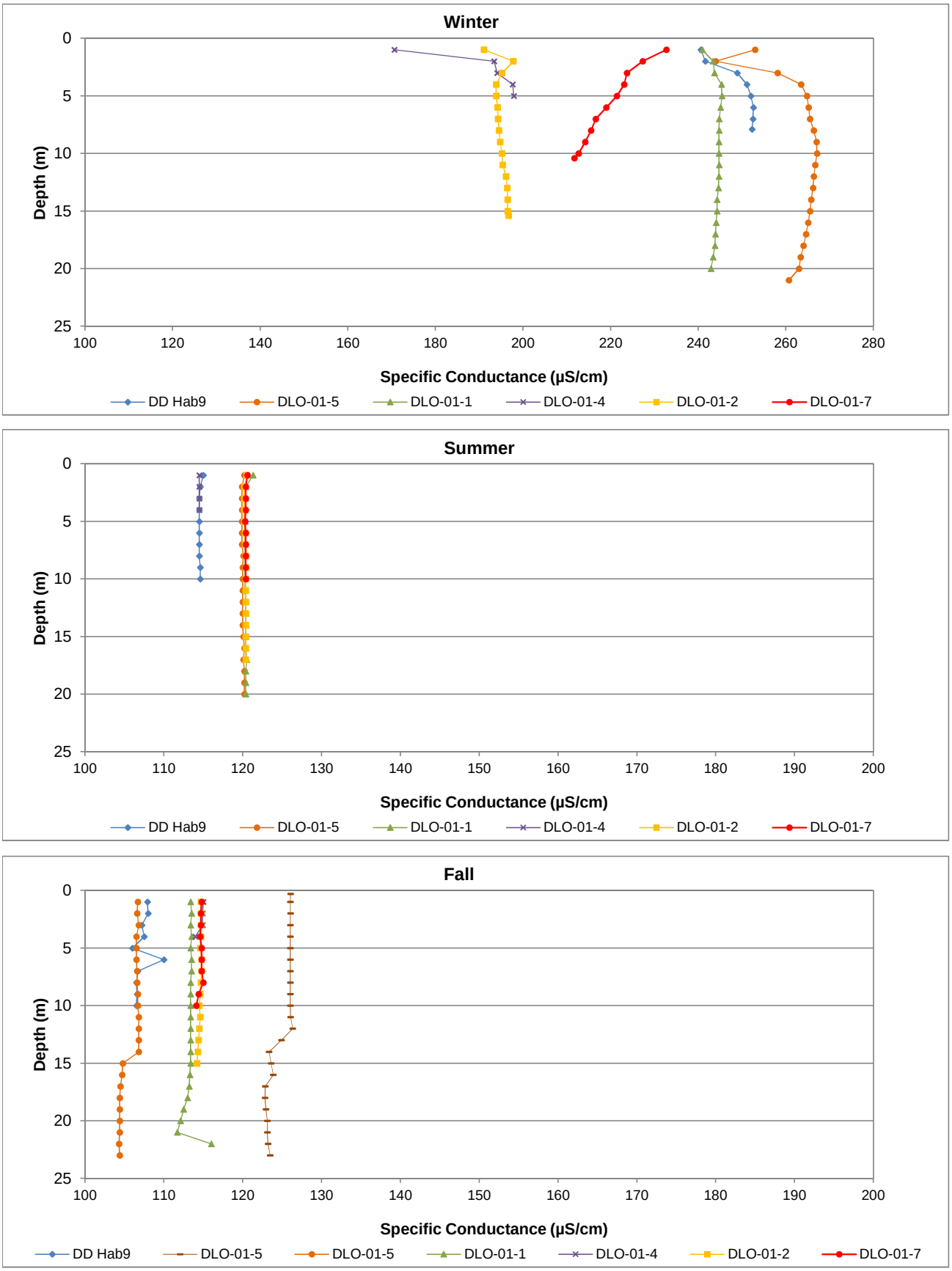


Figure C.14: Vertical Profiles of Specific Conductance Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2017

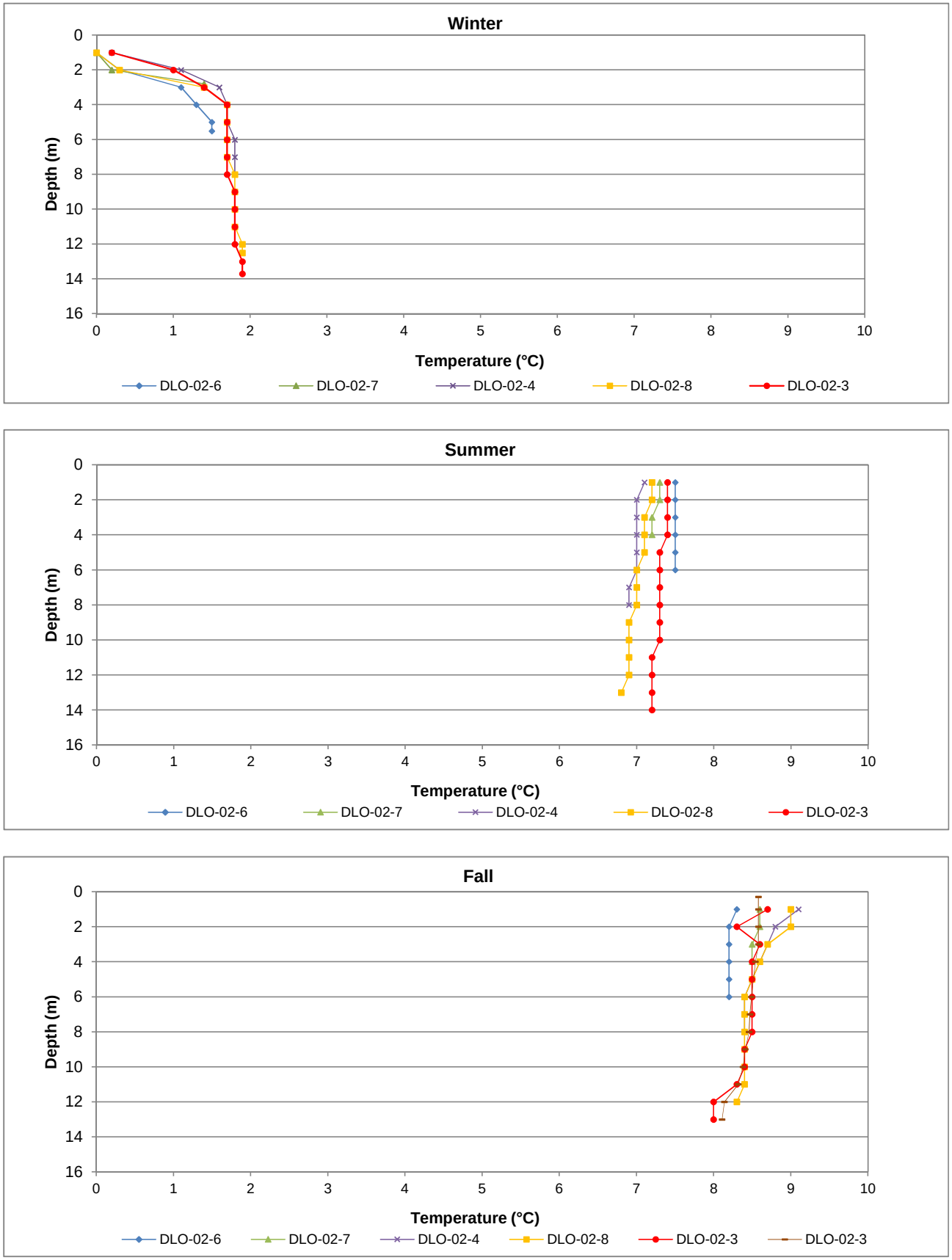
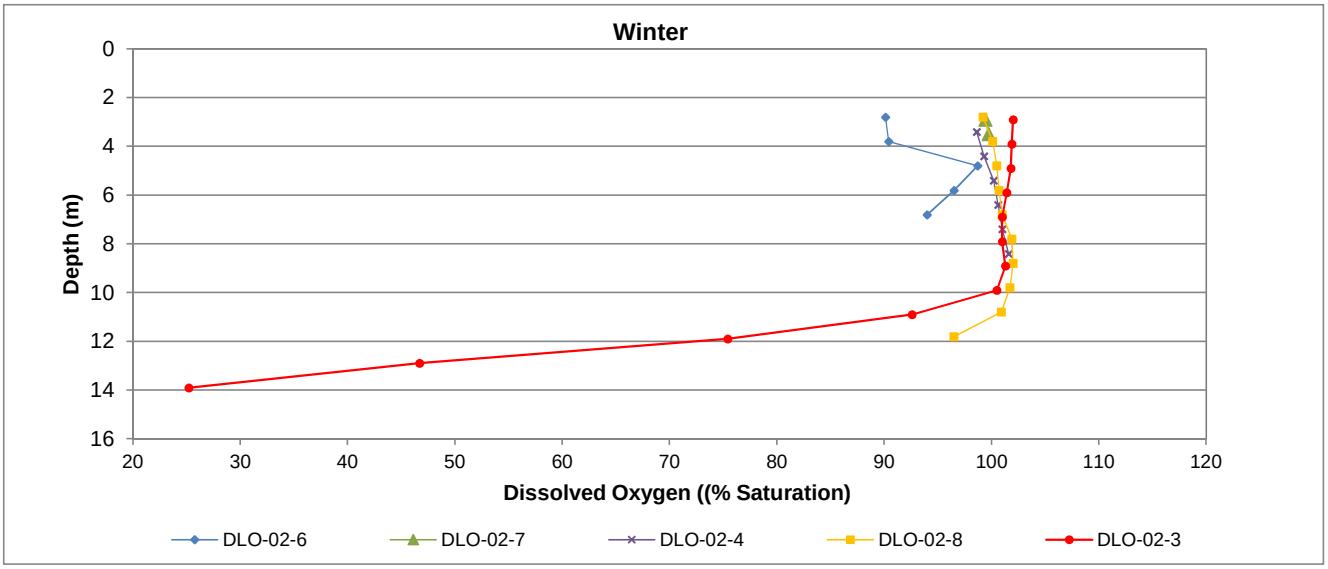
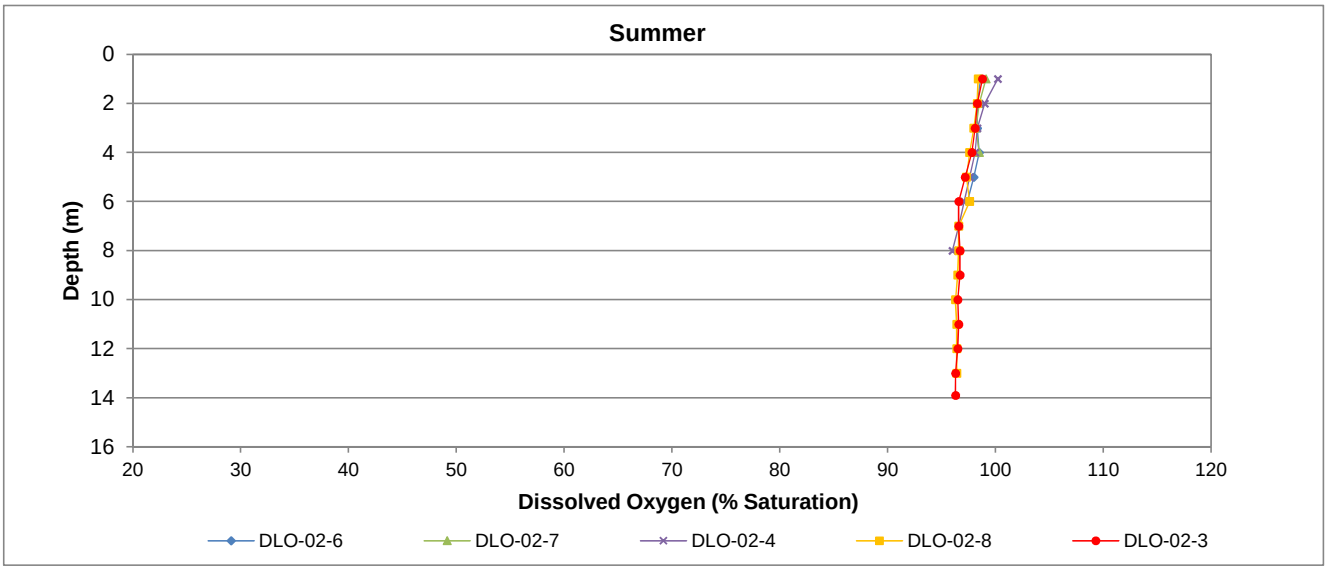


Figure C.15: Vertical Profiles of Temperature Measured at Sheardown Lake SE in Winter, Summer, and Fall, 2017





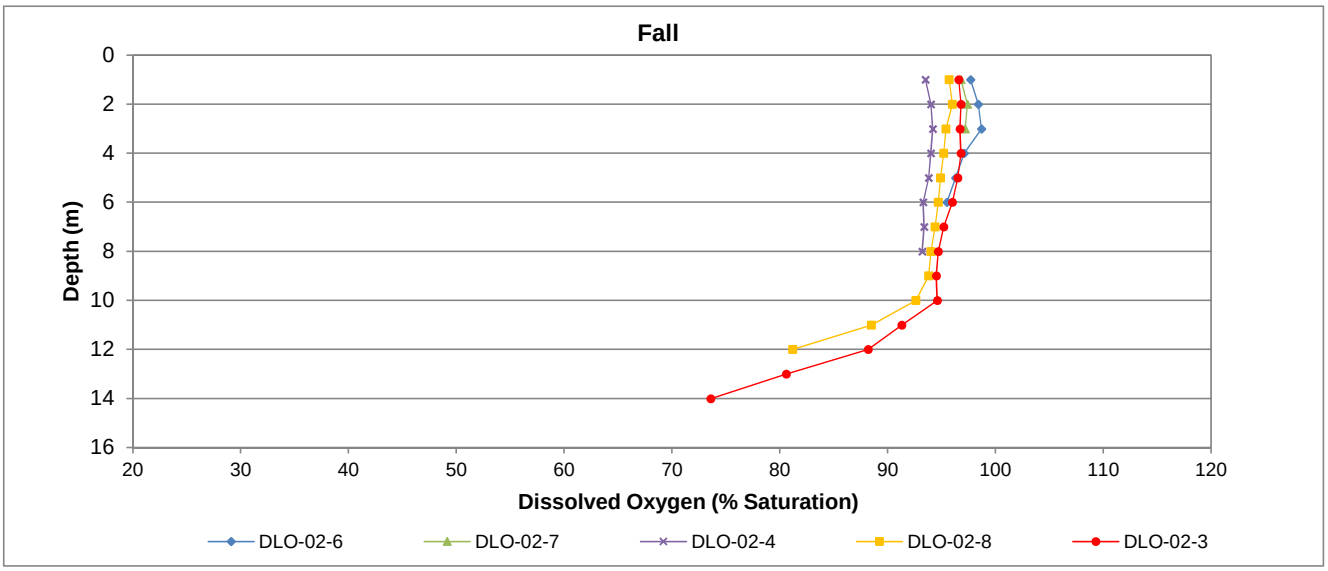


Figure C.16: Vertical Profiles of Dissolved Oxygen Measured at Sheardown Lake SE in Winter, Summer, and Fall, 2017

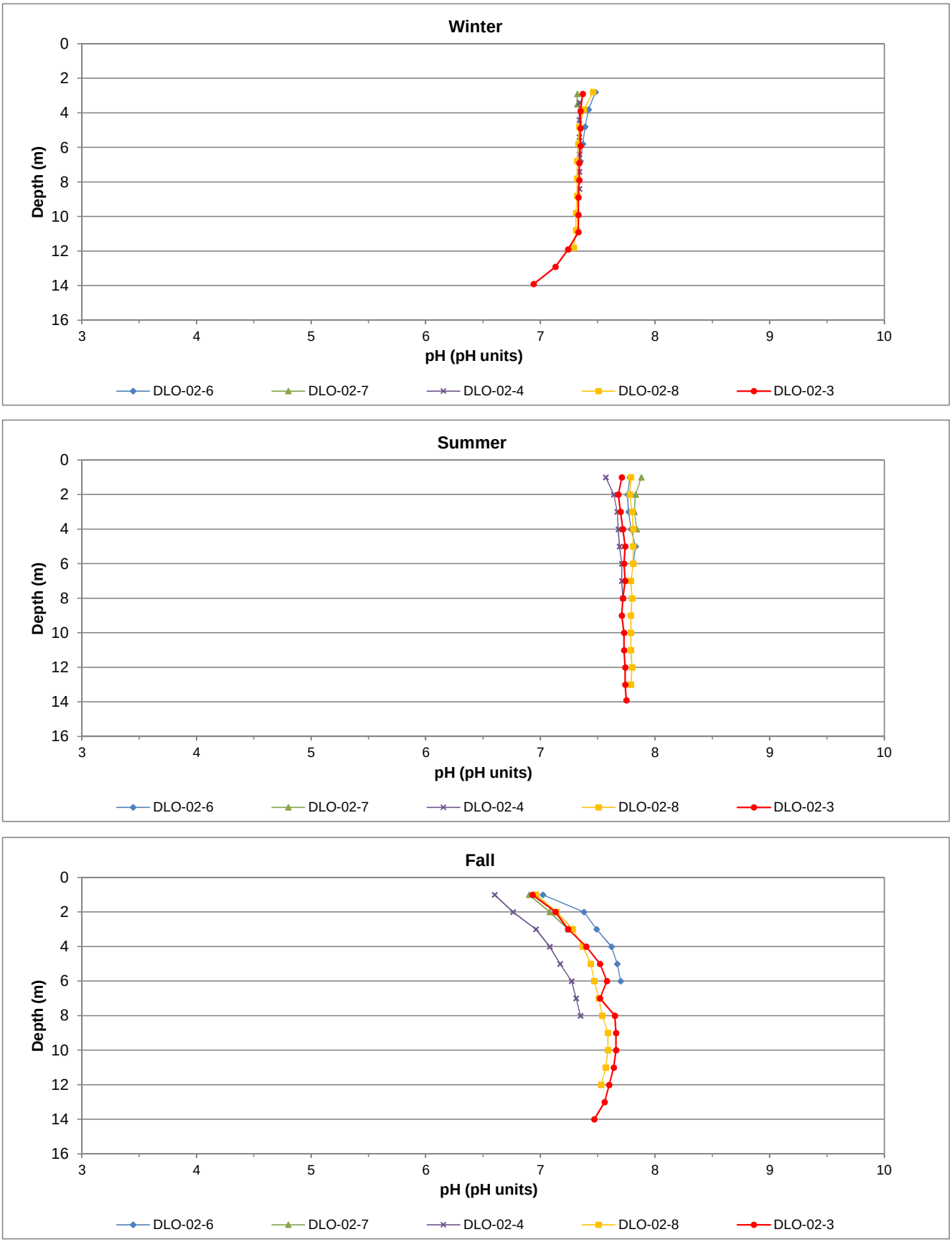


Figure C.17: Vertical Profiles of pH Measured at Sheardown Lake SE in Winter, Summer, and Fall, 2017

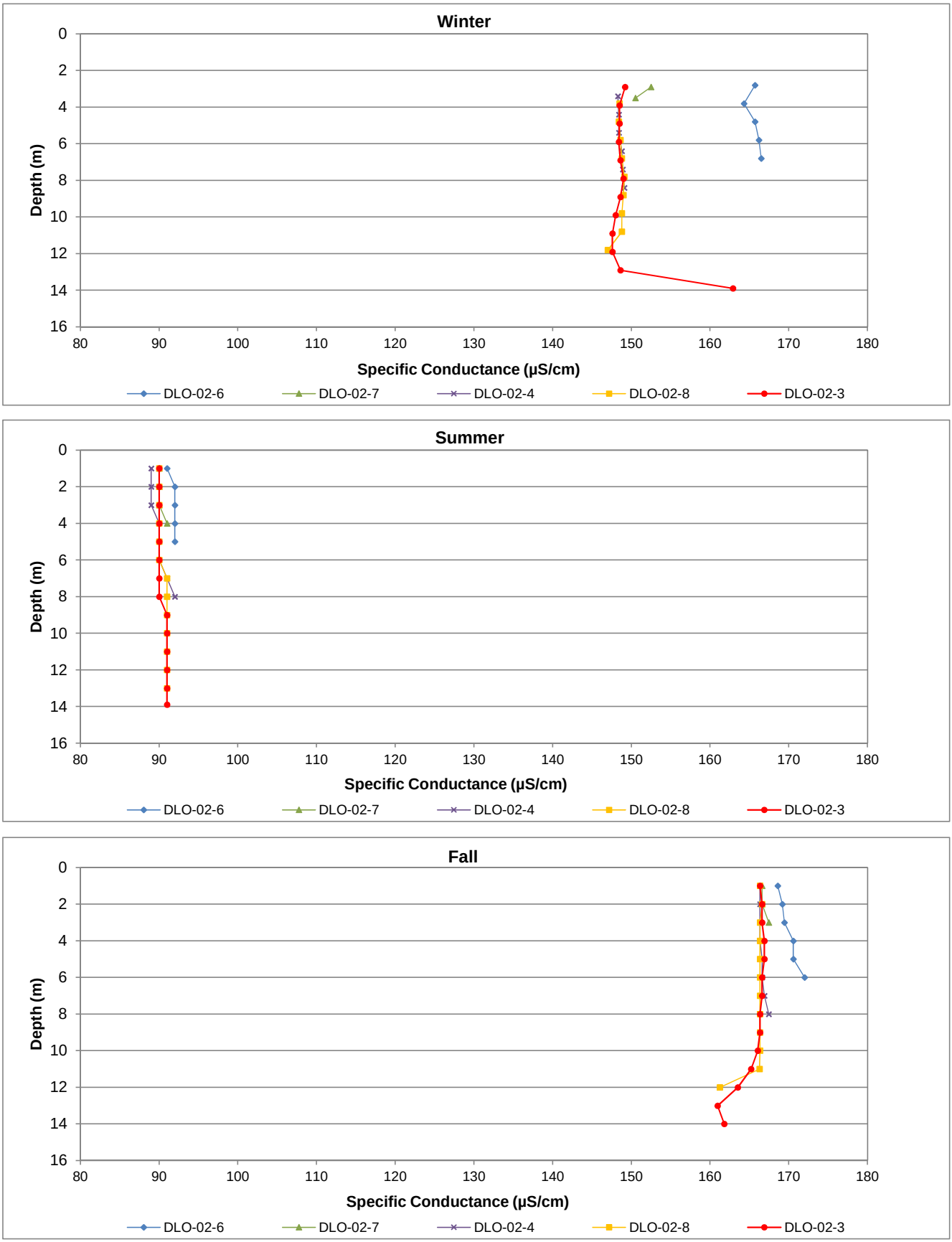


Figure C.18: Vertical Profiles of Conductivity Measured at Sheardown Lake SE in Winter, Summer, and Fall, 2017

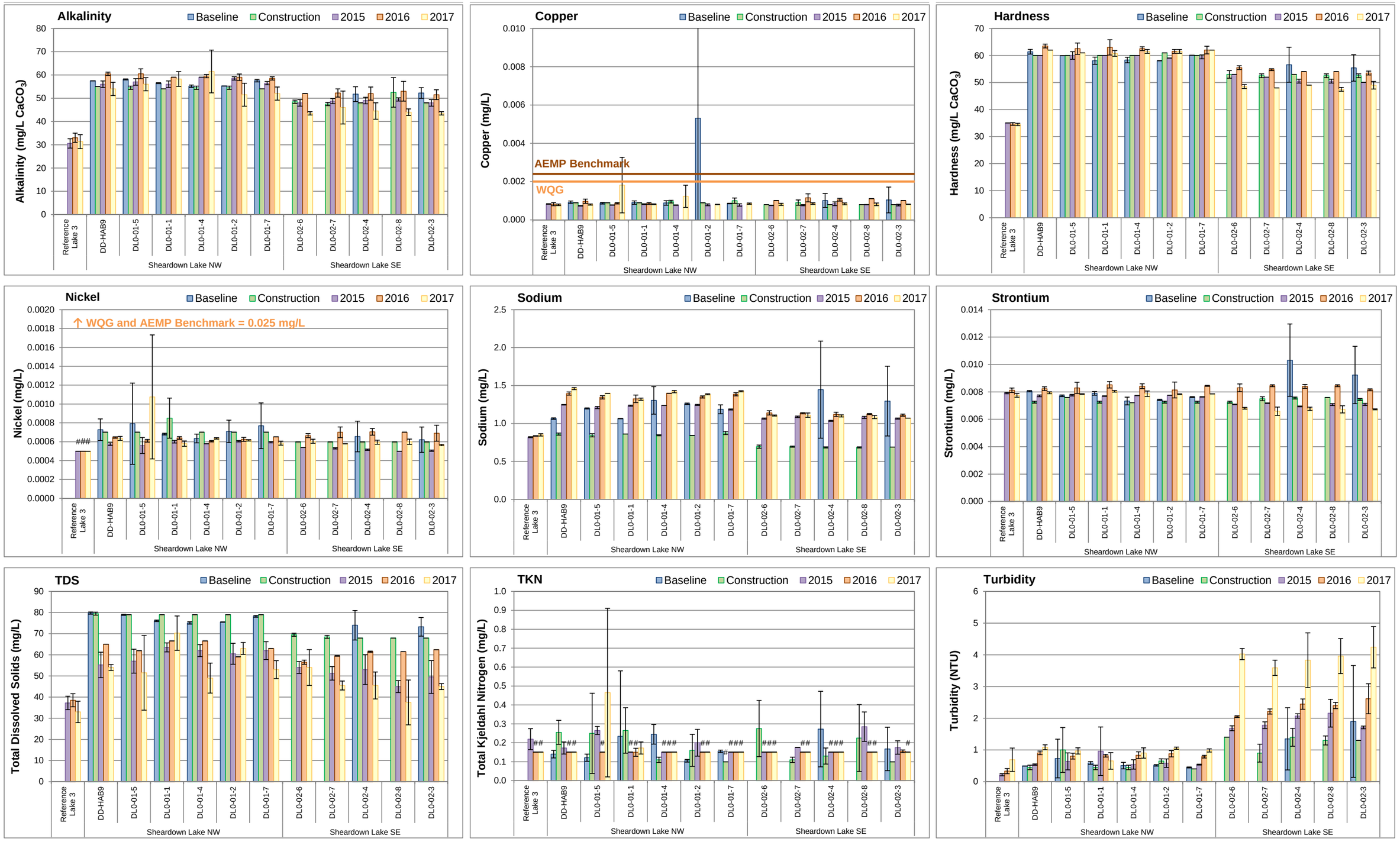
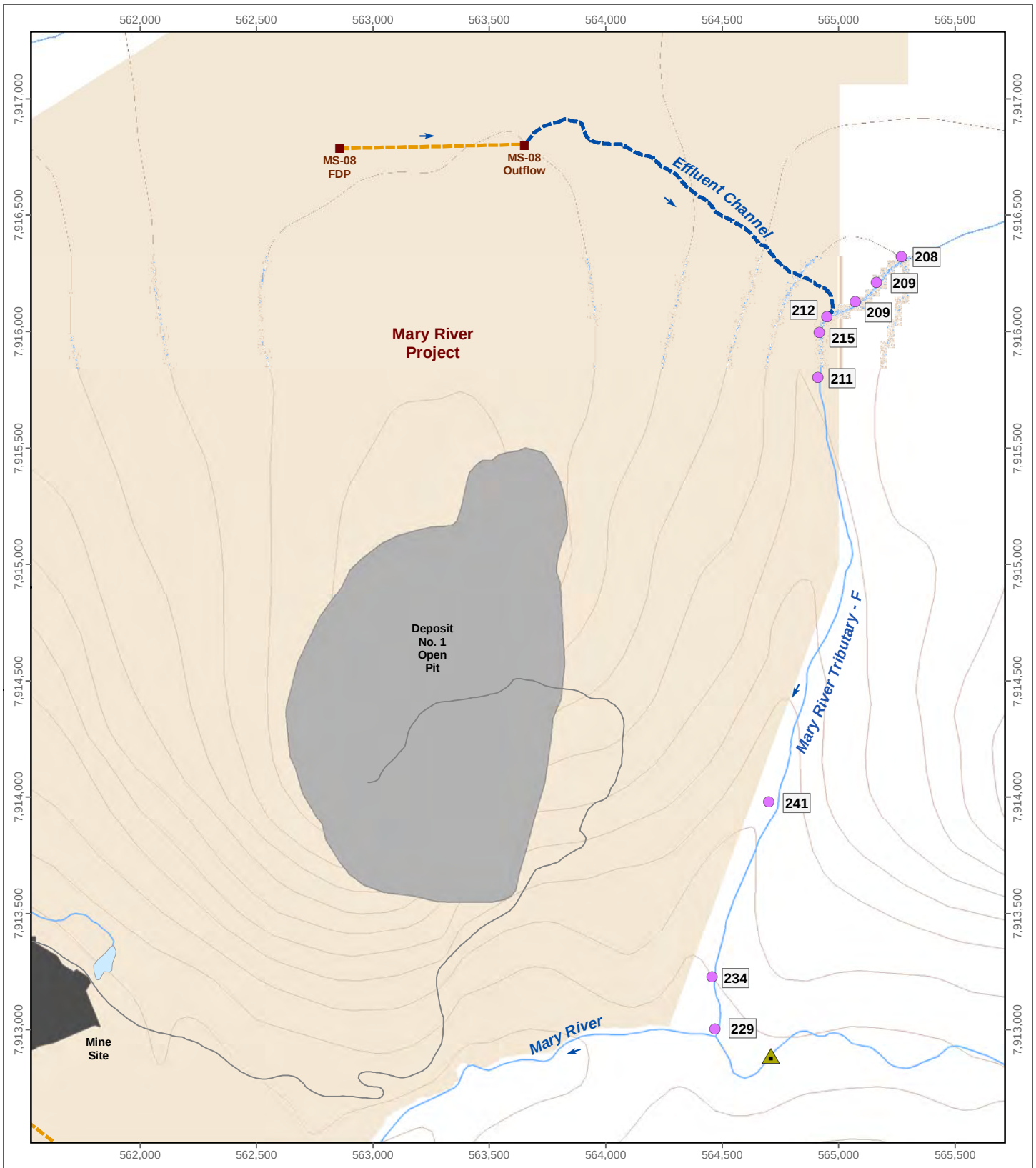


Figure C.19: Temporal Comparison of Water Chemistry at Sheardown Lake Northwest (DLO-01) and Sheardown Lake Southeast (DLO-02) for Mine Baseline (2005 - 2013), Construction (2014), and Operational (2015, 2016, and 2017) Periods during Fall

Notes: Values represent mean ± SD. Pound symbol (#) indicates parameter concentration is below the laboratory method detection limit. See Table 2.2 for information regarding Water Quality Guideline (WQG) criteria. AEMP Benchmarks are specific to Sheardown Lake (northwest and southeast).



LEGEND

- Sampling Location
- Final Discharge Point (FDP)
- Mary River Cascade Barrier
- Discharge Line
- Overland Effluent Channel
- 229 Specific Conductance (uS/cm)

Specific Conductance Data for Mary River Tributary-F During the 2017 EEM Field Study

0 0.25 0.5 1 km

Map Projection: UTM Zone 17N NAD 1983

Data Source: Reproduced under licence from Her Majesty the Queen in Rights of Canada, Department of Natural Resources Canada. All rights reserved.

N W E S

Date: March 2018
Project 177202.0033

minnow environmental inc.

Figure C.20

Document Path: S:\Projects\177202\177202.0033 - Baffinland 2017\2 - Mapping\CREMP Maps\17-33 Fig C.20 Specific Conductance Data.mxd

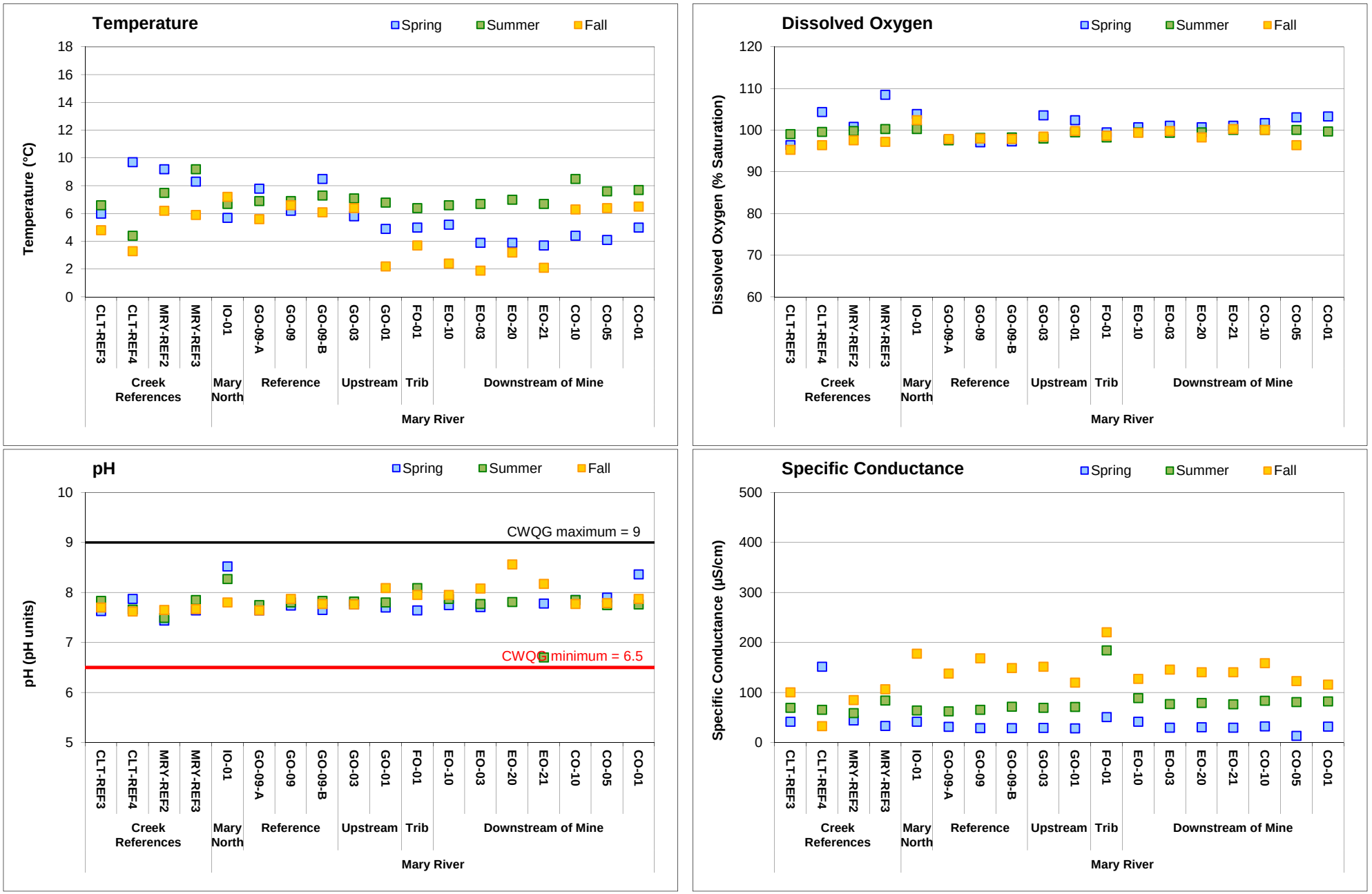


Figure C.21: Comparison of *in situ* Water Quality Variables Measured at Mary River Water Quality Monitoring Stations in Spring, Summer, and Fall 2017, Mary River Project CREMP

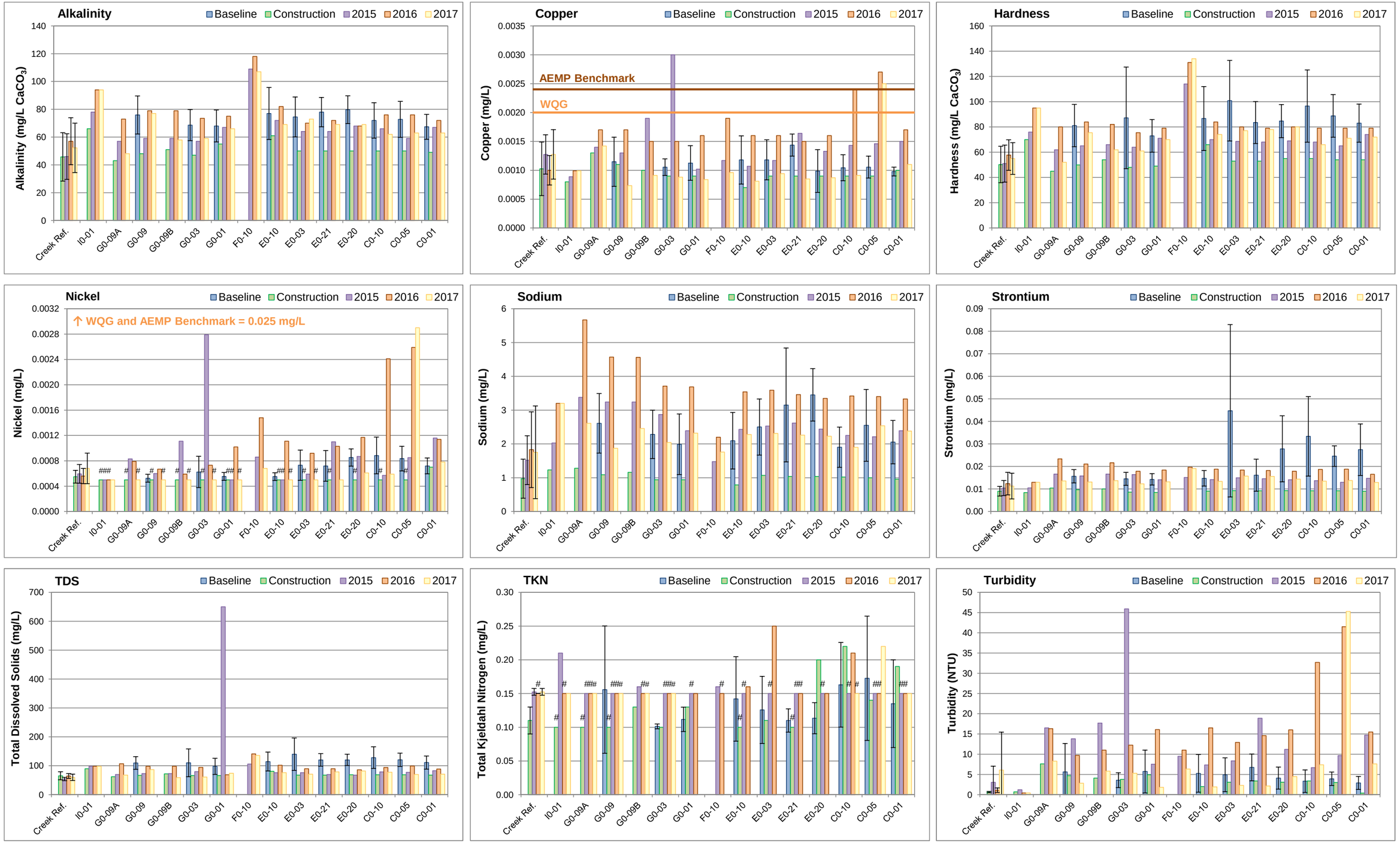


Figure C.22: Temporal Comparison of Water Chemistry at Mary River Stations for Mine Baseline (2005 - 2013), Construction (2014) and Operational (2015 - 2017) Periods in the Fall

Notes: Values represent mean ± SD. Creek reference includes the CLT-REF and MRY-REF series stations (mean ± SD; n = 4). Pound symbol (#) indicates parameter concentration is below the laboratory method detection limit. See Table 2.2 for information regarding Water Quality Guidelines (WQG) AEMP Benchmarks are specific to Mary River.

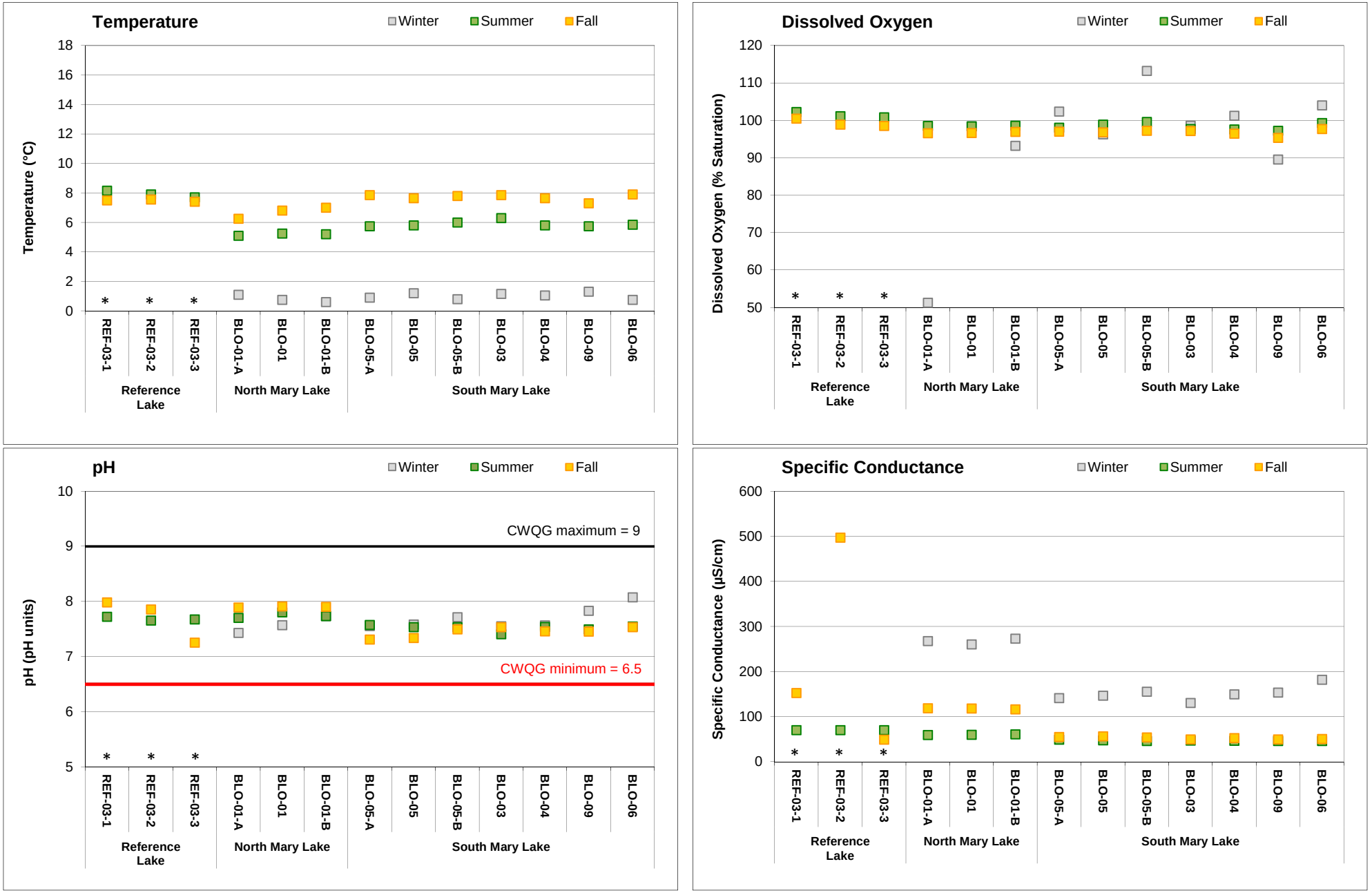


Figure C.23: Comparison of *in situ* Water Quality Variables Measured at Mary Lake Water Quality Monitoring Stations in Winter, Summer, and Fall 2017, Mary River Project CREMP

Notes: Lake values represent mean of surface and bottom in situ water quality measurements. * Reference Lake 3 (REF-03) was not sampled in winter.

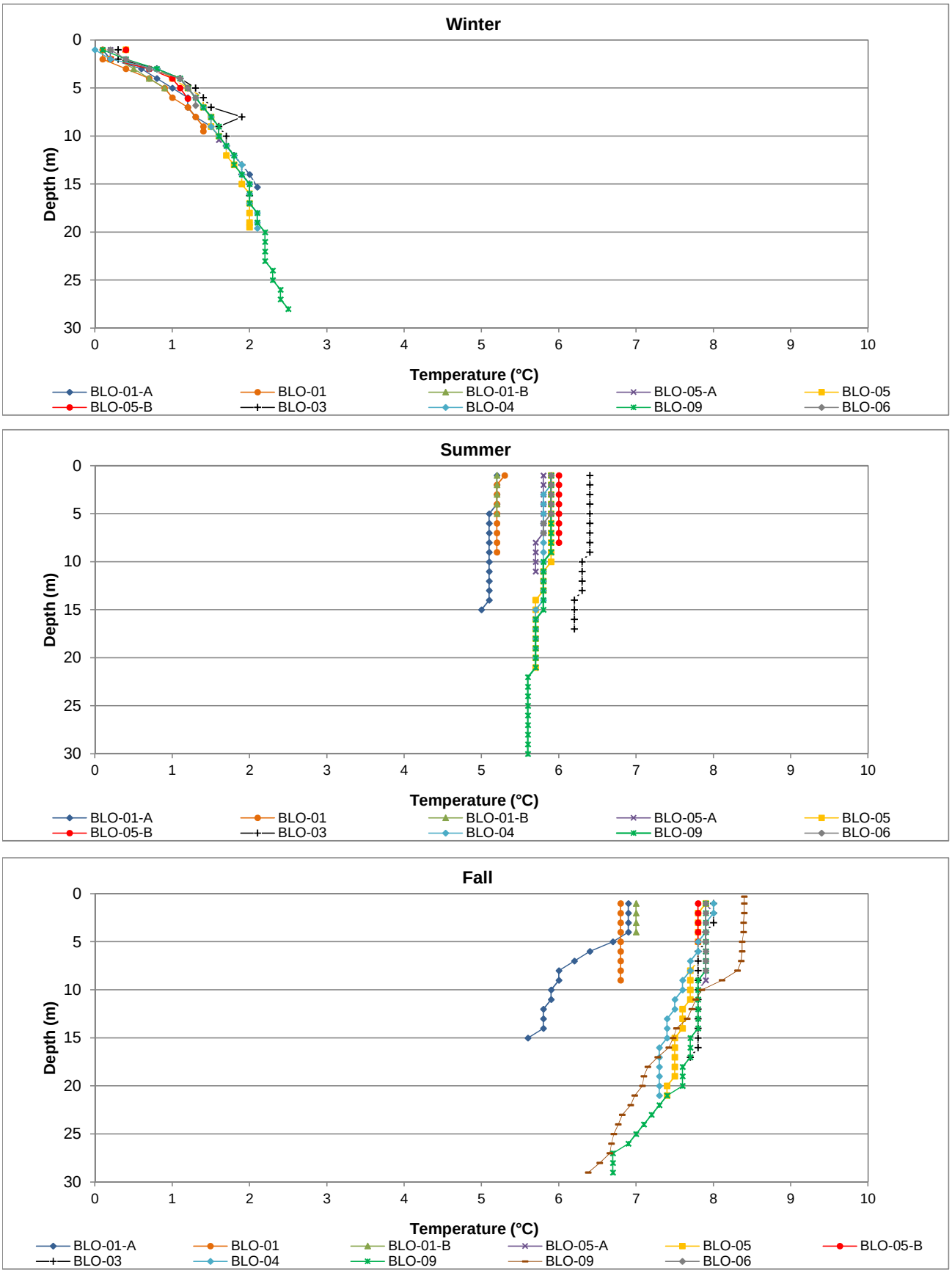


Figure C.24: Vertical Profiles of Temperature Measured at Mary Lake in Winter, Summer, and Fall, 2017

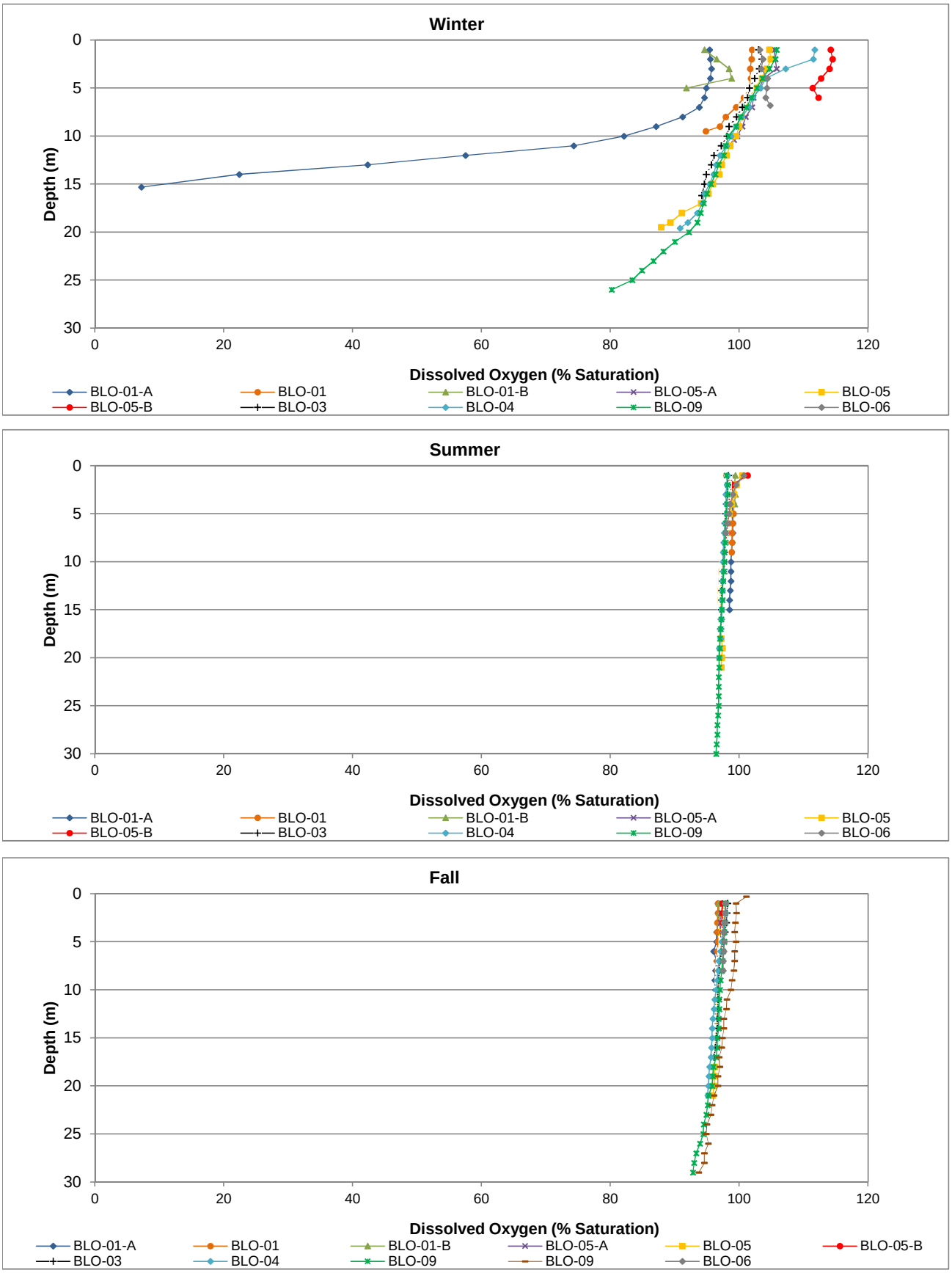


Figure C.25: Vertical Profiles of Dissolved Oxygen Measured at Mary Lake in Winter, Summer, and Fall, 2017

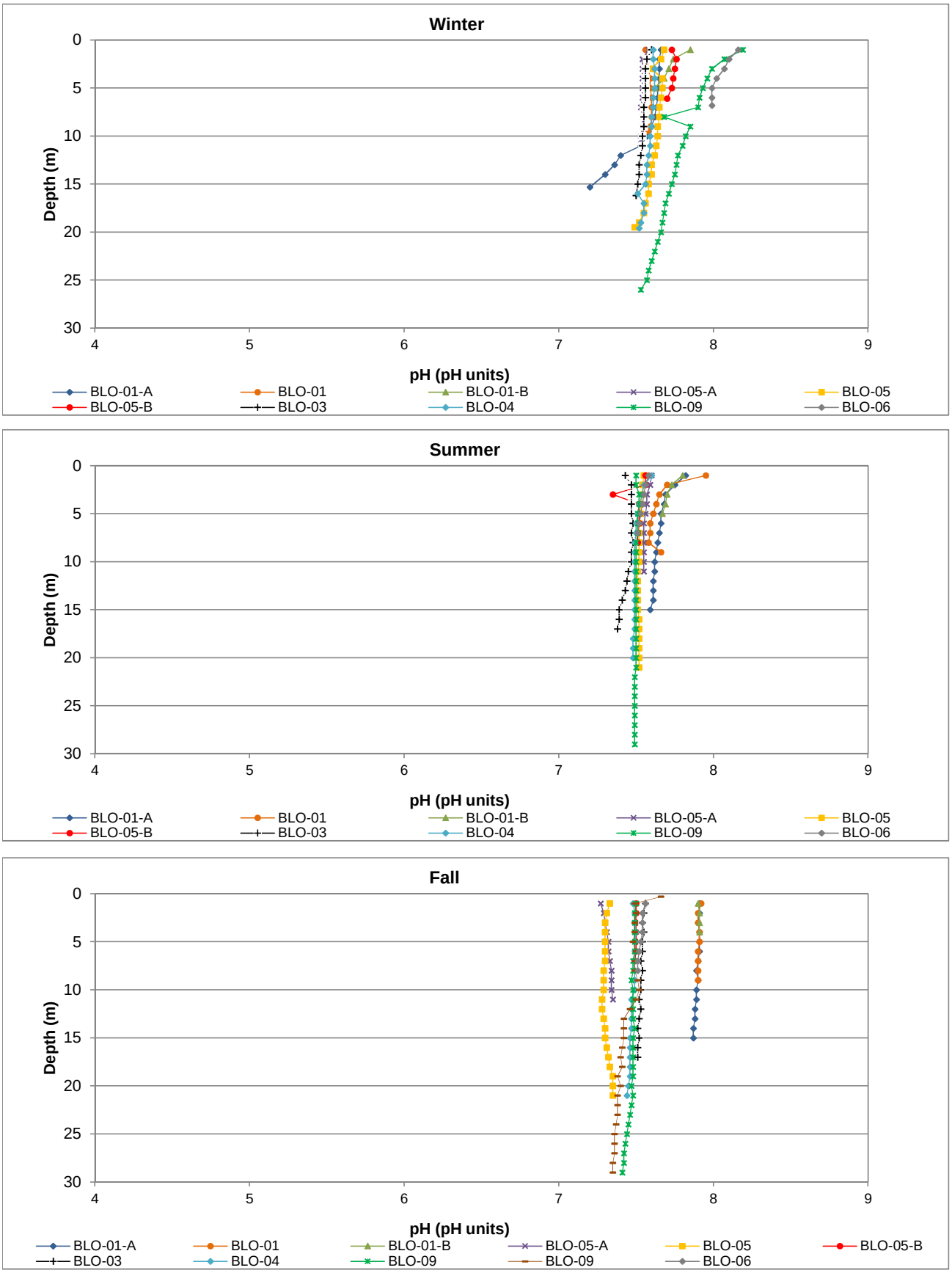


Figure C.26: Vertical Profiles of pH Measured at Mary Lake in Winter, Summer, and Fall, 2017

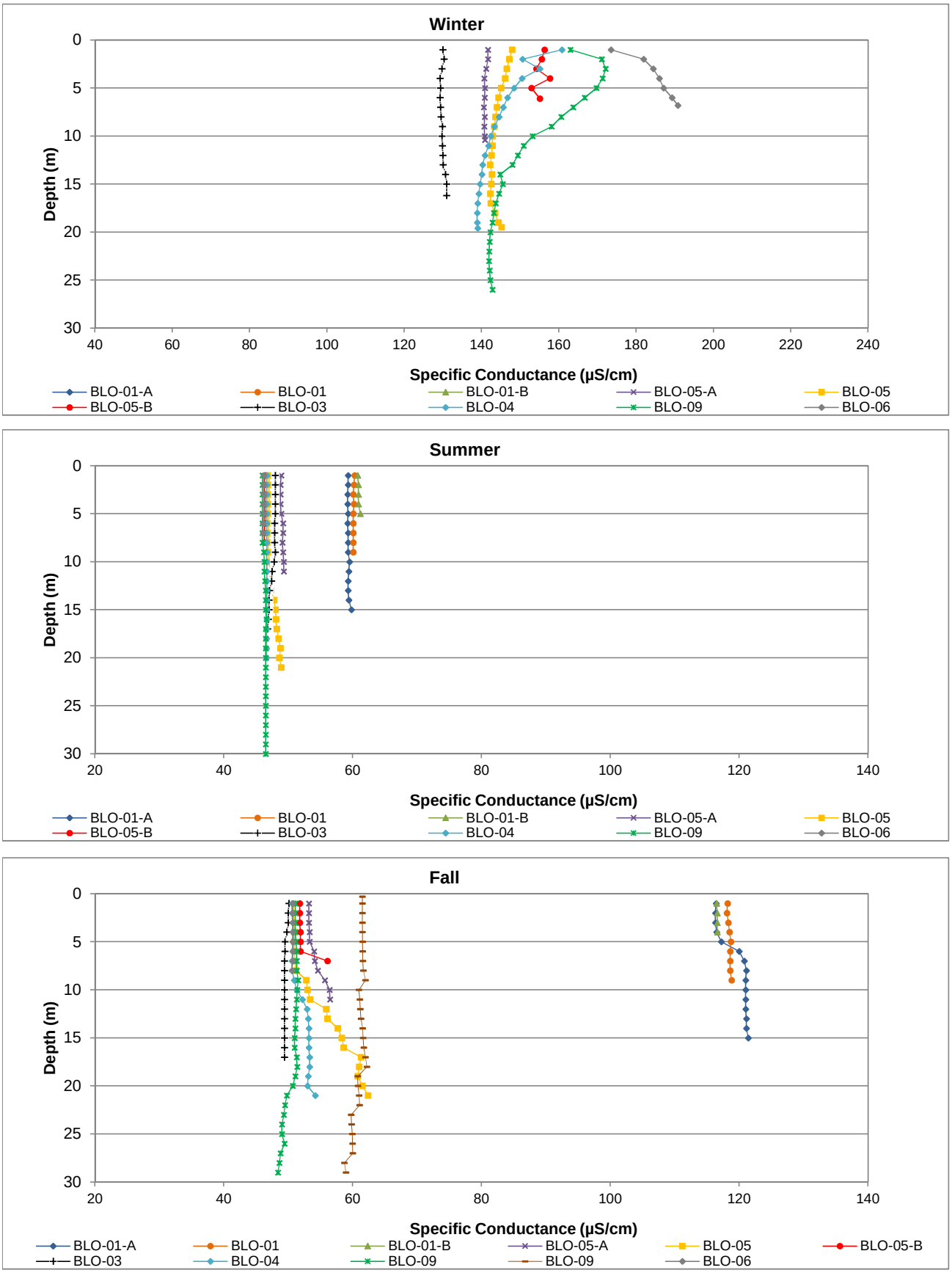


Figure C.27: Vertical Profiles of Specific Conductance Measured at Mary Lake in Winter, Summer, and Fall, 2017

Figure C.28: Temporal Comparison of Water Chemistry at Mary Lake (BLO) for Mine Baseline (2005 - 2013), Construction (2014), and Operational (2015-2017) Periods during Fall

Notes: Values represent mean ± SD. Pound symbol (#) indicates parameter concentration is below the laboratory method detection limit. See Table 2.2 for information regarding Water Quality Guideline (WQG) criteria. AEMP Benchmarks are specific to Mary Lake.

Table C.1: *In Situ* Water Quality Data Collected from Lotic Environments for the Mary River Project CREMP, Spring 2017

Study Area		Station	Sampling Date	*In Situ* Water Quality Parameter				
				Temperature (°C)	Dissolved Oxygen (% saturation)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Camp Lake System	Reference Creek Stations	CLT-REF4	08-07-2017	6.0	96.4	7.63	41.8	0.90
		CLT-REF3	09-07-2017	9.7	104.4	7.87	151.6	0.10
		MRY-REF3	08-07-2017	9.2	100.8	7.44	44.2	0.90
		MRY-REF2	08-07-2017	8.3	108.5	7.64	33.3	1.90
	CLT-1	L1-08	09-07-2017	3.8	99.4	7.91	47.4	0.40
		L1-02	09-07-2017	12.1	100.4	8.56	39.2	-0.10
		L2-03	07-07-2017	14.8	98.8	8.11	225.8	3.30
		L1-09	07-07-2017	11.0	100.7	8.10	106.8	1.70
		L1-05	07-07-2017	11.8	100.1	8.11	114.2	1.00
		L0-01	07-07-2017	11.0	99.7	8.09	121.5	1.20
	CLT-2	K0-01	07-07-2017	8.6	99.5	8.09	97.4	1.00
	Camp Lake	J0-01	09-07-2017	6.5	101.8	8.04	114.8	0.00
Sheardown Lake System	SDL Tribs	D1-05	09-07-2017	14.7	99.7	8.04	191.1	0.80
		D1-00	08-07-2017	7.7	102.7	7.59	26.1	3.00
Mary River/Lake System	Tom River	I0-01	07-07-2017	5.7	103.9	8.52	41.5	1.60
	Mary River	G0-09-A	08-07-2017	7.8	97.8	7.64	31.7	1.40
		G0-09	08-07-2017	6.2	97.1	7.74	29.0	2.30
		G0-09-B	08-07-2017	8.5	97.3	7.65	28.8	2.90
		G0-03	08-07-2017	5.8	103.6	7.76	29.2	3.10
		G0-01	08-07-2017	4.9	102.4	7.70	28.6	3.00
		F0-01	08-07-2017	5.0	99.5	7.64	51.1	7.80
		E0-10	08-07-2017	5.2	100.7	7.75	41.7	4.50
		E0-03	08-07-2017	3.9	101.1	7.71	29.7	3.10
		E0-20	08-07-2017	3.9	100.7	-	30.7	3.40
		E0-21	08-07-2017	3.7	101.1	7.78	29.8	3.30
		C0-10	08-07-2017	4.4	101.7	7.85	32.3	3.40
		C0-05	08-07-2017	4.1	103.1	7.90	13.5	4.00
		C0-01	08-07-2017	5.0	103.3	8.36	32.1	4.10

Table C.2: *In Situ* Water Quality Data Collected from Lotic Environments for the Mary River Project CREMP, Summer 2017

Study Area		Station	Sampling Date	*In Situ* Water Quality Parameter				
				Temperature (°C)	Dissolved Oxygen (% saturation)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Camp Lake System	Reference Creek Stations	CLT-REF4	10-Aug-17	6.60	99.1	7.83	69.6	0.2
		CLT-REF3	10-Aug-17	4.40	99.6	7.66	65.3	0
		MRY-REF3	10-Aug-17	7.50	99.8	7.49	58.9	4.2
		MRY-REF2	10-Aug-17	9.20	100.3	7.85	83.9	-0.2
	CLT-1	L1-08	10-Aug-17	3.40	99.5	7.84	98.1	-0.7
		L1-02	28-07-2017	5.10	98.8	8.10	132.5	0.5
		L2-03	28-07-2017	6.80	97.6	8.05	288.1	1.9
		L1-09	28-07-2017	5.30	98.9	8.04	151.9	1.3
		L1-05	28-07-2017	5.60	99.9	8.03	152.3	0.1
		L0-01	28-07-2017	5.70	99.1	8.13	158.6	0.2
	CLT-2	K0-01	27-07-2017	7.80	98.3	7.81	152.2	-0.4
	Camp Lake	J0-01	10-Aug-17	10.60	104.9	7.95	115.7	-0.6
Sheardown Lake System	SDL Tribs	D1-05	28-07-2017	5.00	96.8	7.82	197.6	0.8
		D1-00	28-07-2017	6.80	99.9	8.1	282.5	0.8
Mary River/Lake System	Tom River	I0-01	27-07-2017	6.70	100.3	8.27	64.1	0.3
	Mary River	G0-09-A	10-Aug-17	6.90	97.6	7.75	62.5	10.7
		G0-09	10-Aug-17	6.90	98.2	7.8	65.4	10.3
		G0-09-B	10-Aug-17	7.30	98.3	7.83	71.5	8.2
		G0-03	10-Aug-17	7.10	98.0	7.82	69.5	5.4
		G0-01	10-Aug-17	6.80	99.5	7.8	71.4	5.7
		F0-01	10-Aug-17	6.40	98.3	8.09	184.4	1.1
		E0-10	10-Aug-17	6.60	99.5	7.87	88.9	5.2
		E0-03	10-Aug-17	6.70	99.4	7.77	76.9	4.5
		E0-20	10-Aug-17	7.00	99.5	7.81	79.4	4.9
		E0-21	10-Aug-17	6.70	100.1	6.7	76.7	5.2
		C0-10	10-Aug-17	8.50	100.1	7.85	83.7	4.1
		C0-05	10-Aug-17	7.60	100.1	7.75	80.8	4.7
		C0-01	10-Aug-17	7.70	99.7	7.76	82.3	6.3

Table C.3: *In Situ* Water Quality Data Collected From Lotic Environments for the Mary River Project CREMP, Fall 2017

Study Area		Station	Sampling Date	*In Situ* Water Quality Parameter				
				Temperature (°C)	Dissolved Oxygen (% saturation)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Camp Lake System	Reference Creek Stations	CLT-REF4	27-Aug-17	4.8	95.3	7.70	100.3	-2.5
		CLT-REF3	27-Aug-17	3.3	96.4	7.62	32.7	-4.6
		MRY-REF3	27-Aug-17	6.2	97.6	7.65	85.1	17.3
		MRY-REF2	27-Aug-17	5.9	97.2	7.67	106.8	-4.9
	CLT-1	L1-08	1-Sep-17	1.8	98.4	7.95	118.5	-1.4
		L1-02	27-Aug-17	5.8	100.9	7.84	178.8	-1.9
		L2-03	27-Aug-17	6.2	97.4	7.64	253.4	17.7
		L1-09	27-Aug-17	6.0	100.7	7.79	204.7	0.6
		L1-05	27-Aug-17	6.1	101.3	7.84	210.3	2.3
		L0-01	27-Aug-17	6.3	101.8	7.87	214.8	22.1
	CLT-2	K0-01	27-Aug-17	6.3	101.5	7.88	212.5	-1.2
	Camp Lake	J0-01	1-Sep-17	6.2	99.4	7.88	172.4	-1.4
Sheardown Lake System	SDL Tribs	D1-05	3-Sep-17	3.4	98.4	8.04	181.3	-1.4
		D1-00	3-Sep-17	4.4	97.6	8.23	230.2	-0.5
Mary River/Lake System	Tom River	I0-01	27-Aug-17	7.2	102.4	7.80	177.6	-1.3
	Mary River	G0-09-A	29-Aug-17	5.6	97.9	7.64	138.1	7.7
		G0-09	29-Aug-17	6.6	98.0	7.87	168.4	-4.0
		G0-09-B	29-Aug-17	6.1	97.9	7.77	148.8	2.5
		G0-03	29-Aug-17	6.4	98.5	7.76	151.5	0.4
		G0-01	1-Sep-17	2.2	99.8	8.09	119.9	-0.7
		F0-01	1-Sep-17	3.7	98.7	7.95	220.4	1.9
		E0-10	1-Sep-17	2.4	99.4	7.95	127.3	-0.5
		E0-03	1-Sep-17	1.9	99.8	8.08	145.7	-0.4
		E0-20	1-Sep-17	3.2	98.3	8.56	140.4	-0.7
		E0-21	1-Sep-17	2.1	100.3	8.17	140.7	-0.3
		C0-10	29-Aug-17	6.3	100.1	7.77	158.6	5.8
		C0-05	27-Aug-17	6.4	96.4	7.79	122.8	60.0
		C0-01	27-Aug-17	6.5	11.9	7.87	115.8	4.7

Table C.4: Dissolved Metal Concentrations at Reference Creek Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Spring Sampling Event				Summer Sampling Event				Fall Sampling Event			
			CLT-REF4	CLT-REF3	MRY-REF3	MRY-REF2	CLT-REF4	CLT-REF3	MRY-REF3	MRY-REF2	CLT-REF4	CLT-REF3	MRY-REF3	MRY-REF2
			8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	27-Aug-2017	27-Aug-2017	27-Aug-2017	27-Aug-2017
Dissolved Metals	Aluminum (Al)	mg/L	0.0095	0.0092	0.0172	0.0051	0.0086	0.0082	0.0314	0.0087	0.0059	0.0071	0.0194	0.0062
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00173	0.00274	0.00266	0.00233	0.00329	0.00454	0.00630	0.00558	0.00496	0.00548	0.00818	0.00656
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	3.32	4.12	1.97	4.21	8.07	7.34	5.66	9.07	13.5	10.1	8.48	13.0
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	<0.00050	0.00078	0.00052	<0.00050	<0.00050	0.00106	0.00092	0.00059	0.00047	0.00112	0.00100	0.00061
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.010	0.013	0.011	<0.010
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0011
	Magnesium (Mg)	mg/L	1.83	2.44	0.993	2.42	4.71	4.36	2.95	5.47	7.51	6.16	4.39	7.90
	Manganese (Mn)	mg/L	0.000091	0.000238	0.00040	0.0003	<0.000070	0.000359	0.000124	0.000255	<0.00050	0.00074	0.000570	0.000530
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	<0.000050	0.000185	0.000096	0.000055	0.000158	0.000445	0.000350	0.000159	0.000162	0.000501	0.000414	0.000181
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	0.00061	<0.00050	<0.00050
	Potassium (K)	mg/L	0.270	0.360	0.330	0.340	0.450	0.53	0.72	0.63	0.61	0.64	0.92	0.79
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	0.340	0.520	0.350	0.350	0.64	0.76	0.85	0.67	0.79	0.93	0.90	0.84
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	0.274	0.359	0.85	0.488	0.686	0.601	2.23	1.26	0.95	0.860	3.56	1.44
	Strontium (Sr)	mg/L	0.0025	0.0027	0.0042	0.0031	0.00636	0.00502	0.0127	0.00797	0.0090	0.00630	0.0180	0.0097
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)	mg/L	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00030	<0.00030	0.00037	<0.00030
	Uranium (U)	mg/L	0.000146	0.000221	0.000191	0.000222	0.001790	0.001020	0.000470	0.000910	0.00310	0.00155	0.00105	0.00190
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)	mg/L									<0.00030	<0.00030	<0.00030	<0.00030

Table C.5: *In Situ* Water Quality Profile Data Collected at Reference Lake 3 Water Quality Monitoring Stations in Summer, Mary River Project CREMP, 2017

Depth (m)	Temperature (°C)			Dissolved Oxygen (mg/L)			Dissolved Oxygen (% Saturation)			pH (pH units)			Specific Conductance (µS/cm)		
	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03
Date Collected	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17
1.0	9.6	9.5	9.2	11.8	11.8	12.0	103.8	103.5	104.0	7.77	7.81	7.77	70	70	70
2.0	9.6	9.5	9.2	11.8	11.8	12.0	103.8	103.5	104.1	7.77	7.77	7.76	70	70	70
3.0	9.5	9.5	9.1	11.8	11.8	12.0	103.5	103.4	103.8	7.77	7.75	7.76	70	70	70
4.0	9.4	9.4	9.0	11.9	11.8	12.0	103.4	103.3	103.7	7.77	7.74	7.76	70	70	70
5.0	9.3	9.3	8.9	11.9	11.8	12.0	103.4	103.0	103.5	7.76	7.74	7.76	70	70	70
6.0	9.2	9.2	8.9	11.9	11.9	12.0	103.6	103.1	103.4	7.76	7.74	7.76	70	70	70
7.0	9.0	9.1	8.7	11.9	11.9	12.0	103.0	103.1	103.0	7.76	7.73	7.76	70	70	70
8.0	8.7	8.9	8.4	12.0	11.9	12.1	102.7	103.0	102.3	7.75	7.71	7.76	70	70	70
9.0	8.1	8.8	8.1	12.2	12.0	12.2	102.5	103.1	102.8	7.74	7.70	7.76	70	70	70
10.0	7.5	8.6	7.9	12.3	12.0	12.2	101.6	103.1	102.3	7.73	7.70	7.75	70	70	70
11.0	7.1	8.2	7.5	12.3	12.1	12.3	101.2	102.1	101.7	7.71	7.69	7.74	70	70	70
12.0	6.7	7.3	6.9	12.3	12.2	12.4	100.7	100.4	101.5	7.68	7.66	7.70	70	70	70
13.0		6.7	6.8		12.3	12.3		99.8	100.9		7.61	7.69		70	70
14.0		6.4	6.7		12.2	12.3		99.3	100.7		7.55	7.68		70	70
15.0		6.4	6.6		12.2	12.3		99.3	100.6		7.53	7.67		70	70
16.0		6.4	6.5		12.2	12.3		99.2	100.3		7.52	7.66		70	70
17.0		6.3	6.5		12.2	12.3		99.1	100.2		7.51	7.65		70	70
18.0		6.3	6.5		12.2	12.3		98.8	100.2		7.50	7.65		70	70
19.0			6.4			12.3			99.8			7.63			70
20.0			6.4			12.3			99.8			7.63			70
21.0			6.4			12.3			99.8			7.63			70
22.0			6.4			12.3			99.6			7.63			70
23.0			6.4			12.3			99.5			7.63			70
24.0			6.4			12.2			99.2			7.92			70
25.0			6.3			12.2			99.0			7.91			70
26.0			6.3			12.2			98.8			7.91			70
27.0			6.3			12.2			98.6			7.90			70
28.0			6.2			12.1			98.1			7.59			70
29.0			6.2			12.1			97.9			7.58			70
30.0			6.2			12.1			97.6			7.58			70

Notes:
Total depth at stations REF3-01, REF3-02, and REF3-03 was 12.75, 18.5, and 30.5 m, respectively, at the time of summer sampling.

Table C.6: ***In Situ*** **Water Quality Profile Data Collected at Reference Lake 3 Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)				Dissolved Oxygen (mg/L)				Dissolved Oxygen (% Saturation)				pH (pH units)				Specific Conductance (µS/cm)			
	REF3-01	REF3-02	REF3-03	REF3-03	REF3-01	REF3-02	REF3-03	REF3-03	REF3-01	REF3-02	REF3-03	REF3-03	REF3-01	REF3-02	REF3-03	REF3-03	REF3-01	REF3-02	REF3-03	REF3-03
Date Collected	2-Sep-17	2-Sep-17	2-Sep-17	21-Aug-17	2-Sep-17	2-Sep-17	2-Sep-17	21-Aug-17	2-Sep-17	2-Sep-17	2-Sep-17	21-Aug-17	2-Sep-17	2-Sep-17	2-Sep-17	21-Aug-17	2-Sep-17	2-Sep-17	2-Sep-17	21-Aug-17
surface				8.70				11.85				101.90				7.16				74
1.0	7.50	7.60	7.60	8.66	12.24	12.46	12.41	11.76	102.4	104.7	104.1	101.00	8.27	8.02	7.99	7.21	151	494	492	73
2.0	7.50	7.60	7.70	8.58	12.05	12.30	12.29	11.75	100.7	104.0	103.2	100.60	8.07	8.00	7.91	7.24	153	499	196	73
3.0	7.50	7.60	7.70	8.56	11.98	12.24	12.20	11.74	100.0	102.4	102.4	100.50	7.98	7.98	7.86	7.26	155	501	200	73
4.0	7.50	7.60	7.60	8.55	11.95	12.15	12.14	11.74	99.8	102.0	101.8	100.50	7.92	7.90	7.84	7.30	155	508	504	73
5.0	7.50	7.60	7.60	8.54	11.93	12.08	12.11	11.75	99.5	101.3	101.5	100.50	7.86	7.82	7.81	7.32	156	508	505	73
6.0	7.50	7.60	7.60	8.53	11.91	11.95	12.08	11.73	99.4	100.0	107.1	100.30	7.84	7.78	7.79	7.31	156	512	507	73
7.0	7.50	7.60	7.60	8.51	11.89	11.94	12.06	11.72	99.2	99.9	100.8	100.20	7.81	7.75	7.77	7.34	157	514	507	73
8.0	7.50	7.50	7.50	8.47	11.88	11.91	12.03	11.71	99.1	99.7	100.5	100.00	7.81	7.74	7.76	7.35	155	515	507	73
9.0	7.50	7.50	7.50	8.44	11.88	11.89	12.01	11.71	99.0	99.8	100.3	100.00	7.80	7.73	7.75	7.36	155	515	507	73
10.0	7.50	7.50	7.50	8.40	11.88	11.89	12.00	11.71	99.0	99.4	100.1	99.90	7.80	7.72	7.74	7.37	155	515	506	73
11.0	7.50	7.50	7.50	8.32	11.86	11.81	11.97	11.71	98.8	99.0	100.0	99.70	7.78	7.72	7.73	7.41	154	515	506	73
12.0	7.50	7.50	7.50	8.30	11.85	11.74	11.96	11.70	98.8	98.6	99.9	99.50	7.72	7.72	7.73	7.43	154	515	505	73
13.0	7.50	7.50	7.50	8.23	11.84	11.54	11.94	11.69	98.6	98.1	99.7	99.30	7.70	7.72	7.72	7.42	154	515	504	74
14.0		7.50	7.50	8.16		11.49	11.93	11.71		97.3	99.6	99.30		7.71	7.72	7.43		515	502	74
15.0		7.50	7.50	8.10		11.41	11.91	11.71		93.4	99.4	99.00		7.70	7.71	7.43		515	500	74
16.0		7.50	7.50	8.05		11.30	11.90	11.71		94.0	99.3	99.00		7.70	7.70	7.43		500	496	74
17.0		7.50	7.50	8.00		11.24	11.89	11.71		93.1	99.3	98.80		7.69	7.70	7.42		500	494	74
18.0			7.50	7.94			11.89	11.68			99.2	98.70			7.70	7.41			492	73
19.0			7.50	7.93			11.88	11.73			99.2	98.80			7.70	7.40			490	73
20.0			7.50	7.53			11.87	11.81			99.0	98.60			7.69	7.42			488	74
21.0			7.40	7.15			11.86	11.86			99.0	98.10			7.69	7.42			486	73
22.0			7.40	6.84			11.85	11.92			98.9	97.80			7.68	7.40			482	73
23.0			7.40	6.82			11.84	11.99			98.8	98.30			7.68	7.44			479	74
24.0			7.40	6.62			11.85	11.97			98.6	97.70			7.68	7.41			151	74
25.0			7.40	6.50			11.84	11.99			98.5	97.50			7.67	7.40			151	73
26.0			7.40	6.33			11.83	11.97			98.5	97.00			7.67	7.39			150	73
27.0			7.40	6.20			11.82	11.92			98.4	96.30			7.67	7.36			150	73
28.0			7.40	6.18			11.82	11.91			98.3	96.10			7.67	7.34			147	73
29.0			7.40	6.15			11.81	11.88			98.3	95.80			7.68	7.35			145	73
30.0			7.40	6.11			11.81	11.81			98.3	95.20			7.64	7.35			144	74

Notes:
2-Sep-17 sampling was conducted by Baffinland. 21-Aug-17 sampling was conducted by Minnow.
Total depths at stations REF3-01, REF3-02, and REF3-03 were 14.1, 17.8, and 30.1 m, respectively, at the time of fall sampling.

Table C.7: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Reference Lake 3 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017

Replicate ID	Date Sampled	Station Depth (m)	Secchi Depth (m)	Colour/ Clarity	Depth sampled	Temperature (°C)	Dissolved Oxygen		pH (pH units)	Specific Conductance (µS/cm)
							(mg/L)	(% sat.)		
REF 03-1	21-Aug-17	8.5	8.5	-	surface	9.10	11.80	102	7.76	73.2
					bottom	8.42	11.69	100	7.72	74.6
REF 03-2	21-Aug-17	9.4	9.4	-	surface	9.54	11.92	105	7.87	73.8
					bottom	8.42	11.83	101	7.32	73.2
REF 03-3	21-Aug-17	10.3	8.1	clear	surface	9.18	11.84	103	7.91	73.1
					bottom	8.20	11.86	101	7.36	73.6
REF 03-4	21-Aug-17	9.3	7.8	clear	surface	9.25	11.80	103	7.86	72.9
					bottom	8.05	11.76	99	7.46	73.9
REF 03-5	21-Aug-17	11.2	7.5	clear	surface	8.98	12.06	104	7.92	73.5
					bottom	8.38	11.82	101	7.31	73.3
REF 03-6	21-Aug-17	19.5	9.0	clear	surface	9.38	11.70	102	7.62	74.1
					bottom	7.42	11.90	99	7.23	73.8
REF 03-7	21-Aug-17	24.2	8.2	clear	surface	9.39	11.74	103	7.91	74.1
					bottom	6.47	11.50	94	7.23	78.9
REF 03-8	21-Aug-17	18.5	8.0	clear	surface	9.30	11.81	103	7.23	72.8
					bottom	7.70	10.70	93	7.31	80.6
REF 03-9	21-Aug-17	20.1	7.9	clear	surface	9.24	11.87	103	7.80	73.0
					bottom	7.71	12.01	101	7.37	73.2
REF 03-10	21-Aug-17	20.5	8.3	clear	surface	9.15	11.93	104	7.82	73.1
					bottom	8.10	11.78	100	7.30	73.8

Table C.8: Statistical Comparison of Bottom *In Situ* Water Quality Between Littoral and Profundal Stations of Reference Lake 3, Mary River Project CREMP, August 2017

Lake	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Station Type	n	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Reference Lake 3	Secchi Depth (m)	NO	0.960	α	Littoral	5	8.3	0.7	0.3	7.5	9.4
					Profundal	5	8.3	0.4	0.2	7.9	9.0
	Temperature (˚C)	YES	0.021	α	Littoral	5	8.3	0.2	0.1	8.1	8.4
					Profundal	5	7.5	0.6	0.3	6.5	8.1
	Dissolved Oxygen (mg/L)	NO	0.394	α,δ	Littoral	5	11.8	0.1	0.0	11.7	11.9
					Profundal	5	11.6	0.5	0.2	10.7	12.0
	Dissolved Oxygen (% saturation)	NO	0.107	α,δ	Littoral	5	100.3	0.9	0.4	99.0	101.0
					Profundal	5	97.3	3.6	1.6	93.0	100.7
	pH (units)	NO	0.108	α	Littoral	5	7.43	0.17	0.08	7.31	7.72
					Profundal	5	7.29	0.06	0.03	7.23	7.37
	Specific Conductance (umho/cm)	NO	0.174	α,δ	Littoral	5	73.7	0.6	0.3	73.2	74.6
					Profundal	5	76.1	3.5	1.5	73.2	80.6

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - single factor ANOVA test results validated using Mann-Whitney U-test; and, δ - single-factor ANOVA test results validated using t-test assuming unequal variance.

Table C.9: Dissolved Metal Concentrations at Reference Lake 3 Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Summer Sampling Event						Fall Sampling Event					
			REF3-01 bottom 12-Aug-2017	REF3-01 surface 12-Aug-2017	REF3-02 bottom 12-Aug-2017	REF3-02 surface 12-Aug-2017	REF3-03 bottom 12-Aug-2017	REF3-03 surface 12-Aug-2017	REF3-01 bottom 2-Sep-2017	REF3-01 surface 2-Sep-2017	REF3-02 bottom 2-Sep-2017	REF3-02 surface 2-Sep-2017	REF3-03 bottom 2-Sep-2017	REF3-03 surface 2-Sep-2017
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00679	0.00638	0.00643	0.00651	0.00643	0.00647	0.00623	0.00638	0.00633	0.00643	0.00637	0.00624
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	6.98	7.04	6.98	6.98	6.94	6.92	6.83	6.88	6.81	6.79	6.95	6.95
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00081	0.00080	0.00088	0.00084	0.00079	0.00085	0.00085	0.00085	0.0009	0.00077	0.0008	0.00076
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	4.50	4.39	4.41	4.53	4.34	4.36	4.25	4.215	4.3	4.25	4.22	4.19
	Manganese (Mn)	mg/L	0.000415	0.000252	0.000138	0.000232	0.000149	0.000241	0.000153	0.000238	0.000168	0.000196	0.00015	0.000189
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.000140	0.000144	0.000145	0.000136	0.000140	0.000138	0.000107	0.000112	0.00011	0.000111	0.000108	0.000113
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.95	0.93	0.92	0.92	0.92	0.91	0.85	0.855	0.86	0.84	0.84	0.85
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.41	0.40	0.43	0.41	0.42	0.41	0.39	0.4	0.4	0.4	0.41	0.39
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	0.901	0.889	0.891	0.901	0.888	0.900	0.877	0.8745	0.884	0.889	0.854	0.883
	Strontium (Sr)	mg/L	0.00792	0.00795	0.00795	0.00790	0.00782	0.00779	0.00783	0.007835	0.00778	0.00783	0.00791	0.0079
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000272	0.000268	0.000257	0.000273	0.000261	0.000266	0.000259	0.0002525	0.000251	0.000256	0.000255	0.000252
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.10: Average Relative Percent Difference (RPD) Values between Water Chemistry Samples Taken at the Top and Bottom of the Water Column at Lake Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Reference Lake		Camp Lake			Sheardown Lake Northwest			Sheardown Lake Southeast			Mary Lake North Basin			Mary Lake South Basin		
		Summer	Fall	Winter	Summer	Fall	Winter	Summer	Fall	Winter	Summer	Fall	Winter	Summer	Fall	Winter	Summer	Fall
Conventionals[b]	Conductivity (lab)	0.3	1.9	3.9	0	0.3	4	1	0	3.2	0.3	0	1.5	0.2	1.4	7.2	1.7	5.9
	pH (lab)	0.6	1.0	1.7	0.7	0.4	0.9	0.3	1.2	1.5	0.6	0.4	2.9	0.1	0.3	1.2	0.8	1.1
	Hardness (as $CaCO_3$)	0.5	1.4	8.1	0.9	1.2	3.6	1.3	1.0	4.9	0.6	1.6	2.8	1.0	2.3	8.4	2.1	5.1
	Total Suspended Solids (TSS)	0	0	3.6	5.2	0	9.5	0	9.9	21	5.6	1.0	0	25	0	0.7	33	16
	Total Dissolved Solids (TDS)	20	19	6.0	13	16	13	7.6	18	3.0	17	19	6.5	4.9	24	11	48	11
	Turbidity	4.8	71	27	13	20	24	22	20	72	11	18	82	23	6.9	51	31	44
	Alkalinity (as $CaCO_3$)	11	15	6.8	3.3	3.1	5.7	15	11	4.3	3.6	8.4	3.7	4.2	3.2	10	2.7	7.6
Nutrients and Organics	Total Ammonia	66	0	4.7	2.8	8.6	22	0	15	29	0	0	54	0	11	0	0	0
	Nitrate	0	0	25	0	0	31	11	6.7	34	0	0	27	0	20	23	0.7	0.7
	Nitrite	0	0	0	0	0	0	0	0	0	0	0	6.1	0	0	0	0	0
	Total Kjeldahl Nitrogen (TKN)	20	0	0	0	2.5	3.0	1.1	27	19	0	0	32	0	0	0	0	1.7
	Dissolved Organic Carbon	6.2	1.9	7.1	1.1	7.1	17	5.1	13	13	3.3	11	7.5	3.2	6.5	12	13	8.7
	Total Organic Carbon	6.4	2.4	6.2	2.2	1.1	6.1	4.9	2.0	9.6	5.2	4.1	7.5	7.2	4.9	10	3.6	5.2
	Total Phosphorus	15	16	22	25	32	17	23	29	37	10	24	48	18	70	23	27	42
	Phenols	0	45	1.9	0	27	11	0	13	44	0	0	0	24	19	2.7	0	30
Anions	Bromide (Br)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chloride (Cl)	4.4	4.3	6.7	0.8	5.0	3.4	1.1	4.2	11	1.3	0.9	3.9	4.0	6.2	7.5	2.5	12
	Sulphate (SO_4)	6.0	1.6	5.6	1.2	7.7	3.7	0.7	6.7	6.3	1.0	1.7	15	10	7.4	9.5	15	22
Total Metals	Aluminum (Al)	14	32	8.3	26	18	0	23	26	40	8.7	13	8.7	12	13	48	44	43
	Antimony (Sb)	0	0	0	0	0	0	1.6	0	0	0	0	0	0	0	0	0	0
	Arsenic (As)	9.2	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0
	Barium (Ba)	2.8	2.1	5.6	2.5	0.9	3.2	2.8	2.3	4.1	1.5	2.7	4.0	0.9	2.3	6.0	10	13
	Beryllium (Be)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bismuth (Bi)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Boron (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cadmium (Cd)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Calcium (Ca)	1.3	1.3	6.5	2.3	0.5	3.7	2.6	2.8	1.3	3.3	4.3	2.4	0.6	1.8	8.9	2.6	6.2
	Chromium (Cr)	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0
	Cobalt (Co)	0	0	0	0	0	0	0	0	0	0	0	29	0	0	0	6.4	9.5
	Copper (Cu)	6.4	6.8	5.4	4.9	8.2	5.5	30	32	9.5	13	7.8	23	0	2.2	7.3	9.2	12
	Iron (Fe)	0	0	0	0	0	0	6.9	30	0	0	13	51	0	2.2	0	41	45
	Lead (Pb)	0	0	0	0	0	0	12	0	0	9.7	11	0	9.5	0	0	39	21
	Lithium (Li)	0	0	15	0	3.7	0	0	0.7	2.4	0	0	5.3	0	3.2	0	0	0
	Magnesium (Mg)	0.9	1.9	6.7	1.8	1.3	4.7	2.6	3.5	5.8	2.7	2.3	2.7	3.3	2.4	7.7	2.9	6.3
	Manganese (Mn)	8.4	10	48	2.7	5.0	45	5.2	30	62	4.9	9.6	89	10	8.4	58	31	66
	Mercury (Hg)	0	0	48	39	0	26	24	0	16	40	0	3.2	0	0	34	0	0
	Molybdenum (Mo)	4.0	2.8	11	2.7	2.5	4.9	2.5	2.5	9.6	5.1	3.2	9.1	3.3	3.3	11	8.7	9.8
	Nickel (Ni)	0	0	7.4	4.1	4.1	3.8	11	18	7.5	9.0	3.7	11	0	0	0	12	3.5
	Potassium (K)	2.6	1.9	6.2	0.4	1.5	3.4	2.0	1.3	6.4	2.9	0.9	2.7	1.8	0.6	9.9	5.1	10
	Selenium (Se)	0	0	0	0	0	0	0	0	0	0	0	0	1.3	0	0	0	0
	Silicon (Si)	2.0	2.1	16	1.6	8.1	10	3.8	11	15	3.5	4.3	20	5.0	3.6	11	14	15
	Silver (Ag)	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0
	Sodium (Na)	2.6	2.6	8.2	1.8	1.9	4.1	3.6	1.0	6.8	2.5	1.8	4.6	2.4	1.8	7.1	1.8	6.6
	Strontium (Sr)	1.4	1.5	4.3	3.2	1.1	2.9	1.1	1.1	4.4	3.7	3.3	3.4	1.1	2.6	10	4.1	6.5
	Thallium (Tl)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tin (Sn)	0	0	46	25	0	39	61	0	53	42	0	37	0	0	40	0	0
	Titanium (Ti)	0	0	0	0	0	0	27	0	0	15	0	0	11	0	0	47	7.4
	Uranium (U)	1.4	3.2	9.8	2.0	3.2	5.0	1.1	5.1	3.8	1.1	1.8	12	3.1	5.1	14	5.1	38
	Vanadium (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zinc (Zn)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: Shaded values indicate RDP >30%

Table C.11: ***In Situ*** **Water Quality Measurements Collected at Camp Lake Tributary 1 and Tributary 2 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017**

Study Area	Station	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	pH (pH units)	Conductivity (µS/cm)	Specific Conductance (µS/cm)
Unnamed Reference Creek	REF-CRK-B1	9.7	11.55	101.7	7.93	112	157
	REF-CRK-B2	9.2	11.80	102.7	7.92	111	159
	REF-CRK-B3	8.2	11.98	101.8	7.93	109	161
	REF-CRK-B4	7.3	12.20	101.5	7.91	108	163
	REF-CRK-B5	6.5	12.39	100.7	7.88	104	160
Camp Lake Tributary 1 Upstream	CLT-1-US-B1	6.9	12.39	101.7	8.22	183	120
	CLT-1-US B2	7.3	12.23	101.5	8.22	184	122
	CLT-1-US-B3	7.2	12.23	101.3	8.22	183	121
	CLT-1-US-B4	7.2	12.30	101.8	8.18	183	121
	CLT-1-US-B5	7.1	12.43	102.6	8.10	184	121
Camp Lake Tributary 1 Downstream	CLT-1-DS-B1	7.7	12.24	102.8	8.31	229	154
	CLT-1-DS-B2	7.1	12.39	102.5	8.29	229	151
	CLT-1-DS-B3	6.3	12.68	102.7	8.23	231	148
	CLT-1-DS-B4	5.8	12.78	102.2	8.21	232	147
	CLT-1-DS-B5	4.8	13.06	101.8	7.74	229	141
Camp Lake Tributary 2 Upstream	CLT-2-US-B1	7.8	11.94	100.4	8.21	138	206
	CLT-2-US-B2	7.0	12.21	100.6	8.18	126	190
	CLT-2-US-B3	5.3	12.56	98.9	8.16	146	188
	CLT-2-US-B4	4.3	12.72	97.5	8.11	107	178
	CLT-2-US-B5	3.1	13.47	100.4	8.10	114	196
Camp Lake Tributary 2 Downstream	CLT-2-DS-B1	8.7	11.85	101.7	8.18	137	201
	CLT-2-DS-B2	7.4	12.23	101.8	8.19	124	187
	CLT-2-DS-B3	6.2	12.54	101.4	8.15	135	210
	CLT-2-DS-B4	4.7	13.02	101.0	8.10	114	186
	CLT-2-DS-B5	2.8	13.69	101.1	8.05	123	213

Table C.12: *In Situ* Water Quality Summary Statistics for the Camp Lake Tributary Benthic Stations, Mary River Project CREMP, August 2017

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Temperature (°C)	Unnamed Reference Creek	8.2	1.3	0.6	6.5	9.8	6.5	9.7
	CLT1-US North Branch	7.1	0.2	0.1	7.0	7.3	6.9	7.3
	CLT1-DS Lower Main Stem	6.3	1.1	0.5	4.9	7.7	4.8	7.7
	CLT2-US Upstream	5.5	1.9	0.9	3.1	7.9	3.1	7.8
	CLT2-DS Downstream	6.0	2.3	1.0	3.1	8.8	2.8	8.7
Dissolved Oxygen (mg/L)	Unnamed Reference Creek	11.98	0.33	0.15	11.58	12.39	11.55	12.39
	CLT1-US North Branch	12.32	0.09	0.04	12.20	12.43	12.23	12.43
	CLT1-DS Lower Main Stem	12.63	0.32	0.14	12.23	13.03	12.24	13.06
	CLT2-US Upstream	12.58	0.58	0.26	11.86	13.30	11.94	13.47
	CLT2-DS Downstream	12.67	0.72	0.32	11.78	13.55	11.85	13.69
Dissolved Oxygen (% Saturation)	Unnamed Reference Creek	101.7	0.7	0.3	100.8	102.6	100.7	102.7
	CLT1-US North Branch	101.8	0.5	0.2	101.2	102.4	101.3	102.6
	CLT1-DS Lower Main Stem	102.4	0.4	0.2	101.9	102.9	101.8	102.8
	CLT2-US Upstream	99.6	1.3	0.6	97.9	101.2	97.5	100.6
	CLT2-DS Downstream	101.4	0.4	0.2	101.0	101.8	101.0	101.8
pH (units)	Unnamed Reference Creek	7.91	0.02	0.01	7.89	7.94	7.88	7.93
	CLT1-US North Branch	8.19	0.05	0.02	8.12	8.25	8.10	8.22
	CLT1-DS Lower Main Stem	8.16	0.24	0.11	7.86	8.45	7.74	8.31
	CLT2-US Upstream	8.15	0.05	0.02	8.09	8.21	8.10	8.21
	CLT2-DS Downstream	8.13	0.06	0.03	8.06	8.21	8.05	8.19
Specific Conductance (µS/cm)	Unnamed Reference Creek	160	2.2	1.0	157	163	157	163
	CLT1-US North Branch	121	0.7	0.3	120	122	120	122
	CLT1-DS Lower Main Stem	148	4.9	2.2	142	154	141	154
	CLT2-US Upstream	192	10.3	4.6	179	204	178	206
	CLT2-DS Downstream	199	12.6	5.6	184	215	186	213

Table C.13: *In Situ* Water Quality Statistical Comparisons among Camp Lake Tributary 1 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2017

Metric	Overall 3-group Comparison[a]			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	P-value	Statistical Test [b]	(I) Area	(J) Area	Significant Difference Between 2 Areas?	P-value	Statistical Test
Water Temperature (°C)	YES	0.0412	α	Unnamed Reference Creek	CLT1 North Branch	NO	0.3916	Tamhane's
				Unnamed Reference Creek	CLT1 Lower Main Stem	NO	0.1314	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.4661	
Dissolved Oxygen (mg/L)	YES	0.0094	α	Unnamed Reference Creek	CLT1 North Branch	NO	0.1724	Tukey's HSD
				Unnamed Reference Creek	CLT1 Lower Main Stem	YES	0.0071	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.2028	
Dissolved Oxygen (% saturation)	NO	0.1264	α	Unnamed Reference Creek	CLT1 North Branch	NO	0.9564	Tukey's HSD
				Unnamed Reference Creek	CLT1 Lower Main Stem	NO	0.1424	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.2221	
pH (units)	YES	0.0181	α,γ	Unnamed Reference Creek	CLT1 North Branch	YES	0.0079	Mann-Whitney U-test
				Unnamed Reference Creek	CLT1 Lower Main Stem	NO	0.1508	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.4206	
Specific Conductance (µS/cm)	YES	0.0000	α	Unnamed Reference Creek	CLT1 North Branch	YES	0.0000	Tukey's HSD
				Unnamed Reference Creek	CLT1 Lower Main Stem	YES	0.0002	
				CLT1 North Branch	CLT1 Lower Main Stem	YES	0.0000	

Note: Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - single factor ANOVA test results validated using Kraskal Wallis H-test or Mann-Whitney U-test, as appropriate.

Table C.14: Water Chemistry at Lotic Camp Lake Tributary (CLT) Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Spring Sampling Event							Summer Sampling Event							Fall Sampling Event						
					L1-08	L1-02	L2-03	L1-09	L1-05	L0-01	K0-01	L1-08	L1-02	L2-03	L1-09	L1-05	L0-01	K0-01	LI-08	L1-02	L2-03	L1-09	L0-05	L0-01	K0-01
					09/Jul/17	09/Jul/17	07/Jul/17	07/Jul/17	07/Jul/17	07/Jul/17	07/Jul/17	10/Aug/17	28/Jul/17	28/Jul/17	28/Jul/17	28/Jul/17	28/Jul/17	27/Jul/17	01/Sep/17	27/Aug/17	27/Aug/17	27/Aug/17	27/Aug/17	27/Aug/17	27/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	-	54	89	225	107	114	122	98	116	140	308	165	160	171	164	135	188	336	231	245	255	253
	pH (lab)	pH	6.5 - 9.0	-	7.64	7.87	8.06	7.92	7.94	7.95	7.84	7.95	7.96	8.01	7.98	8.05	8.01	8.06	8.03	8.13	8.18	8.14	8.18	8.09	8.20
	Hardness (as $CaCO_3$)	mg/L	-	-	25	41	93	50	52	59	45	55	68	123	78	77	84	79	65	94	153	114	117	124	129
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	2.1	<2.0	<2.0	<2.0	<2.0	<2.0	3.4	<2.0	<2.0	<2.0	2.5	<2.0	<2.0	<2.0	8.8	2.7	3.7	15.7	2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	27	48	66	54	59	66	49	56	64	163	100	77	115	83	73	96	169	90	114	152	134
	Turbidity	NTU	-	-	0.6	0.6	3.2	1.1	0.9	0.6	0.5	0.5	0.5	2.9	0.6	1.2	1.3	0.7	0.7	1.1	17.3	4.1	4.3	18.9	1.8
	Alkalinity (as $CaCO_3$)	mg/L	-	-	25	40	75	44	46	51	37	54	70	107	74	72	74	72	63	84	140	102	110	109	102
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	0.032	<0.020	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.031	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.032	<0.020	0.066	<0.020	<0.020
	Nitrate	mg/L	13	13	0.081	<0.020	0.352	0.024	0.033	0.033	0.051	0.061	0.023	0.688	0.065	0.074	0.073	0.023	0.041	0.109	0.539	0.180	0.161	0.164	0.111
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	0.30	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.37	<0.15	0.16	<0.15	<0.15	<0.15	0.24	0.47	0.30	0.22	0.17	<0.15
	Dissolved Organic Carbon	mg/L	-	-	0.9	1.0	3.0	1.4	1.4	1.4	0.9	1.9	2.0	3.9	2.1	2.2	2.1	1.5	2.3	2.6	5.0	3.3	3.5	3.4	2.6
	Total Organic Carbon	mg/L	-	-	0.9	1.2	3.0	1.6	1.5	1.5	1.0	2.0	2.3	4.1	2.2	2.2	2.3	1.6	2.1	2.8	5.1	3.5	4.0	3.5	2.8
	Total Phosphorus	mg/L	0.030[α]	-	0.0065	<0.0030	0.0130	0.0053	<0.0030	0.0035	0.0048	0.0045	<0.0030	0.0057	<0.0030	0.0037	0.0055	0.0108	0.0072	0.0034	0.0096	0.0177	0.0060	0.0126	0.0044
	Phenols	mg/L	0.004[α]	-	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	0.0016	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	0.7	0.8	16.6	2.6	3.9	4.1	1.3	1.3	1.6	26.0	4.3	4.7	5.3	1.9	2.0	2.6	19.9	8.6	9.8	10.9	3.1
	Sulphate (SO_4)	mg/L	218[β]	218	1.0	3.3	9.1	3.8	3.9	4.2	6.8	2.7	5.4	10.4	5.0	5.9	6.4	11.8	4.1	7.3	9.4	7.3	6.0	6.5	26.4
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	0.020	0.009	0.062	0.014	0.021	0.044	0.012	0.018	0.008	0.053	0.012	0.017	0.031	0.008	0.022	0.032	***0.395***	0.100	0.179	***0.620***	0.063
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	<0.00010	0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0043	0.0060	0.0105	0.0066	0.0069	0.0074	0.0052	0.0086	0.0086	0.0124	0.0094	0.0091	0.0093	0.0088	0.0089	0.0112	0.0153	0.0132	0.0139	0.0175	0.0126
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00005	<0.00050	<0.00005	<0.00005	<0.00050	<0.00050	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00008	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	5	8	19	10	11	12	9	11	13	24	15	15	17	16	13	19	30	23	24	24	25
	Chromium (Cr)	mg/L	0.0089	0.000856	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00034	0.00012	0.00016	0.00033	<0.00010
	Copper (Cu)	mg/L	0.002	0.0022	0.0016	0.0013	0.0012	0.0013	0.0016	0.0012	0.0007	***0.0024***	0.0019	0.0011	0.0017	0.0017	0.0017	0.0008	***0.0025***	0.0021	0.0016	0.0019	0.0020	0.0022	0.0011
	Iron (Fe)	mg/L	0.30	0.326	<0.030	<0.030	0.217	<0.030	0.041	0.063	<0.030	<0.030	<0.030	0.287	0.044	<0.050	0.063	<0.030	<0.030	<0.050	***0.705***	0.204	0.323	***0.821***	0.082
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	0.000137	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000104	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000604	0.000147	0.000217	0.000651	0.000058
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	0.0025	<0.0010	0.0010	0.0011	<0.0010	<0.0010	<0.0010	0.0022	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0031	0.0021	0.0025	0.0030	0.0016
	Magnesium (Mg)	mg/L	-	-	3.1	5.3	11.2	5.9	6.4	6.8	5.8	6.7	8.2	14.8	9.4	9.4	9.6	9.91	7.9	11.4	19.9	13.7	14.6	15.0	16.2
	Manganese (Mn)	mg/L	0.935[β]	-	0.0007	0.0003	0.0243	0.0018	0.0034	0.0038	0.0007	0.0006	0.0004	0.0300	0.0038	0.0032	0.0029	0.0006	0.0006	0.0019	0.0456	0.0142	0.0184	0.0243	0.0029
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00029	0.00029	0.00178	0.00037	0.00038	0.00037	0.00017	0.00080	0.00042	0.00267	0.00063	0.00064	0.00067	0.00027	0.00074	0.00070	0.00141	0.00087	0.00088	0.00071	0.00035
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	0.00092	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00110	0.00056	0.00073	0.00078	<0.00050	<0.00050	0.00067	0.00135	0.00092	0.00108	0.00144	0.00054
	Potassium (K)	mg/L	-	-	0.95	1.11	2.49	1.20	1.23	1.29	0.79	1.79	1.40	2.82	1.60	1.51	1.55	1.19	1.91	1.94	2.96	2.17	2.25	2.53	1.59
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	0.000088	<0.001000	<0.000050	<0.000050	<0.001000	<0.001000	<0.000050	0.000078	0.000055	<0.000050	0.000053	<0.000050
	Silicon (Si)	mg/L	-	-	0.47	0.47	0.59	0.48	0.51	0.58	0.44	0.72	0.72	0.67	0.77	0.75	0.79	0.64	0.83	1.01	1.76	1.22	1.42	2.02	1.08
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	0.2	0.6	7.9	1.2	1.3	1.4	1.0	0.5	0.7	11.6	1.9	1.8	2.1	1.4	0.5	1.4	9.9	3.6	3.9	4.1	2.0
	Strontium (Sr)	mg/L	-	-	0.003	0.004	0.023	0.009	0.011	0.012	0.005	0.006	0.007	0.026	0.012	0.012	0.014	0.009	0.008	0.010	0.026	0.024	0.028	0.027	0.015
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00001	<0.00010	<0.00001	<0.00001	<0.00010	<0.00010	<0.00001	0.00001	<0.00001	<0.00001	0.00002	<0.00001
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	0.0025	<0.0100	0.0007	0.0019	<0.0100	<0.0100	<0.0020	0.0210	<0.0060	0.0103	0.0418	<0.0040
	Uranium (U)	mg/L	0.015	-	0.0002	0.0003	0.0052	0.0007	0.0008	0.0008	0.0003	0.0020	0.0010	0.0091	0.0018	0.0018	0.0019	0.0009	0.0029	0.0021	0.0088	0.0033	0.0036	0.0035	0.0019
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0005	0.0008	<0.0005	0.0006	0.0011	<0.0005
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0039	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0031	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0034	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Camp Lake Tributaries.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.15: Magnitude of Elevation in Seasonal Average Water Chemistry (Total Metal Concentration Data Provided) Between the Camp Lake Tributaries and Average Reference Creek Stations, Mary River Project CREMP, 2017

Variable	Spring				Summer				Fall			
	CLT1			CLT2	CLT1			CLT2	CLT1			CLT2
	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01
Conductivity (lab)	1.9	6.1	3.1	2.7	1.6	3.8	2.0	2.0	1.4	2.9	2.1	2.2
Hardness (as $CaCO_3$)	2.0	5.6	3.3	2.7	1.7	3.3	2.2	2.1	1.4	2.8	2.2	2.3
Total Suspended Solids (TSS)	0.8	0.8	0.8	0.8	1.4	1.0	1.1	1.0	0.5	2.1	1.8	0.5
Total Dissolved Solids (TDS)	1.9	3.4	3.1	2.5	1.5	4.2	2.5	2.1	1.4	2.8	2.0	2.2
Turbidity	0.3	1.7	0.5	0.3	0.3	1.4	0.5	0.3	0.1	2.8	1.5	0.3
Alkalinity (as $CaCO_3$)	2.1	4.8	3.0	2.3	1.7	3.0	2.0	2.0	1.4	2.7	2.0	2.0
Total Ammonia	1.3	1.1	1.0	1.0	1.0	1.6	1.0	1.0	0.8	1.2	1.3	0.8
Nitrate	2.5	18	1.5	2.5	2.1	34	3.5	1.2	1.2	8.6	2.7	1.8
Nitrite	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Kjeldahl Nitrogen (TKN)	1.0	2.0	1.0	1.0	1.0	2.5	1.0	1.0	1.3	3.1	1.5	1.0
Dissolved Organic Carbon	0.9	2.7	1.3	0.8	1.6	3.1	1.7	1.2	1.5	3.1	2.1	1.6
Total Organic Carbon	0.9	2.4	1.2	0.8	1.7	3.2	1.7	1.2	1.4	3.0	2.1	1.6
Total Phosphorus	0.8	2.3	0.7	0.8	1.0	1.5	1.1	2.8	0.7	1.2	1.5	0.6
Phenols	0.7	0.7	0.7	1.3	1.0	1.0	1.0	1.0	1.3	1.0	1.2	1.0
Bromide (Br)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Chloride (Cl)	0.9	19	4.1	1.5	0.8	15	2.7	1.1	0.9	7.9	3.9	1.2
Sulphate (SO_4)	2.5	11	4.6	8.0	1.5	3.9	2.2	4.4	1.4	2.3	1.6	6.4
Aluminum (Al)	0.3	1.3	0.5	0.2	0.3	1.1	0.4	0.2	0.1	1.9	1.4	0.3
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.2	0.9	0.9
Barium (Ba)	2.0	4.1	2.7	2.0	1.6	2.4	1.8	1.7	1.3	2.0	2.0	1.7
Beryllium (Be)	1.0	1.0	1.0	1.0	1.0	0.2	0.5	1.0	1.0	1.0	1.0	1.0
Bismuth (Bi)	1.0	1.0	1.0	1.0	1.0	0.1	0.4	1.0	1.0	1.0	1.0	1.0
Boron (B)	1.0	1.5	1.0	1.0	1.0	1.7	1.0	1.0	1.0	1.3	1.0	1.0
Cadmium (Cd)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Calcium (Ca)	1.9	5.6	3.1	2.5	1.6	3.2	2.1	2.2	1.4	2.7	2.1	2.3
Chromium (Cr)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	0.7	0.7	0.7
Cobalt (Co)	1.0	1.2	1.0	1.0	1.0	1.5	1.0	1.0	0.7	2.2	1.3	0.7
Copper (Cu)	2.3	1.8	2.2	1.1	2.5	1.3	1.9	1.0	1.8	1.3	1.6	0.9
Iron (Fe)	0.7	5.0	1.0	0.7	0.7	6.8	1.2	0.7	0.2	3.2	2.0	0.4
Lead (Pb)	0.8	2.1	0.8	0.8	0.6	1.3	0.6	0.6	0.2	2.9	1.6	0.3
Lithium (Li)	1.0	2.5	1.0	1.0	1.0	2.2	1.0	1.0	0.7	2.3	1.9	1.2
Magnesium (Mg)	2.1	5.7	3.2	2.9	1.7	3.4	2.1	2.3	1.5	3.0	2.2	2.5
Manganese (Mn)	0.7	34	4.3	1.0	0.8	50	5.5	0.9	0.4	14	5.7	0.9
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Molybdenum (Mo)	3.0	19	3.9	1.8	2.3	10	2.4	1.0	2.1	4.1	2.4	1.0
Nickel (Ni)	1.0	1.8	1.0	1.0	1.0	2.1	1.3	1.0	0.9	2.0	1.7	0.8
Potassium (K)	3.0	7.3	3.6	2.3	2.7	4.8	2.6	2.0	2.4	3.6	2.8	1.9
Selenium (Se)	1.0	1.0	1.0	1.0	1.0	0.1	0.4	1.0	1.0	1.6	1.1	1.0
Silicon (Si)	1.0	1.2	1.1	0.9	0.9	0.8	1.0	0.8	0.7	1.4	1.2	0.9
Silver (Ag)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.6	1.0	1.0	1.0
Sodium (Na)	0.8	16	2.6	2.1	0.5	9.6	1.6	1.1	0.6	5.6	2.2	1.1
Strontium (Sr)	1.1	7.2	3.4	1.7	0.9	3.3	1.6	1.2	0.8	2.3	2.3	1.3
Thallium (Tl)	1.0	1.0	1.0	1.0	1.0	0.1	0.4	1.0	0.8	1.0	1.1	0.8
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0	0.2	0.4	1.0	0.5	1.7	1.6	0.3
Uranium (U)	1.2	24	3.6	1.4	1.4	8.4	1.7	0.8	1.2	4.1	1.6	0.9
Vanadium (V)	1.0	1.0	1.0	1.0	1.0	0.5	0.7	1.0	1.0	1.0	1.0	0.7
Zinc (Zn)	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference value).
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference value).
Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference value).

Table C.16: Dissolved Metal Concentrations at Camp Lake Tributary Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Spring Sampling Event							Summer Sampling Event							Fall Sampling Event						
			L1-08	L1-02	L2-03	L1-09	L1-05	L0-01	K0-01	L1-08	L1-02	L2-03	L1-09	L1-05	L0-01	K0-01	LI-08	L1-02	L2-03	L1-09	L0-05	L0-01	K0-01
			09/Jul/17	09/Jul/17	07/Jul/17	07/Jul/17	07/Jul/17	07/Jul/17	07/Jul/17	10/Aug/17	28/Jul/17	28/Jul/17	28/Jul/17	28/Jul/17	28/Jul/17	27/Jul/17	01/Sep/17	27/Aug/17	27/Aug/17	27/Aug/17	27/Aug/17	27/Aug/17	27/Aug/17
Dissolved Metals	Aluminum (Al)	mg/L	0.0052	0.0042	0.0100	0.0049	0.0054	0.0135	0.0049	0.0060	0.0052	0.0076	0.0055	0.0055	0.0046	0.0202	0.0062	<0.0050	0.0075	0.0052	0.0058	0.0054	<0.0050
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.0041	0.0060	0.0099	0.0066	0.0067	0.0074	0.0052	0.0088	0.0089	0.0129	0.0094	0.0093	0.0096	0.0087	0.0090	0.0114	0.0124	0.0121	0.0124	0.0121	0.0123
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Boron (B)	mg/L	<0.010	<0.010	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	4.89	8.10	18.7	9.95	10.80	12.40	8.67	10.70	13.50	23.80	15.70	15.10	16.80	15.90	13.00	18.40	29.60	23.60	23.40	24.90	25.50
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00124	0.00118	0.00113	0.00126	0.00141	0.00118	0.00075	0.00253	0.00219	0.00088	0.00167	0.00156	0.00149	0.00087	0.00247	0.00194	0.00093	0.00170	0.00161	0.00156	0.00099
	Iron (Fe)	mg/L	<0.030	<0.030	0.068	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.115	<0.030	<0.030	<0.030	<0.030	<0.030	0.012	0.113	0.040	0.043	0.033	<0.010
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	0.0023	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	0.0026	0.0011	<0.0010	0.0013	<0.0010	<0.0010	0.0017	0.0035	0.0029	0.0031	0.0032	0.0021
	Magnesium (Mg)	mg/L	3.05	4.99	11.20	6.00	6.18	6.77	5.65	6.82	8.42	15.50	9.47	9.45	10.10	9.56	7.80	11.60	19.10	13.40	14.10	15.00	15.90
	Manganese (Mn)	mg/L	0.00025	0.00019	0.02020	0.00104	0.00241	0.00234	0.00035	0.00033	0.00026	0.02850	0.00279	0.00223	0.00142	0.00035	0.00019	0.00094	0.02980	0.00885	0.00855	0.00663	0.00069
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.00029	0.00027	0.00180	0.00038	0.00037	0.00039	0.00018	0.00078	0.00041	0.00249	0.00063	0.00060	0.00063	0.00028	0.00057	0.00065	0.00156	0.00085	0.00084	0.00084	0.00034
	Nickel (Ni)	mg/L	<0.00050	<0.00050	0.00079	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00098	0.00057	0.00055	0.00062	<0.00050	<0.00050	0.00061	0.00085	0.00076	0.00079	0.00084	<0.00050
	Potassium (K)	mg/L	0.960	1.070	2.440	1.200	1.210	1.280	0.785	1.810	1.430	2.950	1.630	1.570	1.630	1.200	1.900	1.900	2.720	2.090	2.110	2.200	1.540
	Selenium (Se)	mg/L	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00005	0.00012	0.00006	0.00005	0.00006	0.00006
	Silicon (Si)	mg/L	0.44	0.44	0.43	0.46	0.48	0.52	0.42	0.71	0.74	0.59	0.74	0.75	0.75	0.61	0.81	0.93	1.20	1.06	1.10	1.10	0.96
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	0.24	0.52	7.80	1.19	1.22	1.34	1.01	0.49	0.74	11.70	1.97	1.91	1.98	1.36	0.55	1.46	9.57	3.36	3.84	4.12	2.01
	Strontium (Sr)	mg/L	0.0027	0.0042	0.0223	0.0086	0.0112	0.0126	0.0052	0.0063	0.0068	0.0252	0.0123	0.0123	0.0138	0.0095	0.0077	0.0093	0.0234	0.0236	0.0276	0.0301	0.0142
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)	mg/L	0.00023	0.00029	0.00526	0.00071	0.00078	0.00080	0.00028	0.00197	0.00101	0.00829	0.00175	0.00168	0.00169	0.00089	0.00283	0.00194	0.00811	0.00311	0.00330	0.00316	0.00180
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0038	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0033	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0020

Table C.17: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between the Camp Lake Tributaries and Average Reference Creek Stations, Mary River Project CREMP, 2017

Variable	Spring				Summer				Fall			
	CLT1			CLT2	CLT1			CLT2	CLT1			CLT2
	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01
Aluminum (Al)	0.5	0.7	1.0	0.5	0.4	0.5	0.3	1.4	0.6	0.8	0.6	0.5
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Barium (Ba)	2.1	2.0	3.0	2.2	1.8	2.6	1.9	1.8	1.6	2.0	1.9	2.0
Beryllium (Be)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	1.0	1.0	1.0
Bismuth (Bi)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.5	1.0	1.0	1.0
Boron (B)	1.0	1.5	1.0	1.0	1.0	1.7	1.0	1.0	1.0	1.2	1.0	1.0
Cadmium (Cd)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Calcium (Ca)	1.9	2.5	3.4	2.5	1.6	3.2	2.2	2.1	1.4	2.6	2.2	2.3
Chromium (Cr)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Cobalt (Co)	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.5	1.0	1.0
Copper (Cu)	2.1	1.5	2.1	1.3	3.1	1.1	2.0	1.1	2.8	1.2	2.0	1.2
Iron (Fe)	1.0	2.3	1.0	1.0	1.0	3.8	1.0	1.0	1.9	10	3.3	0.9
Lead (Pb)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lithium (Li)	1.0	2.3	1.1	1.0	1.0	2.6	1.2	1.0	1.3	3.3	3.0	2.0
Magnesium (Mg)	2.1	2.6	3.4	2.9	1.7	3.5	2.3	2.2	1.5	2.9	2.2	2.4
Manganese (Mn)	0.9	100	8.4	1.4	1.5	141	8.8	1.7	1.0	51	13	1.2
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Molybdenum (Mo)	2.9	6.5	4.0	1.8	2.1	9.0	2.2	1.0	1.9	5.0	2.7	1.1
Nickel (Ni)	1.0	1.6	1.0	1.0	1.0	2.0	1.2	1.0	1.1	1.6	1.6	0.9
Potassium (K)	3.1	4.2	3.9	2.4	2.8	5.1	2.8	2.1	2.6	3.7	2.9	2.1
Selenium (Se)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	11	2.4	1.1	1.2
Silicon (Si)	1.1	0.6	1.3	1.1	1.0	0.8	1.0	0.8	1.0	1.4	1.3	1.1
Silver (Ag)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.6	1.0	1.0	1.0
Sodium (Na)	0.8	6.5	2.6	2.1	0.5	9.8	1.6	1.1	0.6	5.6	2.3	1.2
Strontium (Sr)	1.1	2.8	3.7	1.6	0.8	3.1	1.7	1.2	0.8	2.2	2.7	1.3
Thallium (Tl)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.5	1.0	1.0	1.0
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	16	0.9	0.9	0.9
Uranium (U)	1.3	5.0	4.0	1.5	1.4	7.9	1.6	0.8	1.3	4.3	1.7	0.9
Vanadium (V)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.0
Zinc (Zn)	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.1	2.0	1.0	1.0	2.0

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference value).
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference value).
Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference value).

Table C.18: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations at the Camp Lake Tributaries between 2017 and Mine Baseline (2005-2013) Periods

Variable	Spring				Summer				Fall			
	CLT1			CLT2	CLT1			CLT2	CLT1			CLT2
	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01	North Branch	Upper Main Stem L2-03	Lower Main Stem	Station KO-01
Aluminum (Al)	0.6	3.2	1.1	0.9	1.1	1.1	1.2	4.1	1.4	2.8	2.1	1.4
Antimony (Sb)	0.5	1.0	1.0	0.6	0.7	1.0	1.0	0.6	0.7	1.0	1.0	0.6
Arsenic (As)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Barium (Ba)	1.6	2.2	1.8	1.0	1.3	1.4	1.1	1.0	1.0	0.7	0.9	1.2
Beryllium (Be)	0.3	RDL	RDL	0.4	0.5	2.1	2.1	0.4	0.3	0.4	0.4	0.1
Bismuth (Bi)	1.1	1.0	1.0	1.1	1.1	1.0	1.0	1.1	0.6	0.1	0.1	0.1
Boron (B)	0.5	1.5	1.0	0.6	0.6	1.7	1.0	1.0	1.0	1.2	1.0	1.0
Cadmium (Cd)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9
Calcium (Ca)	1.5	1.6	1.6	1.2	1.2	1.1	1.1	1.1	1.0	0.7	0.9	1.2
Chromium (Cr)	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL
Cobalt (Co)	0.6	1.0	1.0	0.6	0.8	1.2	1.0	0.6	0.8	1.5	1.0	0.6
Copper (Cu)	1.3	1.9	1.3	1.0	1.4	1.0	1.0	0.9	1.3	1.3	1.0	0.4
Iron (Fe)	1.2	1.9	1.2	1.1	1.6	0.6	1.0	1.4	1.2	1.1	0.9	0.5
Lead (Pb)	0.5	1.0	1.0	0.6	0.7	1.0	1.0	0.6	0.7	1.0	1.0	0.6
Lithium (Li)	0.7	2.3	2.0	0.5	0.4	0.8	0.5	0.4	0.6	0.5	0.8	0.7
Magnesium (Mg)	1.5	1.7	1.6	1.3	1.2	1.3	1.2	1.2	1.0	0.9	1.0	1.2
Manganese (Mn)	0.2	7.1	0.7	0.1	1.0	2.3	1.0	0.5	1.4	2.1	1.8	0.6
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Molybdenum (Mo)	1.5	12	2.6	1.2	1.5	12	1.4	1.0	0.9	5.9	1.4	0.8
Nickel (Ni)	0.8	1.0	0.7	0.2	0.9	0.9	1.0	0.2	0.9	0.7	0.9	0.3
Potassium (K)	1.7	3.1	1.8	1.3	1.3	3.0	1.2	1.2	1.1	1.8	1.2	1.1
Selenium (Se)	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	1.2	0.6	0.0
Silicon (Si)	1.2	0.7	1.2	0.9	1.3	0.7	1.1	1.0	1.1	0.9	1.0	1.5
Silver (Ag)	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL
Sodium (Na)	1.1	7.7	2.1	2.6	1.0	6.6	1.8	1.2	1.0	2.8	1.7	1.1
Strontium (Sr)	1.6	1.7	1.9	1.5	1.3	0.8	1.0	1.2	1.0	0.2	0.5	1.2
Thallium (Tl)	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL	RDL
Titanium (Ti)	1.3	1.0	1.0	1.2	1.1	1.0	1.0	1.2	0.6	0.0	0.0	0.0
Uranium (U)	1.6	24	4.3	1.9	2.5	15	2.3	1.3	0.9	4.9	1.2	1.0
Vanadium (V)	1.0	1.0	1.0	1.0	0.8	1.0	1.0	0.9	0.7	0.5	0.5	0.3
Zinc (Zn)	2.1	2.1	1.5	2.4	2.2	1.7	1.2	1.4	1.5	0.5	0.7	1.6

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference value).

Note: RDL = Laboratory Reportable Detection Limit

Table C.19: *In Situ* Water Quality Statistical Comparisons among Camp Lake Tributary 2 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2017

Metric	Overall 3-group Comparison[a]			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	P-value	Statistical Test [b]	(I) Area	(J) Area	Significant Difference Between 2 Areas?	P-value	Statistical Test
Water Temperature (°C)	YES	0.0958	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.1044	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	NO	0.1939	
				CLT2 Upstream	CLT2 Downstream	NO	0.9223	
Dissolved Oxygen (mg/L)	NO	0.1584	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.2574	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	NO	0.1791	
				CLT2 Upstream	CLT2 Downstream	NO	0.9687	
Dissolved Oxygen (% saturation)	YES	0.0057	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0589	Tamhane's
				Unnamed Reference Creek	CLT2 Downstream	NO	0.8455	
				CLT2 Upstream	CLT2 Downstream	NO	0.1012	
pH (units)	YES	0.0000	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0000	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0000	
				CLT2 Upstream	CLT2 Downstream	NO	0.8042	
Specific Conductance (µS/cm)	YES	0.0001	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0056	Tamhane's
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0055	
				CLT2 Upstream	CLT2 Downstream	NO	0.6806	

Note: Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - single factor ANOVA test results validated using Kraskal Wallis H-test or Mann-Whitney U-test, as appropriate.

Table C.20: ***In Situ*** **Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Winter, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)					Dissolved Oxygen (mg/L)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09
Date Collected	11/Apr/17	11/Apr/17	14/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	14/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	14/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	14/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	11/Apr/17	14/Apr/17	11/Apr/17	11/Apr/17
1.0	0.1	0.1	0.3	0.2	0.1	16.6	15.8	15.0	14.7	15.5	113.6	108.5	103.4	101.3	106.5	8.09	7.82	7.51	7.73	7.75	226	169	189	210	181
2.0	0.1	0.1	0.2	0.6	0.3	16.4	15.8	15.1	14.8	15.2	113.7	108.7	104.1	102.3	105.1	8.08	7.82	7.51	7.74	7.76	222	185	189	218	179
3.0	1.0	1.1	1.0	1.2	1.2	15.2	15.1	14.9	14.4	14.8	107.8	106.7	104.6	101.8	104.4	8.04	7.82	7.55	7.75	7.76	217	178	187	217	174
4.0	1.3	1.3	1.3	1.4	1.3	15.1	14.8	14.7	14.2	14.6	107.2	105.1	104.1	100.9	103.4	8.01	7.81	7.57	7.75	7.75	215	177	185	219	173
5.0	1.4	1.3	1.3	1.4	1.4	15.0	14.6	14.5	14.1	14.4	107.0	104.2	103.1	100.6	102.5	7.97	7.80	7.58	7.75	7.75	211	177	185	219	173
6.0	1.4	1.4	1.4	1.5	1.4	15.0	14.6	14.5	14.1	14.3	106.9	103.5	102.9	100.2	101.9	7.94	7.79	7.59	7.75	7.74	208	177	184	218	172
7.0	1.4	1.4	1.5	1.5	1.5	15.0	14.6	14.2	14.1	14.1	106.7	104.0	101.6	100.7	100.4	7.92	7.78	7.60	7.74	7.74	204	177	184	218	172
8.0	1.5	1.5	1.5	1.5	1.5	14.9	14.6	14.1	14.2	13.9	106.0	104.0	100.8	101.4	99.5	7.91	7.77	7.60	7.73	7.73	202	177	183	217	172
9.0	1.5	1.5	1.6	1.5	1.6	14.9	14.4	13.9	14.2	13.8	106.1	103.0	99.8	101.4	98.5	7.89	7.76	7.60	7.73	7.73	200	176	183	215	171
10.0	1.5	1.5	1.7	1.5	1.6	14.9	14.3	15.8	14.1	13.7	106.0	102.1	98.6	100.5	98.0	7.87	7.75	7.60	7.73	7.73	199	176	182	212	171
11.0	1.5	1.6	1.7	1.6	1.7	14.9	14.1	15.6	13.8	13.5	106.0	101.3	97.6	99.2	96.4	7.86	7.74	7.60	7.73	7.72	198	176	182	209	171
12.0	1.5	1.6	1.8	1.7	1.7	14.6	13.9	13.4	13.6	13.3	104.0	99.1	96.3	97.9	95.7	7.81	7.71	7.60	7.73	7.71	198	177	181	206	170
13.0			1.8	1.8	1.8			13.3	13.4	13.1			96.0	96.4	94.1			7.60	7.72	7.68			182	202	171
14.0			1.9	1.9	1.8			13.2	13.2	12.9			95.2	94.9	93.2			7.58	7.72	7.67			181	198	170
15.0			1.9	1.9	1.9			12.9	13.0	12.6			92.9	93.6	91.0			7.58	7.71	7.66			182	196	170
16.0			1.9	2.0				12.6	12.4				91.0	89.6				7.57	7.67				182	190	
17.0				2.0					11.8					85.5					7.65					189	
18.0				2.0					11.4					82.7					7.62					188	
19.0				2.1					11.2					81.3					7.60					188	
20.0				2.1					10.9					79.1					7.59					187	
21.0				2.1					10.6					77.2					7.56					186	
22.0				2.1					10.5					76.0					7.54					187	
23.0				2.2					10.3					74.6					7.52					186	
24.0				2.2					9.9					71.9					7.50					186	
25.0				2.3					9.3					68.0					7.46					185	
26.0				2.3					9.1					66.6					7.43					186	
27.0				2.5					8.2					60.5					7.40					186	
28.0				2.6					7.1					52.3					7.36					188	
29.0				2.6					6.3					47.0					7.33					188	
30.0				2.7					5.5					40.7					7.30					190	
31.0				2.8					4.5					33.0					7.25					193	
32.0				2.9					2.3					17.3					7.16					203	

Notes:
Total depth at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 12.6, 12.7, 16.2, 33.2, and 16.1 m, respectively, at the time of winter sampling.
Ice thickness at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 1.90, 1.91, 1.80, 1.69, and 1.50 m, respectively, at the time of winter sampling.
Deepest measurement at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 11.6, 11.5, 16.2, 32, and 15 m, respectively, at the time of winter sampling.

Table C.21: ***In Situ*** **Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Summer, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)					Dissolved Oxygen (mg/L)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-09
Date Collected	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17
1.0	6.0	6.1	6.1	6.1	5.9	12.38	11.85	12.00	12.03	12.44	99.4	94.8	98.4	95.8	99.5	7.99	8.05	7.83	7.88	7.94	114	114	114	114	114
2.0	6.0	6.0	6.0	6.0	5.9	12.44	12.18	28.00	12.03	12.45	99.9	97.2	99.9	98.8	99.7	7.97	8.02	7.93	7.95	7.96	114	114	114	114	114
3.0	5.9	6.0	6.0	6.0	5.8	12.45	12.24	12.44	12.37	12.46	99.9	98.4	100.1	99.4	99.7	7.95	7.98	7.96	7.97	7.97	114	114	114	114	114
4.0	5.9	6.0	6.0	6.0	5.8	12.45	12.30	12.45	12.39	12.46	99.9	98.9	100.1	99.6	99.7	7.95	7.96	7.97	7.97	7.97	114	114	114	114	114
5.0	5.9		6.0	6.0	5.8	12.45		12.46	12.41	12.46	99.9		100.3	99.8	99.8	7.94		7.97	7.96	7.97	114		114	114	114
6.0	5.9		6.0	6.0	5.8	12.46		12.48	12.41	12.46	99.9		100.3	99.8	99.7	7.94		7.97	7.97	7.97	114		114	114	114
7.0	5.9		6.0	6.0	5.8	12.45		12.48	12.41	12.46	99.8		100.1	99.8	99.7	7.94		7.97	7.97	7.97	114		114	114	114
8.0	5.9		6.0	6.0	5.8	12.46		12.47	12.41	12.45	99.9		100.0	99.8	99.6	7.94		7.97	7.97	7.97	114		114	114	114
9.0	5.9		6.0	6.0	5.8	12.46		12.46	12.42	12.46	99.9		100.0	99.9	99.7	7.94		7.96	7.97	7.96	114		114	114	114
10.0	5.9		6.0	6.0	5.8	12.45		12.46	12.40	12.42	99.8		100.0	99.7	99.3	7.93		7.96	7.97	7.97	114		114	114	114
11.0	5.9		5.9	6.0	5.8	12.44		12.46	12.42	12.43	99.7		100.0	99.9	99.5	7.93		7.96	7.97	7.97	114		114	114	114
12.0			6.0	6.0	5.9			12.45	12.41	12.43			100.0	99.8	99.5			7.95	7.97	7.97			114	114	114
13.0			6.0	6.0	5.8			12.46	12.40	12.43			100.0	99.8	99.5			7.96	7.97	7.97			114	114	114
14.0			5.9	6.0	5.8			12.45	12.40	12.43			99.9	99.8	99.5			7.96	7.97	7.97			114	114	114
15.0				6.0					12.40					99.7					7.97					114	
16.0				6.0					12.40					99.7					7.97					114	
17.0				6.0					12.39					99.7					7.97					114	
18.0				6.0					12.39					99.6					7.97					114	
19.0				6.0					12.38					99.6					7.97					114	
20.0				6.0					12.38					99.5					7.97					114	
21.0				6.0					12.38					99.4					7.97					114	
22.0				6.0					12.37					99.4					7.97					114	
23.0				6.0					12.37					99.3					7.97					114	
24.0				6.0					12.37					99.4					7.96					114	
25.0				6.0					12.37					99.3					7.97					114	
26.0				6.0					12.37					99.3					7.97					114	
27.0				5.9					12.37					99.2					7.97					114	
28.0				5.9					12.36					99.2					7.97					114	
29.0				5.9					12.37					99.2					7.97					114	
30.0				5.9					12.36					99.2					7.97					114	
31.0				5.9					12.37					99.2					7.97					114	
32.0				5.9					12.36					99.2					7.97					114	

Note:
Total depth at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 12.26, 5.9, 15.9, 32.45, and 15.64 m, respectively, at the time of summer sampling.

Table C.22: ***In Situ*** **Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)						Dissolved Oxygen (mg/L)						Dissolved Oxygen (% Saturation)					
	JLO-02	JLO-10	JLO-01	JLO-07	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-07	JLO-09
Date Collected	**26/Aug/17**	**25/Aug/17**	**26/Aug/17**	**26/Aug/17**	**19/Aug/17**	**25/Aug/17**	**26/Aug/17**	**25/Aug/17**	**26/Aug/17**	**26/Aug/17**	**19/Aug/17**	**25/Aug/17**	**26/Aug/17**	**25/Aug/17**	**26/Aug/17**	**26/Aug/17**	**19/Aug/17**	**25/Aug/17**
surface					8.4						11.69						100.2	
1.0	8.7	8.7	8.5	8.4	8.4	8.5	11.72	11.81	11.76	11.79	11.53	11.8	100.2	101.4	100.3	100.0	98.4	100.4
2.0	8.5	8.7	8.4	8.4	8.4	8.4	11.74	11.82	11.77	11.78	11.48	11.8	100.4	101.5	100.4	100.3	98.0	100.5
3.0	8.5	8.7	8.4	8.3	8.4	8.4	11.73	11.82	11.76	11.77	11.47	11.8	100.4	101.5	100.4	100.3	97.8	100.6
4.0	8.5	8.7	8.4	8.4	8.4	8.4	11.73	11.81	11.76	11.76	11.44	11.8	100.3	101.4	100.3	100.2	97.6	100.6
5.0	8.5	8.6	8.4	8.3	8.4	8.4	11.73	11.81	11.76	11.75	11.43	11.8	100.3	101.3	100.3	100.1	97.4	100.6
6.0	8.5	8.6	8.4	8.3	8.4	8.4	11.73	11.81	11.75	11.74	11.46	11.8	100.3	101.2	100.3	100.0	97.8	100.6
7.0	8.5	8.5	8.4	8.3	8.4	8.4	11.73	11.82	11.75	11.75	11.44	11.8	100.1	101.1	100.2	100.1	97.5	100.5
8.0	8.5	8.5	8.4	8.3	8.4	8.4	11.73	11.83	11.74	11.74	11.45	11.8	100.2	101.1	100.2	100.0	97.5	100.5
9.0	8.4	8.5	8.4	8.3	8.3	8.3	11.73	11.83	11.74	11.74	11.45	11.8	100.0	101.1	100.1	99.9	97.4	100.2
10.0	8.3		8.4	8.3	8.3	8.3	11.73		11.74	11.73	11.44	11.8	99.8		100.1	99.9	97.2	100.3
11.0	8.3		8.4	8.3	8.2	8.3	11.71		11.73	11.73	11.44	11.8	99.6		100.0	99.9	97.2	100.2
12.0			8.4	8.3	8.1	8.3			11.73	11.72	11.47	11.8			99.9	99.8	97.1	100.1
13.0			8.3	8.3	7.9	8.2			11.72	11.72	11.52	11.7			99.8	99.8	97.0	99.5
14.0			8.3	8.3	7.8	8.2			11.71	11.71	11.54	11.7			99.7	99.7	97.0	99.4
15.0			8.3	8.3	7.7				11.71	11.71	11.55				99.7	99.7	97.0	
16.0				8.3	7.7					11.70	11.56					99.6	96.9	
17.0				8.3	7.6					11.70	11.57					99.6	96.7	
18.0				8.3	7.5					77.69	11.58					99.5	96.7	
19.0				8.3	7.5					11.69	11.59					99.4	96.5	
20.0				8.3	7.3					11.68	11.63					99.4	96.4	
21.0				8.2	7.0					11.63	11.68					98.4	96.1	
22.0				7.5	6.8					11.64	11.67					97.2	95.6	
23.0				7.1	6.7					11.65	11.65					96.3	95.3	
24.0				7.1	6.7					11.63	11.61					96.1	95.0	
25.0				6.9	6.7					11.61	11.61					95.9	94.9	
26.0				6.8	6.7					11.57	11.61					94.9	94.8	
27.0				6.7	6.7					11.57	11.59					94.1	94.7	
28.0				6.7	6.6					11.50	11.58					91.0	94.6	
29.0				6.7	6.6					11.47	11.58					93.7	94.5	
30.0				6.6	6.5					11.45	11.55					93.5	94.0	
31.0				6.6						11.40						93.1		
32.0				6.6						11.33						92.5		

Notes:
25-Aug-17 and 26-Aug-17 sampling was conducted by Baffinland. 19-Aug-17 sampling was conducted by Minnow.
Total depth at Stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 11.5, 9.85, 16.2, 32.5, 15.05 m, respectively, at the time of fall sampling.

Table C.22: ***In Situ*** **Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017**

Depth (m)	pH (pH units)						Specific Conductance (µS/cm)					
	JLO-02	JLO-10	JLO-01	JLO-07	JLO-07	JLO-09	JLO-02	JLO-10	JLO-01	JLO-07	JLO-07	JLO-09
Date Collected	26/Aug/17	25/Aug/17	26/Aug/17	26/Aug/17	19/Aug/17	25/Aug/17	26/Aug/17	25/Aug/17	26/Aug/17	26/Aug/17	19/Aug/17	25/Aug/17
surface					8.09						133	
1.0	7.86	7.74	7.79	7.79	8.13	7.80	121	120	120	120	133	120
2.0	7.86	7.77	7.81	7.77	8.15	7.76	121	120	120	120	133	120
3.0	7.86	7.77	7.83	7.78	8.15	7.75	121	120	120	120	133	120
4.0	7.88	7.77	7.84	7.81	8.15	7.73	121	120	120	120	132	120
5.0	7.87	7.77	7.84	7.83	8.13	7.71	121	120	120	120	132	120
6.0	7.87	7.78	7.85	7.83	8.09	7.70	121	120	120	120	132	120
7.0	7.87	7.77	7.85	7.83	8.08	7.70	120	120	120	120	132	120
8.0	7.87	7.78	7.85	7.83	8.08	7.69	121	120	120	120	132	120
9.0	7.87	7.78	7.86	7.84	8.06	7.70	120	120	120	120	132	120
10.0	7.87		7.86	7.85	8.05	7.70	120		120	120	132	120
11.0	7.86		7.86	7.85	8.05	7.69	121		120	120	132	120
12.0			7.86	7.89	8.02	7.69			120	120	133	120
13.0			7.86	7.89	8.00	7.67			120	120	134	120
14.0			7.86	7.89	7.98	7.66			120	120	133	120
15.0			7.86	7.89	7.96				120	120	133	
16.0				7.83	7.93					120	131	
17.0				7.83	7.92					120	132	
18.0				7.83	7.90					120	132	
19.0				7.82	7.89					120	132	
20.0				7.82	7.89					120	131	
21.0				7.73	7.88					120	131	
22.0				7.75	7.86					119	132	
23.0				7.71	7.83					119	131	
24.0				7.70	7.80					119	131	
25.0				7.68	7.77					118	131	
26.0				7.66	7.78					118	131	
27.0				7.69	7.77					118	131	
28.0				7.63	7.77					118	131	
29.0				7.61	7.76					118	131	
30.0				7.60	7.76					119	131	
31.0				7.59						119		
32.0				7.59						119		

Notes:
25-Aug-17 and 26-Aug-17 sampling was conducted by Baffinland. 19-Aug-17 sampling was conducted by Minnow.
Total depth at Stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 11.5, 9.85, 16.2, 32.5, 15.05 m, respectively, at the time of fall sampling.

Table C.23: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Camp Lake Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017

Categorization & Replicate ID		Date Sampled	Station Depth (m)	Secchi Depth (m)	Depth sampled	Temperature (°C)	Dissolved Oxygen		pH (units)	Specific Conductance (µS/cm)
							(mg/L)	(% sat.)		
Littoral (Shallow) Stations	JLO-02	18-Aug-17	12.4	6.0	surface	8.19	11.86	100.9	8.03	133
					bottom	7.82	12.04	101.7	7.75	134
	JLO-21	19-Aug-17	9.9	6.8	surface	8.20	11.71	99.6	8.17	133
					bottom	7.82	11.58	97.5	8.17	134
	JLO-20	18-Aug-17	6.3	5.8	surface	8.23	12.03	102.7	8.22	132
					bottom	8.04	11.68	98.9	7.78	133
	JLO-19	19-Aug-17	7.0	7.0	surface	8.34	11.68	99.7	8.18	132
					bottom	8.07	11.62	98.3	8.23	133
	JLO-18	19-Aug-17	11.5	6.4	surface	8.20	11.60	98.5	8.01	133
					bottom	7.94	11.56	97.5	7.84	134
Profundal (Deep) Stations	JLO-01	18-Aug-17	16.5	6.8	surface	8.83	11.47	98.0	8.23	130
					bottom	7.81	11.57	97.4	7.70	133
	JLO-07	19-Aug-17	35.1	6.2	surface	8.43	11.69	100.2	8.09	133
					bottom	6.52	11.55	94.0	7.76	131
	JLO-16	19-Aug-17	16.5	5.7	surface	8.27	11.70	99.5	8.14	132
					bottom	7.62	11.42	95.6	8.02	133
	JLO-11	18-Aug-17	33.0	7.0	surface	8.39	11.43	97.4	7.98	132
					bottom	6.48	10.25	83.1	7.19	132
	JLO-12	19-Aug-17	16.2	6.2	surface	8.58	11.58	99.4	8.26	133
					bottom	7.91	11.54	97.2	8.05	132

Table C.24: Statistical Comparison of Bottom *In Situ* Water Quality Between Camp Lake Littoral and Profundal Stations, Mary River Project CREMP, August 2017

Habitat Variable	Statistical Test Results			Summary Statistics					
	Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Lake Zone	Mean (n = 5)	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	NO	1.000	α	Littoral	6.38	0.51	0.23	5.80	7.00
				Profundal	6.38	0.52	0.23	5.70	7.00
Temperature (˚C)	NO	0.102	δ	Littoral	7.94	0.12	0.05	7.82	8.07
				Profundal	7.27	0.71	0.32	6.48	7.91
Dissolved Oxygen (mg/L)	YES	0.016	γ	Littoral	11.7	0.2	0.1	11.6	12.0
				Profundal	11.3	0.6	0.3	10.3	11.6
Dissolved Oxygen (% saturation)	YES	0.008	γ	Littoral	98.8	1.7	0.8	97.5	101.7
				Profundal	93.5	6.0	2.7	83.1	97.4
pH (units)	NO	0.290	α	Littoral	7.95	0.23	0.10	7.75	8.23
				Profundal	7.74	0.35	0.15	7.19	8.05
Specific Conductance (umho/cm)	YES	0.009	α	Littoral	133.5	0.4	0.2	133.0	134.0
				Profundal	132.2	0.8	0.3	131.4	133.2

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.25: Statistical Comparison of Bottom *In Situ* Water Quality Between Camp Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	NO	0.810	α , η	Reference	5	9.74	1.04	0.46	8.50	11.20
					Camp	5	9.42	2.69	1.20	6.30	12.40
	Secchi Depth (m)	YES	0.002	α	Reference	5	8.26	0.74	0.33	7.50	9.40
					Camp	5	6.38	0.51	0.23	5.80	7.00
	Temperature (˚C)	YES	0.004	α	Reference	5	8.29	0.16	0.07	8.05	8.42
					Camp	5	7.94	0.12	0.05	7.82	8.07
	Dissolved Oxygen (mg/L)	NO	0.326	β , ζ	Reference	5	11.8	0.1	0.0	11.7	11.9
					Camp	5	11.7	0.2	0.1	11.6	12.0
	Dissolved Oxygen (% saturation)	NO	0.128	α	Reference	5	100.3	0.9	0.4	99.0	101.0
					Camp	5	98.8	1.7	0.8	97.5	101.7
	pH (units)	YES	0.004	α	Reference	5	7.43	0.17	0.08	7.31	7.72
					Camp	5	7.95	0.23	0.10	7.75	8.23
	Specific Conductance (umho/cm)	YES	< 0.001	α	Reference	5	73.7	0.6	0.3	73.2	74.6
					Camp	5	133.5	0.4	0.2	133.0	134.0
Profundal (Deep) Stations	Station Depth (m)	NO	0.714	β , ζ	Reference	5	20.56	2.17	0.97	18.50	24.20
					Camp	5	23.46	9.70	4.34	16.20	35.10
	Secchi Depth (m)	YES	< 0.001	α	Reference	5	8.28	0.43	0.19	7.90	9.00
					Camp	5	6.38	0.52	0.23	5.70	7.00
	Temperature (˚C)	NO	0.627	α	Reference	5	7.48	0.61	0.27	6.47	8.10
					Camp	5	7.27	0.71	0.32	6.48	7.91
	Dissolved Oxygen (mg/L)	NO	0.405	β , ζ	Reference	5	11.6	0.5	0.2	10.7	12.0
					Camp	5	11.3	0.6	0.3	10.3	11.6
	Dissolved Oxygen (% saturation)	NO	0.259	β , ζ	Reference	5	97.3	3.6	1.6	93.0	100.7
					Camp	5	93.5	6.0	2.7	83.1	97.4
	pH (units)	YES	0.020	α	Reference	5	7.29	0.06	0.03	7.23	7.37
					Camp	5	7.74	0.35	0.15	7.19	8.05
	Specific Conductance (umho/cm)	YES	< 0.001	α , η	Reference	5	76.1	3.5	1.5	73.2	80.6
					Camp	5	132.2	0.8	0.3	131.4	133.2

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.26: Water Chemistry at Camp Lake (JLO) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Winter Sampling Event											Summer Sampling Event					
					JL0-02 bottom 11-Apr-17	JL0-02 surface 11-Apr-17	JL0-10 bottom 11-Apr-17	JL0-10 surface 11-Apr-17	JL0-01 bottom 14-Apr-17	JL0-01 surface 14-Apr-17	JL0-07 bottom 11-Apr-17	JL0-07 surface 11-Apr-17	JL0-09 bottom 11-Apr-17	JL0-09 surface 11-Apr-17	J0-01 outlet 9-Jul-17	JL0-02 bottom 24-Jul-17	JL0-02 surface 24-Jul-17	JL0-10 bottom 24-Jul-17	JL0-10 surface 24-Jul-17	JL0-01 bottom 24-Jul-17	JL0-01 surface 24-Jul-17
Conventionals	Conductivity (lab)	umho/cm	-	-	163	167	160	166	155	168	153	158	174	170	130	137	137	137	137	137	137
	pH (lab)	pH	6.5 - 9.0	-	7.89	7.86	7.77	7.85	7.70	7.86	7.51	7.86	7.78	7.80	7.91	7.85	7.89	7.86	7.90	7.80	7.87
	Hardness (as $CaCO_3$)	mg/L	-	-	82	82	78	86	78	87	78	82	74	86	61	66	65	66	66	66	67
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.6	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	72	77	70	75	84	94	72	72	81	77	68	78	82	79	60	79	77
	Turbidity	NTU	-	-	0.1	0.2	0.2	0.2	0.1	0.2	0.3	0.3	0.1	0.2	0.5	0.8	0.6	0.9	0.8	0.6	0.6
	Alkalinity (as $CaCO_3$)	mg/L	-	-	75	80	74	77	70	78	74	79	85	80	57	64	62	64	62	59	58
Nutrients and Organics	Total Ammonia	mg/L	variable	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.022	0.020	<0.020	0.023	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.023
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	0.023	<0.020	0.068	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Nitrate and Nitrite (as N)	mg/L	-	-	<0.021	<0.021	<0.021	<0.021	0.023	<0.021	0.068	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
	Dissolved Organic Carbon	mg/L	-	-	1.9	2.1	1.9	2.0	1.9	2.1	1.8	1.9	1.9	2.0	1.5	1.8	1.8	1.7	1.8	1.8	1.8
	Total Organic Carbon	mg/L	-	-	2.0	2.1	2.0	2.0	1.8	1.9	1.8	1.9	1.8	2.1	1.7	1.7	1.8	1.8	1.8	1.9	1.8
	Total Phosphorus	mg/L	0.020[α]	-	0.0050	0.0034	<0.0030	0.0033	0.0030	0.0039	0.0033	<0.0030	0.0040	<0.0030	0.0040	0.0038	0.0067	0.0031	0.0041	0.0054	0.0058
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	4.5	4.7	4.4	4.7	4.2	4.6	4.9	4.4	4.9	4.7	3.6	3.7	3.7	3.7	3.7	3.7	3.6
	Sulphate (SO_4)	mg/L	218[β]	218	2.7	2.8	2.6	2.8	2.5	2.8	2.5	2.6	2.9	2.8	2.6	2.7	2.8	2.7	2.7	2.7	2.8
Total Metals	Aluminum (Al)	mg/L	0.100	0.1	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	0.005	0.003	<0.003	<0.003	0.010	0.011	0.018	0.008	0.007	0.007	0.009
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0075	0.0078	0.0077	0.0078	0.0076	0.0080	0.0076	0.0082	0.0072	0.0080	0.0060	0.0065	0.0063	0.0064	0.0065	0.0063	0.0064
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	16	17	16	17	16	17	16	17	15	16	12	13	13	13	13	13	13
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.004	0.0010	0.0010	0.0010	0.0010	0.0010	0.0011	0.0010	0.0010	0.0009	0.0010	0.0008	0.0008	0.0009	0.0009	0.0009	0.0008	0.0008
	Iron (Fe)	mg/L	0.30	0.300	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	0.0013	0.0010	0.0011	0.0011	0.0010	<0.0010	0.0012	0.0011	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	9.7	10.4	9.8	9.8	9.6	10.5	9.5	10.0	9.1	10.3	7.3	8.0	8.1	8.1	8.2	8.2	8.0
	Manganese (Mn)	mg/L	0.935[β]	-	0.0005	0.0004	0.0004	0.0003	0.0005	0.0004	0.0016	0.0004	0.0006	0.0003	0.0030	0.0028	0.0030	0.0029	0.0029	0.0027	0.0029
	Mercury (Hg)	mg/L	0.000026	-	0.00004	0.00002	<0.00001	0.00002	<0.00001	0.00001	0.00002	<0.00001	0.00002	0.00003	<0.00001	0.00004	0.00001	<0.00001	<0.00001	0.00003	0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00033	0.00036	0.00032	0.00035	0.00032	0.00035	0.00029	0.00035	0.00031	0.00034	0.00027	0.00030	0.00028	0.00027	0.00028	0.00028	0.00027
	Nickel (Ni)	mg/L	0.025	0.025	0.00072	0.00077	0.00069	0.00071	0.00071	0.00081	0.00071	0.00069	0.00067	0.00075	0.00057	0.00062	0.00062	0.00060	0.00063	0.00065	0.00060
	Potassium (K)	mg/L	-	-	1.28	1.32	1.26	1.29	1.34	1.46	1.23	1.30	1.21	1.35	1.02	1.09	1.09	1.09	1.09	1.08	1.07
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.43	0.45	0.44	0.43	0.47	0.45	0.94	0.45	0.45	0.45	0.39	0.39	0.39	0.38	0.39	0.38	0.36
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.9	1.8	1.8	1.8	1.8	2.0	2.2	1.9	1.7	1.9	1.4	1.5	1.5	1.6	1.5	1.5	1.6
	Strontium (Sr)	mg/L	-	-	0.012	0.013	0.012	0.013	0.012	0.013	0.012	0.012	0.012	0.012	0.009	0.010	0.010	0.010	0.010	0.010	0.010
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	0.00082	0.00036	0.00088	0.00033	0.00018	0.00018	0.00235	0.00252	0.00113	0.00064	<0.00010	0.00051	0.00073	<0.00010	<0.00010	0.00064	0.00024
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0009	0.0010	0.0009	0.0009	0.0009	0.0010	0.0008	0.0009	0.0008	0.0009	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Camp Lake system.

Shaded cell: Indicates parameter concentration above applicable Water Quality Guideline.

BOLD: Indicates parameter concentration above the AEMP benchmark.

Table C.26: Water Chemistry at Camp Lake (JLO) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Summer Sampling Event					Fall Sampling Event										
					JL0-07 bottom 24-Jul-17	JL0-07 surface 24-Jul-17	JL0-09 bottom 24-Jul-17	JL0-09 surface 24-Jul-17	J0-01 outlet 10-Aug-17	JL0-02 bottom 26-Aug-17	JL0-02 surface 26-Aug-17	JL0-10 bottom 25-Aug-17	JL0-10 surface 25-Aug-17	JL0-01 bottom 26-Aug-17	JL0-01 surface 26-Aug-17	JL0-07 bottom 26-Aug-17	JL0-07 surface 26-Aug-17	JL0-09 bottom 25-Aug-17	JL0-09 surface 25-Aug-17	J0-01 outlet 1-Sep-17
Conventionals	Conductivity (lab)	umho/cm	-	-	137	137	137	137	138	140	140	140	140	140	140	139	141	140	140	139
	pH (lab)	pH	6.5 - 9.0	-	7.89	7.83	7.87	7.80	8.07	8.04	8.05	8.05	8.06	8.05	8.06	8.01	7.92	8.00	8.04	8.02
	Hardness (as $CaCO_3$)	mg/L	-	-	67	66	66	66	64	68	68	65	66	67	67	65	67	66	65	66
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	69	54	78	73	69	70	51	65	53	64	63	65	58	63	54	69
	Turbidity	NTU	-	-	0.7	0.6	0.6	0.7	0.5	0.4	0.6	0.7	0.9	0.5	0.4	0.4	0.4	0.7	0.7	0.7
	Alkalinity (as $CaCO_3$)	mg/L	-	-	63	60	59	61	65	65	67	63	62	66	62	66	65	63	65	66
Nutrients and Organics	Total Ammonia	mg/L	variable	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.031	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.15	0.17	<0.15
	Nitrate and Nitrite (as N)	mg/L	-	-	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
	Dissolved Organic Carbon	mg/L	-	-	1.8	1.8	1.8	1.8	1.9	1.8	1.7	1.7	1.8	1.8	1.8	1.5	1.8	1.6	1.7	1.7
	Total Organic Carbon	mg/L	-	-	1.8	1.8	1.8	1.8	1.9	1.8	1.8	1.7	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.7
	Total Phosphorus	mg/L	0.020[α]	-	0.0052	0.0051	0.0045	0.0033	0.0039	0.0048	0.0055	<0.0030	<0.0030	0.0071	0.0035	0.0081	0.0035	<0.0030	<0.0030	0.0051
	Phenols	mg/L	0.001[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0028	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015	<0.0010	0.0010	<0.0010	0.0019
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	3.7	3.7	3.7	3.7	3.5	3.4	3.7	3.5	3.7	3.3	3.2	3.6	3.7	3.4	3.6	3.7
	Sulphate (SO_4)	mg/L	218[β]	218	2.7	2.7	2.7	2.7	2.9	2.6	3.0	2.7	2.9	2.6	2.4	2.8	2.9	2.7	2.9	3.0
Total Metals	Aluminum (Al)	mg/L	0.100	0.1	0.008	0.010	0.010	0.008	0.004	0.006	0.005	0.004	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.005
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0062	0.0063	0.0065	0.0063	0.0064	0.0067	0.0066	0.0063	0.0064	0.0065	0.0065	0.0064	0.0065	0.0064	0.0065	0.0065
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	13	13	13	13	13	14	14	13	13	13	13	13	13	13	13	13
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.004	0.0008	0.0008	0.0011	0.0010	0.0009	0.0008	0.0008	0.0009	0.0008	0.0008	0.0011	0.0008	0.0008	0.0009	0.0008	0.0008
	Iron (Fe)	mg/L	0.30	0.300	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.057
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0014	0.0015	0.0013	0.0013	0.0014	0.0014	0.0013	0.0013	0.0012	0.0013	0.0012
	Magnesium (Mg)	mg/L	-	-	8.1	8.1	7.9	8.1	7.9	8.4	8.6	8.5	8.3	8.4	8.4	8.3	8.3	8.2	8.1	8.2
	Manganese (Mn)	mg/L	0.935[β]	-	0.0028	0.0028	0.0028	0.0028	0.0024	0.0017	0.0017	0.0016	0.0017	0.0016	0.0017	0.0018	0.0017	0.0017	0.0017	0.0028
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00028	0.00028	0.00029	0.00028	0.00030	0.00030	0.00029	0.00029	0.00029	0.00030	0.00029	0.00028	0.00029	0.00028	0.00029	0.00030
	Nickel (Ni)	mg/L	0.025	0.025	0.00060	0.00061	0.00065	0.00069	0.00059	0.00061	0.00057	0.00058	0.00055	0.00059	0.00058	0.00060	0.00058	0.00058	0.00056	0.00075
	Potassium (K)	mg/L	-	-	1.09	1.09	1.08	1.09	1.06	1.14	1.13	1.11	1.09	1.12	1.13	1.12	1.10	1.10	1.08	1.06
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.39	0.39	0.38	0.38	0.35	0.32	0.32	0.32	0.31	0.32	0.33	0.41	0.31	0.31	0.33	0.34
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.5	1.5	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.4
	Strontium (Sr)	mg/L	-	-	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0007	0.0007	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0008
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Camp Lake system.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.27: Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between Camp Lake and Reference Lake 3 in 2017, and Between Camp Lake 2017 and Baseline (2005 - 2013), Mary River Project CREMP

Parameter	Camp Lake vs Reference Lake 3 in 2017		Camp Lake 2017 vs Baseline		
	Summer	Fall	Winter	Summer	Fall
Conductivity (lab)	1.8	1.8	1.3	1.2	1.2
Hardness (as $CaCO_3$)	1.9	1.9	1.3	1.1	1.1
Total Suspended Solids (TSS)	1.0	1.0	1.0	1.0	1.0
Total Dissolved Solids (TDS)	2.0	1.7	0.9	1.0	0.8
Turbidity	1.8	1.2	1.0	1.3	1.8
Alkalinity (as $CaCO_3$)	1.9	2.0	1.2	1.1	1.1
Total Ammonia	0.6	1.1	0.4	0.3	0.8
Nitrate	1.0	1.0	0.3	0.2	0.2
Nitrite	1.0	1.0	1.9	0.2	1.0
Total Kjeldahl Nitrogen (TKN)	0.8	1.0	0.8	0.7	0.5
Dissolved Organic Carbon	0.6	0.6	1.0	1.0	1.0
Total Organic Carbon	0.6	0.6	1.0	0.9	1.0
Total Phosphorus	0.7	1.1	0.6	1.0	0.9
Phenols	1.0	0.5	1.0	0.8	1.2
Bromide (Br)	1.0	1.0	1.1	0.4	0.4
Chloride (Cl)	3.0	2.7	3.3	1.9	1.6
Sulphate (SO_4)	0.7	0.7	1.9	1.9	1.0
Aluminum (Al)	2.9	1.3	2.0	0.7	0.8
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.0	1.0	1.0
Barium (Ba)	1.0	1.0	1.3	1.2	1.1
Beryllium (Be)	1.0	1.0	1.1	1.3	2.8
Cadmium (Cd)	1.0	1.0	0.6	0.8	0.9
Calcium (Ca)	1.9	1.9	1.3	1.1	1.1
Chromium (Cr)	1.0	1.0	RDL	1.0	1.0
Cobalt (Co)	1.0	1.0	1.0	1.0	0.9
Copper (Cu)	1.0	1.0	0.9	0.3	1.0
Iron (Fe)	1.0	1.0	1.1	1.1	1.7
Lead (Pb)	1.0	1.0	0.7	0.6	1.0
Lithium (Li)	1.0	1.3	0.2	0.2	
Magnesium (Mg)	1.8	1.9	1.3	1.1	1.2
Manganese (Mn)	4.5	2.8	0.6	1.4	1.1
Mercury (Hg)	1.6	1.0	1.8	1.5	1.0
Molybdenum (Mo)	2.0	2.4	1.6	1.4	1.4
Nickel (Ni)	1.3	1.2	1.1	0.9	1.0
Potassium (K)	1.2	1.3		1.3	1.3
Selenium (Se)	1.0	1.0	RDL	RDL	RDL
Silicon (Si)	0.9	0.8	1.0	0.9	0.8
Silver (Ag)	1.0	1.0	1.1	1.6	2.7
Sodium (Na)	1.7	1.7		1.7	1.4
Strontium (Sr)	1.3	1.3	1.7	1.4	1.3
Thallium (Tl)	1.0	1.0	1.1	1.3	RDL
Tin (Sn)	2.7	1.0	0.8	0.6	0.1
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0
Uranium (U)	2.7	2.8	2.0	1.6	1.4
Vanadium (V)	1.0	1.0	1.0	1.0	1.0
Zinc (Zn)	1.0	1.0	2.4	1.3	1.3

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.28: Spearman's Rank Correlation Coefficients for Camp Lake (JLO) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Conventional Parameters							Total Metals														
	Total Dissolved Solids	Turbidity	Alkalinity	Ammonia (total)	Phosphorus (total)	Cloride	Sulphate	Aluminum	Barium	Calcium	Copper	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Silicon	Sodium	Strontium	Uranium
Total Dissolved Solids	1	-0.341	0.227	0.085	-0.004	0.494	-0.149	-0.066	0.269	0.185	0.505	-0.505	0.130	-0.097	0.602	0.250	0.674	0.245	0.605	0.708	0.397	0.518
Turbidity	-0.341	1	-0.675	-0.227	0.080	-0.460	0.185	0.661	-0.660	-0.706	-0.451	-0.055	-0.693	0.694	-0.354	-0.663	-0.510	-0.734	-0.601	-0.550	-0.681	-0.506
Alkalinity	0.227	-0.675	1	0.113	-0.265	0.667	0.163	-0.820	0.814	0.855	0.443	0.235	0.819	-0.831	0.335	0.859	0.538	0.789	0.524	0.533	0.759	0.653
Ammonia (total)	0.085	-0.227	0.113	1	0.123	0.096	0.089	0.032	0.103	0.051	-0.001	-0.136	0.091	-0.042	0.256	-0.117	0.129	0.123	0.275	0.289	-0.054	-0.157
Phosphorus (total)	-0.004	0.080	-0.265	0.123	1	-0.181	0.119	0.421	-0.346	-0.408	-0.340	-0.067	-0.332	0.450	0.094	-0.321	-0.058	-0.330	-0.115	-0.098	-0.386	-0.277
Chloride	0.494	-0.460	0.667	0.096	-0.181	1	0.147	-0.467	0.609	0.556	0.508	-0.318	0.559	-0.463	0.534	0.530	0.746	0.555	0.776	0.799	0.590	0.832
Sulphate	-0.149	0.185	0.163	0.089	0.119	0.147	1	-0.160	-0.064	-0.053	-0.363	0.185	-0.054	-0.024	0.074	0.055	-0.116	-0.195	-0.220	-0.176	-0.054	0.016
Aluminum (total)	-0.066	0.661	-0.820	0.032	0.421	-0.467	-0.160	1	-0.681	-0.818	-0.400	-0.278	-0.827	0.908	-0.175	-0.817	-0.386	-0.717	-0.310	-0.350	-0.772	-0.602
Barium (total)	0.269	-0.660	0.814	0.103	-0.346	0.609	-0.064	-0.681	1	0.854	0.552	0.157	0.776	-0.768	0.360	0.829	0.568	0.770	0.510	0.616	0.793	0.676
Calcium (total)	0.185	-0.706	0.855	0.051	-0.408	0.556	-0.053	-0.818	0.854	1	0.565	0.348	0.908	-0.914	0.226	0.875	0.493	0.889	0.426	0.500	0.883	0.625
Copper (total)	0.505	-0.451	0.443	-0.001	-0.340	0.508	-0.363	-0.400	0.552	0.565	1	-0.245	0.505	-0.450	0.317	0.499	0.643	0.585	0.582	0.687	0.594	0.597
Lithium (total)	-0.505	-0.055	0.235	-0.136	-0.067	-0.318	0.185	-0.278	0.157	0.348	-0.245	1	0.341	-0.358	-0.360	0.228	-0.398	0.243	-0.477	-0.512	0.091	-0.300
Magnesium (total)	0.130	-0.693	0.819	0.091	-0.332	0.559	-0.054	-0.827	0.776	0.908	0.505	0.341	1	-0.904	0.294	0.771	0.517	0.928	0.450	0.481	0.750	0.560
Manganese (total)	-0.097	0.694	-0.831	-0.042	0.450	-0.463	-0.024	0.908	-0.768	-0.914	-0.450	-0.358	-0.904	1	-0.264	-0.861	-0.409	-0.833	-0.342	-0.394	-0.828	-0.540
Mercury (total)	0.602	-0.354	0.335	0.256	0.094	0.534	0.074	-0.175	0.360	0.226	0.317	-0.360	0.294	-0.264	1	0.358	0.552	0.306	0.512	0.587	0.417	0.473
Molybdenum (total)	0.250	-0.663	0.859	-0.117	-0.321	0.530	0.055	-0.817	0.829	0.875	0.499	0.228	0.771	-0.861	0.358	1	0.541	0.728	0.419	0.467	0.870	0.713
Nickel (total)	0.674	-0.510	0.538	0.129	-0.058	0.746	-0.116	-0.386	0.568	0.493	0.643	-0.398	0.517	-0.409	0.552	0.541	1	0.509	0.759	0.832	0.538	0.781
Potassium (total)	0.245	-0.734	0.789	0.123	-0.330	0.555	-0.195	-0.717	0.770	0.889	0.585	0.243	0.928	-0.833	0.306	0.728	0.509	1	0.534	0.572	0.756	0.543
Silicon (total)	0.605	-0.601	0.524	0.275	-0.115	0.776	-0.220	-0.310	0.510	0.426	0.582	-0.477	0.450	-0.342	0.512	0.419	0.759	0.534	1	0.862	0.465	0.676
Sodium (total)	0.708	-0.550	0.533	0.289	-0.098	0.799	-0.176	-0.350	0.616	0.500	0.687	-0.512	0.481	-0.394	0.587	0.467	0.832	0.572	0.862	1	0.580	0.744
Strontium (total)	0.397	-0.681	0.759	-0.054	-0.386	0.590	-0.054	-0.772	0.793	0.883	0.594	0.091	0.750	-0.828	0.417	0.870	0.538	0.756	0.465	0.580	1	0.776
Uranium (total)	0.518	-0.506	0.653	-0.157	-0.277	0.832	0.016	-0.602	0.676	0.625	0.597	-0.300	0.560	-0.540	0.473	0.713	0.781	0.543	0.676	0.744	0.776	1

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 33.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.29: Dissolved Metal Concentrations at Camp Lake Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Winter Sampling Event											Summer Sampling Event					
			JL0-02 bottom 11-Apr-17	JL0-02 surface 11-Apr-17	JL0-10 bottom 11-Apr-17	JL0-10 surface 11-Apr-17	JL0-01 bottom 14-Apr-17	JL0-01 surface 14-Apr-17	JL0-07 bottom 11-Apr-17	JL0-07 surface 11-Apr-17	JL0-09 bottom 11-Apr-17	JL0-09 surface 11-Apr-17	J0-01 outlet 9-Jul-17	JL0-02 bottom 24-Jul-17	JL0-02 surface 24-Jul-17	JL0-10 bottom 24-Jul-17	JL0-10 surface 24-Jul-17	JL0-01 bottom 24-Jul-17	JL0-01 surface 24-Jul-17
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00752	0.00798	0.00734	0.00794	0.00736	0.00810	0.00736	0.00761	0.00712	0.00803	0.00594	0.00620	0.00613	0.00626	0.00634	0.00619	0.00645
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	16.3	16.6	15.8	17.1	15.3	17.0	15.8	16.4	14.5	17.3	12.2	13.2	12.8	13.1	13.1	13.1	13.3
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00095	0.00100	0.00092	0.00096	0.00085	0.00096	0.00088	0.00094	0.00088	0.00121	0.00081	0.00074	0.00080	0.00096	0.00085	0.00082	0.00081
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.0012	0.0011	0.0011	0.0013	0.00125	0.0013	0.0014	0.0011	<0.0010	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	10.10	9.98	9.40	10.50	9.63	10.70	9.27	9.95	9.14	10.30	7.42	7.99	7.99	8.09	8.15	8.12	8.16
	Manganese (Mn)	mg/L	0.00014	0.00025	0.000183	0.000176	0.000192	0.000171	0.000315	0.000150	0.000138	0.000121	0.001770	0.000461	0.00040	0.000435	0.000400	0.000431	0.000481
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	<0.000010	<0.000010	<0.000010	<0.000010	0.00001	0.000016	<0.000010	<0.000010	0.000021	0.000013
	Molybdenum (Mo)	mg/L	0.000344	0.000344	0.000335	0.000348	0.000312	0.000354	0.000307	0.000347	0.000298	0.000364	0.000279	0.000282	0.000284	0.000271	0.000283	0.000282	0.000290
	Nickel (Ni)	mg/L	0.00073	0.00073	0.00069	0.00073	0.00070	0.00077	0.00069	0.00070	0.00067	0.00074	0.00052	0.00060	0.00065	0.00061	0.00059	0.00062	0.00057
	Potassium (K)	mg/L	1.27	1.35	1.24	1.34	1.31	1.49	1.22	1.31	1.18	1.35	1.02	1.08	1.07	1.10	1.09	1.08	1.09
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.41	0.45	0.43	0.44	0.48	0.46	0.87	0.43	0.44	0.45	0.37	0.38	0.37	0.38	0.38	0.37	0.37
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.85	1.91	1.72	1.83	1.79	2.01	2.15	1.86	1.66	1.88	1.41	1.47	1.53	1.53	1.54	1.57	1.53
	Strontium (Sr)	mg/L	0.0119	0.0126	0.0121	0.0127	0.0118	0.0130	0.0119	0.0113	0.0106	0.0128	0.0091	0.00971	0.01000	0.00945	0.00983	0.01010	0.01040
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00125	0.00042	0.00252	0.00077	0.00132	0.00065	0.00337	0.00154	0.00147	0.00271	<0.00010	0.00064	0.00108	<0.00010	<0.00010	0.00113	0.00092
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000932	0.000977	0.000923	0.000981	0.000903	0.001030	0.000773	0.000921	0.000834	0.000996	0.000697	0.000737	0.000731	0.000735	0.000723	0.000715	0.000725
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	0.0069	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.29: Dissolved Metal Concentrations at Camp Lake Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Summer Sampling Event					Fall Sampling Event										
			JL0-07 bottom 24-Jul-17	JL0-07 surface 24-Jul-17	JL0-09 bottom 24-Jul-17	JL0-09 surface 24-Jul-17	J0-01 outlet 10-Aug-17	JL0-02 bottom 26-Aug-17	JL0-02 surface 26-Aug-17	JL0-10 bottom 25-Aug-17	JL0-10 surface 25-Aug-17	JL0-01 bottom 26-Aug-17	JL0-01 surface 26-Aug-17	JL0-07 bottom 26-Aug-17	JL0-07 surface 26-Aug-17	JL0-09 bottom 25-Aug-17	JL0-09 surface 25-Aug-17	J0-01 outlet 1-Sep-17
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	0.0032	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00634	0.00630	0.00628	0.00628	0.00633	0.00661	0.00661	0.00639	0.00642	0.00645	0.00652	0.00638	0.00641	0.00660	0.00650	0.00639
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	13.0	13.3	13.1	12.9	12.6	13.4	13.4	12.9	12.9	13.3	13.3	12.9	13.1	13.0	13.0	13.4
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00080	0.00077	0.00105	0.00076	0.00079	0.00077	0.00087	0.00081	0.00114	0.00077	0.00082	0.00077	0.00142	0.00086	0.00079	0.00077
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.059
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	0.0014	0.0012	0.0011	0.0013	0.0013	0.0012	0.0012	0.0011	0.0012	<0.0010
	Magnesium (Mg)	mg/L	8.31	7.92	8.05	8.15	7.92	8.35	8.39	7.84	8.12	8.26	8.31	8.05	8.36	8.22	7.93	7.95
	Manganese (Mn)	mg/L	0.000470	0.000406	0.000449	0.000378	0.00089	0.000196	0.000268	0.000332	0.000332	0.000164	0.000271	0.000116	0.000190	0.000183	0.000221	0.00179
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.000280	0.000280	0.000277	0.000285	0.000294	0.000289	0.000279	0.000300	0.000299	0.000292	0.000295	0.000280	0.000282	0.000282	0.000284	0.000292
	Nickel (Ni)	mg/L	0.00057	0.00057	0.00062	0.00059	0.00059	0.00055	0.00059	0.00055	0.00053	0.00057	0.00052	0.00056	0.00059	0.00053	0.00058	0.00071
	Potassium (K)	mg/L	1.10	1.09	1.10	1.08	1.07	1.11	1.13	1.06	1.08	1.11	1.12	1.10	1.12	1.10	1.09	1.05
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.37	0.38	0.38	0.38	0.35	0.32	0.32	0.30	0.30	0.32	0.31	0.41	0.31	0.32	0.31	0.34
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.58	1.58	1.57	1.54	1.48	1.39	1.42	1.33	1.34	1.39	1.41	1.41	1.39	1.36	1.36	1.46
	Strontium (Sr)	mg/L	0.0099	0.00969	0.00974	0.00989	0.00995	0.01000	0.0101	0.0098	0.0099	0.0100	0.00994	0.0098	0.00987	0.0100	0.0099	0.0098
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000716	0.000726	0.000706	0.000724	0.000797	0.000709	0.000711	0.000733	0.000686	0.000706	0.000701	0.000672	0.000698	0.000710	0.000695	0.000768
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.30: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Camp Lake and Reference Lake 3 in 2017, and Between Camp Lake 2017 and Baseline (2005 - 2013), Mary River Project CREMP

Parameter	Camp Lake vs Reference Lake 3 in 2017		Camp Lake 2017 vs Baseline		
	Summer	Fall	Winter	Summer	Fall
Aluminum (Al)	1.0	1.0	0.0	0.7	1.0
Antimony (Sb)	1.0	1.0	0.0	0.0	1.0
Arsenic (As)	1.0	1.0	1.0	0.8	1.0
Barium (Ba)	1.0	1.0	0.0	1.2	1.1
Beryllium (Be)	1.0	1.0	1.2	1.2	2.1
Cadmium (Cd)	1.0	1.0	0.4	0.0	0.8
Calcium (Ca)	1.9	1.9	1.2	1.2	1.1
Chromium (Cr)	1.0	1.0	RDL	RDL	RDL
Cobalt (Co)	1.0	1.0	1.0	1.0	0.9
Copper (Cu)	1.0	1.1	0.8	0.6	1.1
Iron (Fe)	1.0	1.0	1.2	1.2	1.7
Lead (Pb)	1.0	1.0	0.6	1.0	1.0
Lithium (Li)	1.0	1.2	0.3	0.0	0.5
Magnesium (Mg)	1.8	1.9	1.2	1.2	1.2
Manganese (Mn)	1.8	1.2	0.6	0.0	0.3
Mercury (Hg)	1.2	1.0	1.0	1.2	1.0
Molybdenum (Mo)	2.0	2.6	1.4	0.0	1.4
Nickel (Ni)	1.2	1.1	1.0	0.6	1.0
Potassium (K)	1.2	1.3	0.8	1.0	0.9
Selenium (Se)	1.0	1.0	RDL	RDL	RDL
Silicon (Si)	0.9	0.8	1.0	0.9	0.8
Silver (Ag)	1.0	1.0	1.2	1.8	2.7
Sodium (Na)	1.7	1.6	1.1	1.2	1.1
Strontium (Sr)	1.2	1.3	1.5	1.4	1.3
Thallium (Tl)	1.0	1.0	1.2	1.3	2.6
Tin (Sn)	4.4	1.0	0.9	0.8	0.1
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0
Uranium (U)	2.7	2.8	1.8	1.6	1.4
Vanadium (V)	1.0	1.0	1.0	1.0	1.0
Zinc (Zn)	1.0	1.0	1.7	1.0	1.9

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.31: ***In Situ*** **Water Quality Measurements Collected at Sheardown Lake Tributary 1, Tributary 12, and Tributary 9 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017**

Study Area	Station	Temperature (^{o}C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	pH (pH units)	Specific Conductance (µS/cm)
Unnamed Reference Creek	REF-CRK-B1	9.7	11.55	101.7	7.93	157
	REF-CRK-B2	9.2	11.80	102.7	7.92	159
	REF-CRK-B3	8.2	11.98	101.8	7.93	161
	REF-CRK-B4	7.3	12.20	101.5	7.91	163
	REF-CRK-B5	6.5	12.39	100.7	7.88	160
Sheardown Lake Tributary 1 Reach 1	SDLT-1-R1 B1	10.8	11.14	100.6	8.14	277
	SDLT-1-R1-B2	9.8	11.53	101.8	8.15	303
	SDLT-1-R1-B3	10.3	11.15	99.0	8.15	225
	SDLT-1-R1-B4	10.4	11.28	100.8	7.90	237
	SDLT-1-R1-B5	9.2	11.66	101.4	8.11	241
Sheardown Lake Tributary 12 Downstream	SDLT-12-DS-B1	5.4	12.38	98.1	8.23	294
	SDLT-12-DS-B2	6.2	12.57	101.6	8.36	290
	SDLT-12-DS-B3	6.1	12.48	100.7	8.36	287
Sheardown Lake Tributary 9 Upstream	SDLT-9-DS-B1	6.6	11.08	90.5	7.95	216
	SDLT-9-DS-B2	4.9	10.56	82.4	7.68	235
	SDLT-9-DS-B3	4.8	11.29	88.1	7.73	235
	SDLT-9-DS-B4	4.9	11.57	90.3	7.75	236
	SDLT-9-DS-B5	5.2	11.82	93.1	7.78	239

Table C.32: *In Situ* Water Quality Summary Statistics for the Sheardown Lake Tributary Benthic Stations, Mary River Project CREMP, August 2017

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Temperature (°C)	Unnamed Reference Creek	8.2	1.3	0.6	6.5	9.8	6.5	9.7
	Sheardown Lake Tributary 1 (SDLT1)	10.1	0.6	0.3	9.3	10.9	9.2	10.8
	Sheardown Lake Tributary 12 (SDLT12)	5.9	0.4	0.2	4.9	7.0	5.4	6.2
	Sheardown Lake Tributary 9 (SDLT9)	5.3	0.8	0.3	4.3	6.2	4.8	6.6
Dissolved Oxygen (mg/L)	Unnamed Reference Creek	11.98	0.33	0.15	11.58	12.39	11.55	12.39
	Sheardown Lake Tributary 1 (SDLT1)	11.35	0.23	0.10	11.06	11.64	11.14	11.66
	Sheardown Lake Tributary 12 (SDLT12)	12.48	0.10	0.05	12.24	12.71	12.38	12.57
	Sheardown Lake Tributary 9 (SDLT9)	11.26	0.48	0.22	10.66	11.86	10.56	11.82
Dissolved Oxygen (% Saturation)	Unnamed Reference Creek	101.7	0.7	0.3	100.8	102.6	100.7	102.7
	Sheardown Lake Tributary 1 (SDLT1)	100.7	1.1	0.5	99.4	102.1	99.0	101.8
	Sheardown Lake Tributary 12 (SDLT12)	100.1	1.8	1.0	95.6	104.6	98.1	101.6
	Sheardown Lake Tributary 9 (SDLT9)	88.9	4.0	1.8	83.9	93.9	82.4	93.1
pH (units)	Unnamed Reference Creek	7.91	0.02	0.01	7.89	7.94	7.88	7.93
	Sheardown Lake Tributary 1 (SDLT1)	8.09	0.11	0.05	7.96	8.22	7.90	8.15
	Sheardown Lake Tributary 12 (SDLT12)	8.32	0.08	0.04	8.13	8.50	8.23	8.36
	Sheardown Lake Tributary 9 (SDLT9)	7.78	0.10	0.05	7.65	7.91	7.68	7.95
Specific Conductance (µS/cm)	Unnamed Reference Creek	160	2.3	1.0	157.2	162.9	157.4	163.4
	Sheardown Lake Tributary 1 (SDLT1)	257	33	15	216	297	225	303
	Sheardown Lake Tributary 12 (SDLT12)	290	4	2	282	299	287	294
	Sheardown Lake Tributary 9 (SDLT9)	232	9	4	221	243	216	239

Note: Five stations were sampled at each study area except Tributary 9, where three stations were sampled.

Table C.33: *In Situ* Water Quality Statistical Comparisons Among the Sheardown Lake Tributaries and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2017

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	P-value	Statistical Test [b]	(I) Area	(J) Area	Significant Difference Between Areas?	P-value	Statistical Test
Water Temperature (°C)	YES	< 0.001	α,γ	Unnamed Reference Creek	Sheardown Tributary 1	YES	0.0523	Tukey's HSD
				Unnamed Reference Creek	Sheardown Tributary 12	YES	0.0145	
				Unnamed Reference Creek	Sheardown Tributary 9	YES	0.0003	
				Sheardown Tributary 1	Sheardown Tributary 12	YES	0.0002	
				Sheardown Tributary 1	Sheardown Tributary 9	YES	0.0000	
				Sheardown Tributary 12	Sheardown Tributary 9	NO	0.5415	
Dissolved Oxygen (% saturation)	YES	< 0.001	α	Unnamed Reference Creek	Sheardown Tributary 1	NO	0.9167	Tukey's HSD
				Unnamed Reference Creek	Sheardown Tributary 12	NO	0.8073	
				Unnamed Reference Creek	Sheardown Tributary 9	YES	0.0000	
				Sheardown Tributary 1	Sheardown Tributary 12	NO	0.9859	
				Sheardown Tributary 1	Sheardown Tributary 9	YES	0.0000	
				Sheardown Tributary 12	Sheardown Tributary 9	YES	0.0001	
pH (units)	YES	< 0.001	α,γ	Unnamed Reference Creek	Sheardown Tributary 1	YES	0.0952	Mann-Whitney U-test
				Unnamed Reference Creek	Sheardown Tributary 12	YES	0.0357	
				Unnamed Reference Creek	Sheardown Tributary 9	NO	0.1508	
				Sheardown Tributary 1	Sheardown Tributary 12	YES	0.0357	
				Sheardown Tributary 1	Sheardown Tributary 9	YES	0.0159	
				Sheardown Tributary 12	Sheardown Tributary 9	YES	0.0357	
Specific Conductance (µS/cm)	YES	< 0.001	α,γ	Unnamed Reference Creek	Sheardown Tributary 1	YES	0.0060	Tamhane's
				Unnamed Reference Creek	Sheardown Tributary 12	YES	0.0000	
				Unnamed Reference Creek	Sheardown Tributary 9	YES	0.0000	
				Sheardown Tributary 1	Sheardown Tributary 12	NO	0.3871	
				Sheardown Tributary 1	Sheardown Tributary 9	NO	0.6665	
				Sheardown Tributary 12	Sheardown Tributary 9	YES	0.0004	

Note: Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - single factor ANOVA test results validated using Kruskal Wallis H-test or Mann-Whitney U-test, as appropriate.

Table C.34: Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Spring Sampling Event		Summer Sampling Event		Fall Sampling Event			
					D1-05 09/Jul/17	D1-00 09/Jul/17	D1-05 28/Jul/17	D1-00 28/Jul/17	D1-05 28/Aug/17	D1-00 28/Aug/17	DI-05 01/Sep/17	DI-00 01/Sep/17
Conventionals	Conductivity (lab)	umho/cm	-	-	170	220	212	305	215	396	200	306
	pH (lab)	pH	6.5 - 9.0	-	7.87	8.11	7.95	8.05	8.05	8.20	8.06	8.17
	Hardness (as $CaCO_3$)	mg/L	-	-	78	102	99	142	104	195	95	145
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	2.2	<2.0	2.6	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	92	129	103	176	80	241	111	159
	Turbidity	NTU	-	-	0.66	2.03	1.00	1.55	1.17	2.56	0.43	0.60
	Alkalinity (as $CaCO_3$)	mg/L	-	-	57	84	80	99	76	116	77	104
Nutrients and Organics	Total Ammonia	mg/L	variable	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	0.241	0.220	0.312	0.593	0.428	1.330	0.319	0.862
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	0.16	0.19	0.19	<0.15	0.18	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	2.1	2.3	2.5	2.7	2.5	2.9	2.7	2.7
	Total Organic Carbon	mg/L	-	-	2.0	2.7	2.6	2.8	2.7	3.2	2.8	2.9
	Total Phosphorus	mg/L	0.030[α]	-	0.0044	0.0119	0.0033	0.0293	0.0047	0.0031	0.0039	0.0046
	Phenols	mg/L	0.004[α]	-	0.0016	0.0012	<0.0010	0.0011	0.0016	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	2.8	5.3	3.9	7.7	4.2	10.9	4.7	8.1
	Sulphate (SO_4)	mg/L	218[β]	218	19.8	21.3	24.2	43.8	18.3	61.7	15.9	37.6
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	0.008	0.043	0.017	0.053	0.017	0.075	0.009	0.016
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0088	0.0126	0.0097	0.0160	0.0101	0.0206	0.0091	0.0150
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	0.011	0.013	0.010	0.011	0.013	0.014	<0.010	0.011
	Cadmium (Cd)	mg/L	0.00012	0.00008	0.00003	0.00001	0.00004	0.00001	0.00003	0.00001	0.00004	0.00002
	Calcium (Ca)	mg/L	-	-	14	20	18	26	18	36	17	27
	Chromium (Cr)	mg/L	0.0089	0.00856	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	0.00015	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0022	***0.0027***	***0.0023***	***0.0034***	***0.0026***	***0.0032***	0.0021	***0.0031***	***0.0024***
	Iron (Fe)	mg/L	0.30	0.326	<0.030	0.118	<0.050	0.128	<0.050	0.154	<0.030	0.045
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	0.000098	0.000072	0.000094	<0.000050	0.000106	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	0.0016	<0.0010	0.0012	0.0011	0.0016	0.0012	0.0018
	Magnesium (Mg)	mg/L	-	-	10.6	13.5	12.8	18.6	12.8	24.3	12.6	19.3
	Manganese (Mn)	mg/L	0.935[β]	-	0.0003	0.0055	<0.0005	0.0049	<0.0005	0.0070	0.0003	0.0025
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00243	0.00219	0.00335	0.00282	0.00403	0.00267	0.00343	0.00282
	Nickel (Ni)	mg/L	0.025	0.025	0.00107	0.00122	0.00124	0.00189	0.00108	0.00158	0.00115	0.00133
	Potassium (K)	mg/L	-	-	1.90	2.32	2.06	2.37	2.26	2.73	2.13	2.34
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	0.000078	0.000074	0.000111	0.000110	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	1.00	1.02	1.10	1.32	1.28	1.63	1.36	1.55
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.7	2.8	2.2	4.1	2.6	5.8	2.2	4.0
	Strontium (Sr)	mg/L	-	-	0.009	0.014	0.012	0.018	0.012	0.022	0.010	0.017
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	0.00001	0.00001	0.00001	0.00001	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0006	0.0032	0.0007	<0.0050	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0026	0.0028	0.0053	0.0052	0.0062	0.0057	0.0055	0.0063
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	0.0035	<0.0030	0.0047	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for WQG information.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data and adopted from the Camp Lake Tributaries.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.35: Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between SDLT1 and Reference Creek Stations in 2016, and at SDLT1 Between 2016 and the Baseline Period, Mary River Project CREMP

Parameter	SDLT1 Station D1-05 (Reach 4)						SDLT1 Station D1-00 (Reach 1)					
	2017 vs Reference Creek			2017 vs Baseline			2017 vs Reference Creek			2017 vs Baseline		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Conductivity (lab)	4.6	2.6	1.8	2.5	1.5	1.0	6.0	3.8	3.0	2.7	1.6	1.4
Hardness (as $CaCO_3$)	4.7	2.7	1.8	2.3	1.4	1.0	6.2	3.9	3.1	2.4	1.4	1.3
Total Suspended Solids (TSS)	0.8	1.0	0.5	1.0	1.0	1.0	0.9	1.3	0.5	1.1	1.3	1.0
Total Dissolved Solids (TDS)	4.8	2.6	1.6	2.1	1.1	0.7	6.7	4.5	3.3	2.4	1.4	1.2
Turbidity	0.4	0.5	0.1	0.9	2.8	2.5	1.1	0.7	0.3	0.5	2.3	4.5
Alkalinity (as $CaCO_3$)	3.6	2.2	1.5	1.9	1.2	0.9	5.3	2.7	2.1	2.2	1.1	1.0
Total Ammonia	1.0	1.0	0.8	0.1	0.2	0.3	1.0	1.0	0.8	0.1	0.4	0.7
Nitrate	12	16	6.0	2.8	3.3	2.6	11	30	17	2.2	5.9	10
Nitrite	1.0	1.0	1.0	1.0		0.7	1.0	1.0	1.0	1.0		0.8
Total Kjeldahl Nitrogen (TKN)	1.0	1.3	1.0	1.1	1.6	1.4	1.1	1.3	1.1	0.7	1.0	1.3
Dissolved Organic Carbon	2.0	2.0	1.6	0.6	1.0	1.1	2.1	2.2	1.7	0.5	0.9	1.1
Total Organic Carbon	1.6	2.0	1.6	0.6	1.0	1.2	2.2	2.2	1.8	0.6	0.9	1.2
Total Phosphorus	0.8	0.9	0.5	0.4	0.7	1.4	2.1	7.6	0.5	1.1	6.4	0.6
Phenols	1.0	1.0	1.3				0.8	1.1	1.0			
Bromide (Br)	1.0	1.0	1.0	0.4			1.0	1.0	1.0	0.4		
Chloride (Cl)	3.2	2.2	1.8	0.6	1.2	0.5	6.2	4.4	3.8		1.6	1.3
Sulphate (SO_4)	23	9.1	4.1	25	5.3	1.8	25	16	12	43	8.0	5.7
Aluminum (Al)	0.2	0.3	0.1	0.2	1.1	1.2	0.9	1.1	0.2	0.3	2.5	4.1
Antimony (Sb)	1.0	1.0	1.0	0.5	0.7	0.7	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0
Barium (Ba)	3.4	1.9	1.3	2.1	1.3	1.0	4.9	3.1	2.3	2.3	1.4	1.4
Boron (B)	1.1	1.0	1.2	1.1	0.6	0.7	1.3	1.1	1.3	1.2	0.6	0.9
Cadmium (Cd)	3.4	3.8	3.6	1.1	1.1	1.0	1.3	1.5	1.3	0.9	0.8	0.9
Calcium (Ca)	4.1	2.4	1.6	2.1	1.3	0.9	5.9	3.5	2.8	2.5	1.4	1.3
Chromium (Cr)	1.0	1.0	0.7	RDL	2.4	RDL	1.0	1.0	0.7	1.0	1.7	RDL
Cobalt (Co)	1.0	1.0	0.7	0.6	0.8	0.8	1.0	1.2	0.8	0.8	1.2	1.3
Copper (Cu)	4.3	3.9	2.5	0.9	1.1	1.3	3.7	3.0	1.8	0.8	1.1	1.3
Iron (Fe)	0.7	1.2	0.2	0.5	1.9	1.6	2.7	3.0	0.4	0.7	1.2	1.9
Lead (Pb)	0.8	0.9	0.2	0.2	0.7	0.6	1.5	1.1	0.4	0.3	1.7	1.5
Lithium (Li)	1.0	1.0	0.9	2.0	1.1	1.3	1.6	1.2	1.3	3.2	0.9	1.5
Magnesium (Mg)	5.4	2.9	1.9	2.4	1.4	1.0	6.9	4.2	3.3	2.6	1.5	1.6
Manganese (Mn)	0.5	0.8	0.1	0.4	0.7	0.8	7.7	8.2	1.4	1.3	1.8	3.2
Mercury (Hg)	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0		
Molybdenum (Mo)	26	13	11	2.7	1.4	1.3	23	11	8.0	1.7	1.4	1.4
Nickel (Ni)	2.1	2.4	1.6	0.7	1.1	1.1	2.4	3.6	2.1	0.6	1.4	1.3
Potassium (K)	5.6	3.5	2.7	2.1	1.3	1.2	6.8	4.0	3.1	2.4	1.4	1.5
Silicon (Si)	2.1	1.4	1.0	1.2	0.9	1.1	2.1	1.6	1.3	0.9	1.0	1.2
Silver (Ag)	1.0	RDL	0.6	0.9			1.0	RDL	0.6			
Sodium (Na)	3.5	1.8	1.4	5.9	2.3	1.1	5.7	3.4	2.8	5.5	3.3	2.3
Strontium (Sr)	2.9	1.5	1.0	2.7	1.6	0.9	4.5	2.2	1.7	2.8	1.5	1.3
Thallium (Tl)	1.0	0.1	0.9	RDL	1.0	4.0	1.0	0.1	0.8	RDL	1.0	5.5
Titanium (Ti)	1.0	0.1	0.4	1.0			1.0	0.3	0.6	1.0		
Uranium (U)	12	4.9	2.7	4.1	2.1	0.8	13	4.8	2.8	4.5	2.1	1.4
Vanadium (V)	1.0	0.5	1.0	1.0			1.0	0.5	1.0	1.0		
Zinc (Zn)	1.0	1.0	1.0	2.2	1.2	1.4	1.0	1.2	1.3	3.0	0.8	1.4

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.36: Dissolved Metal Concentrations at Sheardown Lake Tributary Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Spring Sampling Event		Summer Sampling Event		Fall Sampling Event			
			D1-05 9/Jul/17	D1-00 9/Jul/17	D1-05 28/Jul/17	D1-00 28/Jul/17	D1-05 28/Aug/17	D1-00 28/Aug/17	DI-05 1/Sep/17	DI-00 1/Sep/17
Dissolved Metals	Aluminum (Al)	mg/L	0.0053	0.0109	0.0044	0.0052	0.0055	<0.0050	0.0041	0.0030
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.0088	0.0129	0.0102	0.0161	0.0099	0.0206	0.0093	0.0147
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00005	<0.00005	<0.00050	<0.00050
	Boron (B)	mg/L	0.011	0.013	0.010	0.011	0.013	0.013	<0.010	0.011
	Cadmium (Cd)	mg/L	0.000031	0.000013	0.000034	0.000015	0.000033	0.000012	0.000032	0.000015
	Calcium (Ca)	mg/L	14.4	19.3	17.7	26.2	19.4	36.3	17.9	27.2
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00262	0.00225	0.00296	0.00209	0.00292	0.00183	0.00296	0.00233
	Iron (Fe)	mg/L	<0.030	0.062	<0.030	0.038	<0.010	0.049	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	0.0016	0.0010	0.0014	0.0020	0.0028	0.0010	0.0014
	Magnesium (Mg)	mg/L	10.2	13.0	13.3	18.5	13.5	25.4	12.3	18.6
	Manganese (Mn)	mg/L	0.00031	0.00427	0.00027	0.00346	<0.00050	0.00490	0.00020	0.00214
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.00242	0.00220	0.00310	0.00263	0.00387	0.00258	0.00289	0.00236
	Nickel (Ni)	mg/L	0.00094	0.00117	0.00105	0.00129	0.00103	0.00144	0.00107	0.00133
	Potassium (K)	mg/L	1.86	2.30	2.15	2.42	2.24	2.68	2.06	2.28
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0001	0.0001	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.97	0.97	1.10	1.24	1.26	1.46	1.35	1.52
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.68	2.71	2.28	3.99	2.63	5.98	2.12	3.96
	Strontium (Sr)	mg/L	0.0093	0.0135	0.0118	0.0169	0.0119	0.0212	0.0109	0.0161
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00001	<0.000010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.01000	<0.01000	<0.01000	<0.01000	0.00031	<0.00060	<0.01000	<0.01000
	Uranium (U)	mg/L	0.0026	0.0027	0.0050	0.0048	0.0058	0.0055	0.0058	0.0065
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0010	0.0034	<0.0030	<0.0030

Table C.37: ***In Situ*** **Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Winter, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)						Dissolved Oxygen (mg/L)						Dissolved Oxygen (% Saturation)						pH (pH units)						Specific Conductance (µS/cm)					
	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7
Date Collected	17/Apr/17	17/Apr/17	17/Apr/17	16/Apr/17	16/Apr/17	16/Apr/17	17/Apr/17	17/Apr/17	17/Apr/17	16/Apr/17	16/Apr/17	16/Apr/17	17/Apr/17	17/Apr/17	17/Apr/17	16/Apr/17	16/Apr/17	16/Apr/17	17/Apr/17	17/Apr/17	17/Apr/17	16/Apr/17	16/Apr/17	16/Apr/17	17/Apr/17	17/Apr/17	17/Apr/17	16/Apr/17	16/Apr/17	16/Apr/17
1.0	0.2	1.4	0.5	0.0	0.0	1.1	14.0	14.0	14.2	12.8	15.0	14.5	95.7	98.8	98.5	87.5	102.5	102.1	8.10	7.66	7.79	7.62	7.64	7.73	241	253	241	171	191	233
2.0	0.2	0.4	0.4	0.0	0.3	0.4	13.8	14.4	14.4	14.8	14.9	14.7	97.1	99.5	99.4	100.5	102.3	101.6	7.95	7.65	7.77	7.63	7.63	7.70	242	244	243	193	198	227
3.0	1.3	1.2	1.4	0.8	1.3	1.3	13.7	13.8	13.9	14.4	14.1	14.1	97.4	98.3	98.6	101.3	100.7	100.2	7.92	7.66	7.76	7.64	7.62	7.70	249	258	244	194	195	224
4.0	1.5	1.6	1.5	1.4	1.5	1.5	13.6	13.6	13.7	14.1	13.8	13.8	96.7	97.5	97.9	100.2	98.3	98.5	7.90	7.64	7.74	7.69	7.63	7.67	251	264	245	198	194	223
5.0	1.6	1.6	1.6	1.5	1.6	1.6	13.5	13.5	13.6	14.1	13.7	13.7	96.5	96.5	96.9	100.4	97.8	98.2	7.88	7.63	7.72	7.62	7.63	7.66	252	265	245	198	194	221
6.0	1.6	1.6	1.6		1.6	1.6	13.5	13.4	13.6		13.6	13.7	96.7	96.0	97.0		97.1	98.0	7.86	7.62	7.71		7.63	7.65	253	265	245		194	219
7.0	1.6	1.6	1.6		1.6	1.6	13.5	13.3	13.6		13.5	13.7	96.9	95.5	96.9		96.6	97.9	7.85	7.61	7.69		7.63	7.64	253	266	245		194	217
8.0	1.6	1.6	1.6		1.6	1.6	13.5	13.5	13.5		13.5	13.7	96.9	96.4	96.8		96.3	97.6	7.84	7.61	7.68		7.62	7.64	252	266	245		195	216
9.0		1.6	1.6		1.6	1.6		13.5	13.5		13.4	13.7		96.7	96.8		96.1	97.8		7.60	7.67		7.62	7.63		267	245		195	214
10.0		1.6	1.6		1.6	1.6		13.6	13.5		13.4	13.7		97.2	96.9		96.0	98.0		7.60	7.66		7.62	7.62		267	245		195	213
11.0		1.6	1.6		1.6	1.6		13.5	13.6		13.4	13.7		96.7	96.1		95.9	97.9		7.60	7.60		7.62	7.61		267	245		195	212
12.0		1.7	1.6		1.6			13.4	13.5		13.4			96.2	96.6		95.8			7.58	7.65		7.61			266	245		196	
13.0		1.7	1.7		1.7			13.3	13.4		13.4			95.4	96.1		96.4			7.58	7.64		7.60			266	245		196	
14.0		1.7	1.7		1.7			13.2	13.3		13.4			94.8	95.3		95.9			7.57	7.63		7.60			266	244		197	
15.0		1.7	1.7		1.8			13.0	13.1		13.0			93.8	94.2		93.5			7.57	7.62		7.59			266	244		197	
16.0		1.8	1.7		1.8			12.9	12.7		12.9			93.0	92.0		92.7			7.57	7.61		7.58			265	244		197	
17.0		1.8	1.8					12.7	12.5					91.5	89.9					7.56	7.59					265	244			
18.0		1.9	1.9					12.3	12.0					88.8	86.5					7.55	7.57					264	244			
19.0		1.9	1.9					12.0	11.8					87.0	84.8					7.54	7.56					263	243			
20.0		2.0	2.0					11.6	11.5					84.0	83.4					7.52	7.59					263	243			
21.0		2.0						11.3						81.8						7.51						261				
21.7		2.0						11.2						81.1						7.50						263				

Notes:
Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 8.9, 22.7, 20.9, 6.4, and 11.4 m, respectively, at the time of winter sampling.
Ice thickness at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 2.1, 1.7, 1.8, 2.0, and 1.9 m, respectively, at the time of winter sampling.
Deepest measurement at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 7.9, 21.7, 20, 5.0, 15.4, and 10.4 m, respectively, at the time of winter sampling.

Table C.38: *In Situ* Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Summer, Mary River Project CREMP, 2017

Depth (m)	Temperature (°C)						Dissolved Oxygen (mg/L)						Dissolved Oxygen (% Saturation)						pH (pH units)						Specific Conductance (µS/cm)					
	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7
Date Collected	21/Jul/17	22/Jul/17	22/Jul/17	21/Jul/17	23-Jul-17	23-Jul-17	21/Jul/17	22/Jul/17	22/Jul/17	21/Jul/17	23-Jul-17	23-Jul-17	21/Jul/17	22/Jul/17	22/Jul/17	21/Jul/17	23-Jul-17	23-Jul-17	21/Jul/17	22/Jul/17	22/Jul/17	21/Jul/17	23-Jul-17	23-Jul-17	21/Jul/17	22/Jul/17	22/Jul/17	21/Jul/17	23-Jul-17	23-Jul-17
1.0	6.5	6.6	6.9	6.4	6.6	6.4	12.13	12.15	12.08	12.18	12.24	12.27	98.2	99.0	98.6	98.6	99.6	99.5	7.90	8.03	7.91	7.91	8.27	8.05	115	120	121	115	121	121
2.0	6.3	6.5	6.6	6.6	6.5	6.4	12.20	12.17	12.14	12.19	12.30	12.32	98.6	99.0	98.8	99.4	100.0	99.9	7.81	7.99	7.94	7.67	8.16	7.99	115	120	120	115	120	120
3.0	6.2	6.5	6.5	6.6	6.5	6.3	12.17	12.17	12.18	12.19	12.30	12.24	98.1	99.0	98.9	99.4	100.0	100.0	7.76	7.95	7.95	7.69	8.08	7.98	115	120	120	115	120	120
4.0	6.2	6.5	6.5	6.4	6.5	6.3	12.17	12.16	12.19	12.17	12.30	12.32	98.3	98.9	99.0	98.8	100.0	99.9	7.75	7.93	7.96	7.76	8.04	7.98	115	120	120	115	120	120
5.0	6.1	6.5	6.4	6.5	6.5	6.3	12.19	12.17	12.19		12.30	12.23	98.3	99.0	98.9	99.4	100.0	98.9	7.73	7.92	7.96	7.70	8.01	7.98	115	120	120		120	120
6.0	6.1	6.5	6.4		6.5	6.3	12.18	12.17	12.20		12.30	12.32	98.2	99.0	99.0		100.0	99.9	7.73	7.92	7.96		8.00	7.97	115	120	120		120	120
7.0	6.1	6.5	6.4		6.4	6.3	12.15	12.16	12.16		12.28	12.32	97.9	98.9	98.7		99.8	99.7	7.71	7.91	7.96		7.99	7.97	115	120	120		120	120
8.0	6.1	6.5	6.3		6.4	6.3	12.14	12.15	12.17		12.28	12.31	97.7	98.8	98.6		99.6	99.6	7.70	7.90	7.96		7.98	7.97	115	120	120		120	120
9.0	6.1	6.4	6.3		6.3	6.3	12.13	12.16	12.16		12.26	12.28	97.6	98.8	98.6		99.4	99.3	7.69	7.90	7.96		7.97	7.97	115	120	120		120	120
10.0	6.1	6.4	6.3		6.3	6.3	12.12	12.15	12.14		12.25	12.26	97.5	98.8	98.4		99.9	99.2	7.68	7.89	7.96		7.95	7.96	115	120	120		120	120
11.0		6.4	6.3		6.3			12.15	12.16		12.25			98.7	98.5		99.1			7.89	7.96		7.95			120	120		120	
12.0		6.4	6.3		6.3			12.15	12.15		12.25			98.7	98.5		99.4			7.89	7.96		7.94			120	120		120	
13.0		6.4	6.3		6.3			12.15	12.15		12.23			98.7	98.5		98.9			7.89	7.96		7.94			120	120		120	
14.0		6.4	6.3		6.3			12.15	12.14		12.22			98.7	98.4		98.9			7.89	7.96		7.94			120	120		120	
15.0		6.4	6.3		6.3			12.14	12.14		12.21			98.6	98.4		98.9			7.89	7.96		7.93			120	120		120	
16.0		6.4	6.3		6.0			12.12	12.13		12.20			98.4	98.3		98.7			7.88	7.96		7.93			120	120		120	
17.0		6.4	6.3		6.2			12.12	12.13		12.19			98.4	98.3		98.5			7.88	7.96		7.92			120	121		120	
18.0		6.4	6.3					12.12	12.12					98.4	98.2					7.88	7.96					120	120			
19.0		6.4	6.3					12.11	12.12					98.2	98.3					7.88	7.96					120	120			
20.0		6.3	6.3					12.10	12.10					98.1	98.1					7.87	7.96					120	120			

Note:
Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 10.3, 24.1, 20.3, 6, 18.7, and 10.9 m, respectively, at the time of summer sampling.

Table C.39: ***In Situ*** **Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)							Dissolved Oxygen (mg/L)							Dissolved Oxygen (% Saturation)						
	DD Hab9	DLO-01-5	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7
Date Collected	21/Aug/17	23/Aug/17	21/Aug/17	26/Aug/17	20/Aug/17	20/Aug/17	20/Aug/17	21/Aug/17	23/Aug/17	21/Aug/17	26/Aug/17	20/Aug/17	20/Aug/17	20/Aug/17	21/Aug/17	23/Aug/17	21/Aug/17	26/Aug/17	20/Aug/17	20/Aug/17	20/Aug/17
surface		8.4							12.0							101.8					
1.0	8.9	8.4	9.0	8.7	9.2	9.1	9.2	12.1	11.9	11.7	11.6	11.7	11.7	11.6	104.7	101.2	101.2	99.4	101.3	101.2	100.7
2.0	8.8	8.4	9.0	8.7	9.1	9.1	9.1	12.1	11.9	11.7	11.6	11.7	11.7	11.6	103.8	101.3	100.9	99.5	101.0	100.9	100.6
3.0	8.8	8.4	9.0	8.7	9.1	9.0	9.0	11.9	11.9	11.7	11.6	11.6	11.6	11.6	102.6	101.2	99.8	99.4	100.9	100.8	100.4
4.0	8.8	8.4	8.6	8.7	9.1	9.0	8.9	11.9	11.9	11.6	11.6	11.6	11.6	11.6	102.1	101.0	99.6	99.4	100.7	100.7	100.3
5.0	8.8	8.4	8.5	8.7		8.8	8.9	11.8	11.8	11.6	11.6		11.6	11.6	101.3	100.9	99.1	99.3		100.0	100.3
6.0	8.7	8.4	8.4	8.7		8.7	8.9	11.7	11.8	11.6	11.6		11.6	11.6	100.2	100.9	99.0	99.3		99.7	100.0
7.0	8.6	8.4	8.4	8.7		8.7	8.7	11.6	11.8	11.6	11.6		11.6	11.6	99.0	100.9	98.8	99.3		99.6	99.7
8.0	8.4	8.4	8.4	8.7		8.6	8.5	11.6	11.9	11.6	11.6		11.6	11.6	98.6	101.0	98.6	99.2		99.5	99.4
9.0	8.4	8.4	8.4	8.7		8.5	8.3	11.6	11.8	11.6	11.5		11.6	11.5	98.4	100.9	98.5	99.1		98.7	97.8
10.0	8.4	8.4	8.4	8.6		8.4	8.2	11.5	11.8	11.5	11.5		11.5	11.5	98.3	100.8	98.4	98.9		98.2	97.5
11.0		8.4	8.4	8.6		8.4			11.8	11.5	11.5		11.5			100.8	98.4	98.9		97.9	
12.0		8.3	8.4	8.6		8.3			11.8	11.5	11.5		11.5			100.5	98.3	98.8		97.8	
13.0		8.3	8.4	8.6		8.3			11.8	11.5	11.5		11.5			100.0	98.2	98.8		97.6	
14.0		7.9	8.4	8.6		8.2			11.8	11.5	11.5		11.4			99.2	98.0	98.6		97.2	
15.0		7.4	7.5	8.6		8.2			11.8	11.3	11.5		11.4			98.0	94.1	98.6		96.8	
16.0		7.3	7.5	8.5					11.6	11.2	11.5					96.6	93.5	98.3			
17.0		7.2	7.3	8.5					11.6	11.2	11.5					95.8	93.0	98.1			
18.0		7.2	7.2	8.3					11.5	11.2	11.4					95.4	92.8	97.1			
19.0		7.1	7.1	8.2					11.5	11.2	11.4					95.1	92.4	95.3			
20.0		7.1	7.1	7.8					11.5	11.1	11.3					94.9	91.9	94.6			
21.0		7.1	7.1	7.6					11.5	11.1	11.2					94.6	91.6	93.6			
22.0		7.1	7.0	7.5					11.5	11.0	11.1					94.6	90.9	92.9			
23.0		7.0	6.9						11.5	11.0						94.3	91.5				

Notes:

21-Aug-17 sampling was conducted by Minnow. Sheardown Lake NW water profile sampling on all other dates was conducted by Baffinland.

Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 10.2, 23.15, 22.6, 4.41, 15.35, and 10.9 m, respectively, at the time of fall sampling.

Table C.39: ***In Situ*** **Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017**

Depth (m)	pH (pH units)							Specific Conductance (µS/cm)						
	DD Hab9	DLO-01-5	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	DD Hab9	DLO-01-5	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7
Date Collected	21/Aug/17	23/Aug/17	21/Aug/17	26/Aug/17	20/Aug/17	20/Aug/17	20/Aug/17	21/Aug/17	23/Aug/17	21/Aug/17	26/Aug/17	20/Aug/17	20/Aug/17	20/Aug/17
surface		8.10							126					
1.0	7.96	8.10	7.88	7.33	7.86	7.90	7.66	108	126	107	113	115	115	115
2.0	7.96	8.12	7.88	7.45	7.87	7.89	7.74	108	126	107	114	115	115	115
3.0	7.94	8.13	7.87	7.53	7.87	7.89	7.77	107	126	107	113	115	115	115
4.0	7.94	8.14	7.87	7.57	7.87	7.88	7.78	108	126	107	114	114	115	115
5.0	7.93	8.13	7.87	7.58		7.90	7.78	106	126	107	113		115	115
6.0	7.92	8.12	7.86	7.61		7.90	7.78	110	126	107	114		115	115
7.0	7.90	8.13	7.86	7.62		7.90	7.79	107	126	107	114		115	115
8.0	7.87	8.12	7.85	7.63		7.89	7.79	107	126	107	113		115	115
9.0	7.86	8.11	7.85	7.63		7.86	7.75	107	126	107	113		115	114
10.0	7.85	8.12	7.85	7.65		7.83	7.70	107	126	107	113		115	114
11.0		8.11	7.84	7.69		7.83			126	107	113		115	
12.0		8.12	7.84	7.71		7.82			126	107	113		115	
13.0		8.07	7.83	7.71		7.81			125	107	113		114	
14.0		8.07	7.83	7.71		7.80			123	107	113		114	
15.0		8.02	7.64	7.70		7.79			124	105	113		114	
16.0		7.97	7.60	7.70					124	105	113			
17.0		7.92	7.58	7.70					123	105	113			
18.0		7.90	7.57	7.69					123	104	113			
19.0		7.89	7.55	7.68					123	104	113			
20.0		7.85	7.53	7.67					123	104	112			
21.0		7.83	7.52	7.65					123	104	112			
22.0		7.85	7.50	7.63					123	104	116			
23.0		7.82	7.48						123	104				

Notes:
21-Aug-17 sampling was conducted by Minnow. Sheardown Lake NW water profile sampling on all other dates was conducted by Baffinland.
Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 10.2, 23.15, 22.6, 4.41, 15.35, and 10.9 m, respectively, at the time of fall sampling.

Table C.40: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Sheardown Lake NW Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017

Categorization & Replicate ID		Date Sampled	Station Depth (m)	Secchi Depth (m)	Depth sampled	Temperature (°C)	Dissolved Oxygen		pH (units)	Specific Conductance (µS/cm)
							(mg/L)	(% sat.)		
Littoral (Shallow) Stations	DLO-01-9	23-Aug-2017	7.8	3.8	surface	8.80	11.85	102.4	8.31	127
					bottom	8.79	11.57	99.7	8.29	127
	DLO-01-4	23-Aug-2017	7.8	3.9	surface	8.77	11.73	100.9	8.33	128
					bottom	8.78	11.69	100.5	8.33	127
	DLO-01-3	23-Aug-2017	8.5	4.1	surface	8.62	11.89	102.0	8.33	127
					bottom	8.57	11.84	101.4	8.25	125
	DLO-01-11	23-Aug-2017	8.6	5.1	surface	8.93	12.03	103.9	8.13	127
					bottom	8.80	11.95	103.0	8.08	126
	DLO-01-10	23-Aug-2017	8.3	4.5	surface	9.07	11.97	103.6	8.20	126
					bottom	8.80	11.97	103.1	7.97	126
Profundal (Deep) Stations	DLO-01-5	23-Aug-2017	24.0	4.0	surface	8.36	11.95	101.8	8.10	126
					bottom	6.99	11.48	94.3	7.82	123
	DLO-01-14	23-Aug-2017	24.2	4.4	surface	8.52	12.12	103.7	7.89	126
					bottom	7.33	12.08	100.3	7.83	124
	DLO-01-15	23-Aug-2017	22.5	4.2	surface	8.57	12.05	103.2	8.14	125
					bottom	7.61	11.94	98.8	7.95	124
	DLO-01-2	23-Aug-2017	20.0	4.8	surface	8.62	11.98	102.7	8.17	127
					bottom	7.96	12.02	99.8	7.97	122
	DLO-01-12	23-Aug-2017	15.0	4.6	surface	8.70	11.98	102.9	8.24	126
					bottom	8.60	11.96	102.4	8.04	127

Table C.41: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake NW Littoral and Profundal Stations, Mary River Project CREMP, August 2017

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Lake Zone	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	NO	0.676	α	Littoral	5	4.28	0.53	0.24	3.80	5.10
				Profundal	5	4.40	0.32	0.14	4.00	4.80
Temperature (˚C)	YES	0.007	β , ζ	Littoral	5	8.75	0.10	0.04	8.57	8.80
				Profundal	5	7.70	0.62	0.28	6.99	8.60
Dissolved Oxygen (mg/L)	NO	0.512	β , ζ	Littoral	5	11.8	0.2	0.1	11.6	12.0
				Profundal	5	11.9	0.2	0.1	11.5	12.1
Dissolved Oxygen (% saturation)	NO	0.145	α	Littoral	5	101.5	1.5	0.7	99.7	103.1
				Profundal	5	99.1	3.0	1.3	94.3	102.4
pH (units)	YES	0.012	α	Littoral	5	8.18	0.15	0.07	7.97	8.33
				Profundal	5	7.92	0.09	0.04	7.82	8.04
Specific Conductance (umho/cm)	YES	0.028	α	Littoral	5	126.5	1.0	0.4	125.3	127.5
				Profundal	5	124.0	1.8	0.8	121.6	126.7

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.42: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake NW and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	YES	0.014	α	Reference	5	9.74	1.04	0.46	8.50	11.20
					Sheardown NW	5	8.20	0.38	0.17	7.80	8.60
	Secchi Depth (m)	YES	< 0.001	α	Reference	5	8.26	0.74	0.33	7.50	9.40
					Sheardown NW	5	4.28	0.53	0.24	3.80	5.10
	Temperature (˚C)	YES	0.001	β , ζ	Reference	5	8.29	0.16	0.07	8.05	8.42
					Sheardown NW	5	8.75	0.10	0.04	8.57	8.80
	Dissolved Oxygen (mg/L)	NO	0.888	α , η	Reference	5	11.8	0.1	0.0	11.7	11.9
					Sheardown NW	5	11.8	0.2	0.1	11.6	12.0
	Dissolved Oxygen (% saturation)	NO	0.138	α	Reference	5	100.3	0.9	0.4	99.0	101.0
					Sheardown NW	5	101.5	1.5	0.7	99.7	103.1
	pH (units)	YES	< 0.001	α	Reference	5	7.43	0.17	0.08	7.31	7.72
					Sheardown NW	5	8.18	0.15	0.07	7.97	8.33
	Specific Conductance (umho/cm)	YES	< 0.001	α	Reference	5	73.7	0.6	0.3	73.2	74.6
					Sheardown NW	5	126.5	1.0	0.4	125.3	127.5
Profundal (Deep) Stations	Station Depth (m)	NO	0.775	α	Reference	5	20.56	2.17	0.97	18.50	24.20
					Sheardown NW	5	21.14	3.82	1.71	15.00	24.20
	Secchi Depth (m)	YES	< 0.001	α	Reference	5	8.28	0.43	0.19	7.90	9.00
					Sheardown NW	5	4.40	0.32	0.14	4.00	4.80
	Temperature (˚C)	NO	0.591	α	Reference	5	7.48	0.61	0.27	6.47	8.10
					Sheardown NW	5	7.70	0.62	0.28	6.99	8.60
	Dissolved Oxygen (mg/L)	NO	0.256	β , ζ	Reference	5	11.6	0.5	0.2	10.7	12.0
					Sheardown NW	5	11.9	0.2	0.1	11.5	12.1
	Dissolved Oxygen (% saturation)	NO	0.402	α	Reference	5	97.3	3.6	1.6	93.0	100.7
					Sheardown NW	5	99.1	3.0	1.3	94.3	102.4
	pH (units)	YES	< 0.001	α	Reference	5	7.29	0.06	0.03	7.23	7.37
					Sheardown NW	5	7.92	0.09	0.04	7.82	8.04
	Specific Conductance (umho/cm)	YES	< 0.001	α , η	Reference	5	76.1	3.5	1.5	73.2	80.6
					Sheardown NW	5	124.0	1.8	0.8	121.6	126.7

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.43: Water chemistry at Sheardown Lake NW (DLO-01) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Winter Sampling Event											
					DD-HAB9-STN-1 bottom 17-Apr-2017	DD-HAB9-STN-1 surface 17-Apr-2017	DL0-01-5 bottom 17-Apr-2017	DL0-01-5 surface 17-Apr-2017	DL0-01-1 bottom 17-Apr-2017	DL0-01-1 surface 17-Apr-2017	DL0-01-4 bottom 16-Apr-2017	DL0-01-4 surface 16-Apr-2017	DL0-01-2 bottom 16-Apr-2017	DL0-01-2 surface 16-Apr-2017	DL0-01-7 bottom 16-Apr-2017	DL0-01-7 surface 16-Apr-2017
Conventionals	Conductivity (lab)	umho/cm	-	-	155	160	150	157	154	160	158	166	155	161	155	159
	pH (lab)	pH	6.5 - 9.0	-	7.64	7.63	7.46	7.67	7.50	7.65	7.70	7.72	7.60	7.60	7.69	7.70
	Hardness (as $CaCO_3$)	mg/L	-	-	78	77	77	81	77	80	81	83	76	80	76	73
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	3.6	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	77	79	67	111	77	74	72	78	69	74	74	67
	Turbidity	NTU	-	-	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.3	0.2	0.2	0.2
	Alkalinity (as $CaCO_3$)	mg/L	-	-	70	72	68	59	70	73	66	70	69	74	70	70
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	0.020	<0.020	0.022	<0.020	<0.020	<0.020	0.046	<0.020	0.032
	Nitrate	mg/L	13	13	0.061	0.052	0.101	0.054	0.094	0.053	0.056	0.051	0.066	0.049	0.051	0.058
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.18
	Dissolved Organic Carbon	mg/L	-	-	1.7	1.8	1.6	1.7	1.6	1.9	1.7	1.9	1.7	1.8	<1.0	1.8
	Total Organic Carbon	mg/L	-	-	2.0	1.9	1.7	2.0	1.8	1.9	2.0	2.0	2.0	2.1	1.9	2.0
	Total Phosphorus	mg/L	0.020[α]	-	0.0036	0.0038	0.0032	0.0036	0.0049	0.0036	0.0047	0.0031	0.0040	0.0041	0.0033	<0.0030
	Phenols	mg/L	0.004[α]	-	<0.0010	0.0012	<0.0010	<0.0010	0.0011	<0.0010	0.0015	0.0011	<0.0010	0.0011	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	3.8	3.8	3.7	3.8	3.8	3.9	3.8	4.1	3.8	3.9	3.8	3.9
	Sulphate (SO_4)	mg/L	218[β]	218	5.0	5.1	4.9	5.1	5.0	5.3	5.2	5.4	5.0	5.2	5.0	5.2
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173[c]	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0074	0.0076	0.0075	0.0076	0.0075	0.0075	0.0077	0.0080	0.0075	0.0081	0.0076	0.0073
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	15	15	15	15	15	16	16	16	15	16	16	15
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0009	0.0009	0.0009	0.0010	0.0009	0.0009	0.0009	0.0010	0.0009	0.0010	0.0009	0.0009
	Iron (Fe)	mg/L	0.30	0.300	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	9.6	9.9	9.4	10.2	9.7	10.0	10.1	10.4	9.6	10.4	10.2	9.8
	Manganese (Mn)	mg/L	0.935[β]	-	0.0009	0.0008	0.0014	0.0006	0.0014	0.0007	0.0008	0.0007	0.0011	0.0007	0.0013	0.0007
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002
	Molybdenum (Mo)	mg/L	0.073	-	0.00092	0.00092	0.00086	0.00094	0.00085	0.00092	0.00091	0.00097	0.00091	0.00092	0.00091	0.00087
	Nickel (Ni)	mg/L	0.025	0.025	0.00079	0.00080	0.00076	0.00078	0.00076	0.00079	0.00077	0.00082	0.00079	0.00083	0.00080	0.00083
	Potassium (K)	mg/L	-	-	1.38	1.43	1.36	1.44	1.39	1.41	1.44	1.49	1.39	1.48	1.41	1.41
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.64	0.66	0.87	0.65	0.79	0.64	0.63	0.65	0.70	0.66	0.63	0.63
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.9	1.9	1.8	1.9	1.9	1.9	1.9	2.0	1.8	1.9	1.9	1.8
	Strontium (Sr)	mg/L	-	-	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.010	0.011	0.010	0.010
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	0.00084	0.00085	0.00087	0.00058	0.00072	0.00239	0.00048	0.00072	0.00058	0.00065	0.00057	0.00078
	Titanium (Ti)	mg/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.015	-	0.0012	0.0012	0.0011	0.0012	0.0012	0.0012	0.0012	0.0013	0.0012	0.0013	0.0012	0.0012
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

[c] Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.43: Water chemistry at Sheardown Lake NW (DLO-01) water quality monitoring stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Summer Sampling Event											
					DD-HAB9-STN-1 bottom 21-Jul-2017	DD-HAB9-STN-1 surface 21-Jul-2017	DL0-01-5 bottom 22-Jul-2017	DL0-01-5 surface 22-Jul-2017	DL0-01-1 bottom 22-Jul-2017	DL0-01-1 surface 22-Jul-2017	DL0-01-4 bottom 21-Jul-2017	DL0-01-4 surface 21-Jul-2017	DL0-01-2 bottom 23-Jul-2017	DL0-01-2 surface 23-Jul-2017	DL0-01-7 bottom 23-Jul-2017	DL0-01-7 surface 23-Jul-2017
Conventionals	Conductivity (lab)	umho/cm	-	-	131	133	131	131	132	132	132	131	131	131	131	132
	pH (lab)	pH	6.5 - 9.0	-	7.84	7.81	7.84	7.84	7.84	7.85	7.83	7.85	7.91	7.95	7.88	7.82
	Hardness (as $CaCO_3$)	mg/L	-	-	62	63	62	62	62	63	60	62	63	62	64	63
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	77	67	69	70	71	65	70	73	71	67	72	80
	Turbidity	NTU	-	-	1.0	1.1	1.1	1.5	1.1	1.3	1.2	1.2	1.5	1.2	0.9	1.6
	Alkalinity (as $CaCO_3$)	mg/L	-	-	56	55	59	58	60	56	56	57	55	31	46	56
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	0.031	0.034	0.032	0.031	0.022	0.032	0.029	0.028	0.031	0.035	0.033	0.032
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.16	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.6	1.6	1.7	1.7	1.7	1.7	1.5	1.8	1.7	1.6	1.7	1.6
	Total Organic Carbon	mg/L	-	-	1.7	1.7	1.6	1.7	1.8	1.7	1.6	1.8	1.6	1.7	1.7	1.7
	Total Phosphorus	mg/L	0.020[α]	-	0.0045	0.0054	0.0049	0.0041	0.0045	0.0065	0.0047	0.0068	0.0036	0.0031	0.0043	0.0038
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
	Sulphate (SO_4)	mg/L	218[β]	218	4.5	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173[c]	0.016	0.015	0.013	0.013	0.016	0.015	0.016	0.017	0.017	0.012	0.039	0.015
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0063	0.0060	0.0061	0.0060	0.0061	0.0062	0.0061	0.0063	0.0061	0.0060	0.0061	0.0062
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	12	12	12	12	12	12	12	12	12	13	12	12
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	<0.0010	<0.0010	0.0022	<0.0010	0.0011	0.0018	0.0010	<0.0010	0.0014	0.0011	0.0014	<0.0010
	Iron (Fe)	mg/L	0.30	0.300	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.076	<0.050
	Lead (Pb)	mg/L	0.001	0.001	0.000051	0.000058	<0.000050	<0.000050	0.000055	0.000058	0.000054	<0.000050	0.000057	<0.000050	0.000070	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	7.6	7.4	7.7	7.7	7.9	7.3	7.6	7.5	7.9	7.6	7.6	7.6
	Manganese (Mn)	mg/L	0.935[β]	-	0.0048	0.0046	0.0045	0.0045	0.0047	0.0045	0.0046	0.0045	0.0045	0.0044	0.0052	0.0044
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	0.00001	0.00001	<0.00001	0.00003	0.00002	0.00002	0.00002	0.00001	0.00002	0.00002	0.00002
	Molybdenum (Mo)	mg/L	0.073	-	0.00077	0.00080	0.00078	0.00079	0.00079	0.00078	0.00080	0.00078	0.00077	0.00081	0.00081	0.00079
	Nickel (Ni)	mg/L	0.025	0.025	0.00075	0.00079	0.00091	0.00075	0.00079	0.00083	0.00075	0.00078	0.00084	0.00079	0.00108	0.00083
	Potassium (K)	mg/L	-	-	1.12	1.09	1.10	1.11	1.12	1.09	1.09	1.11	1.12	1.09	1.11	1.12
	Selenium (Se)	mg/L	0.001	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	0.55	0.54	0.54	0.56	0.57	0.55	0.55	0.54	0.56	0.54	0.58	0.54
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.5	1.4	1.5	1.4
	Strontium (Sr)	mg/L	-	-	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Tin (Sn)	mg/L	-	-	0.00063	0.00122	0.00017	0.00040	0.00042	0.00095	0.00030	0.00021	0.00049	0.00022	0.00058	0.00042
	Titanium (Ti)	mg/L	-	-	0.0007	0.0008	0.0007	0.0007	0.0008	0.0007	0.0008	0.0008	0.0009	0.0006	0.0027	0.0009
	Uranium (U)	mg/L	0.015	-	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

[c] Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.43: Water chemistry at Sheardown Lake NW (DLO-01) water quality monitoring stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Fall Sampling Event											
					DD-HAB9-STN-1 bottom 21/Aug/17	DD-HAB9-STN-1 surface 21/Aug/17	DL0-01-5 bottom 21/Aug/17	DL0-01-5 surface 21/Aug/17	DL0-01-1 bottom 26/Aug/17	DL0-01-1 surface 26/Aug/17	DL0-01-4 bottom 20/Aug/17	DL0-01-4 surface 20/Aug/17	DL0-01-2 bottom 20/Aug/17	DL0-01-2 surface 20/Aug/17	DL0-01-7 bottom 20/Aug/17	DL0-01-7 surface 20/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	-	132	131	129	130	131	132	131	131	130	130	130	130
	pH (lab)	pH	6.5 - 9.0	-	8.08	8.03	7.67	8.05	7.98	8.00	8.02	8.00	8.00	8.07	8.02	8.00
	Hardness (as $CaCO_3$)	mg/L	-	-	62	62	61	61	60	62	62	61	61	62	62	62
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	3.7	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	53	55	64	39	76	65	54	44	61	65	50	56
	Turbidity	NTU	-	-	1.0	1.1	1.0	0.9	0.8	0.5	0.8	1.0	1.0	1.1	1.0	1.0
	Alkalinity (as $CaCO_3$)	mg/L	-	-	56	52	54	58	56	61	55	68	55	48	54	50
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	0.021	0.055	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	0.021	<0.020	0.035	0.025	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	0.78	<0.15	0.20	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.5	1.7	1.6	1.6	1.4	1.7	1.9	1.5	1.5	1.4	1.4	1.7
	Total Organic Carbon	mg/L	-	-	1.6	1.7	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.7	1.7
	Total Phosphorus	mg/L	0.020[α]	-	0.0051	0.0042	0.0036	0.0036	0.0061	0.0042	0.0044	0.0033	0.0061	0.0053	0.0064	<0.0030
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0023	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	2.6	3.0	3.0	3.0	3.0	3.0	3.0	2.9	3.0	2.9	3.0	3.0
	Sulphate (SO_4)	mg/L	218[β]	218	4.4	5.4	4.7	5.1	4.9	5.1	5.2	5.0	5.1	4.8	5.1	5.1
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173[c]	0.015	0.008	0.013	0.010	0.012	0.009	0.015	0.011	0.010	0.011	0.012	0.013
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0062	0.0067	0.0061	0.0061	0.0061	0.0063	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	12	12	12	12	12	12	12	12	12	12	12	12
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	***0.0216****	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0008	0.0008	***0.00284****	0.0008	0.0008	0.0008	0.0008	0.0016	0.0008	0.0008	0.0009	0.0008
	Iron (Fe)	mg/L	0.30	0.300	<0.030	<0.030	***0.534****	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	0.0010	<0.0010	0.0012	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	7.7	8.2	7.6	7.7	7.8	8.0	7.6	7.7	7.3	7.7	7.6	7.4
	Manganese (Mn)	mg/L	0.935[β]	-	0.0018	0.0018	***0.0124****	0.0016	0.0017	0.0015	0.0018	0.0017	0.0019	0.0017	0.0018	0.0018
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00077	0.00074	0.00078	0.00074	0.00074	0.00075	0.00074	0.00077	0.00074	0.00074	0.00076	0.00075
	Nickel (Ni)	mg/L	0.025	0.025	0.00062	0.00065	***0.00154****	0.00061	0.00056	0.00060	0.00063	0.00064	0.00062	0.00061	0.00060	0.00057
	Potassium (K)	mg/L	-	-	1.15	1.21	1.13	1.13	1.13	1.14	1.14	1.15	1.13	1.14	1.14	1.14
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.41	0.41	0.56	0.38	0.49	0.43	0.43	0.41	0.42	0.39	0.42	0.41
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.5	1.5	1.4	1.4	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4
	Strontium (Sr)	mg/L	-	-	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.015	-	0.0009	0.0008	0.0009	0.0009	0.0008	0.0008	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

[c] Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.44: Summary of the Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between the Sheardown Lake Basins and Reference Lake 3 in 2017, and at the Sheardown Lake Basins Between 2017 and the Baseline Period

Variable	Sheardown Lake NW					Sheardown Lake SE				
	2017 vs Reference Lake 3		2017 vs Baseline			2017 vs Reference Lake 3		2017 vs Baseline		
	Summer	Fall	Winter	Summer	Fall	Summer	Fall	Winter	Summer	Fall
Conductivity (lab)	1.7	1.7	1.1	1.1	1.1	1.2	1.3	1.0	0.9	0.9
Hardness (as $CaCO_3$)	1.7	1.8	1.2	1.1	1.0	1.2	1.4	1.0	0.9	0.9
Total Suspended Solids (TSS)	1.0	1.1	1.1	0.5	0.8	1.1	1.0	1.1	0.8	0.8
Total Dissolved Solids (TDS)	1.9	1.6	0.8	0.9	0.7	1.4	1.3	0.8	0.8	0.6
Turbidity	3.2	1.9	0.8	1.6	1.8	4.0	8.1	1.1	0.9	2.2
Alkalinity (as $CaCO_3$)	1.7	1.7	1.0	1.0	1.0	1.3	1.4	1.0	0.9	0.9
Total Ammonia	0.6	1.2	0.1	0.4	0.5	0.6	1.0	0.2	0.8	0.7
Nitrate	1.5	1.1	0.6	0.3	0.2	1.0	1.0	0.3	0.2	0.2
Nitrite	1.0	1.0	1.3	0.1	1.1	1.0	1.0	1.4	0.4	1.1
Total Kjeldahl Nitrogen (TKN)	0.8	1.4	0.7	0.9	1.3	0.8	1.0	0.9	1.0	0.7
Dissolved Organic Carbon	0.6	0.6	0.9	0.9	0.9	0.5	0.5	1.0	1.0	0.9
Total Organic Carbon	0.5	0.6	1.1	0.9	0.9	0.5	0.5	1.0	0.9	0.9
Total Phosphorus	0.7	1.1	1.0	0.7	0.9	0.9	1.7	1.2	0.9	1.2
Phenols	1.0	0.4	1.1	1.0	1.1	1.0	0.4	1.4	1.0	1.0
Bromide (Br)	1.0	1.0	0.6	0.4	0.4	1.0	1.0	0.7	0.4	0.4
Chloride (Cl)	2.6	2.3	1.2	1.3	1.1	1.7	1.6	1.0	0.8	0.7
Sulphate (SO_4)	1.2	1.2	1.6	1.7	1.6	0.7	0.7	1.2	1.1	1.2
Aluminum (Al)	5.2	3.0	1.0	1.2	0.6	10	21	0.6	0.4	1.2
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Barium (Ba)	0.9	1.0	1.3	1.2	1.2	0.7	1.0	1.2	0.8	1.0
Beryllium (Be)	0.2	1.0	2.0	0.3	1.5	0.2	1.0	1.5	0.2	1.3
Cadmium (Cd)	1.0	1.0	0.8	0.9	0.9	1.0	1.0	0.8	0.8	0.8
Calcium (Ca)	1.7	1.7	1.1	1.0	1.0	1.2	1.4	1.0	0.9	0.8
Chromium (Cr)	1.0	1.0	RDL	RDL	RDL	1.0	1.0	RDL	RDL	2.1
Cobalt (Co)	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	0.9	0.9
Copper (Cu)	1.5	1.0	0.9	1.2	0.7	1.3	1.0	0.8	0.9	0.8
Iron (Fe)	1.7	1.0	1.2	1.8	0.8	1.7	2.1	0.6	0.5	0.8
Lead (Pb)	1.1	1.0	0.9	1.0	0.1	1.1	1.8	0.5	0.5	1.1
Lithium (Li)	1.0	1.0	0.4	0.3	0.0	1.0	1.0	0.3	0.2	0.3
Magnesium (Mg)	1.7	1.7	1.1	1.1	1.1	1.2	1.3	1.1	1.0	0.9
Manganese (Mn)	7.3	2.8	1.4	2.6	0.8	7.4	6.1	0.3	0.8	1.1
Mercury (Hg)	1.6	1.0	1.2	1.4	0.3	1.4	1.0	1.1	1.6	1.0
Molybdenum (Mo)	5.6	6.1	1.1	1.2	1.1	3.0	3.5	1.2	1.2	1.0
Nickel (Ni)	1.6	1.2	1.0	1.3	0.9	1.2	1.2	0.9	0.9	0.9
Potassium (K)	1.2	1.3	1.4	1.4	1.3	0.9	1.1	1.3	1.2	1.2
Selenium (Se)	0.1	1.0	RDL	0.6	RDL	0.1	1.0	RDL	0.6	RDL
Silicon (Si)	1.3	1.1	0.9	0.9	0.7	1.0	1.5	0.8	0.6	0.8
Silver (Ag)	RDL	1.0	2.5	RDL	1.3	RDL	1.0	1.6	RDL	1.4
Sodium (Na)	1.6	1.7	1.3	1.3	1.2	1.1	1.3	1.3	1.5	1.2
Strontium (Sr)	1.0	1.0	1.1	1.1	1.0	0.8	0.9	0.9	0.8	0.7
Thallium (Tl)	0.1	1.0	2.3	0.2	0.4	0.1	1.0	1.6	0.1	1.3
Tin (Sn)	5.0	1.0	1.4	0.9	0.2	6.9	1.0	0.8	0.5	0.1
Titanium (Ti)	0.1	1.0	1.0	0.1	1.0	0.2	1.0	1.0	0.1	0.9
Uranium (U)	3.5	3.5	1.3	1.2	1.0	2.1	2.5	1.1	1.0	0.8
Vanadium (V)	0.5	1.0	1.0	0.5	1.0	0.5	1.0	1.0	0.5	1.0
Zinc (Zn)	1.0	1.0	1.2	1.5	1.2	1.0	1.0	1.0	1.8	1.9

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.45: Dissolved Metal Concentrations at Sheardown Lake NW Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Winter Sampling Event												Summer Sampling Event					
			DD-HAB9-STN-1 bottom 17-Apr-2017	DD-HAB9-STN-1 surface 17-Apr-2017	DL0-01-5 bottom 17-Apr-2017	DL0-01-5 surface 17-Apr-2017	DL0-01-1 bottom 17-Apr-2017	DL0-01-1 surface 17-Apr-2017	DL0-01-4 bottom 16-Apr-2017	DL0-01-4 surface 16-Apr-2017	DL0-01-2 bottom 16-Apr-2017	DL0-01-2 surface 16-Apr-2017	DL0-01-7 bottom 16-Apr-2017	DL0-01-7 surface 16-Apr-2017	DD-HAB9-STN1 bottom 21-Jul-2017	DD-HAB9-STN1 surface 21-Jul-2017	DL0-01-5 bottom 22-Jul-2017	DL0-01-5 surface 22-Jul-2017	DL0-01-1 bottom 22-Jul-2017	DL0-01-1 surface 22-Jul-2017
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.00335
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00740	0.00744	0.00756	0.00794	0.00731	0.00765	0.00758	0.00780	0.00724	0.00757	0.00750	0.00718	0.00610	0.00634	0.00609	0.00607	0.00620	0.00610
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	15.5	14.6	14.7	15.9	14.7	15.8	15.4	16.4	14.9	15.8	14.6	14.2	12.2	12.3	12.2	12.0	12.0	12.2
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00097	0.00087	0.00086	0.00101	0.00086	0.00093	0.00094	0.00095	0.00082	0.00090	0.00087	0.00085	0.00075	0.00078	0.00090	0.00077	0.00094	0.00077
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.00110	<0.0010	0.0012	0.0011	<0.0010	0.0011	0.0011	0.0014	<0.0010	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	9.62	9.94	9.88	9.92	9.80	9.87	10.20	10.20	9.27	9.91	9.52	9.19	7.59	7.90	7.65	7.74	7.78	7.76
	Manganese (Mn)	mg/L	0.000161	0.000272	0.000122	0.0002	0.00010	0.000087	0.000127	0.000271	0.000075	0.000102	0.000081	<0.000070	0.000161	0.000208	0.000183	0.000211	0.000246	0.000209
	Mercury (Hg)	mg/L	<0.000010	0.000014	<0.000010	0.000014	<0.000010	0.000012	0.000011	<0.000010	<0.000010	0.000013	<0.000010	0.000017	0.00001	0.000011	<0.000010	<0.000010	0.000027	<0.000010
	Molybdenum (Mo)	mg/L	0.000921	0.000888	0.000892	0.000950	0.000844	0.000930	0.000872	0.000973	0.000872	0.000913	0.000869	0.000816	0.000772	0.000771	0.000754	0.000746	0.000744	0.000761
	Nickel (Ni)	mg/L	0.000840	0.000750	0.00074	0.00081	0.00074	0.00078	0.00080	0.00079	0.00076	0.00079	0.000740	0.000730	0.00061	0.00066	0.00066	0.00060	0.00063	0.00066
	Potassium (K)	mg/L	1.40	1.42	1.38	1.46	1.39	1.43	1.43	1.50	1.35	1.44	1.39	1.34	1.11	1.13	1.12	1.13	1.14	1.14
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.650	0.640	0.87	0.65	0.80	0.62	0.64	0.65	0.69	0.64	0.610	0.590	0.51	0.52	0.51	0.52	0.53	0.52
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.94	1.82	1.80	1.90	1.79	1.85	1.84	1.91	1.76	1.82	1.82	1.69	1.41	1.47	1.44	1.44	1.48	1.45
	Strontium (Sr)	mg/L	0.01040	0.01000	0.01030	0.01080	0.0097	0.01050	0.01010	0.01120	0.00967	0.01070	0.00977	0.00959	0.00804	0.00802	0.00784	0.00784	0.00785	0.00799
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00085	0.00164	0.00128	0.00134	0.00097	0.00369	0.00077	0.00116	0.00094	0.00104	0.00069	0.00138	0.00041	0.00044	0.00069	0.00018	0.00165	0.000455
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.00120	0.00120	0.00111	0.001250	0.00111	0.00128	0.00121	0.00131	0.00119	0.00127	0.00122	0.00116	0.000850	0.000892	0.000863	0.000879	0.000873	0.000866
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.00360	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.45: Dissolved Metal Concentrations at Sheardown Lake NW Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Summer Sampling Event						Fall Sampling Event											
			DL0-01-04 bottom 21-Jul-2017	DL0-01-04 surface 21-Jul-2017	DL0-01-2 bottom 23-Jul-2017	DL0-01-2 surface 23-Jul-2017	DL0-01-7 bottom 23-Jul-2017	DL0-01-7 surface 23-Jul-2017	DD-HAB9-STN1 bottom 21-Aug-2017	DD-HAB9-STN1 surface 21-Aug-2017	DL0-01-1 bottom 26-Aug-2017	DL0-01-1 surface 26-Aug-2017	DL0-01-5 bottom 21-Aug-2017	DL0-01-5 surface 21-Aug-2017	DL0-01-4 bottom 20-Aug-2017	DL0-01-4 surface 20-Aug-2017	DL0-01-2 bottom 20-Aug-2017	DL0-01-2 surface 20-Aug-2017	DL0-01-7 bottom 20-Aug-2017	DL0-01-7 surface 20-Aug-2017
Dissolved Metals	Aluminum (Al)	mg/L	0.0032	0.0038	<0.0030	<0.0030	0.0033	<0.0030	0.0036	0.0037	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0032	<0.0030	<0.0030	<0.0030	0.0031
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00630	0.00589	0.00612	0.00619	0.00625	0.00609	0.00617	0.00632	0.00633	0.00635	0.00600	0.00601	0.00601	0.00614	0.00612	0.00617	0.00609	0.00619
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	11.7	12.2	12.6	12.2	12.5	12.2	11.8	12.1	11.8	12.0	12.0	11.8	11.9	12.0	11.9	12.1	12.1	12.0
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00082	0.00096	0.00076	0.00075	0.00101	0.00080	0.00079	0.00078	0.00074	0.00077	0.00080	0.00079	0.00080	0.0008	0.00078	0.0007	0.00084	0.0008
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	7.58	7.74	7.74	7.71	7.77	7.94	7.81	7.76	7.51	7.75	7.66	7.72	7.80	7.60	7.72	7.61	7.70	7.67
	Manganese (Mn)	mg/L	0.000233	0.000330	0.000153	0.000137	0.000117	0.000208	0.000299	0.000218	<0.000070	0.000103	0.000121	0.000181	0.000190	0.000206	0.000231	0.000180	0.000093	0.000208
	Mercury (Hg)	mg/L	0.000023	0.000015	<0.000010	<0.000010	0.0000135	0.000015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.000728	0.000765	0.000774	0.000775	0.000766	0.000756	0.000786	0.000797	0.000721	0.000744	0.000759	0.000771	0.000779	0.000750	0.000798	0.000774	0.000757	0.000762
	Nickel (Ni)	mg/L	0.00060	0.00064	0.00069	0.00060	0.00060	0.00066	0.00069	0.00058	0.00054	0.00055	0.00058	0.00060	0.00058	0.00057	0.00057	0.00056	0.00058	0.00056
	Potassium (K)	mg/L	1.11	1.11	1.13	1.14	1.13	1.14	1.17	1.16	1.12	1.15	1.15	1.15	1.15	1.14	1.15	1.13	1.13	1.13
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.51	0.50	0.52	0.52	0.53	0.52	0.39	0.41	0.47	0.39	0.52	0.39	0.39	0.39	0.38	0.38	0.42	0.39
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.45	1.48	1.49	1.51	1.43	1.45	1.50	1.45	1.29	1.31	1.41	1.41	1.44	1.43	1.42	1.40	1.38	1.41
	Strontium (Sr)	mg/L	0.00784	0.00804	0.00810	0.00798	0.00798	0.00813	0.00773	0.00793	0.00785	0.00787	0.00779	0.00786	0.00808	0.00788	0.00795	0.00792	0.00780	0.00788
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00051	0.00023	0.00038	0.00137	0.001035	0.00156	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000868	0.000867	0.000882	0.000876	0.000882	0.000891	0.00094	0.00091	0.000787	0.000834	0.000859	0.000920	0.00091	0.00088	0.00090	0.000908	0.000881	0.00092
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0075	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.46: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Sheardown Lake Northwest and Reference Lake 3 in 2017, and at Sheardown Lake Northwest Between 2017 and the Baseline Period

Dissolved Metal	Sheardown Lake NW				
	2017 vs Reference Lake 3		2017 vs Baseline		
	Summer	Fall	Winter	Summer	Fall
Aluminum (Al)	1.0	1.0	0.0	0.7	1.0
Antimony (Sb)	1.0	1.0	0.0	0.0	1.0
Arsenic (As)	1.0	1.0	1.0	0.8	1.0
Barium (Ba)	0.9	1.0	0.0	1.2	1.1
Beryllium (Be)	1.0	1.0	1.2	1.2	2.1
Cadmium (Cd)	1.0	1.0	0.4	0.0	0.8
Calcium (Ca)	1.7	1.7	1.2	1.1	1.0
Chromium (Cr)	1.0	1.0	RDL	RDL	RDL
Cobalt (Co)	1.0	1.0	1.0	1.0	0.9
Copper (Cu)	1.0	1.0	0.8	0.6	1.0
Iron (Fe)	1.0	1.0	1.2	1.2	1.7
Lead (Pb)	1.0	1.0	0.6	1.0	1.0
Lithium (Li)	1.0	1.0	0.3	0.0	0.4
Magnesium (Mg)	1.8	1.8	1.2	1.2	1.1
Manganese (Mn)	0.8	1.0	0.2	0.0	0.3
Mercury (Hg)	1.4	1.0	1.2	1.4	1.0
Molybdenum (Mo)	5.4	7.0	3.9	0.0	3.8
Nickel (Ni)	1.3	1.2	1.1	0.7	1.0
Potassium (K)	1.2	1.3	0.9	1.0	1.0
Selenium (Se)	1.0	1.0	RDL	RDL	RDL
Silicon (Si)	1.3	1.0	1.4	1.3	1.0
Silver (Ag)	1.0	1.0	1.2	1.8	2.7
Sodium (Na)	1.6	1.6	1.1	1.1	1.1
Strontium (Sr)	1.0	1.0	1.3	1.1	1.0
Thallium (Tl)	1.0	1.0	1.2	1.3	2.6
Tin (Sn)	7.4	1.0	0.9	1.3	0.1
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0
Uranium (U)	3.3	3.5	2.5	1.9	1.8
Vanadium (V)	1.0	1.0	1.0	1.0	1.0
Zinc (Zn)	1.0	1.1	1.5	1.0	2.1

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration ≥ 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.47: Spearman's Rank Correlation Coefficients for Sheardown Lake NW (DLO-1) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Conventional Parameters										Total Metals											
	Conduct-ivity	Hardness	Total Dissolved Solids	Turbidity	Alkalinity	Nitrate	Total Organic Carbon	Total Phosphorus	Chloride	Sulphate	Aluminum	Barium	Copper	Manganese	Molybdenum	Nickel	Potassium	Silicon	Sodium	Strontium	Tin	Uranium
Conductivity	1	0.799	0.607	-0.607	0.796	0.784	0.446	-0.260	0.837	0.350	-0.572	0.708	0.117	-0.625	0.823	0.527	0.608	0.759	0.745	0.841	0.761	0.847
Hardness	0.799	1	0.608	-0.581	0.558	0.772	0.518	-0.310	0.851	0.359	-0.543	0.671	0.137	-0.568	0.806	0.608	0.616	0.775	0.834	0.788	0.784	0.816
Total Dissolved Solids	0.607	0.608	1	-0.273	0.473	0.693	0.289	-0.091	0.691	-0.028	-0.218	0.437	0.340	-0.234	0.681	0.503	0.254	0.696	0.540	0.720	0.614	0.579
Turbidity	-0.607	-0.581	-0.273	1	-0.651	-0.551	-0.274	0.396	-0.546	-0.700	0.788	-0.726	0.379	0.847	-0.526	-0.028	-0.855	-0.520	-0.619	-0.520	-0.340	-0.582
Alkalinity	0.796	0.558	0.473	-0.651	1	0.631	0.357	-0.294	0.689	0.396	-0.669	0.696	0.020	-0.691	0.666	0.318	0.644	0.658	0.642	0.709	0.549	0.696
Nitrate	0.784	0.772	0.693	-0.551	0.631	1	0.300	-0.291	1	0.173	-0.560	0.530	0.189	-0.523	0.838	0.542	0.418	0.875	0.621	0.878	0.807	0.705
Total Organic Carbon	0.446	0.518	0.289	-0.274	0.357	0.300	1	-0.245	0.570	0	-0.135	0.357	0.187	-0.241	0.396	0.479	0.268	0.428	0.426	0.356	0.423	0.439
Total Phosphorus	-0.260	-0.310	-0.091	0.396	-0.294	-0.291	-0.245	1	-0.338	-0.295	0	-0.235	-0.004	0.464	-0.424	-0.236	-0.410	-0.309	-0.450	-0.416	-0.198	-0.261
Chloride	0.837	0.851	0.691	-0.546	0.689	0.855	0.570	-0.338	1	0.329	-0.519	1	0.319	-0.502	0.856	0.734	0.468	0.845	0.752	0.900	0.844	0.832
Sulphate	0.350	0.359	-0.028	-0.700	0.396	0.173	0.411	-0.295	0.329	1	-0.741	0.632	0	-0.750	0.168	-0.106	0.743	0.139	0.350	0.140	0.054	0.248
Aluminum (total)	-0.572	-0.543	-0.218	0.788	-0.669	-0.560	-0.135	0.423	-0.519	-0.741	1	-0.757	0.400	1	-0.501	-0.017	-0.851	-0.467	-0.562	-0.529	-0.298	-0.463
Barium (total)	0.708	0.671	0.437	-0.726	0.696	0.530	0.357	-0.235	0.623	0.632	-0.757	1	-0.198	-0.780	1	0.176	0.846	0.556	0.645	0.611	0.426	0.629
Copper (total)	0.117	0.137	0.340	0.379	0.020	0.189	0.187	-0.004	0.319	-0.466	0.400	-0.198	1	0.438	0.345	1	-0.427	0.285	0.107	0.334	0.371	0.169
Manganese (total)	-0.625	-0.568	-0.234	0.847	-0.691	-0.523	-0.241	0.464	-0.502	-0.750	0.926	-0.780	0.438	1	-0.501	-0.002	-1	-0.422	-0.576	-0.491	-0.243	-0.518
Molybdenum (total)	0.823	0.806	0.681	-0.526	0.666	0.838	0.396	-0.424	0.856	0.168	-0.501	0.521	0.345	-0.501	1	0.646	0.468	1	0.779	0.906	0.782	0.816
Nickel (total)	0.527	0.608	0.503	-0.028	0.318	0.542	0.479	-0.236	0.734	-0.106	-0.017	0.176	0.674	-0.002	0.646	1	0.008	0.601	0	0.628	0.682	0.567
Potassium (total)	0.608	0.616	0.254	-0.855	0.644	0.418	0.268	-0.410	0.468	0.743	-0.851	0.846	-0.427	-0.909	0.468	0.008	1	0.458	0.730	0	0.229	0.565
Silicon (total)	0.759	0.775	0.696	-0.520	0.658	0.875	0.428	-0.309	0.845	0.139	-0.467	0.556	0.285	-0.422	0.876	0.601	0.458	1	0.748	0.875	1	0.785
Sodium (total)	0.745	0.834	0.540	-0.619	0.642	0.621	0.426	-0.450	0.752	0.350	-0.562	0.645	0.107	-0.576	0.779	0.475	0.730	0.748	1	0.786	0.591	1
Strontium (total)	0.841	0.788	0.720	-0.520	0.709	0.878	0.356	-0.416	0.900	0.140	-0.529	0.611	0.334	-0.491	0.906	0.628	0.476	0.875	0.786	1	0.779	0.790
Tin (total)	0.761	0.784	0.614	-0.340	0.549	0.807	0.423	-0.198	0.844	0.054	-0.298	0.426	0.371	-0.243	0.782	0.682	0.229	0.799	0.591	0.779	1	0.776
Uranium (total)	0.847	0.816	0.579	-0.582	0.696	0.705	0.439	-0.261	0.832	0.248	-0.463	0.629	0.169	-0.518	0.816	0.567	0.565	0.785	0.793	0.790	0.776	1
Aluminum (dissolved)	-0.214	-0.271	-0.306	0.350	-0.311	-0.388	0.006	0.225	-0.327	-0.249	0.412	-0.118	0.125	0.363	-0.278	-0.092	-0.269	-0.360	-0.212	-0.285	-0.216	-0.272
Barium (dissolved)	0.671	0.711	0.347	-0.675	0.533	0.611	0.241	-0.497	0.676	0.469	-0.689	0.573	-0.076	-0.651	0.756	0.324	0.686	0.658	0.766	0.667	0.576	0.702
Copper (dissolved)	0.605	0.599	0.537	-0.577	0.569	0.522	0.445	-0.090	0.584	0.293	-0.336	0.500	0.168	-0.397	0.648	0.385	0.462	0.571	0.638	0.590	0.407	0.578
Manganese (dissolved)	-0.070	-0.222	-0.025	0.451	-0.168	-0.401	0.123	0.299	-0.263	-0.235	0.405	-0.151	0.111	0.409	-0.228	-0.114	-0.290	-0.321	-0.197	-0.239	-0.158	-0.111
Molybdenum (dissolved)	0.702	0.795	0.422	-0.706	0.502	0.624	0.382	-0.287	0.660	0.559	-0.701	0.781	-0.270	-0.716	0.573	0.252	0.763	0.583	0.698	0.619	0.537	0.745
Nickel (dissolved)	0.907	0.874	0.680	-0.514	0.720	0.820	0.437	-0.198	0.854	0.210	-0.499	0.656	0.204	-0.540	0.829	0.601	0.541	0.792	0.782	0.857	0.767	0.879
Potassium (dissolved)	0.750	0.679	0.338	-0.793	0.672	0.574	0.311	-0.345	0.586	0.679	-0.835	0.758	-0.348	-0.874	0.549	0.142	0.852	0.524	0.674	0.560	0.396	0.652
Silicon (dissolved)	0.803	0.828	0.722	-0.521	0.637	0.936	0.373	-0.303	0.855	0.153	-0.502	0.529	0.269	-0.471	0.876	0.580	0.456	0.942	0.762	0.902	0.816	0.760
Sodium (dissolved)	0.880	0.833	0.597	-0.507	0.663	0.756	0.456	-0.331	0.794	0.282	-0.529	0.632	0.162	-0.556	0.825	0.551	0.574	0.746	0.804	0.820	0.696	0.872
Strontium (dissolved)	0.729	0.875	0.600	-0.597	0.567	0.714	0.509	-0.410	0.821	0.470	-0.581	0.761	0.086	-0.592	0.718	0.519	0.618	0.722	0.700	0.731	0.726	0.795
Tin (dissolved)	0.735	0.713	0.681	-0.317	0.527	0.758	0.440	-0.349	0.818	0.051	-0.307	0.352	0.415	-0.275	0.834	0.732	0.253	0.772	0.644	0.814	0.775	0.726
Uranium (dissolved)	0.752	0.781	0.337	-0.732	0.577	0.525	0.363	-0.385	0.582	0.615	-0.730	0.779	-0.310	-0.795	0.602	0.198	0.852	0.523	0.752	0.582	0.440	0.684

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 36.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.47: Spearman's Rank Correlation Coefficients for Sheardown Lake NW (DLO-1) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Dissolved Metals											
	Aluminum	Barium	Copper	Manganese	Molybdenum	Nickel	Potassium	Silicon	Sodium	Strontium	Tin	Uranium
Conductivity	-0.214	0.671	0.605	-0.070	0.702	0.907	0.750	0.803	0.880	0.729	0.735	0.752
Hardness	-0.271	0.711	0.599	-0.222	0.795	0.874	0.679	0.828	0.833	0.875	0.713	0.781
Total Dissolved Solids	-0.306	0.347	0.537	-0.025	0.422	0.680	0.338	0.722	0.597	0.600	0.681	0.337
Turbidity	0.350	-0.675	-0.577	0.451	-0.706	-0.514	-0.793	-0.521	-0.507	-0.597	-0.317	-0.732
Alkalinity	-0.311	0.533	0.569	-0.168	0.502	0.720	0.672	0.637	0.663	0.567	0.527	0.577
Nitrate	-0.388	0.611	0.522	-0.401	0.624	0.820	0.574	0.936	0.756	0.714	0.758	0.525
Total Organic Carbon	0.006	0.241	0.445	0.123	0.382	0.437	0.311	0.373	0.456	0.509	0.440	0.363
Total Phosphorus	0.225	-0.497	-0.090	0.299	-0.287	-0.198	-0.345	-0.303	-0.331	-0.410	-0.349	-0.385
Chloride	-0.327	0.676	0.584	-0.263	0.660	0.854	0.586	0.855	0.794	0.821	0.818	0.582
Sulphate	-0.249	0.469	0.293	-0.235	0.559	0.210	0.679	0.153	0.282	0.470	0.051	0.615
Aluminum (total)	0.412	-0.689	-0.336	0.405	-0.701	-0.499	-0.835	-0.502	-0.529	-0.581	-0.307	-0.730
Barium (total)	-0.118	0.573	0.500	-0.151	0.781	0.656	0.758	0.529	0.632	0.761	0.352	0.779
Copper (total)	0.125	-0.076	0.168	0.111	-0.270	0.204	-0.348	0.269	0.162	0.086	0.415	-0.310
Manganese (total)	0.363	-0.651	-0.397	0.409	-0.716	-0.540	-0.874	-0.471	-0.556	-0.592	-0.275	-0.795
Molybdenum (total)	-0.278	0.756	0.648	-0.228	0.573	0.829	0.549	0.876	0.825	0.718	0.834	0.602
Nickel (total)	-0.092	0.324	0.385	-0.114	0.252	0.601	0.142	0.580	0.551	0.519	0.732	0.198
Potassium (total)	-0.269	0.686	0.462	-0.290	0.763	0.541	0.852	0.456	0.574	0.618	0.253	0.852
Silicon (total)	-0.360	0.658	0.571	-0.321	0.583	0.792	0.524	0.942	0.746	0.722	0.772	0.523
Sodium (total)	0	1	1	0	1	1	1	1	1	1	1	0.752
Strontium (total)	-0.285	0.667	0.590	-0.239	0.619	0.857	0.560	0.902	0.820	0.731	0.814	0.582
Tin (total)	-0.216	0.576	0.407	-0.158	0.537	0.767	0.396	0.816	0.696	0.726	0.775	0.440
Uranium (total)	-0.272	0.702	0.578	-0.111	0.745	0.879	0.652	0.760	0.872	0.795	0.726	0.684
Aluminum (dissolved)	1	-0.235	0.010	0.456	-0.259	-0.264	-0.300	-0.336	-0.153	-0.306	-0.293	-0.203
Barium (dissolved)	-0.235	1	0.447	-0.319	0.662	0.614	0.690	0.664	0.696	0.683	0.563	0.695
Copper (dissolved)	0.010	0.447	1	-0.018	0.438	0.625	0.473	0.612	0.623	0.485	0.569	0.519
Manganese (dissolved)	0.456	-0.319	-0.018	1	-0.164	-0.101	-0.191	-0.305	-0.010	-0.222	-0.129	-0.122
Molybdenum (dissolved)	-0.259	0.662	0.438	-0.164	1	0.738	0.823	0.601	0.782	0.824	0.451	0.877
Nickel (dissolved)	-0.264	0.614	0.625	-0.101	0.738	1	0.667	0.842	0.921	0.761	0.720	0.698
Potassium (dissolved)	-0.300	0.690	0.473	-0.191	0.823	0.667	1	0.594	0.729	0.676	0.430	0.839
Silicon (dissolved)	-0.336	0.664	0.612	-0.305	0.601	0.842	0.594	1	0.807	0.719	0.809	0.547
Sodium (dissolved)	-0.153	0.696	0.623	-0.010	0.782	0.921	0.729	0.807	1	0.781	0.729	0.753
Strontium (dissolved)	-0.306	0.683	0.485	-0.222	0.824	0.761	0.676	0.719	0.781	1	0.640	0.732
Tin (dissolved)	-0.293	0.563	0.569	-0.129	0.451	0.720	0.430	0.809	0.729	0.640	1	0.426
Uranium (dissolved)	-0.203	0.695	0.519	-0.122	0.877	0.698	0.839	0.547	0.753	0.732	0.426	1

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 36.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.48: *In Situ* Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Winter, Mary River Project CREMP, 2017

Depth (m)	Temperature (°C)					Dissolved Oxygen (mg/L)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3
Date Collected	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17	13/Apr/17
1.0	0.0	0.0	0.2	0.0	0.2	13.59	14.64	15.17	15.54	14.69	93.0	100.2	104.3	106.5	101.0	7.30	7.36	7.69	7.54	7.30	186	176	197	179	185
2.0	0.3	0.2	1.1	0.3	1.0	13.42	14.55	15.11	15.57	14.68	92.6	100.1	107.1	107.5	103.1	7.30	7.36	7.65	7.53	7.33	186	174	205	177	184
3.0	1.1	1.4	1.6	1.4	1.4	13.28	14.21	14.78	14.97	14.57	93.7	101.2	105.9	106.5	103.8	7.30	7.38	7.63	7.54	7.35	184	171	204	171	182
4.0	1.3		1.7	1.7	1.7	13.22		14.66	14.69	14.44	93.8		105.3	105.5	103.5	7.30		7.62	7.53	7.37	184		203	170	180
5.0	1.5		1.7	1.7	1.7	13.13		14.61	14.61	14.39	93.6		105.0	104.9	103.2	7.30		7.61	7.52	7.37	183		201	170	180
6.0	1.5		1.8	1.7	1.7	13.11		14.58	14.57	14.37	93.6		104.8	104.6	103.2	7.30		7.60	7.52	7.37	183		199	170	180
7.0			1.8	1.7	1.7			14.57	14.51	14.45			104.7	104.3	103.7			7.53	7.51	7.38			197	171	180
8.0			1.8	1.8	1.7			14.57	14.06	14.43			104.8	101.1	103.7			7.58	7.50	7.39			195	171	179
9.0				1.8	1.8				13.87	14.30				99.8	102.8				7.48	7.39				171	179
10.0				1.8	1.8				13.76	14.33				99.1	103.1				7.47	7.39				172	179
11.0				1.8	1.8				13.47	14.33				97.1	103.2				7.46	7.39				173	179
12.0				1.9	1.8				12.18	14.30				88.0	103.0				7.43	7.39				174	179
13.0				1.9	1.9				12.91	11.72				79.0	84.6				7.38	7.35				175	179
14.0					1.9					10.42					75.4					7.31					180

Notes:
Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 6.5, 3.9, 8.3, 13.5, and 14.7 m, respectively, at the time of winter sampling.
Ice thickness at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 1.6, 1.8, 1.75, 1.75, and 1.8 m, respectively, at the time of winter sampling.
Deepest measurement at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 5.5, 2.8, 8.0, 12.5, and 13.7 m, respectively, at the time of winter sampling.

Table C.49: ***In Situ*** **Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Summer, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)					Dissolved Oxygen (mg/L)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3
Date Collected	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17	23/Jul/17
1.0	7.5	7.3	7.1	7.2	7.4	11.93	12.19	12.11	11.95	12.03	99.4	101.1	99.9	99.2	99.7	7.94	8.00	7.92	8.02	7.98	88	84	82	82	83
2.0	7.5	7.3	7.0	7.2	7.4	12.17	12.18	12.13	12.13	12.17	101.4	101.1	100.0	100.2	101.2	7.95	7.98	7.90	8.00	7.97	87	84	82	82	83
3.0	7.5	7.2	7.0	7.1	7.4	12.20	12.18	12.13	12.17	12.19	101.7	101.0	100.0	100.6	101.3	7.97	7.97	7.91	7.98	7.96	87	84	82	82	83
4.0	7.5	7.2	7.0	7.1	7.4	12.21	12.18	12.13	12.17	12.20	101.8	101.0	99.9	100.5	101.4	7.97	7.96	7.91	7.96	7.96	88	84	82	82	83
5.0	7.5		7.0	7.1	7.3	12.22		12.13	12.15	12.20	101.8		99.9	100.4	101.4	7.97		7.91	7.95	7.96	88		82	82	83
6.0	7.5		7.0	7.0	7.3	12.23		12.10	12.14	12.19	101.9		99.7	100.1	101.3	7.97		7.91	7.93	7.95	88		82	82	83
7.0			6.9	7.0	7.3			12.10	12.14	12.19			99.0	100.1	101.2			7.91	7.93	7.95			82	82	83
8.0			6.9	7.0	7.3			12.07	12.12	12.19			99.1	99.8	101.1			7.90	7.93	7.95			82	82	83
9.0				6.9	7.3				12.10	12.19				99.5	101.2				7.92	7.95				82	83
10.0				6.9	7.3				12.08	12.18				99.4	101.1				7.92	7.95				82	83
11.0				6.9	7.2				12.07	12.14				99.2	100.5				7.91	7.95				82	82
12.0				6.9	7.2				12.05	12.15				99.0	100.5				7.90	7.94				82	82
13.0				6.8	7.2				12.03	12.15				98.7	100.5				7.90	7.94				82	82
14.0					7.2					12.14					100.4					7.94					82

Note:
Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 7.1, 5.0, 9.3, 13.8, and 14.9 m, respectively, at the time of summer sampling.

Table C.50: ***In Situ*** **Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)						Dissolved Oxygen (mg/L)						Dissolved Oxygen (% Saturation)					
	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-3
Date Collected	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**22-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**22-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**21-Aug-17**	**22-Aug-17**
surface						8.6						11.21						96.0
1.0	8.3	8.6	9.1	9.0	8.7	8.6	11.3	11.5	11.6	12.0	11.6	11.13	96.2	98.6	100.3	103.7	99.5	95.3
2.0	8.2	8.6	8.8	9.0	8.3	8.6	11.3	11.4	11.5	11.8	11.5	11.11	96.0	98.1	98.6	101.4	98.4	95.2
3.0	8.2	8.5	8.7	8.7	8.6	8.6	11.3	11.4	11.4	11.7	11.4	11.09	95.9	97.7	98.1	100.0	98.0	95.0
4.0	8.2	8.5	8.6	8.6	8.5	8.5	11.3	11.4	11.3	11.5	11.4	11.07	96.0	97.2	97.0	98.6	97.1	94.9
5.0	8.2		8.5	8.5	8.5	-	11.3		11.3	11.3	11.3	-	95.5		96.2	96.9	96.9	-
6.0	8.2		8.4	8.4	8.5	8.5	11.3		11.2	11.3	11.3	11.08	95.6		95.7	96.2	96.7	94.7
7.0			8.4	8.4	8.5	8.5			11.2	11.3	11.3	11.04			95.4	96.0	96.2	94.3
8.0			8.4	8.4	8.5	8.5			11.1	11.2	11.2	11.06			94.7	95.8	96.0	94.5
9.0				8.4	8.4	8.4				11.2	11.2	11.02				95.4	95.9	94.0
10.0				8.4	8.4	8.4				11.2	11.1	11.05				95.3	94.8	94.2
11.0				8.4	8.3	8.3				11.1	11.1	11.02				94.9	94.1	93.7
12.0				8.3	8.0	8.1				11.1	10.6	10.81				94.4	89.7	91.9
13.0					8.0	8.1					10.6	10.65					89.0	90.3

Notes:
21-Aug-17 sampling was conducted by Baffinland. 22-Aug-17 sampling was conducted by Minnow.
Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 6.85, 4.3, 8.4, 12.6, and 13.85 m, respectively, at the time of fall sampling.

Table C.50: ***In Situ*** **Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017**

Depth (m)	pH (pH units)						Specific Conductance (µS/cm)					
	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-3	DLO-02-6	DLO-02-7	DLO-02-4	DLO-02-8	DLO-02-3	DLO-02-3
Date Collected	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	22-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	22-Aug-17
surface						7.81						99
1.0	7.91	7.72	7.70	7.74	7.72	7.84	85	83	84	84	84	99
2.0	7.80	7.70	7.68	7.72	7.70	7.82	85	83	83	83	83	99
3.0	7.76	7.69	7.68	7.70	7.69	7.86	85	83	83	83	83	98
4.0	7.73	7.68	7.67	7.68	7.68	7.87	85	83	83	83	83	98
5.0	7.71		7.65	7.66	7.67	-	85		83	83	83	-
6.0	7.70		7.64	7.64	7.67	7.85	85		83	83	83	98
7.0			7.62	7.63	7.66	7.86			83	83	83	98
8.0			7.60	7.63	7.66	7.86			84	83	83	98
9.0				7.62	7.65	7.82				83	84	98
10.0				7.61	7.64	7.86				83	83	98
11.0				7.60	7.61	7.85				83	83	98
12.0				7.60	7.55	7.84				83	83	99
13.0					7.52	7.80					83	99

Notes:
21-Aug-17 sampling was conducted by Baffinland. 22-Aug-17 sampling was conducted by Minnow.
Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 6.85, 4.3, 8.4, 12.6, and 13.85 m, respectively, at the time of fall sampling.

Table C.51: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Sheardown Lake SE Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017

Categorization & Replicate ID		Date Sampled	Station Depth (m)	Secchi Depth (m)	Depth sampled	Temperature (°C)	Dissolved Oxygen		pH (units)	Specific Conductance (µS/cm)
							(mg/L)	(% sat.)		
Littoral (Shallow) Stations	DLO-02-1	22-Aug-17	11.5	2.8	surface	8.20	11.23	95.3	8.00	100
					bottom	7.94	10.99	93.0	7.93	102
	DLO-02-11	22-Aug-17	8.0	1.7	surface	8.69	11.13	95.6	7.88	99
					bottom	8.68	11.05	94.9	7.82	99
	DLO-02-10	22-Aug-17	7.5	1.7	surface	8.69	11.25	96.9	8.08	99
					bottom	8.68	10.92	93.5	7.72	99
	DLO-02-4	22-Aug-17	8.8	2.6	surface	8.54	11.08	94.8	8.09	99
					bottom	8.51	9.99	85.7	7.88	99
	DLO-02-9	22-Aug-17	9.7	2.8	surface	8.56	11.44	97.9	7.98	98
					bottom	8.47	10.89	93.1	7.70	99
Profundal (Deep) Stations	DLO-02-12	22-Aug-17	10.5	1.9	surface	8.60	11.26	96.5	8.08	99
					bottom	8.54	11.10	95.0	7.80	99
	DLO-02-8	22-Aug-17	12.5	2.1	surface	8.56	11.25	96.3	8.08	99
					bottom	8.47	11.11	94.9	7.84	99
	DLO-02-13	22-Aug-17	13.2	2.2	surface	8.55	11.22	96.0	8.05	99
					bottom	8.26	10.78	91.8	7.52	100
	DLO-02-2	22-Aug-17	12.5	2.5	surface	8.55	11.14	95.4	8.04	99
					bottom	8.41	11.07	94.4	7.95	98
	DLO-02-3	22-Aug-17	13.5	3.0	surface	8.58	11.21	96.0	7.81	99
					bottom	8.11	10.65	90.3	7.80	99

Table C.52: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake SE Littoral and Profundal Stations, Mary River Project CREMP, August 2017

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Lake Zone	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	NO	0.879	β , ζ	Littoral	5	2.32	0.57	0.26	1.70	2.80
				Profundal	5	2.34	0.43	0.19	1.90	3.00
Temperature (˚C)	NO	0.548	α	Littoral	5	8.46	0.30	0.14	7.94	8.68
				Profundal	5	8.36	0.17	0.08	8.11	8.54
Dissolved Oxygen (mg/L)	NO	0.446	β , ζ	Littoral	5	10.8	0.4	0.2	10.0	11.1
				Profundal	5	10.9	0.2	0.1	10.7	11.1
Dissolved Oxygen (% saturation)	NO	0.524	β , ζ	Littoral	5	92.0	3.6	1.6	85.7	94.9
				Profundal	5	93.3	2.1	0.9	90.3	95.0
pH (units)	NO	0.747	α	Littoral	5	7.81	0.10	0.04	7.70	7.93
				Profundal	5	7.78	0.16	0.07	7.52	7.95
Specific Conductance (umho/cm)	NO	0.428	β , ζ	Littoral	5	99.7	1.5	0.7	98.8	102.4
				Profundal	5	99.1	0.7	0.3	98.1	100.0

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.53: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake SE and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	NO	0.470	α	Reference	5	9.74	1.04	0.46	8.50	11.20
					Sheardown SE	5	9.10	1.58	0.71	7.50	11.50
	Secchi Depth (m)	YES	< 0.001	β , ζ	Reference	5	8.26	0.74	0.33	7.50	9.40
					Sheardown SE	5	2.32	0.57	0.26	1.70	2.80
	Temperature (˚C)	NO	0.325	α	Reference	5	8.29	0.16	0.07	8.05	8.42
					Sheardown SE	5	8.46	0.30	0.14	7.94	8.68
	Dissolved Oxygen (mg/L)	YES	0.001	β , ζ	Reference	5	11.8	0.1	0.0	11.7	11.9
					Sheardown SE	5	10.8	0.4	0.2	10.0	11.1
	Dissolved Oxygen (% saturation)	YES	0.002	β , ζ	Reference	5	100.3	0.9	0.4	99.0	101.0
					Sheardown SE	5	92.0	3.6	1.6	85.7	94.9
	pH (units)	YES	0.003	α	Reference	5	7.43	0.17	0.08	7.31	7.72
					Sheardown SE	5	7.81	0.10	0.04	7.70	7.93
	Specific Conductance (umho/cm)	YES	< 0.001	β , ζ	Reference	5	73.7	0.6	0.3	73.2	74.6
					Sheardown SE	5	99.7	1.5	0.7	98.8	102.4
Profundal (Deep) Stations	Station Depth (m)	YES	< 0.001	α	Reference	5	20.56	2.17	0.97	18.50	24.20
					Sheardown SE	5	12.44	1.17	0.52	10.50	13.50
	Secchi Depth (m)	YES	< 0.001	α	Reference	5	8.28	0.43	0.19	7.90	9.00
					Sheardown SE	5	2.34	0.43	0.19	1.90	3.00
	Temperature (˚C)	YES	0.015	α	Reference	5	7.48	0.61	0.27	6.47	8.10
					Sheardown SE	5	8.36	0.17	0.08	8.11	8.54
	Dissolved Oxygen (mg/L)	YES	0.037	α	Reference	5	11.6	0.5	0.2	10.7	12.0
					Sheardown SE	5	10.9	0.2	0.1	10.7	11.1
	Dissolved Oxygen (% saturation)	YES	0.063	α , η	Reference	5	97.3	3.6	1.6	93.0	100.7
					Sheardown SE	5	93.3	2.1	0.9	90.3	95.0
	pH (units)	YES	< 0.001	α	Reference	5	7.29	0.06	0.03	7.23	7.37
					Sheardown SE	5	7.78	0.16	0.07	7.52	7.95
	Specific Conductance (umho/cm)	YES	< 0.001	α , η	Reference	5	76.1	3.5	1.5	73.2	80.6
					Sheardown SE	5	99.1	0.7	0.3	98.1	100.0

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.54: Water chemistry at Sheardown Lake SE (DLO-02) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Winter Sampling Event								
					DL0-02-6 bottom 13-Apr-17	DL0-02-6 surface 13-Apr-17	DL0-02-7 surface 13-Apr-17	DL0-02-4 bottom 13-Apr-17	DL0-02-4 surface 13-Apr-17	DL0-02-8 bottom 13-Apr-17	DL0-02-8 surface 13-Apr-17	DL0-02-3 bottom 13-Apr-17	DL0-02-3 surface 13-Apr-17
Conventionals	Conductivity (lab)	umho/cm	-	-	172	178	160	153	160	154	161	156	157
	pH (lab)	pH	6.5 - 9.0	-	7.42	7.43	7.53	7.60	7.58	7.40	7.59	7.40	7.63
	Hardness (as $CaCO_3$)	mg/L	-	-	87	90	77	75	79	75	81	75	78
	Total Suspended Solids (TSS)	mg/L	-	-	2.5	<2.0	<2.0	<2.0	<2.0	3.6	3.2	2.0	3.4
	Total Dissolved Solids (TDS)	mg/L	-	-	91	91	80	69	73	73	73	67	72
	Turbidity	NTU	-	-	0.3	0.6	0.4	1.0	0.3	0.7	0.3	0.4	0.3
	Alkalinity (as $CaCO_3$)	mg/L	-	-	79	81	77	75	76	70	79	72	73
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	0.052	<0.020	<0.020	<0.020	<0.020	0.026
	Nitrate	mg/L	13	13	0.051	0.050	0.023	<0.020	<0.020	0.037	0.024	0.055	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	0.49	0.23	0.17	0.18	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	2.0	2.0	1.9	2.1	1.8	1.6	2.0	1.7	2.0
	Total Organic Carbon	mg/L	-	-	2.0	1.9	1.9	1.8	1.9	1.8	2.0	1.6	1.9
	Total Phosphorus	mg/L	0.020[α]	-	0.0070	0.0054	0.0051	0.0067	0.0037	0.0054	0.0087	0.0039	0.0046
	Phenols	mg/L	0.004[α]	-	<0.0010	0.0015	0.0014	0.0038	<0.0010	<0.0010	<0.0010	<0.0010	0.0012
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	3.6	3.7	2.7	3.2	3.3	3.2	3.3	3.3	4.7
	Sulphate (SO_4)	mg/L	218[β]	218	3.9	3.9	2.7	3.4	3.6	3.3	3.6	3.1	2.8
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173[c]	<0.003	<0.003	0.004	0.005	<0.003	0.006	<0.003	0.004	<0.003
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0087	0.0089	0.0081	0.0076	0.0079	0.0075	0.0081	0.0076	0.0078
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	17	18	17	16	16	16	16	16	16
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0009	0.0008	0.0009	0.0008	0.0009	0.0008	0.0010	0.0008	0.0008
	Iron (Fe)	mg/L	0.30	0.300	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	0.0011	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	10.9	10.8	9.5	9.1	10.2	9.4	10.1	9.4	9.8
	Manganese (Mn)	mg/L	0.935[β]	-	0.0032	0.0037	0.0025	0.0032	0.0015	0.0038	0.0017	0.0038	0.0015
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002
	Molybdenum (Mo)	mg/L	0.073	-	0.00065	0.00066	0.00063	0.00060	0.00063	0.00056	0.00065	0.00054	0.00063
	Nickel (Ni)	mg/L	0.025	0.025	0.00076	0.00079	0.00067	0.00065	0.00071	0.00065	0.00075	0.00064	0.00066
	Potassium (K)	mg/L	-	-	1.40	1.46	1.28	1.24	1.32	1.22	1.34	1.20	1.27
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.81	0.83	0.65	0.61	0.64	0.76	0.64	0.87	0.61
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.8	1.9	1.7	1.6	1.8	1.7	1.8	1.6	1.7
	Strontium (Sr)	mg/L	-	-	0.011	0.012	0.011	0.010	0.011	0.010	0.011	0.010	0.011
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	0.00051	0.00119	0.00057	0.00098	0.00037	0.00123	0.00083	0.00077	0.00074
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0010	0.0010	0.0009	0.0009	0.0010	0.0009	0.0010	0.0009	0.0009
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

[c] Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.54: Water chemistry at Sheardown Lake SE (DLO-02) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Summer Sampling Event								
					DL0-02-6 bottom 23-Jul-17	DL0-02-6 surface 23-Jul-17	DL0-02-7 surface 23-Jul-17	DL0-02-4 bottom 23-Jul-17	DL0-02-4 surface 23-Jul-17	DL0-02-8 bottom 23-Jul-17	DL0-02-8 surface 23-Jul-17	DL0-02-3 bottom 23-Jul-17	DL0-02-3 surface 23-Jul-17
Conventionals	Conductivity (lab)	umho/cm	-	-	96	96	93	90	90	90	90	90	91
	pH (lab)	pH	6.5 - 9.0	-	7.76	7.85	7.86	7.74	7.78	7.67	7.71	7.78	7.77
	Hardness (as $CaCO_3$)	mg/L	-	-	46	46	43	42	43	43	43	43	43
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	2.4	2.3	<2.0	2.4	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	54	50	43	46	55	48	50	67	46
	Turbidity	NTU	-	-	1.5	1.7	1.1	1.6	1.8	1.5	1.5	1.3	1.6
	Alkalinity (as $CaCO_3$)	mg/L	-	-	44	45	41	43	42	40	41	43	40
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.5	1.5	1.5	1.5	1.6	1.4	1.5	1.5	1.5
	Total Organic Carbon	mg/L	-	-	1.5	1.4	1.5	1.4	1.4	1.4	1.5	1.4	1.5
	Total Phosphorus	mg/L	0.020[α]	-	0.0045	0.0045	0.0104	0.0063	0.0062	0.0047	0.0064	0.0049	0.0054
	Phenols	mg/L	0.001[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	2.1	2.1	2.0	2.0	2.0	2.0	2.0	1.9	2.0
	Sulphate (SO_4)	mg/L	218[β]	218	2.7	2.7	2.5	2.4	2.4	2.4	2.4	2.4	2.4
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173[c]	0.028	0.024	0.033	0.038	0.038	0.040	0.035	0.036	0.034
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0048	0.0047	0.0046	0.0046	0.0046	0.0046	0.0047	0.0045	0.0046
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	9	9	9	8	8	8	8	8	8
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	0.0013	<0.0010
	Iron (Fe)	mg/L	0.30	0.300	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Lead (Pb)	mg/L	0.001	0.001	0.000053	<0.000050	0.000055	0.000056	<0.000050	0.000050	0.000059	0.000055	0.000058
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	5.6	5.5	5.5	5.0	5.0	5.1	5.2	5.1	5.4
	Manganese (Mn)	mg/L	0.935[β]	-	0.0042	0.0041	0.0045	0.0052	0.0048	0.0052	0.0047	0.0046	0.0046
	Mercury (Hg)	mg/L	0.000026	-	0.00002	0.00001	0.00002	<0.00001	<0.00001	0.00001	0.00002	0.00003	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00046	0.00047	0.00044	0.00041	0.00040	0.00041	0.00039	0.00039	0.00043
	Nickel (Ni)	mg/L	0.025	0.025	0.00059	0.00058	0.00062	0.00057	0.00054	0.00066	0.00057	0.00059	0.00068
	Potassium (K)	mg/L	-	-	0.82	0.78	0.79	0.78	0.74	0.78	0.78	0.76	0.78
	Selenium (Se)	mg/L	0.001	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	0.43	0.41	0.43	0.43	0.43	0.45	0.43	0.44	0.42
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Strontium (Sr)	mg/L	-	-	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Tin (Sn)	mg/L	-	-	0.00042	0.00019	0.00061	0.00068	0.00083	0.00038	0.00057	0.00077	0.00105
	Titanium (Ti)	mg/L	-	-	0.0014	0.0012	0.0016	0.0018	0.0017	0.0018	0.0017	0.0020	0.0015
	Uranium (U)	mg/L	0.015	-	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

[c] Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.54: Water chemistry at Sheardown Lake SE (DLO-02) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Fall Sampling Event									
					DL0-02-6 bottom 21-Aug-17	DL0-02-6 surface 21-Aug-17	DL0-02-7 bottom 21-Aug-17	DL0-02-7 surface 21-Aug-17	DL0-02-4 bottom 21-Aug-17	DL0-02-4 surface 21-Aug-17	DL0-02-8 bottom 21-Aug-17	DL0-02-8 surface 21-Aug-17	DL0-02-3 bottom 21-Aug-17	DL0-02-3 surface 21-Aug-17
Conventionals	Conductivity (lab)	umho/cm	-	-	104	104	102	102	102	102	102	102	102	102
	pH (lab)	pH	6.5 - 9.0	-	7.90	7.91	7.90	7.93	7.94	7.94	7.90	7.88	7.88	7.96
	Hardness (as $CaCO_3$)	mg/L	-	-	48	49	48	48	49	49	48	47	48	50
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	2.1	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	60	48	47	44	41	50	45	30	44	46
	Turbidity	NTU	-	-	4.2	3.9	3.8	3.4	4.4	3.2	4.4	3.6	4.7	3.8
	Alkalinity (as $CaCO_3$)	mg/L	-	-	43	44	41	51	47	42	43	45	44	43
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.4	1.4	1.3	1.7	1.3	1.2	1.3	1.2	1.3	1.5
	Total Organic Carbon	mg/L	-	-	1.5	1.5	1.4	1.5	1.4	1.4	1.4	1.5	1.4	1.5
	Total Phosphorus	mg/L	0.020[α]	-	0.0060	0.0076	0.0042	0.0076	0.0068	0.0055	0.0072	0.0067	0.0080	0.0072
	Phenols	mg/L	0.001[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Sulphate (SO_4)	mg/L	218[β]	218	3.1	3.1	3.0	3.0	3.0	3.0	2.9	3.0	2.9	3.0
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173[c]	0.091	0.081	0.090	0.088	0.087	0.078	0.085	0.067	0.074	0.087
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0061	0.0060	0.0063	0.0060	0.0061	0.0061	0.0062	0.0060	0.0060	0.0061
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00009	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	10	10	9	10	9	9	10	9	10	9
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0009	0.0008	0.0009	0.0008	0.0008	0.0009	0.0009	0.0008	0.0008	0.0008
	Iron (Fe)	mg/L	0.30	0.300	0.064	0.069	0.068	0.062	0.069	0.060	0.073	0.057	0.057	0.063
	Lead (Pb)	mg/L	0.001	0.001	0.000094	0.000091	0.000087	0.000095	0.000100	0.000083	0.000099	0.000082	0.000086	0.000093
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	6.0	5.9	5.8	6.0	6.0	5.8	5.9	6.0	6.0	5.9
	Manganese (Mn)	mg/L	0.935[β]	-	0.0040	0.0038	0.0036	0.0037	0.0041	0.0034	0.0042	0.0034	0.0034	0.0034
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00043	0.00045	0.00042	0.00043	0.00043	0.00045	0.00044	0.00042	0.00043	0.00044
	Nickel (Ni)	mg/L	0.025	0.025	0.00062	0.00059	0.00058	0.00058	0.00061	0.00058	0.00062	0.00058	0.00056	0.00057
	Potassium (K)	mg/L	-	-	0.94	0.93	0.92	0.92	0.91	0.92	0.93	0.91	0.91	0.91
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.60	0.59	0.62	0.63	0.60	0.62	0.64	0.59	0.58	0.62
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	Strontium (Sr)	mg/L	-	-	0.007	0.007	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

[c] Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.55: Dissolved Metal Concentrations at Sheardown Lake SE Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Winter Sampling Event									Summer Sampling Event				
			DL0-02-6 bottom 13-Apr-17	DL0-02-6 surface 13-Apr-17	DL0-02-7 surface 13-Apr-17	DL0-02-4 bottom 13-Apr-17	DL0-02-4 surface 13-Apr-17	DL0-02-8 bottom 13-Apr-17	DL0-02-8 surface 13-Apr-17	DL0-02-3 bottom 13-Apr-17	DL0-02-3 surface 13-Apr-17	DL0-02-6 bottom 23-Jul-17	DL0-02-6 surface 23-Jul-17	DL0-02-7 surface 23-Jul-17	DL0-02-4 bottom 23-Jul-17	DL0-02-4 surface 23-Jul-17
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0049	0.0046	0.0054	0.005	0.0053
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00872	0.00885	0.00775	0.00762	0.00792	0.00733	0.00816	0.00735	0.00763	0.00482	0.0046	0.00454	0.00451	0.00442
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	17.7	18.0	15.7	14.6	15.5	14.7	16.2	14.8	15.4	9.08	8.91	8.52	8.36	8.23
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00084	0.00084	0.00082	0.00080	0.00089	0.00079	0.00085	0.00074	0.00080	0.00063	0.00066	0.00082	0.00057	0.00087
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.00130	0.00100	<0.0010	<0.0010	<0.0010	<0.0010	0.00110	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	10.40	10.8	9.28	9.42	9.68	9.31	9.96	9.29	9.67	5.55	5.67	5.33	5.2	5.34
	Manganese (Mn)	mg/L	0.00035	0.000626	0.000486	0.000160	0.000476	0.000326	0.000305	0.000317	0.00016	0.000358	0.000378	0.000301	0.000247	0.000323
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000021	0.000012	<0.000010
	Molybdenum (Mo)	mg/L	0.000667	0.000661	0.000617	0.000589	0.000632	0.000554	0.000651	0.000540	0.000615	0.000442	0.000437	0.0004	0.000386	0.000387
	Nickel (Ni)	mg/L	0.000740	0.000770	0.000680	0.000660	0.000695	0.000600	0.000700	0.000610	0.000650	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	1.39	1.44	1.28	1.24	1.27	1.20	1.32	1.19	1.26	0.82	0.84	0.8	0.78	0.78
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.770	0.810	0.640	0.590	0.620	0.760	0.650	0.840	0.590	0.36	0.38	0.36	0.37	0.36
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.80	1.81	1.67	1.66	1.70	1.62	1.79	1.59	1.68	1.1	1.07	1.08	1.03	1.01
	Strontium (Sr)	mg/L	0.0119	0.0120	0.0108	0.00985	0.01055	0.00991	0.01100	0.01030	0.01040	0.0061	0.00599	0.00589	0.00579	0.00573
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00127	0.00082	0.00072	0.00127	0.00136	0.00245	0.00199	0.00169	0.00122	0.00104	0.00059	0.00108	0.00084	0.0008
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.001030	0.001060	0.000973	0.000940	0.000981	0.000914	0.001020	0.000912	0.000960	0.000551	0.000556	0.000521	0.000498	0.000495
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.55: Dissolved Metal Concentrations at Sheardown Lake SE Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Summer Sampling Event				Fall Sampling Event									
			DL0-02-8 bottom 23-Jul-17	DL0-02-8 surface 23-Jul-17	DL0-02-3 bottom 23-Jul-17	DL0-02-3 surface 23-Jul-17	DL0-02-6 bottom 21-Aug-17	DL0-02-6 surface 21-Aug-17	DL0-02-7 bottom 21-Aug-17	DL0-02-7 surface 21-Aug-17	DL0-02-4 bottom 21-Aug-17	DL0-02-4 surface 21-Aug-17	DL0-02-8 bottom 21-Aug-17	DL0-02-8 surface 21-Aug-17	DL0-02-3 bottom 21-Aug-17	DL0-02-3 surface 21-Aug-17
Dissolved Metals	Aluminum (Al)	mg/L	0.0057	0.005	0.0061	0.0047	0.0081	0.0087	0.0092	0.0081	0.0073	0.0113	0.0087	0.0105	0.0124	0.0093
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00462	0.00447	0.00453	0.00455	0.00548	0.00548	0.00542	0.00531	0.00538	0.00542	0.00536	0.00546	0.00543	0.00547
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	8.38	8.81	8.48	8.43	9.4	9.8	9.3	9.5	9.7	9.8	9.4	9.3	9.5	10.0
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00085	0.001	0.00098	0.00093	0.00069	0.00070	0.00077	0.00072	0.00076	0.00070	0.00078	0.00071	0.00068	0.00073
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	5.26	5.1	5.29	5.35	6.04	5.99	6.06	5.85	6.00	5.98	5.95	5.88	5.81	5.99
	Manganese (Mn)	mg/L	0.000277	0.000312	0.000355	0.000326	0.000262	0.00025	0.000248	0.00027	0.000489	0.000352	0.000193	0.000282	0.000488	0.000304
	Mercury (Hg)	mg/L	0.000011	<0.000010	0.000027	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.00038	0.00039	0.0004	0.000398	0.000478	0.000452	0.000469	0.000467	0.000478	0.000473	0.000479	0.000465	0.000459	0.000460
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.78	0.78	0.79	0.79	0.89	0.90	0.91	0.90	0.90	0.89	0.89	0.90	0.89	0.90
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.36	0.36	0.37	0.36	0.45	0.45	0.45	0.44	0.46	0.46	0.45	0.46	0.50	0.45
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.03	1.04	1.04	1.06	1.11	1.09	1.08	1.09	1.11	1.10	1.11	1.11	1.07	1.11
	Strontium (Sr)	mg/L	0.00573	0.00578	0.00584	0.00572	0.00665	0.00687	0.00671	0.00672	0.00670	0.00656	0.00661	0.00657	0.00657	0.00654
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00055	0.00011	0.00229	0.00038	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000498	0.000503	0.000501	0.000499	0.000603	0.000611	0.000596	0.000590	0.000578	0.000587	0.000603	0.000592	0.000587	0.000603
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.56: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Sheardown Lake Southeast and Reference Lake 3 in 2017, and at Sheardown Lake Southeast Between 2017 and the Baseline Period

Dissolved Metal	Sheardown Lake SE				
	2017 vs Reference Lake 3		2017 vs Baseline		
	Summer	Fall	Winter	Summer	Fall
Aluminum (Al)	1.7	3.1	0.0	1.1	3.1
Antimony (Sb)	1.0	1.0	0.0	0.0	1.0
Arsenic (As)	1.0	1.0	1.0	0.8	1.0
Barium (Ba)	0.7	0.9	0.0	0.9	0.9
Beryllium (Be)	1.0	1.0	1.2	1.2	2.1
Cadmium (Cd)	1.0	1.0	0.4	0.0	0.8
Calcium (Ca)	1.2	1.4	1.2	0.8	0.8
Chromium (Cr)	1.0	1.0	RDL	RDL	RDL
Cobalt (Co)	1.0	1.0	1.0	1.0	0.9
Copper (Cu)	1.0	0.9	0.7	0.5	0.9
Iron (Fe)	1.0	1.0	1.2	1.2	1.7
Lead (Pb)	1.0	1.0	0.6	1.0	1.0
Lithium (Li)	1.0	1.0	0.2	0.0	0.4
Magnesium (Mg)	1.2	1.4	1.2	0.8	0.8
Manganese (Mn)	1.3	1.7	0.6	0.0	0.5
Mercury (Hg)	1.3	1.0	1.0	1.3	1.0
Molybdenum (Mo)	2.9	4.2	2.7	0.0	2.3
Nickel (Ni)	1.0	1.0	1.0	0.5	0.9
Potassium (K)	0.9	1.1	0.8	0.7	0.7
Selenium (Se)	1.0	1.0	RDL	RDL	RDL
Silicon (Si)	0.9	1.1	1.4	0.9	1.1
Silver (Ag)	1.0	1.0	1.2	1.8	2.7
Sodium (Na)	1.2	1.3	1.0	0.8	0.8
Strontium (Sr)	0.7	0.8	1.4	0.8	0.9
Thallium (Tl)	1.0	1.0	1.2	1.3	2.6
Tin (Sn)	8.5	1.0	0.9	1.5	0.1
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0
Uranium (U)	1.9	2.3	2.0	1.1	1.2
Vanadium (V)	1.0	1.0	1.0	1.0	1.0
Zinc (Zn)	1.0	1.0	1.5	1.0	1.9

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).
Denotes highly elevated concentration (mean concentration ≥ 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.57: Spearman's Rank Correlation Coefficients for Sheardown Lake SE (DLO-2) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Conventional Parameters									Total Metals													
	Conduct-ivity	Hardness	Total Dissolved Solids	Turbidity	Alkalinity	Dissolved Organic Carbon	Total Phosphorus	Chloride	Sulphate	Aluminum	Barium	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Potassium	Silicon	Sodium	Strontium	Tin	Uranium
Conductivity	1	0.957	0.602	-0.438	0.851	0.516	-0.008	0.925	0.862	-0.468	0.942	-0.606	-0.431	-0.294	-0.809	0.867	0.639	0.980	0.834	0.971	0.959	0.110	0.977
Hardness	0.957	1	0.613	-0.440	0.828	0.526	-0.018	0.883	0.836	-0.467	0.944	-0.584	-0.427	-0.304	-0.824	0.857	0.599	0.938	0.850	0.947	0.943	0.097	0.938
Total Dissolved Solids	0.602	0.613	1	-0.766	0.595	0.739	-0.411	0.624	0.414	-0.732	0.596	0.060	-0.774	-0.745	-0.389	0.651	0.608	0.598	0.492	0.599	0.533	0.588	0.583
Turbidity	-0.438	-0.440	-0.766	1	-0.523	-0.815	0.383	-0.514	-0.203	0.921	-0.430	-0.181	0.937	0.855	0.344	-0.606	-0.684	-0.445	-0.333	-0.461	-0.436	-0.714	-0.441
Alkalinity	0.851	0.828	0.595	-0.523	1	0.663	-0.018	0.865	0.681	-0.612	0.771	-0.510	-0.573	-0.444	-0.701	0.809	0.528	0.808	0.658	0.789	0.846	0.236	0.860
Dissolved Organic Carbon	0.516	0.526	0.739	-0.815	0.663	1	-0.122	0.572	0.302	-0.785	0.471	0.003	-0.835	-0.718	-0.364	0.635	0.557	0.513	0.383	0.475	0.525	0.698	0.526
Total Phosphorus	-0.008	-0.018	-0.411	0.383	-0.018	-0.122	1	-0.160	0.102	0.304	-0.064	-0.236	0.350	0.450	-0.012	-0.078	-0.204	0.006	-0.017	-0.064	0.056	-0.228	0.049
Chloride	0.925	0.883	0.624	-0.514	0.865	0.572	-0.160	1	0.798	-0.568	0.867	-0.536	-0.508	-0.414	-0.742	0.898	0.609	0.902	0.667	0.893	0.881	0.169	0.915
Sulphate	0.862	0.836	0.414	-0.203	0.681	0.302	0.102	0.798	1	-0.231	0.811	-0.633	-0.202	-0.084	-0.701	0.708	0.486	0.857	0.758	0.852	0.792	-0.041	0.859
Aluminum (total)	-0.468	-0.467	-0.732	0.921	-0.612	-0.785	0.304	-0.568	-0.231	1	-0.445	-0.111	0.945	0.878	0.348	-0.682	-0.647	-0.452	-0.263	-0.453	-0.473	-0.729	-0.480
Barium (total)	0.942	0.944	0.596	-0.430	0.771	0.471	-0.064	0.867	0.811	-0.445	1	-0.519	-0.418	-0.290	-0.794	0.807	0.587	0.956	0.872	0.954	0.917	0.072	0.916
Copper (total)	-0.606	-0.584	0.060	-0.181	-0.510	0.003	-0.236	-0.536	-0.633	-0.111	-0.519	1	-0.096	-0.193	0.528	-0.355	-0.085	-0.543	-0.561	-0.537	-0.608	0.252	-0.597
Iron (total)	-0.431	-0.427	-0.774	0.937	-0.573	-0.835	0.350	-0.508	-0.202	0.945	-0.418	-0.096	1	0.922	0.324	-0.584	-0.605	-0.414	-0.294	-0.413	-0.417	-0.799	-0.430
Lead (total)	-0.294	-0.304	-0.745	0.855	-0.444	-0.718	0.450	-0.414	-0.084	0.878	-0.290	-0.193	0.922	1	0.207	-0.505	-0.516	-0.268	-0.160	-0.288	-0.263	-0.737	-0.275
Manganese (total)	-0.809	-0.824	-0.389	0.344	-0.701	-0.364	-0.012	-0.742	-0.701	0.348	-0.794	0.528	0.324	0.207	1	-0.691	-0.356	-0.788	-0.630	-0.792	-0.740	0.123	-0.803
Molybdenum (total)	0.867	0.857	0.651	-0.606	0.809	0.635	-0.078	0.898	0.708	-0.682	0.807	-0.355	-0.584	-0.505	-0.691	1	0.682	0.862	0.632	0.850	0.873	0.258	0.861
Nickel (total)	0.639	0.599	0.608	-0.684	0.528	0.557	-0.204	0.609	0.486	-0.647	0.587	-0.085	-0.605	-0.516	-0.356	0.682	1	0.655	0.511	0.645	0.681	0.458	0.639
Potassium (total)	0.980	0.938	0.598	-0.445	0.808	0.513	0.006	0.902	0.857	-0.452	0.956	-0.543	-0.414	-0.268	-0.788	0.862	0.655	1	0.848	0.982	0.957	0.095	0.977
Silicon (total)	0.834	0.850	0.492	-0.333	0.658	0.383	-0.017	0.667	0.758	-0.263	0.872	-0.561	-0.294	-0.160	-0.630	0.632	0.511	0.848	1	0.864	0.839	0.043	0.815
Sodium (total)	0.971	0.947	0.599	-0.461	0.789	0.475	-0.064	0.893	0.852	-0.453	0.954	-0.537	-0.413	-0.288	-0.792	0.850	0.645	0.982	0.864	1	0.934	0.098	0.951
Strontium (total)	0.959	0.943	0.533	-0.436	0.846	0.525	0.056	0.881	0.792	-0.473	0.917	-0.608	-0.417	-0.263	-0.740	0.873	0.681	0.957	0.839	0.934	1	0.097	0.961
Tin (total)	0.110	0.097	0.588	-0.714	0.236	0.698	-0.228	0.169	-0.041	-0.729	0.072	0.252	-0.799	-0.737	0.123	0.258	0.458	0.095	0.043	0.098	0.097	1	0.108
Uranium (total)	0.977	0.938	0.583	-0.441	0.860	0.526	0.049	0.915	0.859	-0.480	0.916	-0.597	-0.430	-0.275	-0.803	0.861	0.639	0.977	0.815	0.951	0.961	0.108	1
Aluminum (dissolved)	-0.463	-0.448	-0.770	0.878	-0.605	-0.867	0.372	-0.589	-0.226	0.896	-0.444	-0.100	0.904	0.827	0.215	-0.636	-0.694	-0.464	-0.296	-0.448	-0.485	-0.775	-0.465
Barium (dissolved)	0.973	0.953	0.602	-0.440	0.807	0.477	-0.038	0.900	0.870	-0.466	0.934	-0.608	-0.442	-0.325	-0.834	0.836	0.651	0.948	0.804	0.940	0.925	0.085	0.946
Copper (dissolved)	-0.008	0.080	0.390	-0.521	-0.008	0.427	-0.101	-0.089	-0.092	-0.425	0.052	0.387	-0.455	-0.413	0.042	-0.012	0.467	0.014	0.095	0.017	0.039	0.549	0.029
Manganese (dissolved)	0.109	0.178	0.234	-0.135	0.265	0.053	-0.210	0.078	0.037	-0.285	0.072	0.075	-0.235	-0.217	-0.065	0.198	0.124	0.016	0.056	0.051	0.123	0.106	0.077
Molybdenum (dissolved)	0.951	0.944	0.595	-0.441	0.827	0.496	-0.036	0.871	0.825	-0.453	0.960	-0.520	-0.415	-0.262	-0.798	0.823	0.647	0.959	0.862	0.954	0.938	0.102	0.947
Nickel (dissolved)	0.829	0.824	0.755	-0.767	0.860	0.846	-0.110	0.793	0.636	-0.748	0.800	-0.293	-0.772	-0.622	-0.660	0.806	0.725	0.833	0.735	0.818	0.830	0.475	0.840
Potassium (dissolved)	0.960	0.956	0.552	-0.454	0.853	0.534	-0.025	0.893	0.843	-0.462	0.934	-0.603	-0.432	-0.299	-0.850	0.822	0.606	0.939	0.835	0.951	0.922	0.107	0.938
Silicon (dissolved)	0.919	0.911	0.549	-0.397	0.828	0.419	-0.047	0.823	0.803	-0.461	0.902	-0.669	-0.459	-0.322	-0.766	0.743	0.515	0.881	0.852	0.901	0.876	0.143	0.894
Sodium (dissolved)	0.939	0.932	0.573	-0.493	0.836	0.524	-0.013	0.907	0.829	-0.517	0.933	-0.535	-0.457	-0.297	-0.777	0.869	0.684	0.935	0.804	0.917	0.944	0.139	0.936
Strontium (dissolved)	0.969	0.937	0.582	-0.443	0.875	0.530	-0.009	0.900	0.827	-0.446	0.930	-0.590	-0.412	-0.276	-0.784	0.818	0.599	0.964	0.852	0.967	0.942	0.085	0.960
Tin (dissolved)	0.266	0.253	0.688	-0.864	0.435	0.726	-0.318	0.355	0.131	-0.830	0.226	0.224	-0.864	-0.811	-0.107	0.446	0.515	0.250	0.187	0.280	0.247	0.805	0.260
Uranium (dissolved)	0.972	0.952	0.607	-0.444	0.818	0.525	0.010	0.903	0.867	-0.466	0.954	-0.561	-0.416	-0.281	-0.815	0.852	0.621	0.974	0.839	0.955	0.942	0.088	0.971

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 28.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.57: Spearman's Rank Correlation Coefficients for Sheardown Lake SE (DLO-2) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Dissolved Metals											
	Aluminum	Barium	Copper	Manganese	Molybdenum	Nickel	Potassium	Silicon	Sodium	Strontium	Tin	Uranium
Conductivity	-0.463	0.973	-0.008	0.109	0.951	0.829	0.960	0.919	0.939	0.969	0.266	0.972
Hardness	-0.448	0.953	0.080	0.178	0.944	0.824	0.956	0.911	0.932	0.937	0.253	0.952
Total Dissolved Solids	-0.770	0.602	0.390	0.234	0.595	0.755	0.552	0.549	0.573	0.582	0.688	0.607
Turbidity	0.878	-0.440	-0.521	-0.135	-0.441	-0.767	-0.454	-0.397	-0.493	-0.443	-0.864	-0.444
Alkalinity	-0.605	0.807	-0.008	0.265	0.827	0.860	0.853	0.828	0.836	0.875	0.435	0.818
Dissolved Organic Carbon	-0.867	0.477	0.427	0.053	0.496	0.846	0.534	0.419	0.524	0.530	0.726	0.525
Total Phosphorus	0.372	-0.038	-0.101	-0.210	-0.036	-0.110	-0.025	-0.047	-0.013	-0.009	-0.318	0.010
Chloride	-0.589	0.900	-0.089	0.078	0.871	0.793	0.893	0.823	0.907	0.900	0.355	0.903
Sulphate	-0.226	0.870	-0.092	0.037	0.825	0.636	0.843	0.803	0.829	0.827	0.131	0.867
Aluminum (total)	0.896	-0.466	-0.425	-0.285	-0.453	-0.748	-0.462	-0.461	-0.517	-0.446	-0.830	-0.466
Barium (total)	-0.444	0.934	0.052	0.072	0.960	0.800	0.934	0.902	0.933	0.930	0.226	0.954
Copper (total)	-0.100	-0.608	0.387	0.075	-0.520	-0.293	-0.603	-0.669	-0.535	-0.590	0.224	-0.561
Iron (total)	0.904	-0.442	-0.455	-0.235	-0.415	-0.772	-0.432	-0.459	-0.457	-0.412	-0.864	-0.416
Lead (total)	0.827	-0.325	-0.413	-0.217	-0.262	-0.622	-0.299	-0.322	-0.297	-0.276	-0.811	-0.281
Manganese (total)	0.215	-0.834	0.042	-0.065	-0.798	-0.660	-0.850	-0.766	-0.777	-0.784	-0.107	-0.815
Molybdenum (total)	-0.636	0.836	-0.012	0.198	0.823	0.806	0.822	0.743	0.869	0.818	0.446	0.852
Nickel (total)	-0.694	0.651	0.467	0.124	0.647	0.725	0.606	0.515	0.684	0.599	0.515	0.621
Potassium (total)	-0.464	0.948	0.014	0.016	0.959	0.833	0.939	0.881	0.935	0.964	0.250	0.974
Silicon (total)	-0.296	0.804	0.095	0.056	0.862	0.735	0.835	0.852	0.804	0.852	0.187	0.839
Sodium (total)	-0.448	0.940	0.017	0.051	0.954	0.818	0.951	0.901	0.917	0.967	0.280	0.955
Strontium (total)	-0.485	0.925	0.039	0.123	0.938	0.830	0.922	0.876	0.944	0.942	0.247	0.942
Tin (total)	-0.775	0.085	0.549	0.106	0.102	0.475	0.107	0.143	0.139	0.085	0.805	0.088
Uranium (total)	-0.465	0.946	0.029	0.077	0.947	0.840	0.938	0.894	0.936	0.960	0.260	0.971
Aluminum (dissolved)	1	-0.427	-0.427	-0.177	-0.463	-0.768	-0.454	-0.413	-0.503	-0.464	-0.816	-0.449
Barium (dissolved)	-0.427	1	0.027	0.099	0.914	0.802	0.944	0.907	0.926	0.926	0.245	0.963
Copper (dissolved)	-0.427	0.027	1	0.132	0.093	0.341	0.073	-0.010	0.074	0.021	0.435	0.063
Manganese (dissolved)	-0.177	0.099	0.132	1	0.137	0.154	0.115	0.208	0.121	0.089	0.143	0.031
Molybdenum (dissolved)	-0.463	0.914	0.093	0.137	1	0.825	0.943	0.902	0.959	0.944	0.275	0.943
Nickel (dissolved)	-0.768	0.802	0.341	0.154	0.825	1	0.842	0.778	0.812	0.847	0.586	0.820
Potassium (dissolved)	-0.454	0.944	0.073	0.115	0.943	0.842	1	0.902	0.926	0.966	0.262	0.957
Silicon (dissolved)	-0.413	0.907	-0.010	0.208	0.902	0.778	0.902	1	0.860	0.900	0.297	0.883
Sodium (dissolved)	-0.503	0.926	0.074	0.121	0.959	0.812	0.926	0.860	1	0.905	0.312	0.941
Strontium (dissolved)	-0.464	0.926	0.021	0.089	0.944	0.847	0.966	0.900	0.905	1	0.278	0.955
Tin (dissolved)	-0.816	0.245	0.435	0.143	0.275	0.586	0.262	0.297	0.312	0.278	1	0.256
Uranium (dissolved)	-0.449	0.963	0.063	0.031	0.943	0.820	0.957	0.883	0.941	0.955	0.256	1

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 28.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.58: Water Chemistry at Mary River Tributary-F and Mary River CREMP and EEM Stations during Periods of Effluent Discharge in 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	Mary River Tributary-F			Mary River Upstream				Mary River Downstream						
				MRTF-1	FO-01	FO-01	MS-08-US	MS-08-US	GO-01	G0-01	E0-10	MS-08-DS	MS-08-DS	EO-21	E0-21	CO-01	CO-01
				24/Aug/17	8/Jul/17	1/Sep/17	21/Jul/17	24/Aug/17	8/Jul/17	1/Sep/17	1/Sep/17	21/Jul/17	24/Aug/17	8/Jul/17	1/Sep/17	8/Jul/17	27/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	196	51	266	50	136	30	151	158	53	141	30	164	32	143
	pH (lab)	pH	6.5 - 9.0	8.12	7.57	8.22	7.62	8.06	7.22	8.08	8.10	7.63	8.04	7.32	8.04	7.44	8.01
	Hardness (as $CaCO_3$)	mg/L	-	96	27	134	22	61	13	70	74	24	63	13	78	14	72
	Total Suspended Solids (TSS)	mg/L	-	<2.0	7.3	5.2	3.4	<2.0	3.9	<2.0	<2.0	3.6	<2.0	<2.0	<2.0	3.4	3.3
	Total Dissolved Solids (TDS)	mg/L	-	106	35	136	-	76	19	74	76	-	43	17	79	25	71
	Alkalinity (as $CaCO_3$)	mg/L	-	97	22	107	24	58	11	66	69	24	61	10	69	14	63
Nutrients and Anions	Total Ammonia	mg/L	variable[c]	0.177	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	0.116	<0.020	0.134	<0.020	<0.020	<0.020	<0.020	0.035	0.075	<0.020	<0.020	0.058	<0.020	0.070
	Total Organic Carbon	mg/L	-	<1.0	1.0	1.0	<1.0	1.4	1.3	1.1	1.2	<1.0	1.5	1.5	1.1	1.2	1.3
	Total Phosphorus	mg/L	0.020[α]	<0.0030	0.0112	0.0067	0.0065	0.0046	0.0078	0.0036	0.0038	0.0110	0.0053	0.0088	0.0037	0.0103	0.0066
	Chloride (Cl)	mg/L	120	1.3	<0.5	5.4	1.1	3.9	0.7	4.6	4.7	1.5	3.9	0.8	4.7	0.7	4.1
	Sulphate (SO_4)	mg/L	218[β]	2.8	1.2	25.3	0.6	2.4	0.3	2.9	4.3	0.7	3.0	0.4	7.5	0.6	3.8
Total Metals	Aluminum (Al)	mg/L	0.100	0.057	0.133	0.187	0.091	0.154	0.099	0.059	0.071	0.095	0.150	0.101	0.070	0.123	0.219
	Antimony (Sb)	mg/L	0.020[α]	0.00043	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	0.0076	0.0036	0.0138	0.0039	0.0091	0.0030	0.0090	0.0093	0.0037	0.0095	0.0028	0.0097	0.0030	0.0101
	Beryllium (Be)	mg/L	0.011[α]	<0.00010	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00010
	Bismuth (Bi)	mg/L	-	<0.00005	<0.00050	<0.00050	<0.00005	<0.00005	<0.00050	<0.00050	<0.00050	<0.00005	<0.00005	<0.00050	<0.00050	<0.00050	<0.00005
	Boron (B)	mg/L	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	21	5	27	5	13	3	14	15	5	13	3	16	3	14
	Chromium (Cr)	mg/L	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	<0.00010	0.00011	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013
	Copper (Cu)	mg/L	0.002	<0.0010	0.0006	0.0010	<0.0010	0.0010	0.0005	0.0008	0.0008	<0.0010	<0.0010	0.0005	0.0009	0.0005	0.0011
	Iron (Fe)	mg/L	0.30	<0.050	0.189	0.237	0.090	0.114	0.071	0.043	0.053	0.102	0.091	0.083	0.053	0.090	0.237
	Lead (Pb)	mg/L	0.001	0.000051	0.000225	0.000253	0.000112	0.000103	0.000087	<0.000050	0.000057	0.000095	0.000089	0.000087	0.000073	0.000109	0.000175
	Lithium (Li)	mg/L	-	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	11.5	3.2	16.4	2.7	6.9	1.6	8.0	8.9	3.0	7.3	1.7	8.9	1.8	8.2
	Manganese (Mn)	mg/L	0.935[β]	0.0005	0.0033	0.0068	0.0016	0.0019	0.0018	0.0006	0.0010	0.0016	0.0011	0.0017	0.0051	0.0021	0.0054
	Mercury (Hg)	mg/L	0.000026	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	0.00019	<0.00005	0.00026	0.00009	0.00031	<0.00005	0.00027	0.00026	0.00009	0.00032	0.00005	0.00056	0.00005	0.00032
	Nickel (Ni)	mg/L	0.025	<0.00050	0.00051	0.00068	0.00060	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	0.00050	<0.00050	0.00078
	Potassium (K)	mg/L	-	0.90	0.37	1.38	0.47	1.04	0.35	0.92	0.97	0.46	1.06	0.35	0.98	0.37	1.11
	Selenium (Se)	mg/L	0.001	<0.000050	<0.001000	<0.001000	<0.000050	<0.000050	<0.001000	<0.001000	<0.001000	<0.000050	<0.000050	<0.001000	<0.001000	<0.001000	<0.000050
	Silicon (Si)	mg/L	-	0.88	0.50	1.23	0.64	0.99	0.50	0.99	1.02	0.64	1.02	0.57	1.01	0.56	1.11
	Silver (Ag)	mg/L	0.00025	<0.000050	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000050
	Sodium (Na)	mg/L	-	0.9	0.3	1.8	0.7	2.2	0.5	2.3	2.3	0.6	2.1	0.4	2.3	0.5	2.4
	Strontium (Sr)	mg/L	-	0.011	0.003	0.019	0.005	0.013	0.003	0.013	0.013	0.004	0.013	0.003	0.016	0.003	0.013
	Thallium (Tl)	mg/L	0.0008	<0.00001	<0.00010	<0.00010	<0.00001	<0.00001	<0.00010	<0.00010	<0.00010	<0.00001	<0.00001	<0.00010	<0.00010	<0.00010	<0.00001
	Tin (Sn)	mg/L	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	<0.0003	<0.0100	0.0140	0.0050	0.0057	<0.0100	<0.0100	<0.0100	0.0054	0.0050	<0.0100	<0.0100	<0.0100	0.0113
	Uranium (U)	mg/L	0.015	0.0025	0.0002	0.0026	0.0003	0.0023	0.0001	0.0028	0.0028	0.0003	0.0024	0.0001	0.0027	0.0002	0.0021
	Vanadium (V)	mg/L	0.006[α]	<0.0005	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	0.0006
	Zinc (Zn)	mg/L	0.030	0.0038	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013).

Indicates parameter concentration above applicable Water Quality Guideline.

Table C.59: *In Situ* Water Quality Measurements Collected at Mary River Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017

Study Area	Station	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	pH (pH units)	Specific Conductance (µS/cm)
Mary River Upstream (GO-09)	GO-09 B1	7.3	12.00	99.6	8.00	163
	GO-09 B2	6.2	12.35	99.8	7.97	155
	GO-09 B3	4.6	12.84	99.6	7.95	153
	GO-09 B4	3.9	13.11	99.7	7.96	148
	GO-09 B5	3.0	13.45	99.8	8.06	160
Mary River Upstream (GO-03)	GO-03 B1	7.5	12.22	101.6	8.07	178
	GO-03 B2	6.3	12.59	101.8	8.05	175
	GO-03 B3	5.5	12.80	101.6	8.01	175
	GO-03 B4	6.7	12.95	100.6	7.98	175
	GO-03 B5	5.0	12.88	100.8	7.98	177
Mary River Downstream (EO-01)	EO-01 B1	5.6	12.75	101.4	8.07	176
	EO-01 B2	5.7	12.61	100.4	8.02	173
	EO-01 B3	5.1	12.84	100.9	8.01	190
	EO-01 B4	4.9	12.88	100.5	8.00	174
	EO-01 B5	4.8	12.50	99.8	7.98	177
Mary River Downstream (EO-20)	EO-20 B1	7.7	12.05	101.1	8.11	178
	EO-20 B2	7.6	12.11	101.4	8.11	178
	EO-20 B3	7.4	12.16	101.2	8.10	178
	EO-20 B4	7.2	12.23	101.3	8.10	177
	EO-20 B5	7.1	12.29	101.6	8.09	176
Mary River Downstream (CO-05)	CO-05 B1	7.0	13.60	103.9	7.98	174
	CO-05 B2	7.1	12.50	102.7	7.95	162
	CO-05 B3	5.7	12.80	102.1	7.97	167
	CO-05 B4	5.3	12.71	100.4	7.94	171
	CO-05 B5	4.9	12.72	99.4	7.94	162

Table C.60: *In Situ* Water Quality Summary for Mary River Benthic Invertebrate Community Study Areas, Mary River Project CREMP, August 2017

Metric	Station	Sample Size	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
						Lower Bound	Upper Bound		
Temperature (˚C)	GO-09	5	5.00	1.74	0.78	2.84	7.16	3.00	7.30
	GO-03	5	6.20	0.98	0.44	4.98	7.42	5.00	7.50
	EO-01	5	5.22	0.41	0.18	4.71	5.73	4.80	5.70
	EO-20	5	7.40	0.25	0.11	7.08	7.72	7.10	7.70
	CO-05	5	6.00	1.00	0.45	4.76	7.24	4.90	7.10
Dissolved Oxygen (mg/L)	GO-09	5	12.8	0.6	0.3	12.0	13.5	12.0	13.5
	GO-03	5	12.7	0.3	0.1	12.3	13.1	12.2	13.0
	EO-01	5	12.7	0.2	0.1	12.5	12.9	12.5	12.9
	EO-20	5	12.2	0.1	0.0	12.1	12.3	12.1	12.3
	CO-05	5	12.9	0.4	0.2	12.3	13.4	12.5	13.6
Dissolved Oxygen (% saturation)	GO-09	5	99.7	0.1	0.0	99.6	99.8	99.6	99.8
	GO-03	5	101.3	0.5	0.2	100.6	102.0	100.6	101.8
	EO-01	5	100.6	0.6	0.3	99.9	101.3	99.8	101.4
	EO-20	5	101.3	0.2	0.1	101.1	101.6	101.1	101.6
	CO-05	5	101.7	1.8	0.8	99.5	103.9	99.4	103.9
pH (pH units)	GO-09	5	7.99	0.04	0.02	7.93	8.04	7.95	8.06
	GO-03	5	8.02	0.04	0.02	7.97	8.07	7.98	8.07
	EO-01	5	8.02	0.03	0.02	7.97	8.06	7.98	8.07
	EO-20	5	8.10	0.01	0.00	8.09	8.11	8.09	8.11
	CO-05	5	7.96	0.02	0.01	7.93	7.98	7.94	7.98
Specific Conductance (µS/cm)	GO-09	5	155.7	6.1	2.7	148.2	163.2	147.7	163.0
	GO-03	5	175.8	1.5	0.7	174.0	177.6	174.5	178.0
	EO-01	5	178.0	6.8	3.0	169.5	186.4	173.3	189.9
	EO-20	5	177.2	0.9	0.4	176.1	178.3	175.9	178.2
	CO-05	5	167.1	5.6	2.5	160.2	174.1	161.6	173.9

Table C.61: Statistical Comparison of *In Situ* Water Quality Variables Among Mary River Benthic Invertebrate Community Study Areas, Mary River Project CREMP, August 2017

In Situ Variable	Overall 5-group Comparison			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	P-value	Statistical Test[b]	(I) Area	(J) Area	Significant Difference Between Areas?	P-value	Statistical Test
Temperature (˚C)	YES	0.0113	α	GO-09	GO-03	NO	0.922	Tamhane's
				GO-09	EO-01	NO	1.000	
				GO-09	EO-20	NO	0.306	
				GO-09	CO-05	NO	0.974	
				GO-03	EO-01	NO	0.617	
				GO-03	EO-20	NO	0.407	
				GO-03	CO-05	NO	1.000	
				EO-01	EO-20	YES	0.000	
				EO-01	CO-05	NO	0.833	
				EO-20	CO-05	NO	0.285	
Dissolved Oxygen (% Saturation)	YES	0.0160	α	GO-09	GO-03	YES	0.024	Tamhane's
				GO-09	EO-01	NO	0.238	
				GO-09	EO-20	YES	< 0.001	
				GO-09	CO-05	NO	0.505	
				GO-03	EO-01	NO	0.634	
				GO-03	EO-20	NO	1.000	
				GO-03	CO-05	NO	1.000	
				EO-01	EO-20	NO	0.412	
				EO-01	CO-05	NO	0.946	
				EO-20	CO-05	NO	1.000	
pH (pH units)	YES	< 0.001	α	GO-09	GO-03	NO	0.557	Tukey's HSD
				GO-09	EO-01	NO	0.641	
				GO-09	EO-20	YES	< 0.001	
				GO-09	CO-05	NO	0.539	
				GO-03	EO-01	NO	1.000	
				GO-03	EO-20	YES	0.004	
				GO-03	CO-05	YES	0.041	
				EO-01	EO-20	YES	0.003	
				EO-01	CO-05	YES	0.055	
				EO-20	CO-05	YES	< 0.001	
Specific Conductance (umho/cm)	YES	< 0.001	δ	GO-09	GO-03	YES	0.008	Mann-Whitney U-test
				GO-09	EO-01	YES	0.008	
				GO-09	EO-20	YES	0.008	
				GO-09	CO-05	YES	0.032	
				GO-03	EO-01	NO	1.000	
				GO-03	EO-20	NO	0.151	
				GO-03	CO-05	NO	0.310	
				EO-01	EO-20	NO	0.310	
				EO-01	CO-05	YES	0.016	
				EO-20	CO-05	YES	0.008	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

b Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - single factor ANOVA test results validated using Kruskal Wallis H-test or Mann-Whitney U-test, as appropriate; δ - data log-transformed, Kruskal Wallis test conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.62: Water chemistry at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Spring Sampling Event									
					G0-09-A 08/Jul/17	G0-09 08/Jul/17	G0-09-B 08/Jul/17	G0-03 08/Jul/17	G0-01 08/Jul/17	F0-01 08/Jul/17	E0-03 08/Jul/17	E0-21 08/Jul/17	E0-20 08/Jul/17	C0-01 08/Jul/17
Conventionals	Conductivity (lab)	umho/cm	-	-	32	29	29	29	30	51	30	30	31	32
	pH (lab)	pH	6.5 - 9.0	-	7.41	7.37	7.33	7.34	7.22	7.57	7.30	7.32	7.33	7.44
	Hardness (as $CaCO_3$)	mg/L	-	-	15	14	13	13	13	27	13	13	14	14
	Total Suspended Solids (TSS)	mg/L	-	-	4.2	2.5	<2.0	<2.0	3.9	7.3	2.1	<2.0	2.5	3.4
	Total Dissolved Solids (TDS)	mg/L	-	-	19	14	<10	16	19	35	16	17	20	25
	Turbidity	NTU	-	-	1.7	2.1	3.4	3.1	5.0	11.3	4.3	4.6	5.9	6.8
	Alkalinity (as $CaCO_3$)	mg/L	-	-	13	<10	12	12	11	22	11	10	15	14
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	0.8	1.4	1.4	1.2	1.3	0.8	1.2	1.2	1.2	1.2
	Total Organic Carbon	mg/L	-	-	1.8	1.4	1.6	1.2	1.3	1.0	1.3	1.5	1.2	1.2
	Total Phosphorus	mg/L	0.030[α]	-	0.0113	0.0092	0.0093	0.0083	0.0078	0.0112	0.0070	0.0088	0.0071	0.0103
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	0.0013	0.0015	<0.0010	0.0014	<0.0010	0.0015	0.0013	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	0.5	<0.5	0.6	0.7	0.7	<0.5	0.7	0.8	0.8	0.7
	Sulphate (SO_4)	mg/L	218[β]	218	<0.3	<0.3	<0.3	0.3	0.3	1.2	0.4	0.4	0.4	0.6
Total Metals	Aluminum (Al)	mg/L	0.100	0.966	0.037	0.041	0.084	0.107	0.099	0.133	0.118	0.101	0.117	0.123
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0027	0.0022	0.0029	0.0029	0.0030	0.0036	0.0029	0.0028	0.0030	0.0030
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	3	3	3	3	3	5	3	3	3	3
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	***0.0209***	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	0.00021	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	<0.0005	<0.0005	***0.0067***	0.0005	0.0005	0.0006	0.0005	0.0005	<0.0005	0.0005
	Iron (Fe)	mg/L	0.30	0.874	<0.030	<0.030	***2.160***	0.073	0.071	0.189	0.086	0.083	0.084	0.09
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	0.000080	0.000079	0.000087	0.000225	0.000083	0.000087	0.000084	0.000109
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	1.8	1.6	1.6	1.6	1.6	3.2	1.7	1.7	1.7	1.8
	Manganese (Mn)	mg/L	0.935[β]	-	0.0014	0.0017	0.0172	0.0017	0.0018	0.0033	0.0017	0.0017	0.0015	0.0021
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	<0.00005	<0.00005	0.00369	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.00006	0.00005
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	0.00245	<0.00050	<0.00050	0.00051	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.34	0.28	0.35	0.36	0.35	0.37	0.35	0.35	0.36	0.37
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.42	0.35	0.53	0.52	0.50	0.50	0.54	0.57	0.55	0.56
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	0.3	0.3	0.4	0.4	0.5	0.3	0.4	0.4	0.4	0.455000
	Strontium (Sr)	mg/L	-	-	0.0026	0.0021	0.0026	0.0025	0.0026	0.0029	0.0025	0.0026	0.0027	0.0027
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0002
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criter

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Mary River system.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.62: Water chemistry at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Summer Sampling Event												
					G0-09-A 10/Aug/17	G0-09 10/Aug/17	G0-09-B 10/Aug/17	G0-03 10/Aug/17	G0-01 10/Aug/17	F0-01 10/Aug/17	E0-10 10/Aug/17	E0-03 10/Aug/17	E0-21 10/Aug/17	E0-20 10/Aug/17	C0-10 10/Aug/17	C0-05 10/Aug/17	C0-01 10/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	-	74	78	85	83	85	218	109	91	91	94	94	95	98
	pH (lab)	pH	6.5 - 9.0	-	7.81	7.83	7.92	7.91	7.85	8.16	7.94	7.90	7.88	7.89	7.87	7.88	7.77
	Hardness (as $CaCO_3$)	mg/L	-	-	33	33	37	36	38	103	47	41	41	43	43	43	44
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	39	28	40	27	31	85	49	42	52	43	44	42	39
	Turbidity	NTU	-	-	12.5	10.5	8.9	6.8	6.5	2.1	6.1	6.4	6.5	6.0	6.2	3.9	4.6
	Alkalinity (as $CaCO_3$)	mg/L	-	-	34	36	38	37	37	85	41	38	39	39	38	41	45
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	0.125	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	1.0	1.1
	Total Organic Carbon	mg/L	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	1.2
	Total Phosphorus	mg/L	0.020[α]	-	0.0085	0.0082	0.0078	0.0048	0.0040	0.0041	0.0052	0.0044	0.0056	0.0042	0.0047	0.0062	0.0049
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	2.4	2.4	2.5	2.2	2.2	2.9	2.2	2.1	2.1	2.0	2.0	2.1	2.1
	Sulphate (SO_4)	mg/L	218[β]	218	1.4	1.3	1.4	1.4	1.4	21.0	3.5	2.9	2.9	2.8	2.8	2.7	3.0
Total Metals	Aluminum (Al)	mg/L	0.100	0.966	0.147	0.163	0.120	0.106	0.098	0.049	0.083	0.108	0.097	0.055	0.057	0.066	0.081
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0061	0.0065	0.0065	0.0062	0.0063	0.0116	0.0068	0.0068	0.0066	0.0066	0.0068	0.0069	0.0067
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	7	7	8	8	8	21	9	8	9	9	9	9	9
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0009	0.0008
	Iron (Fe)	mg/L	0.30	0.874	0.151	0.153	0.110	0.092	0.084	0.046	0.079	0.091	0.091	0.065	0.069	0.073	0.075
	Lead (Pb)	mg/L	0.001	0.001	0.000248	0.000200	0.000163	0.000127	0.000120	0.000056	0.000116	0.000127	0.000130	0.000108	0.000112	0.000109	0.000098
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	4.0	4.1	4.4	4.5	4.5	12.7	5.5	5.1	5.0	5.1	5.2	5.2	5.3
	Manganese (Mn)	mg/L	0.935[β]	-	0.0021	0.0019	0.0016	0.0013	0.0011	0.0015	0.0011	0.0025	0.0022	0.0019	0.0018	0.0022	0.0020
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00013	0.00014	0.00014	0.00014	0.00015	0.00029	0.00017	0.00022	0.00023	0.00022	0.00023	0.00022	0.00024
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.75	0.75	0.75	0.72	0.71	1.21	0.76	0.75	0.74	0.74	0.75	0.75	0.76
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.78	0.89	0.79	0.79	0.77	0.92	0.80	0.83	0.82	0.73	0.72	0.77	0.81
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.5	1.5	1.6	1.4	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.4	1.4
	Strontium (Sr)	mg/L	-	-	0.0081	0.0084	0.0086	0.0079	0.0082	0.015	0.0088	0.0090	0.0093	0.0089	0.0092	0.0091	0.0090
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0011	0.0011	0.0011	0.0009	0.0009	0.0021	0.0010	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Mary River system.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.62: Water chemistry at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Fall Sampling Event												
					G0-09-A 29/Aug/17	G0-09 29/Aug/17	G0-09-B 29/Aug/17	G0-03 29/Aug/17	GO-01 01/Sep/17	F0-01 01/Sep/17	E0-10 01/Sep/17	EO-03 01/Sep/17	EO-21 01/Sep/17	EO-20 01/Sep/17	C0-10 29/Aug/17	C0-05 27/Aug/17	CO-01 27/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	-	120	158	138	132	151	266	158	164	164	163	146	151	143
	pH (lab)	pH	6.5 - 9.0	-	7.93	8.09	8.01	7.99	8.08	8.22	8.10	8.06	8.04	7.99	7.98	8.01	8.01
	Hardness (as $CaCO_3$)	mg/L	-	-	52	76	62	61	70	134	74	77	78	80	66	71	72
	Total Suspended Solids (TSS)	mg/L	-	-	2.3	<2.0	<2.0	<2.0	<2.0	5.2	<2.0	<2.0	<2.0	9.5	<2.0	20.2	3.3
	Total Dissolved Solids (TDS)	mg/L	-	-	68	87	59	61	74	136	76	71	79	82	78	70	71
	Turbidity	NTU	-	-	8.3	2.8	5.8	5.3	1.8	6.3	1.9	2.3	2.2	4.5	7.4	45.3	7.6
	Alkalinity (as $CaCO_3$)	mg/L	-	-	48	77	58	59	66	107	69	73	69	69	62	63	63
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	0.057	<0.020	0.029	0.028	<0.020	0.134	0.035	0.062	0.058	0.057	0.053	0.076	0.070
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15							<0.15	0.22	0.15
	Dissolved Organic Carbon	mg/L	-	-	1.0	1.2	1.2	1.2	1.2	<1.0	1.1	1.0	1.1	1.3	1.3	1.8	1.2
	Total Organic Carbon	mg/L	-	-	<1.0	1.2	1.1	1.2	1.1	1.0	1.2	1.1	1.1	1.3	1.3	1.6	1.3
	Total Phosphorus	mg/L	0.020[α]	-	0.0097	0.0045	0.0053	0.0060	0.0036	0.0067	0.0046	0.0196	0.0037	0.0060	0.0078	0.0250	0.0066
	Phenols	mg/L	0.004[α]	-	0.0015	<0.0010	0.0012	<0.0010	<0.0010	0.0012	0.0013	0.0012	<0.0010	<0.0010	0.0023	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	5.2	2.9	4.6	4.1	4.6	5.4	4.7	4.7	4.7	4.2	3.9	5.2	4.1
	Sulphate (SO_4)	mg/L	218[β]	218	3.2	2.5	2.8	2.7	2.9	25.3	4.3	7.5	7.5	6.7	5.5	4.8	3.8
Total Metals	Aluminum (Al)	mg/L	0.100	0.966	0.186	0.087	0.168	0.167	0.059	0.187	0.071	0.108	0.070	0.072	0.178	***1.480***	0.219
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	<0.00010
	Barium (Ba)	mg/L	-	-	0.0090	0.0087	0.0090	0.0089	0.0090	0.0138	0.0093	0.0102	0.0097	0.0101	0.0095	0.0179	0.0101
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	11	16	13	13	14	27	15	15	16	15	14	15	14
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0031	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00091	0.00013
	Copper (Cu)	mg/L	0.002	0.0024	0.0014	0.0007	0.0009	0.0009	0.0008	0.0010	0.0008	0.0009	0.0009	0.0009	0.0009	***0.0025***	0.0011
	Iron (Fe)	mg/L	0.30	0.874	0.146	0.052	0.103	0.105	0.043	0.237	0.053	0.098	0.053	0.044	0.159	***2.120***	0.237
	Lead (Pb)	mg/L	0.001	0.001	0.000199	0.000056	0.000119	0.000105	<0.000050	0.000253	0.000057	0.000099	0.000073	<0.000050	0.000155	0.000862	0.000175
	Lithium (Li)	mg/L	-	-	0.0011	<0.0010	0.0011	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0023	<0.0010
	Magnesium (Mg)	mg/L	-	-	6.1	9.0	7.6	7.2	8.0	16.4	8.9	9.3	8.9	9.6	8.3	9.2	8.2
	Manganese (Mn)	mg/L	0.935[β]	-	0.0026	0.0007	0.0015	0.0013	0.0006	0.0068	0.0010	0.0068	0.0051	0.0033	0.0064	0.0360	0.0054
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00029	0.00018	0.00024	0.00023	0.00027	0.00026	0.00026	0.00050	0.00056	0.00055	0.00034	0.00034	0.00032
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00068	<0.00050	<0.00050	0.00050	0.00061	0.00059	0.00290	0.00078
	Potassium (K)	mg/L	-	-	1.07	0.94	1.05	0.98	0.92	1.38	0.97	1.03	0.98	1.12	1.04	1.60	1.11
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.0010	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	1.10	1.19	1.27	1.28	0.99	1.23	1.02	1.08	1.01	1.05	1.26	3.09	1.11
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	2.6	1.9	2.5	2.0	2.3	1.8	2.3	2.3	2.3	2.2	1.9	2.5	2.4
	Strontium (Sr)	mg/L	-	-	0.0136	0.0131	0.0137	0.0123	0.0132	0.019	0.0134	0.016	0.016	0.014	0.0135	0.0138	0.0129
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00003	<0.00001
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	0.0140	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	0.0731	0.0113
	Uranium (U)	mg/L	0.015	-	0.0026	0.0027	0.0027	0.0022	0.0028	0.0026	0.0028	0.0027	0.0027	0.0016	0.0021	0.0021	0.0021
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0023	0.0006
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0038	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Mary River system.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.63: Summary of the Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between Mary River Mine-Exposed and Reference (GO-09) Stations in 2017

Variable	Spring						Summer									Fall								
	G0-03	G0-01	E0-03	E0-21	E0-20	CO-01	G0-03	G0-01	E0-10	E0-03	E0-21	E0-20	C0-10	CO-05	CO-01	G0-03	G0-01	E0-10	E0-03	E0-21	E0-20	C0-10	CO-05	CO-01
Conductivity (lab)	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.0	1.1	1.1	1.2	1.2	1.2	1.1	1.1	1.0
Hardness (as $CaCO_3$)	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.4	1.2	1.2	1.3	1.3	1.3	1.3	1.0	1.1	1.2	1.2	1.2	1.3	1.0	1.1	1.1
Total Suspended Solids (TSS)	0.7	1.3	0.7	0.7	0.9	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4.5	1.0	9.6	1.6
Total Dissolved Solids (TDS)	1.1	1.3	1.1	1.2	1.4	1.7	0.8	0.9	1.4	1.2	1.5	1.2	1.2	1.2	1.1	0.9	1.0	1.1	1.0	1.1	1.2	1.1	1.0	1.0
Turbidity	1.3	2.1	1.8	1.9	2.5	2.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4	0.9	0.3	0.3	0.4	0.4	0.8	1.3	8.0	1.3
Alkalinity (as $CaCO_3$)	1.0	0.9	0.9	0.9	1.3	1.2	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.0	1.1	1.1	1.2	1.1	1.1	1.0	1.0	1.0
Total Ammonia	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nitrate	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8	0.6	1.0	1.8	1.6	1.6	1.5	2.2	2.0
Nitrite	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Kjeldahl Nitrogen (TKN)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0						1.0	1.5	1.0
Dissolved Organic Carbon	1.0	1.1	1.0	0.9	0.9	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	0.9	0.9	1.0	1.1	1.1	1.6	1.1
Total Organic Carbon	0.8	0.8	0.8	0.9	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.2	1.2	1.5	1.2
Total Phosphorus	0.8	0.8	0.7	0.9	0.7	1.0	0.6	0.5	0.6	0.5	0.7	0.5	0.6	0.8	0.6	0.9	0.6	0.7	3.0	0.6	0.9	1.2	3.9	1.0
Phenols	1.4	0.9	0.9	1.4	1.2	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	0.8	0.8	1.1	1.0	0.8	0.8	1.9	0.8	0.8
Bromide (Br)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Chloride (Cl)	1.3	1.4	1.4	1.4	1.5	1.4	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.0	0.9	1.2	1.0
Sulphate (SO_4)	1.1	1.1	1.3	1.3	1.4	2.0	1.0	1.0	2.6	2.1	2.2	2.1	2.0	2.0	2.2	0.9	1.0	1.5	2.6	2.6	2.3	1.9	1.7	1.3
Aluminum (Al)	2.0	1.8	2.2	1.9	2.2	2.3	0.7	0.7	0.6	0.8	0.7	0.4	0.4	0.5	0.6	1.1	0.4	0.5	0.7	0.5	0.5	1.2	10	1.5
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.6	1.0
Barium (Ba)	1.1	1.2	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	2.0	1.1
Beryllium (Be)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.2	0.2
Cadmium (Cd)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Calcium (Ca)	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.3	1.2	1.2	1.2	1.2	1.3	1.2	0.9	1.0	1.1	1.1	1.2	1.1	1.0	1.1	1.0
Chromium (Cr)	0.1	0.1	0.1	0.1	0.1	0.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	6.1	1.0
Cobalt (Co)	0.7	0.7	0.7	0.7	0.7	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	9.1	1.3
Copper (Cu)	0.2	0.2	0.2	0.2	0.2	0.2	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.8	0.8	0.9	0.8	0.9	0.9	2.4	1.1
Iron (Fe)	0.1	0.1	0.1	0.1	0.1	0.1	0.7	0.6	0.6	0.7	0.7	0.5	0.5	0.5	0.5	1.0	0.4	0.5	1.0	0.5	0.4	1.6	21	2.4
Lead (Pb)	1.3	1.5	1.4	1.5	1.4	1.8	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.8	0.4	0.5	0.8	0.6	0.4	1.2	6.9	1.4
Lithium (Li)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	1.0	2.2	0.9
Magnesium (Mg)	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.3	1.2	1.2	1.2	1.3	1.2	1.3	1.0	1.1	1.2	1.2	1.2	1.3	1.1	1.2	1.1
Manganese (Mn)	0.2	0.3	0.2	0.3	0.2	0.3	0.7	0.6	0.6	1.3	1.2	1.0	1.0	1.2	1.1	0.8	0.4	0.6	4.3	3.2	2.1	4.0	23	3.4
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Molybdenum (Mo)	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.1	1.3	1.6	1.6	1.6	1.6	1.6	1.7	1.0	1.1	1.1	2.1	2.4	2.3	1.4	1.4	1.4
Nickel (Ni)	0.4	0.4	0.4	0.4	0.4	0.4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	5.8	1.6
Potassium (K)	1.1	1.1	1.1	1.1	1.1	1.1	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	1.0	1.0	1.1	1.0	1.6	1.1
Selenium (Se)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.1	0.1
Silicon (Si)	1.2	1.2	1.2	1.3	1.3	1.3	1.0	0.9	1.0	1.0	1.0	0.9	0.9	0.9	1.0	1.1	0.8	0.9	0.9	0.9	0.9	1.1	2.6	0.9
Silver (Ag)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.0	5.0
Sodium (Na)	1.3	1.4	1.3	1.3	1.3	1.4	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	0.8	1.1	1.0
Strontium (Sr)	1.0	1.1	1.0	1.1	1.1	1.1	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.9	1.0	1.0	1.2	1.2	1.1	1.0	1.0	1.0
Thallium (Tl)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.3	0.1
Tin (Sn)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.3	1.1
Uranium (U)	1.3	1.3	1.3	1.3	1.4	1.4	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.1	1.0	1.0	1.0	0.6	0.8	0.8	0.8
Vanadium (V)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.3	0.6
Zinc (Zn)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).
Denotes highly elevated concentration (mean concentration≥ 10 times higher than respective mean reference or baseline period value).

Table C.64: Dissolved Metal Concentrations at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Spring Sampling Event										Summer Sampling Event									
			G0-09-A	G0-09	G0-09-B	G0-03	G0-01	F0-01	E0-03	E0-21	E0-20	C0-01	G0-09-A	G0-09	G0-09-B	G0-03	G0-01	F0-01	E0-10	E0-03	E0-21	E0-20
			8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	8-Jul-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017	10-Aug-2017
Dissolved Metals	Aluminum (Al)	mg/L	0.0088	0.0071	0.0138	0.0131	0.0127	0.0053	0.0132	0.0139	0.0127	0.0115	0.0188	0.0133	0.0130	0.0156	0.0108	0.0057	0.0105	0.0186	0.0153	0.0105
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00242	0.00187	0.00230	0.00216	0.00221	0.00221	0.00215	0.00228	0.00221	0.00226	0.00463	0.00484	0.00530	0.00562	0.00546	0.01080	0.00604	0.00583	0.00577	0.00595
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	3.00	2.87	2.70	2.72	2.59	6.04	2.70	2.79	2.90	2.85	6.6	6.86	7.72	7.27	7.79	20.60	9.40	8.30	8.3	8.69
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00062	0.00057	0.00065	0.00082	0.00062	0.00095	0.00077	0.00065	0.00061	0.00084
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000066	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	1.720	1.56	1.51	1.57	1.49	2.96	1.58	1.53	1.64	1.660	3.95	3.97	4.32	4.38	4.59	12.40	5.52	4.98	4.89	5.23
	Manganese (Mn)	mg/L	0.00081	0.00094	0.00072	0.00051	0.00049	0.00044	0.00050	0.00045	0.00064	0.00059	0.00014	0.00014	0.00014	0.001360	0.000127	0.000812	0.000130	0.001360	0.001110	0.000985
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000059	0.000056	0.000052	0.000233	0.000214	0.000216	0.000194	0.000194	0.000297	0.000214	0.000271	0.000282	0.000284
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.320	0.270	0.310	0.330	0.310	0.290	0.320	0.310	0.310	0.320	0.69	0.670	0.690	0.70	0.69	1.18	0.75	0.72	0.70	0.73
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.360	0.300	0.370	0.350	0.320	0.260	0.340	0.330	0.320	0.320	0.57	0.570	0.630	0.61	0.63	0.82	0.66	0.66	0.65	0.67
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	0.347	0.276	0.368	0.441	0.445	0.266	0.44	0.415	0.456	0.456	1.5	1.45	1.57	1.400	1.380	1.360	1.375	1.370	1.370	1.380
	Strontium (Sr)	mg/L	0.0026	0.0021	0.0024	0.0025	0.0024	0.0034	0.0025	0.0025	0.0026	0.0026	0.0080	0.0080	0.0085	0.00757	0.00801	0.01530	0.00864	0.00894	0.00892	0.00883
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000097	0.000074	0.000108	0.000111	0.000114	0.000116	0.000109	0.000112	0.000117	0.000116	0.000971	0.000971	0.001060	0.000834	0.000856	0.001990	0.000965	0.000878	0.00085	0.000811
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0051	<0.0030	<0.0030	<0.0030	<0.0030

Table C.64: Dissolved Metal Concentrations at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Summer Sampling Event			Fall Sampling Event												
			C0-10	C0-05	C0-01	G0-09-A	G0-09	G0-09-B	G0-03	GO-01	FO-01	EO-10	EO-03	EO-21	EO-20	C0-10	C0-05	CO-01
			10-Aug-2017	10-Aug-2017	10-Aug-2017	29-Aug-2017	29-Aug-2017	29-Aug-2017	29-Aug-2017	1-Sep-2017	1-Sep-2017	1-Sep-2017	1-Sep-2017	1-Sep-2017	1-Sep-2017	29-Aug-2017	27-Aug-2017	27-Aug-2017
Dissolved Metals	Aluminum (Al)	mg/L	0.0099	0.0110	0.011	0.0143	0.0061	0.0090	0.0113	0.0068	0.0037	0.0056	0.0050	0.0149	0.0114	0.0100	0.0093	0.0184
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00601	0.00597	0.00608	0.00710	0.00806	0.00776	0.0076	0.0087	0.0118	0.0091	0.0092	0.0094	0.0098	0.0079	0.0087	0.0091
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011
	Calcium (Ca)	mg/L	8.61	8.77	8.9	10.70	15.95	12.90	12.5	14.6	27.3	15.4	15.8	16.1	16.0	13.2	14.6	15.3
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00067	0.00078	0.0007	0.0008	0.00065	0.00071	0.00072	0.00076	0.00069	0.00077	0.00079	0.00082	0.00071	0.00072	0.00086	0.00144
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.014	0.019
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000082
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0014
	Magnesium (Mg)	mg/L	5.25	5.15	5.32	6.22	8.70	7.29	7.12	8.11	16.00	8.57	9.14	9.2	9.80	7.97	8.39	8.14
	Manganese (Mn)	mg/L	0.000959	0.001290	0.00091	0.000152	0.000087	0.000102	0.000118	0.000102	0.001370	0.00022	0.004980	0.004480	0.003670	0.003600	0.002380	0.002280
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.000268	0.000261	0.000277	0.000336	0.000169	0.000262	0.000238	0.000291	0.000310	0.000257	0.000553	0.000576	0.000522	0.000347	0.000309	0.000379
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	0.00082
	Potassium (K)	mg/L	0.74	0.76	0.73	1.01	0.91	0.97	0.92	0.90	1.29	0.94	0.97	0.97	1.03	0.96	1.11	1.15
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050
	Silicon (Si)	mg/L	0.66	0.67	0.68	0.83	0.97	0.91	0.94	0.89	0.97	0.90	0.88	0.88	0.96	0.92	0.92	0.79
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050
	Sodium (Na)	mg/L	1.400	1.350	1.36	2.640	1.820	2.360	2.01	2.29	1.80	2.27	2.35	2.27	2.19	1.89	2.61	2.51
	Strontium (Sr)	mg/L	0.00875	0.00875	0.0090	0.01330	0.01280	0.01310	0.0120	0.0134	0.0197	0.0138	0.0163	0.0157	0.0147	0.0126	0.0142	0.0141
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010	<0.000010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00030	<0.00050
	Uranium (U)	mg/L	0.000787	0.000836	0.000889	0.002410	0.002535	0.002550	0.00215	0.00279	0.00256	0.002760	0.00270	0.00271	0.00186	0.00180	0.00158	0.00192
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0010	0.0039

Table C.65: Summary of the Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Mary River Mine-Exposed and Reference (GO-09) Stations in 2017

Variable	Spring						Summer									Fall								
	G0-03	G0-01	E0-03	E0-21	E0-20	CO-01	G0-03	G0-01	E0-10	E0-03	E0-21	E0-20	C0-10	CO-05	CO-01	G0-03	G0-01	E0-10	E0-03	E0-21	E0-20	C0-10	CO-05	CO-01
Aluminum (Al)	1.3	1.3	1.3	1.4	1.3	1.2	1.0	0.7	0.7	1.2	1.0	0.7	0.7	0.7	0.7	1.2	0.7	0.6	0.5	1.5	1.2	1.0	1.0	1.9
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Barium (Ba)	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.0	1.1	1.2	1.2	1.2	1.3	1.0	1.1	1.2
Beryllium (Be)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.2	0.2
Cadmium (Cd)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1
Calcium (Ca)	1.0	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.3	1.2	1.2	1.2	1.2	1.2	1.3	0.9	1.1	1.2	1.2	1.2	1.2	1.0	1.1	1.2
Chromium (Cr)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Cobalt (Co)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Copper (Cu)	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.3	1.1	1.0	1.4	1.1	1.3	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.0	1.2	2.0
Iron (Fe)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.6
Lead (Pb)	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.6
Lithium (Li)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.7	1.4
Magnesium (Mg)	1.0	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.4	1.2	1.2	1.3	1.3	1.3	1.3	1.0	1.1	1.2	1.2	1.2	1.3	1.1	1.1	1.1
Manganese (Mn)	0.6	0.6	0.6	0.5	0.8	0.7	9.8	0.9	0.9	9.8	8.0	7.1	6.9	9.3	6.5	1.0	0.9	1.9	44	39	32	32	21	20
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Molybdenum (Mo)	1.0	1.0	1.0	1.2	1.1	1.0	0.9	0.9	1.0	1.2	1.3	1.3	1.2	1.2	1.3	0.9	1.1	1.0	2.2	2.3	2.0	1.4	1.2	1.5
Nickel (Ni)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.6
Potassium (K)	1.1	1.0	1.1	1.0	1.0	1.1	1.0	1.0	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	0.9	1.0	1.0	1.0	1.1	1.0	1.2	1.2
Selenium (Se)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.1	0.1
Silicon (Si)	1.0	0.9	1.0	1.0	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	0.9
Silver (Ag)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	RDL	RDL
Sodium (Na)	1.3	1.3	1.3	1.3	1.4	1.4	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	0.8	1.1	1.1
Strontium (Sr)	1.1	1.0	1.0	1.1	1.1	1.1	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.9	1.0	1.1	1.2	1.2	1.1	1.0	1.1	1.1
Thallium (Tl)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.1	0.1
Tin (Sn)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.1
Uranium (U)	1.2	1.2	1.2	1.2	1.3	1.2	0.8	0.9	1.0	0.9	0.8	0.8	0.8	0.8	0.9	0.9	1.1	1.1	1.1	1.1	0.7	0.7	0.6	0.8
Vanadium (V)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5
Zinc (Zn)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.3	1.3

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).
Denotes highly elevated concentration (mean concentration ≥ 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.66: Spearman's Rank Correlation Coefficients for Mary River Water Quality Data Collected in Spring, Summer and Fall 2017[a]

Parameters	Conventional Parameters										Total Metals											
	Conduct-ivity	Hardness	Total Suspended Solids	Total Dissolved Solids	Turbidity	Alkalinity	Dissolved Organic Carbon	Total Phosphorus	Chloride	Sulphate	Aluminum	Barium	Copper	Iron	Lead	Manganese	Molybdenum	Potassium	Silicon	Sodium	Strontium	Uranium
Conductivity	1	0.992	-0.096	0.969	-0.102	0.986	-0.056	-0.430	0.867	0.928	0.043	0.957	0.523	-0.038	0.050	0.132	0.764	0.921	0.854	0.804	0.963	0.882
Hardness	0.992	1	-0.071	0.967	-0.108	0.985	-0.039	-0.429	0.854	0.922	0.021	0.952	0.527	-0.053	0.036	0.137	0.773	0.923	0.843	0.795	0.958	0.864
Total Suspended Solids	-0.096	-0.071	1	-0.072	0.174	-0.121	0.188	0.510	-0.093	-0.092	0.258	-0.030	-0.115	0.100	0.074	0.327	-0.138	-0.021	-0.135	-0.111	-0.078	-0.213
Total Dissolved Solids	0.969	0.967	-0.072	1	-0.030	0.967	-0.044	-0.424	0.847	0.902	0.086	0.936	0.498	-0.019	0.091	0.136	0.724	0.908	0.847	0.785	0.949	0.870
Turbidity	-0.102	-0.108	0.174	-0.030	1	-0.108	-0.171	0.258	0.109	0.049	0.714	0.052	0.357	0.744	0.919	0.353	-0.070	0.145	0.164	0.140	-0.011	0.030
Alkalinity	0.986	0.985	-0.121	0.967	-0.108	1	-0.044	-0.429	0.861	0.906	0.058	0.950	0.534	-0.010	0.043	0.120	0.777	0.920	0.859	0.802	0.956	0.888
Dissolved Organic Carbon	-0.056	-0.039	0.188	-0.044	-0.171	-0.044	1	0.127	0.009	-0.086	0.106	0.015	0.044	-0.031	-0.313	0.052	0.170	0.043	0.114	0.072	-0.082	-0.033
Total Phosphorus	-0.430	-0.429	0.510	-0.424	0.258	-0.429	0.127	1	-0.261	-0.389	0.426	-0.326	0.061	0.443	0.239	0.451	-0.244	-0.255	-0.259	-0.247	-0.336	-0.352
Chloride	0.867	0.854	-0.093	0.847	0.109	0.861	0.009	-0.261	1	0.816	0.343	0.889	0.704	0.209	0.247	0.139	0.728	0.909	0.918	0.952	0.889	0.948
Sulphate	0.928	0.922	-0.092	0.902	0.049	0.906	-0.086	-0.389	0.816	1	0.095	0.941	0.551	0.068	0.201	0.307	0.783	0.898	0.792	0.734	0.927	0.773
Aluminum (total)	0.043	0.021	0.258	0.086	0.714	0.058	0.106	0.426	0.343	0.095	1	0.215	0.476	0.857	0.735	0.368	0.070	0.319	0.427	0.364	0.139	0.267
Barium (total)	0.957	0.952	-0.030	0.936	0.052	0.950	0.015	-0.326	0.889	0.941	0.215	1	0.644	0.138	0.208	0.279	0.810	0.968	0.890	0.853	0.968	0.858
Copper (total)	0.523	0.527	-0.115	0.498	0.357	0.534	0.044	0.061	0.704	0.551	0.476	0.644	1	0.622	0.504	0.544	0.769	0.694	0.697	0.725	0.624	0.605
Iron (total)	-0.038	-0.053	0.100	-0.019	0.744	-0.010	-0.031	0.443	0.209	0.068	0.857	0.138	0.622	1	0.818	0.540	0.199	0.216	0.297	0.209	0.080	0.136
Lead (total)	0.050	0.036	0.074	0.091	0.919	0.043	-0.313	0.239	0.247	0.201	0.735	0.208	0.504	0.818	1	0.426	0.047	0.269	0.286	0.244	0.153	0.167
Manganese (total)	0.132	0.137	0.327	0.136	0.353	0.120	0.052	0.451	0.139	0.307	0.368	0.279	0.544	0.540	0.426	1	0.444	0.258	0.161	0.130	0.265	-0.012
Molybdenum (total)	0.764	0.773	-0.138	0.724	-0.070	0.777	0.170	-0.244	0.728	0.783	0.070	0.810	0.769	0.199	0.047	0.444	1	0.781	0.735	0.714	0.825	0.672
Potassium (total)	0.921	0.923	-0.021	0.908	0.145	0.920	0.043	-0.255	0.909	0.898	0.319	0.968	0.694	0.216	0.269	0.258	0.781	1	0.922	0.877	0.937	0.869
Silicon (total)	0.854	0.843	-0.135	0.847	0.164	0.859	0.114	-0.259	0.918	0.792	0.427	0.890	0.697	0.297	0.286	0.161	0.735	0.922	1	0.905	0.874	0.899
Sodium (total)	0.804	0.795	-0.111	0.785	0.140	0.802	0.072	-0.247	0.952	0.734	0.364	0.853	0.725	0.209	0.244	0.130	0.714	0.877	0.905	1	0.835	0.920
Strontium (total)	0.963	0.958	-0.078	0.949	-0.011	0.956	-0.082	-0.336	0.889	0.927	0.139	0.968	0.624	0.080	0.153	0.265	0.825	0.937	0.874	0.835	1	0.869
Uranium (total)	0.882	0.864	-0.213	0.870	0.030	0.888	-0.033	-0.352	0.948	0.773	0.267	0.858	0.605	0.136	0.167	-0.012	0.672	0.869	0.899	0.920	0.869	1
Aluminum (dissolved)	-0.414	-0.413	-0.152	-0.364	0.363	-0.400	0.020	0.027	-0.146	-0.253	0.239	-0.308	0.119	0.279	0.237	0.179	-0.111	-0.247	-0.148	-0.087	-0.332	-0.272
Barium (dissolved)	0.978	0.979	-0.110	0.941	-0.115	0.970	-0.013	-0.419	0.869	0.923	0.032	0.954	0.601	-0.006	0.039	0.179	0.835	0.925	0.855	0.809	0.956	0.853
Copper (dissolved)	0.786	0.788	-0.207	0.723	0.049	0.774	-0.091	-0.411	0.737	0.803	0.019	0.814	0.569	0.039	0.180	0.127	0.694	0.781	0.694	0.737	0.758	0.692
Manganese (dissolved)	0.248	0.268	0.242	0.202	-0.010	0.221	0.002	0.090	0.103	0.415	-0.063	0.318	0.227	0.059	0.057	0.690	0.406	0.211	0.105	0.047	0.300	-0.060
Molybdenum (dissolved)	0.845	0.843	-0.107	0.825	0.103	0.821	-0.091	-0.316	0.805	0.923	0.128	0.882	0.656	0.111	0.226	0.427	0.818	0.852	0.773	0.783	0.895	0.723
Potassium (dissolved)	0.935	0.940	-0.055	0.909	-0.004	0.930	0.012	-0.346	0.883	0.908	0.176	0.964	0.638	0.082	0.154	0.210	0.794	0.959	0.880	0.846	0.939	0.825
Silicon (dissolved)	0.916	0.916	-0.162	0.901	-0.098	0.925	0.105	-0.402	0.857	0.814	0.120	0.895	0.615	0.029	0.042	0.098	0.780	0.892	0.910	0.834	0.903	0.847
Sodium (dissolved)	0.771	0.770	-0.111	0.769	0.203	0.770	0.071	-0.237	0.937	0.716	0.375	0.817	0.721	0.231	0.283	0.123	0.698	0.844	0.884	0.968	0.811	0.902
Strontium (dissolved)	0.972	0.970	-0.067	0.948	-0.034	0.967	-0.095	-0.363	0.890	0.941	0.128	0.965	0.598	0.054	0.126	0.245	0.804	0.939	0.869	0.840	0.978	0.876
Uranium (dissolved)	0.897	0.883	-0.215	0.888	-0.014	0.905	-0.043	-0.389	0.947	0.805	0.227	0.874	0.598	0.093	0.128	0.016	0.695	0.882	0.887	0.913	0.890	0.987

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 36.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.66: Spearman's Rank Correlation Coefficients for Mary River Water Quality Data Collected in Spring, Summer and Fall 2017[a]

Parameters	Dissolved Metals									
	Aluminum	Barium	Copper	Manganese	Molybdenum	Potassium	Silicon	Sodium	Strontium	Uranium
Conductivity	-0.414	0.978	0.786	0.248	0.845	0.935	0.916	0.771	0.972	0.897
Hardness	-0.413	0.979	0.788	0.268	0.843	0.940	0.916	0.770	0.970	0.883
Total Suspended Solids	-0.152	-0.110	-0.207	0.242	-0.107	-0.055	-0.162	-0.111	-0.067	-0.215
Total Dissolved Solids	-0.364	0.941	0.723	0.202	0.825	0.909	0.901	0.769	0.948	0.888
Turbidity	0.363	-0.115	0.049	-0.010	0.103	-0.004	-0.098	0.203	-0.034	-0.014
Alkalinity	-0.400	0.970	0.774	0.221	0.821	0.930	0.925	0.770	0.967	0.905
Dissolved Organic Carbon	0.020	-0.013	-0.091	0.002	-0.091	0.012	0.105	0.071	-0.095	-0.043
Total Phosphorus	0.027	-0.419	-0.411	0.090	-0.316	-0.346	-0.402	-0.237	-0.363	-0.389
Chloride	-0.146	0.869	0.737	0.103	0.805	0.883	0.857	0.937	0.890	0.947
Sulphate	-0.253	0.923	0.803	0.415	0.923	0.908	0.814	0.716	0.941	0.805
Aluminum (total)	0.239	0.032	0.019	-0.063	0.128	0.176	0.120	0.375	0.128	0.227
Barium (total)	-0.308	0.954	0.814	0.318	0.882	0.964	0.895	0.817	0.965	0.874
Copper (total)	0.119	0.601	0.569	0.227	0.656	0.638	0.615	0.721	0.598	0.598
Iron (total)	0.279	-0.006	0.039	0.059	0.111	0.082	0.029	0.231	0.054	0.093
Lead (total)	0.237	0.039	0.180	0.057	0.226	0.154	0.042	0.283	0.126	0.128
Manganese (total)	0.179	0.179	0.127	0.690	0.427	0.210	0.098	0.123	0.245	0.016
Molybdenum (total)	-0.111	0.835	0.694	0.406	0.818	0.794	0.780	0.698	0.804	0.695
Potassium (total)	-0.247	0.925	0.781	0.211	0.852	0.959	0.892	0.844	0.939	0.882
Silicon (total)	-0.148	0.855	0.694	0.105	0.773	0.880	0.910	0.884	0.869	0.887
Sodium (total)	-0.087	0.809	0.737	0.047	0.783	0.846	0.834	0.968	0.840	0.913
Strontium (total)	-0.332	0.956	0.758	0.300	0.895	0.939	0.903	0.811	0.978	0.890
Uranium (total)	-0.272	0.853	0.692	-0.060	0.723	0.825	0.847	0.902	0.876	0.987
Aluminum (dissolved)	1	-0.330	-0.116	0.072	-0.063	-0.247	-0.329	-0.060	-0.304	-0.252
Barium (dissolved)	-0.330	1	0.808	0.302	0.867	0.955	0.924	0.783	0.969	0.873
Copper (dissolved)	-0.116	0.808	1	0.328	0.799	0.843	0.716	0.729	0.786	0.691
Manganese (dissolved)	0.072	0.302	0.328	1	0.494	0.300	0.160	0.067	0.309	-0.027
Molybdenum (dissolved)	-0.063	0.867	0.799	0.494	1	0.870	0.776	0.777	0.907	0.761
Potassium (dissolved)	-0.247	0.955	0.843	0.300	0.870	1	0.916	0.821	0.947	0.840
Silicon (dissolved)	-0.329	0.924	0.716	0.160	0.776	0.916	1	0.810	0.898	0.852
Sodium (dissolved)	-0.060	0.783	0.729	0.067	0.777	0.821	0.810	1	0.811	0.881
Strontium (dissolved)	-0.304	0.969	0.786	0.309	0.907	0.947	0.898	0.811	1	0.900
Uranium (dissolved)	-0.252	0.873	0.691	-0.027	0.761	0.840	0.852	0.881	0.900	1

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 36.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.67: *In Situ* Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Winter, Mary River Project CREMP, 2017

Depth (m)	Temperature (°C)										Dissolved Oxygen (mg/L)										Dissolved Oxygen (% Saturation)				
	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05
Date Collected	12-Apr-17	12-Apr-17	12-Apr-17	15-Apr-17	15-Apr-17	15-Apr-17	14-Apr-17	14-Apr-17	14-Apr-17	15-Apr-17	12-Apr-17	########	12-Apr-17	15-Apr-17	########	15-Apr-17	########	########	########	########	12-Apr-17	########	12-Apr-17	15-Apr-17	########
1.0	0.1	0.1	0.3	0.2	0.4	0.4	0.3	0.0	0.1	0.2	13.9	14.9	13.7	15.3	15.1	16.5	14.9	16.3	15.4	15.0	95.4	102.0	94.6	105.5	104.7
2.0	0.2	0.1	0.3	0.2	0.2	0.2	0.3	0.2	0.4	0.4	13.9	14.8	14.0	15.3	15.2	16.7	15.0	16.2	15.3	15.3	95.5	101.9	96.5	105.6	104.9
3.0	0.6	0.4	0.5	0.7	0.8	0.7	0.8	0.8	0.8	0.7	13.8	14.7	14.2	15.0	14.9	16.3	14.8	15.3	15.0	15.1	95.7	101.7	98.4	105.8	104.3
4.0	0.8	0.7	0.7	1.1	1.0	1.0	1.1	1.1	1.1	1.1	13.6	14.6	14.2	14.7	14.7	16.0	14.5	14.8	14.7	14.8	95.5	101.8	98.8	103.8	103.4
5.0	1.0	0.9	0.9	1.2	1.2	1.1	1.3	1.2	1.2	1.2	13.5	14.5	13.1	14.6	14.5	15.7	14.3	14.6	14.5	14.7	94.9	101.5	91.8	103.1	102.5
6.0	1.2	1.0		1.4	1.4	1.2	1.4	1.3	1.3	1.3	13.4	14.3		14.4	14.3	15.9	14.2	14.4	14.3	14.7	94.6	100.7		102.2	101.5
7.0	1.2	1.2		1.4	1.4		1.5	1.4	1.4	1.3	13.2	14.1		14.3	14.2		14.1	14.3	14.2	14.8	93.8	99.5		102.0	101.2
8.0	1.3	1.3		1.5	1.5		1.9	1.5	1.5		12.8	13.8		14.2	14.1		16.0	14.2	14.0		91.2	97.9		101.0	100.4
9.0	1.5	1.4		1.6	1.5		1.6	1.5	1.6		12.2	13.6		14.1	14.0		13.7	13.9	13.9		87.1	97.0		100.5	100.0
10.0	1.6	1.4		1.6	1.6		1.7	1.6	1.6		11.5	13.3		13.9	13.9		13.7	13.8	13.7		82.1	94.8		99.7	99.5
11.0	1.7			1.6	1.7		1.7	1.7	1.7		10.3			13.9	13.8		13.5	13.7	13.6		74.3			99.2	98.6
12.0	1.8				1.7		1.8	1.8	1.8		6.6				13.6		13.4	19.5	13.6		57.5				98.0
13.0	1.9				1.8		1.9	1.9	1.8		5.8				13.5		13.3	13.4	13.4		42.3				97.3
14.0	2.0				1.9		1.9	1.9	1.9		3.1				13.4		13.2	13.3	13.4		22.4				96.9
15.0	2.1				1.9		2.0	2.0	2.0		1.0				13.3		13.1	13.2	13.2		7.2				95.9
16.0					2.0		2.0	2.0	2.0						13.2		13.0	13.1	13.1						95.2
17.0					2.0			2.0	2.0						13.0			13.0	13.1						94.1
18.0					2.0			2.1	2.1						12.6			12.9	13.0						91.1
19.0					2.0			2.1	2.1						12.3			12.7	12.9						89.3
20.0					2.0			2.1	2.2						12.2			12.5	12.7						87.9
21.0									2.2										12.4						
22.0									2.2										12.1						
23.0									2.2										11.9						
24.0									2.3										11.6						
25.0									2.3										11.4						
26.0									2.4										11.0						
27.0									2.4										10.7						
28.0									2.5										10.0						
29.0																									
30.0																									

Note:
Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 16.3, 10.6, 6.0, 11.4, 20.5, 7.1, 17.2, 20.6, 29.1, and 7.8 m, respectively, at the time of winter sampling.
Ice thickness at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 1.5, 1.74, 1.52, 1.5, 1.8, 1.7, 1.3, 2.3, 1.2, and 1.7 m, respectively, at the time of winter sampling.
Deepest measurement at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.3, 9.5, 5.0, 10.4, 19.5, 6.1, 16.2, 19.6, 28, and 6.8 m, respectively, at the time of winter sampling.

Table C.67: ***In Situ*** **Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Winter, Mary River Project CREMP, 2017**

Depth (m)	Dissolved Oxygen (% Saturation)					pH (pH units)										Specific Conductance (µS/cm)									
	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06
Date Collected	15-Apr-17	########	########	########	########	12-Apr-17	########	12-Apr-17	15-Apr-17	########	15-Apr-17	########	########	########	########	12-Apr-17	########	12-Apr-17	15-Apr-17	########	15-Apr-17	########	########	########	########
1.0	114.2	103.0	111.7	105.8	103.2	7.66	7.56	7.85	7.58	7.68	7.73	7.60	7.61	8.19	8.16	270	266	246	142	148	156	130	161	163	174
2.0	114.5	103.5	111.5	105.6	103.7	7.65	7.57	7.74	7.54	7.66	7.76	7.57	7.61	8.07	8.10	271	262	288	142	147	156	130	151	171	182
3.0	114.0	103.1	107.2	104.7	103.4	7.65	7.58	7.71	7.54	7.60	7.75	7.56	7.62	7.99	8.07	269	261	295	141	147	154	130	155	172	184
4.0	112.7	102.4	104.1	103.6	104.4	7.65	7.59	7.68	7.54	7.67	7.74	7.56	7.62	7.96	8.02	267	261	298	141	146	158	129	151	171	186
5.0	111.4	101.6	103.3	102.7	104.3	7.64	7.59	7.62	7.54	7.67	7.73	7.56	7.62	7.93	7.99	264	259	301	141	145	153	129	148	170	187
6.0	112.3	101.3	102.1	101.9	104.1	7.64	7.60		7.54	7.66	7.70	7.56	7.61	7.91	7.99	262	258		141	144	155	129	147	167	189
7.0		100.5	101.5	101.1	104.8	7.63	7.60		7.53	7.65		7.55	7.61	7.90	7.99	261	256		141	144		129	146	164	191
8.0		99.6	100.4	100.2		7.62	7.60		7.54	7.65		7.55	7.60	7.68		259	255		141	144		130	145	161	
9.0		98.4	99.5	99.5		7.60	7.59		7.54	7.64		7.55	7.60	7.85		257	255		141	143		130	143	158	
10.0		98.1	98.7	98.3		7.57	7.58		7.53	7.64		7.54	7.59	7.82		255	255		141	143		130	142	153	
11.0		97.2	98.0	97.9		7.53			7.53	7.63		7.54	7.59	7.80		254			141	143		130	142	151	
12.0		96.1	97.0	97.6		7.40				7.62		7.53	7.58	7.77		254				143		130	141	149	
13.0		95.7	96.4	96.8		7.36				7.60		7.52	7.57	7.76		254				142		130	140	148	
14.0		94.9	96.0	96.3		7.30				7.60		7.52	7.57	7.75		256				143		131	140	145	
15.0		94.6	95.4	95.6		7.20				7.58		7.51	7.56	7.73		265				143		131	140	146	
16.0		94.2	94.6	95.0						7.58		7.50	7.51	7.71						142		131	139	145	
17.0			94.3	94.5						7.56			7.55	7.69						142			139	144	
18.0			93.5	94.0						7.55			7.55	7.68						144			139	143	
19.0			92.0	93.5						7.52			7.53	7.67						144			139	143	
20.0			90.8	92.2						7.49			7.52	7.66						145			139	142	
21.0				90.0										7.64										142	
22.0				88.2										7.62										142	
23.0				86.7										7.60										142	
24.0				84.9										7.58										142	
25.0				83.4										7.57										142	
26.0				80.2										7.53										143	
27.0				78.2										7.51										144	
28.0				73.3										7.47										144	
29.0																									
30.0																									

Note:
Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 16.3, 10.6, 6.0, 11.4, 20.5, 7.1, 17.2, 20.6, 29.1, and 7.8 m, respectively, at the time of winter sampling.
Ice thickness at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 1.5, 1.74, 1.52, 1.5, 1.8, 1.7, 1.3, 2.3, 1.2, and 1.7 m, respectively, at the time of winter sampling.
Deepest measurement at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.3, 9.5, 5.0, 10.4, 19.5, 6.1, 16.2, 19.6, 28, and 6.8 m, respectively, at the time of winter sampling.

Table C.68: ***In Situ*** **Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Summer, Mary River Project CREMP, 2017**

Depth (m)	Temperature (°C)										Dissolved Oxygen (mg/L)										Dissolved Oxygen (% Saturation)				
	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05
Date Collected	30-Jul-17	30-Jul-17	30-Jul-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	30-Jul-17	30-Jul-17	30-Jul-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	30-Jul-17	30-Jul-17	30-Jul-17	1-Aug-17	1-Aug-17
1.0	5.2	5.3	5.2	5.8	5.9	6.0	6.4	5.9	5.9	5.9	12.6	12.5	12.6	12.3	12.5	12.6	12.1	12.3	12.2	12.5	98.6	98.0	99.4	98.3	100.5
2.0	5.2	5.2	5.2	5.8	5.9	6.0	6.4	5.9	5.9	5.9	12.6	12.6	12.6	12.3	12.4	12.3	12.1	12.3	12.2	12.4	99.0	99.0	99.3	98.3	99.6
3.0	5.2	5.2	5.2	5.8	5.9	6.0	6.4	5.8	5.9	5.9	12.6	12.6	12.6	12.3	12.4	12.3	12.1	12.3	12.2	12.4	99.0	99.0	99.4	98.2	99.2
4.0	5.2	5.2	5.2	5.8	5.9	6.0	6.4	5.8	5.9	5.9	12.6	12.6	12.6	12.3	12.3	12.3	12.1	12.3	12.2	12.3	99.0	99.1	99.3	98.1	98.8
5.0	5.1	5.2	5.2	5.8	5.9	6.0	6.4	5.8	5.9	5.9	12.6	12.6	12.4	12.3	12.3	12.2	12.1	12.3	12.2	12.3	98.9	99.1	97.8	98.0	98.5
6.0	5.1	5.2		5.8	5.9	6.0	6.4	5.8	5.9	5.8	12.6	12.6		12.3	12.3	12.2	12.1	12.2	12.2	12.3	99.0	99.0		97.9	98.2
7.0	5.1	5.2		5.8	5.9	6.0	6.4	5.8	5.9	5.8	12.6	12.6		12.3	12.2	12.2	12.1	12.2	12.2	12.2	99.0	98.9		97.9	98.1
8.0	5.1	5.2		5.7	5.9	6.0	6.4	5.8	5.9		12.6	12.6		12.3	12.2	12.2	12.1	12.2	12.2		98.9	98.9		97.9	97.8
9.0	5.1	5.2		5.7	5.9		6.4	5.8	5.9		12.6	12.6		12.3	12.2		12.1	12.2	12.2		98.8	98.8		97.8	97.7
10.0	5.1			5.7	5.9		6.3	5.8	5.8		12.6			12.3	12.2		12.0	12.2	12.2		98.7			97.7	97.5
11.0	5.1			5.7	5.8		6.3	5.8	5.8		12.6			12.3	12.2		12.0	12.2	12.2		98.7			97.8	97.3
12.0	5.1				5.8		6.3	5.8	5.8		12.6				12.2		12.0	12.2	12.2		98.7				97.2
13.0	5.1				5.8		6.3	5.8	5.8		12.6				12.2		12.0	12.2	12.2		98.6				97.1
14.0	5.1				5.7		6.2	5.8	5.8		12.6				12.2		12.0	12.2	12.2		98.5				97.1
15.0	5.0				5.7		6.2	5.7	5.8		12.6				12.2		12.0	12.2	12.2		98.5				97.1
16.0					5.7		6.2	5.7	5.7						12.2		12.0	12.2	12.2						97.2
17.0					5.7		6.2	5.7	5.7						12.2		12.0	12.2	12.2						97.2
18.0					5.7			5.7	5.7						12.2			12.2	12.2						97.2
19.0					5.7			5.7	5.7						12.2			12.2	12.2						97.4
20.0					5.7			5.7	5.7						12.2			12.2	12.2						97.3
21.0					5.7				5.7						12.2*				12.2						97.2
22.0									5.6										12.2						
23.0									5.6										12.2						
24.0									5.6										12.2						
25.0									5.6										12.2						
26.0									5.6										12.2						
27.0									5.6										12.1						
28.0									5.6										12.1						
29.0									5.6										12.1						
30.0									5.6										12.1						

Note:
Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 16.09, 9.95, 5.14, 11.0, 21.7, 8.5, 19.9, 20.99, 30.5, and 8.2 m, respectively, at the time of summer sampling.

Table C.68: ***In Situ*** **Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Summer, Mary River Project CREMP, 2017**

Depth (m)	Dissolved Oxygen (% Saturation)					pH (pH units)										Specific Conductance (µS/cm)									
	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06
Date Collected	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	30-Jul-17	30-Jul-17	30-Jul-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	30-Jul-17	30-Jul-17	30-Jul-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17
1.0	101.3	98.3	98.2	98.0	100.7	7.82	7.95	7.80	7.60	7.55	7.56	7.43	7.60	7.50	7.58	95	97	98	77	74	73	74	74	72	73
2.0	98.9	98.2	98.1	98.2	99.5	7.75	7.70	7.73	7.59	7.54	7.56	7.47	7.55	7.50	7.56	95	97	98	77	74	73	74	74	72	73
3.0	98.5	98.2	97.9	98.2	99.0	7.69	7.65	7.70	7.57	7.54	7.35	7.47	7.54	7.52	7.55	95	97	98	77	74	73	74	74	72	73
4.0	98.4	98.0	98.0	98.1	98.6	7.68	7.63	7.69	7.57	7.53	7.52	7.47	7.52	7.52	7.54	95	97	98	77	74	73	74	74	72	73
5.0	98.3	97.9	98.0	98.1	98.4	7.66	7.61	7.67	7.56	7.53	7.52	7.47	7.51	7.51	7.53	96	97	98	77	74	73	74	74	72	73
6.0	98.2	97.8	97.8	97.9	98.2	7.66	7.59		7.55	7.52	7.52	7.48	7.50	7.51	7.52	95	97		78	74	73	74	74	72	73
7.0	98.1	97.8	97.7	97.9	97.9	7.65	7.59		7.55	7.52	7.51	7.47	7.50	7.51	7.51	96	97		78	74	73	74	74	72	73
8.0	97.9	97.7	97.6	97.8		7.64	7.58		7.55	7.52	7.51	7.48	7.49	7.50		96	97		78	74	73	74	74	72	
9.0		97.7	97.5	97.7		7.63	7.66		7.55	7.52		7.47	7.49	7.50		96	97		78	74		74	74	73	
10.0		97.6	97.5	97.7		7.62			7.55	7.52		7.47	7.49	7.50		96			78	74		74	74	73	
11.0		97.5	97.5	97.6		7.62			7.55	7.51		7.45	7.49	7.50		96			78	74		74	74	73	
12.0		97.4	97.4	97.5		7.61				7.51		7.44	7.49	7.50		96				75		74	74	73	
13.0		97.3	97.4	97.4		7.61				7.51		7.43	7.49	7.50		96				75		73	74	73	
14.0		97.3	97.3	97.4		7.61				7.51		7.41	7.49	7.50		96				76		73	74	73	
15.0		97.2	97.3	97.3		7.59				7.51		7.39	7.49	7.50		97				76		73	74	73	
16.0		97.2	97.2	97.2						7.52		7.39	7.49	7.50						76		73	74	74	
17.0		97.1	97.1	97.1						7.52		7.38	7.49	7.50						76		73	74	74	
18.0			97.1	97.0						7.52			7.48	7.50						77			74	74	
19.0			96.9	97.0						7.52			7.48	7.50						77			74	74	
20.0			96.9	96.9						7.52			7.48	7.50						77			74	74	
21.0				96.9						7.52				7.50						77				74	
22.0				96.8										7.49										74	
23.0				96.8										7.49										74	
24.0				96.8										7.49										74	
25.0				96.8										7.49										74	
26.0				96.7										7.49										74	
27.0				96.6										7.49										74	
28.0				96.6										7.49										74	
29.0				96.5										7.49										74	
30.0				96.4										7.49										74	

Note:
Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 were 16.09, 9.95, 5.14, 11.0, 21.7, 8.5, 19.9, 20.99, 30.5, and 8.2 m, respectively, at the time of summer sampling.

Table C.69: *In Situ* Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017

Depth (m)	Temperature (°C)											Dissolved Oxygen (mg/L)											Dissolved Oxygen (% Saturation)				
	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05
Date Collected	30-Aug-17	30-Aug-17	30-Aug-17	28-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	26-Aug-18	29-Aug-17	30-Aug-17	30-Aug-17	30-Aug-17	28-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	26-Aug-18	29-Aug-17	30-Aug-17	30-Aug-17	30-Aug-17	28-Aug-17	29-Aug-17
surface										8.4											11.73							
1.0	6.9	6.8	7.0	7.9	7.9	7.8	8.0	8.0	7.9	8.4	7.9	11.76	11.80	11.75	11.55	11.61	11.61	11.63	11.59	11.62	11.68	11.62	96.7	96.7	96.8	97.4	97.7
2.0	6.9	6.8	7.0	8.0	7.8	7.8	8.0	8.0	7.9	8.4	7.9	11.75	11.78	11.76	11.52	11.60	11.60	11.62	11.60	11.60	11.68	11.62	96.7	96.7	96.9	97.2	97.6
3.0	6.9	6.8	7.0	8.0	7.8	7.8	8.0	7.9	7.9	8.4	7.9	11.75	11.78	11.77	11.51	11.59	11.60	11.60	11.59	11.61	11.66	11.61	96.7	96.6	97.0	97.1	97.5
4.0	6.9	6.8	7.0	7.9	7.8	7.8	7.9	7.9	7.9	8.4	7.9	11.76	11.79	11.77	11.52	11.58	11.60	11.60	11.58	11.60	11.65	11.60	96.5	96.6	97.1	97.1	97.3
5.0	6.7	6.8		7.9	7.8	7.8	7.9	7.8	7.9	8.4	7.9	11.81	11.81		11.52	11.56	11.59	11.58	11.57	11.59	11.68	11.60	96.5	96.7		97.2	97.2
6.0	6.4	6.8		7.9	7.8	7.8	7.8	7.8	7.9	8.4	7.9	11.92	11.80		11.52	11.56	11.59	11.55	11.56	11.58	11.65	11.60	96.0	96.6		97.1	97.1
7.0	6.2	6.8		7.9	7.8	7.8	7.8	7.7	7.9	8.4	7.9	11.97	11.80		11.51	11.55	11.57	11.54	11.55	11.57	11.66	11.59	96.5	96.6		97.0	97.0
8.0	6.0	6.8		7.9	7.7		7.8	7.7	7.9	8.3	7.9	11.98	11.80		11.50	11.50		11.52	11.54	11.56	11.68	11.58	96.3	96.6		96.8	96.9
9.0	6.0	6.8		7.9	7.7		7.8	7.6	7.8	8.1		11.99	11.79		11.48	11.54		11.52	11.54	11.55	11.70		96.2	96.6		96.6	96.7
10.0	5.9			7.8	7.7		7.8	7.6	7.8	7.9		12.01			11.48	11.54		11.51	11.53	11.55	11.73		96.3			96.6	96.6
11.0	5.9			7.8	7.7		7.8	7.5	7.8	7.8		12.02			11.48	11.52		11.50	11.54	11.54	11.68		96.3			96.6	96.5
12.0	5.8				7.6		7.8	7.5	7.8	7.7		12.04				11.52		11.51	11.53	11.54	11.69		96.3				96.4
13.0	5.8				7.6		7.8	7.4	7.8	7.7		12.05				11.54		11.50	11.53	11.53	11.68		96.3				96.4
14.0	5.8				7.6		7.8	7.4	7.8	7.5		12.05				11.53		11.49	11.53	11.53	11.69		96.3				96.4
15.0	5.6				7.5		7.8	7.4	7.7	7.5		12.13				11.54		11.49	11.52	11.51	11.68		96.5				96.3
16.0					7.5		7.8	7.3	7.7	7.4						11.54		11.47	11.51	11.51	11.68						96.3
17.0					7.5		7.7	7.3	7.7	7.3						11.54		11.46	11.50	11.50	11.73						96.2
18.0					7.5			7.3	7.6	7.2						11.54			11.49	11.48	11.73						96.2
19.0					7.5			7.3	7.6	7.1						11.54			11.48	11.47	11.70						96.2
20.0					7.4			7.3	7.6	7.1						11.53			11.47	11.46	11.71						96.1
21.0					7.4			7.3	7.4	7.0						11.53			11.47	11.46	11.68						95.9
22.0									7.3	6.9										11.46	11.66						
23.0									7.2	6.8										11.46	11.67						
24.0									7.1	6.8										11.45	11.61						
25.0									7.0	6.7										11.45	11.62						
26.0									6.9	6.7										11.43	11.64						
27.0									6.7	6.7										11.39	11.58						
28.0									6.7	6.5										11.37	11.62						
29.0									6.7	6.4										11.36	11.55						

Notes:
28-Aug-17 to 30-Aug-17 sampling was conducted by Baffinland. 26-Aug-17 sampling was conducted by Minnow.
Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.4, 9.8, 4.8, 11.95, 21.3, 7.95, 17.6, 21.21, 29.05, and 9.0 m, respectively, at the time of fall sampling.

Table C.69: *In Situ* Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, 2017

Depth (m)	Dissolved Oxygen (% Saturation)						pH (pH units)											Specific Conductance (µS/cm)										
	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-09	BLO-06	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-09	BLO-06
Date Collected	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	26-Aug-18	29-Aug-17	30-Aug-17	30-Aug-17	30-Aug-17	28-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	26-Aug-18	29-Aug-17	30-Aug-17	30-Aug-17	30-Aug-17	28-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	26-Aug-18	29-Aug-17
surface					101.1											7.66											61	
1.0	97.4	98.2	97.8	97.9	99.5	97.9	7.91	7.92	7.90	7.27	7.33	7.50	7.56	7.48	7.50	7.49	7.56	116	118	117	53	51	52	50	51	51	61	51
2.0	97.4	98.1	97.9	97.8	99.6	97.8	7.91	7.90	7.91	7.29	7.31	7.50	7.55	7.49	7.49	7.50	7.54	116	118	117	53	51	52	50	51	51	61	51
3.0	97.4	98.0	97.6	97.8	99.4	97.8	7.90	7.90	7.91	7.30	7.30	7.50	7.54	7.49	7.49	7.49	7.54	116	118	117	53	51	52	50	51	51	62	51
4.0	97.4	97.8	97.5	97.7	99.3	97.6	7.91	7.91	7.91	7.31	7.30	7.50	7.55	7.50	7.49	7.49	7.54	117	119	117	53	51	52	50	51	51	62	51
5.0	97.4	97.5	97.3	97.7	99.5	97.7	7.91	7.91		7.32	7.30	7.50	7.54	7.49	7.49	7.48	7.53	117	119		53	51	52	50	51	51	62	51
6.0	97.3	97.2	97.1	97.5	99.3	97.6	7.91	7.90		7.32	7.30	7.50	7.54	7.49	7.49	7.50	7.52	120	119		54	51	52	50	51	51	62	51
7.0	97.1	97.0	96.8	97.4	99.3	97.5	7.90	7.90		7.33	7.30	7.49	7.53	7.49	7.48	7.49	7.51	121	119		54	51	56	49	51	51	62	51
8.0		96.9	96.7	97.3	99.2	97.5	7.89	7.90		7.34	7.29		7.54	7.49	7.48	7.49	7.51	121	119		55	51		49	51	51	62	51
9.0		96.8	96.6	97.1	98.9		7.90	7.90		7.34	7.29		7.53	7.49	7.47	7.51		121	119		56	53		49	51	52	62	
10.0		96.7	96.4	97.0	98.7		7.89			7.34	7.29		7.53	7.49	7.48	7.52		121			56	53		49	51	51	61	
11.0		96.7	96.2	96.9	98.1		7.89			7.35	7.28		7.52	7.47	7.48	7.50		121			57	53		49	52	51	61	
12.0		96.7	96.1	96.9	98.0		7.88				7.28		7.53	7.47	7.48	7.46		121				56		49	53	51	61	
13.0		96.6	95.9	96.8	97.6		7.88				7.29		7.52	7.47	7.48	7.42		121				56		49	53	51	61	
14.0		96.6	95.8	96.8	97.6		7.87				7.30		7.51	7.47	7.49	7.42		121				58		49	53	51	62	
15.0		96.5	95.8	96.6	97.4		7.87				7.30		7.52	7.46	7.48	7.42		121				58		49	53	51	62	
16.0		96.3	95.7	96.6	97.3						7.31		7.51	7.46	7.48	7.41						59		49	53	51	62	
17.0		96.1	95.6	96.4	96.9						7.32		7.51	7.46	7.48	7.40						61		49	53	51	62	
18.0			95.4	96.0	97.0						7.33			7.46	7.48	7.41						61			53	51	62	
19.0			95.3	95.9	96.7						7.35			7.46	7.48	7.38						61			53	51	61	
20.0			95.2	95.8	96.7						7.35			7.45	7.47	7.40						62			53	51	61	
21.0			95.1	95.2	96.1						7.35			7.44	7.48	7.38						62			54	50	61	
22.0				95.1	95.8										7.47	7.38										50	61	
23.0				94.9	95.6										7.46	7.38										49	60	
24.0				94.5	95.0										7.45	7.37										49	60	
25.0				94.4	94.9										7.44	7.36										49	60	
26.0				93.9	95.2										7.43	7.36										49	60	
27.0				93.3	94.6										7.42	7.36										49	60	
28.0				93.0	94.6										7.42	7.35										49	59	
29.0				92.8	93.7										7.41	7.35										48	59	

Notes:
28-Aug-17 to 30-Aug-17 sampling was conducted by Baffinland. 26-Aug-17 sampling was conducted by Minnow.
Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 were 15.4, 9.8, 4.8, 11.95, 21.3, 7.95, 17.6, 21.21, 29.05, and 9.0 m, respectively, at the time of fall sampling.

Table C.70: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Mary Lake Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2017

Categorization & Replicate ID		Date Sampled	Station Depth (m)	Secchi Depth (m)	Depth sampled	Temperature (°C)	Dissolved Oxygen		pH (units)	Specific Conductance (µS/cm)
							(mg/L)	(% sat.)		
Littoral (Shallow) Stations	BLO-01	30-Aug-17	9.8	4.5	surface	7.00	11.72	96.5	7.67	117
					bottom	6.70	11.76	96.1	7.78	118
	BLO-11	20-Aug-17	9.1	3.4	surface	8.24	11.55	97.9	7.67	94
					bottom	7.75	11.46	96.1	7.36	92
	BLO-07	20-Aug-17	12.0	4.0	surface	8.92	11.49	99.1	7.67	87
					bottom	7.64	11.23	95.0	6.89	90
	BLO-06	20-Aug-17	6.6	4.0	surface	8.80	11.40	98.2	7.47	87
					bottom	8.57	11.37	97.4	7.02	87
Profundal (Deep) Stations	BLO-03	20-Aug-17	15.0	4.3	surface	9.21	11.67	101.0	7.54	87
					bottom	7.97	11.59	97.6	7.22	89
	BLO-15	20-Aug-17	29.0	4.9	surface	9.45	11.45	100.2	7.08	87
					bottom	6.58	10.99	87.8	6.84	89
	BLO-14	20-Aug-17	20.0	6.0	surface	9.36	11.42	99.7	7.48	87
					bottom	7.20	11.11	91.7	6.87	91
	BLO-05	20-Aug-17	21.5	3.5	surface	8.16	11.48	97.2	7.60	90
					bottom	6.82	11.34	93.0	7.40	93
	BLO-13	20-Aug-17	22.0	4.3	surface	9.07	11.55	100.0	7.66	88
					bottom	7.05	11.35	93.7	6.98	96
	BLO-04	20-Aug-17	22.0	4.4	surface	8.79	11.50	98.9	7.24	88
					bottom	6.85	11.35	93.7	6.87	95

Table C.71: Statistical Comparison of Bottom *In Situ* Water Quality Between Mary Lake Littoral and Profundal Stations, Mary River Project CREMP, August 2017

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Lake Zone	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	NO	0.235	α	Littoral	4	3.98	0.45	0.23	3.40	4.50
				Profundal	6	4.57	0.83	0.34	3.50	6.00
Temperature (˚C)	NO	0.172	α	Littoral	4	7.67	0.77	0.38	6.70	8.57
				Profundal	6	7.08	0.49	0.20	6.58	7.97
Dissolved Oxygen (mg/L)	NO	0.266	α	Littoral	4	11.5	0.2	0.1	11.2	11.8
				Profundal	6	11.3	0.2	0.1	11.0	11.6
Dissolved Oxygen (% saturation)	YES	0.089	α	Littoral	4	96.2	1.0	0.5	95.0	97.4
				Profundal	6	92.9	3.2	1.3	87.8	97.6
pH (units)	NO	0.270	α	Littoral	4	7.26	0.40	0.20	6.89	7.78
				Profundal	6	7.03	0.23	0.09	6.84	7.40
Specific Conductance (umho/cm)	NO	0.475	α , η	Littoral	4	97.0	14.4	7.2	87.4	118.4
				Profundal	6	92.3	2.9	1.2	88.9	95.9

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.72: Statistical Comparison of Bottom *In Situ* Water Quality Between Mary Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	NO	0.752	α	Reference	5	9.74	1.04	0.46	8.50	11.20
					Mary Lake	4	9.38	2.22	1.11	6.60	12.00
	Secchi Depth (m)	YES	< 0.001	α	Reference	5	8.26	0.74	0.33	7.50	9.40
					Mary Lake	4	3.98	0.45	0.23	3.40	4.50
	Temperature (˚C)	NO	0.112	α	Reference	5	8.29	0.16	0.07	8.05	8.42
					Mary Lake	4	7.67	0.77	0.38	6.70	8.57
	Dissolved Oxygen (mg/L)	YES	0.014	α	Reference	5	11.8	0.1	0.0	11.7	11.9
					Mary Lake	4	11.5	0.2	0.1	11.2	11.8
	Dissolved Oxygen (% saturation)	YES	< 0.001	α	Reference	5	100.3	0.9	0.4	99.0	101.0
					Mary Lake	4	96.2	1.0	0.5	95.0	97.4
	pH (units)	NO	0.408	α	Reference	5	7.43	0.17	0.08	7.31	7.72
					Mary Lake	4	7.26	0.40	0.20	6.89	7.78
	Specific Conductance (umho/cm)	YES	0.003	β , η	Reference	5	73.7	0.6	0.3	73.2	74.6
					Mary Lake	4	97.0	14.4	7.2	87.4	118.4
Profundal (Deep) Stations	Station Depth (m)	NO	0.655	α	Reference	5	20.56	2.17	0.97	18.50	24.20
					Mary Lake	6	21.58	4.50	1.84	15.00	29.00
	Secchi Depth (m)	YES	< 0.001	α	Reference	5	8.28	0.43	0.19	7.90	9.00
					Mary Lake	6	4.57	0.83	0.34	3.50	6.00
	Temperature (˚C)	NO	0.256	α	Reference	5	7.48	0.61	0.27	6.47	8.10
					Mary Lake	6	7.08	0.49	0.20	6.58	7.97
	Dissolved Oxygen (mg/L)	NO	0.245	α	Reference	5	11.6	0.5	0.2	10.7	12.0
					Mary Lake	6	11.3	0.2	0.1	11.0	11.6
	Dissolved Oxygen (% saturation)	YES	0.060	α	Reference	5	97.3	3.6	1.6	93.0	100.7
					Mary Lake	6	92.9	3.2	1.3	87.8	97.6
	pH (units)	YES	0.038	α , η	Reference	5	7.29	0.06	0.03	7.23	7.37
					Mary Lake	6	7.03	0.23	0.09	6.84	7.40
	Specific Conductance (umho/cm)	YES	< 0.001	α	Reference	5	76.1	3.5	1.5	73.2	80.6
					Mary Lake	6	92.3	2.9	1.2	88.9	95.9

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table C.73: Water Chemistry at Mary Lake North Basin (BLO-01) Water Quality Monitoring Stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Winter Sampling Event						er Sampling Event						Fall Sampling Event					
					BL0-01-A bottom 12/Apr/17	BL0-01-A surface 12/Apr/17	BL0-01 bottom 12/Apr/17	BL0-01 surface 12/Apr/17	BL0-01-B bottom 12/Apr/17	BL0-01-B surface 12/Apr/17	BL0-01-A bottom 30/Jul/17	BL0-01-A surface 30/Jul/17	BL0-01 bottom 30/Jul/17	BL0-01 surface 30/Jul/17	BL0-01-B bottom 30/Jul/17	BL0-01-B surface 30/Jul/17	BLO-01-A bottom 30/Aug/17	BLO-01-A surface 30/Aug/17	BLO-01 bottom 30/Aug/17	BLO-01 surface 30/Aug/17	BLO-01-B bottom 30/Aug/17	BLO-01-B surface 30/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	-	262	263	259	269	267	266	73	73	74	74	74	75	154	149	152	151	149	149
	pH (lab)	pH	6.5 - 9.0	-	7.28	7.77	7.76	7.87	7.77	7.82	7.79	7.79	7.77	7.79	7.80	7.80	8.06	8.04	8.07	8.02	8.06	8.05
	Hardness (as $CaCO_3$)	mg/L	-	-	131	132	127	134	136	133	35	34	35	35	36	36	75	72	74	73	72	71
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.2	2.1	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	123	122	120	125	121	140	49	44	49	51	46	46	82	68	99	79	59	80
	Turbidity	NTU	-	-	2.1	0.1	0.2	0.1	0.2	0.2	2.6	2.5	2.0	3.0	2.7	2.1	0.9	0.9	0.9	0.8	0.8	0.9
	Alkalinity (as $CaCO_3$)	mg/L	-	-	130	127	122	132	130	131	31	33	34	34	31	33	72	70	68	64	67	66
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	0.192	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.028	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	0.045	0.091	0.078	0.084	0.072	0.077	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.038	0.026	0.032	0.029	0.028	0.024
	Nitrite	mg/L	0.06	0.06	0.0060	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	0.42	0.17	0.16	0.18	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	2.3	2.1	2.1	2.3	2.3	2.2	1.0	<1.0	<1.0	<1.0	1.1	<1.0	1.4	1.6	1.7	1.6	1.6	1.6
	Total Organic Carbon	mg/L	-	-	2.3	2.3	2.4	2.3	2.5	3.0	1.2	1.1	1.3	1.1	1.1	1.1	1.6	1.7	1.8	1.7	1.8	1.7
	Total Phosphorus	mg/L	0.020[α]	-	0.0109	0.0044	0.0030	0.0034	0.0065	0.0041	0.0046	0.0051	0.0060	0.0075	0.0054	0.0044	0.0244	0.0039	0.0054	<0.0030	0.0035	0.0038
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0019	0.0013	<0.0010	0.0012	0.0016	0.0019	<0.0010	<0.0010	<0.0010	<0.0010	0.0018	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	10.8	11.5	11.1	11.6	11.2	11.1	1.2	1.2	1.2	1.2	1.2	1.3	4.0	3.9	3.9	3.9	3.9	3.5
	Sulphate (SO_4)	mg/L	218[β]	218	2.5	3.7	3.6	3.8	3.6	3.6	0.7	0.6	0.6	0.6	0.5	0.6	2.7	2.6	2.7	2.7	2.6	2.2
Total Metals	Aluminum (Al)	mg/L	0.100	0.13	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	0.040	0.048	0.048	0.048	0.055	0.046	0.022	0.023	0.018	0.022	0.022	0.024
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0139	0.0128	0.0127	0.0132	0.0132	0.0132	0.0036	0.0036	0.0036	0.0035	0.0037	0.0036	0.0075	0.0072	0.0073	0.0074	0.0072	0.0073
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	26	26	25	27	26	26	7	7	7	7	7	7	15	15	15	15	14	15
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	0.00025	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0007	0.0011	0.0011	0.0011	0.0011	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0009	0.0008	0.0008	0.0008	0.0008	0.0009
	Iron (Fe)	mg/L	0.30	0.326	0.221	<0.030	<0.030	<0.030	<0.030	<0.030	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.030	0.031	0.031	0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000055	0.000061	0.000053	0.000054	0.000051	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	0.0012	0.0012	0.0012	0.0013	0.0013	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
	Magnesium (Mg)	mg/L	-	-	15.6	15.7	15.5	16.5	16.6	16.4	4.2	4.2	4.1	4.2	4.5	4.2	9.1	8.7	8.9	9.0	8.7	8.6
	Manganese (Mn)	mg/L	0.935[β]	-	0.0036	0.0012	0.0020	0.0015	0.0028	0.0019	0.0011	0.0012	0.0013	0.0012	0.0013	0.0012	0.0026	0.0032	0.0031	0.0032	0.0034	0.0034
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00027	0.00034	0.00033	0.00034	0.00034	0.00036	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00016	0.00016	0.00017	0.00016	0.00016	0.00017
	Nickel (Ni)	mg/L	0.025	0.025	0.00083	0.00068	0.00063	0.00070	0.00069	0.00070	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	1.31	1.32	1.30	1.40	1.40	1.40	0.42	0.43	0.41	0.42	0.42	0.41	0.81	0.82	0.81	0.81	0.82	0.82
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	2.25	1.25	1.27	1.30	1.32	1.32	0.56	0.62	0.59	0.58	0.63	0.61	0.83	0.76	0.80	0.79	0.76	0.75
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	***0.000101***	0.000088	***0.000170***	***0.000130***	0.000069	0.000061	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	4.6	4.8	4.8	4.9	4.8	5.0	0.8	0.8	0.7	0.8	0.8	0.7	2.0	1.9	2.0	2.0	2.0	2.0
	Strontium (Sr)	mg/L	-	-	0.018	0.017	0.017	0.017	0.018	0.018	0.005	0.005	0.005	0.005	0.005	0.005	0.010	0.009	0.010	0.010	0.010	0.010
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	0.00080	0.00056	0.00062	0.00113	0.00099	0.00118	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	0.0018	0.0022	0.0021	0.0020	0.0023	<0.0020	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0025	0.0033	0.0033	0.0035	0.0034	0.0034	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0015	0.0014	0.0013	0.0014	0.0013	0.0014
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intinsik (2013) using baseline water quality data specific to Mary Lake.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.74: Summary of the Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentrations Provided) Between Mary Lake and Reference Lake 3 in 2017, and at Mary Lake Between 2017 and the Baseline Period

Parameter	Mary Lake North Basin					Mary Lake South Basin				
	2017 vs Reference Lake 3		2017 vs Baseline			2017 vs Reference Lake 3		2017 vs Baseline		
	Summer	Fall	Winter	Summer	Fall	Summer	Fall	Winter	Summer	Fall
Conductivity (lab)	1.0	2.0	1.1	0.7	0.9	0.8	0.9	1.0	0.9	0.8
Hardness (as $CaCO_3$)	1.0	2.1	1.1	0.6	0.9	0.7	0.9	1.0	0.8	0.8
Total Suspended Solids (TSS)	1.2	1.0	1.0	1.2	1.0	2.1	1.2	1.0	1.3	1.2
Total Dissolved Solids (TDS)	1.3	2.2	0.8	0.7	0.7	1.6	1.0	0.8	1.4	0.7
Turbidity	6.6	1.8	2.3	0.9	1.0	16	4.6	0.4	3.5	1.9
Alkalinity (as $CaCO_3$)	1.0	2.1	1.1	0.6	0.8	1.0	0.9	1.0	1.0	0.8
Total Ammonia	0.6	1.1	0.5	0.2	0.2	0.6	1.0	0.2	0.3	0.3
Nitrate	1.0	1.5	0.7	0.2	0.3	1.0	1.0	0.4	0.2	0.2
Nitrite	1.0	1.0	1.2	1.2	0.8	1.0	1.0	1.6	0.3	1.1
Total Kjeldahl Nitrogen (TKN)	0.8	1.0	1.0	0.5	0.6	0.8	1.0	1.1	0.9	0.9
Dissolved Organic Carbon	0.3	0.6	1.1	0.7	0.9	0.4	0.4	0.9	0.9	0.8
Total Organic Carbon	0.4	0.6	1.2	0.7	1.0	0.5	0.4	0.9	0.9	0.8
Total Phosphorus	0.8	1.8	0.8	0.7	1.0	1.4	1.4	1.2	1.7	0.9
Phenols	1.5	0.4	1.0	1.5	1.1	1.0	0.6	1.0	1.0	1.5
Bromide (Br)	1.0	1.0	0.5	0.5	0.7	1.0	1.0	0.9	0.4	0.4
Chloride (Cl)	1.0	2.9	1.3	0.7	1.0	1.1	1.2	0.7	0.6	0.5
Sulphate (SO_4)	0.2	0.6	0.6	0.3	0.6	0.2	0.3	0.7	0.3	0.4
Aluminum (Al)	15	5.6	0.6	0.6	0.3	33	15	0.5	1.6	1.8
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.1	1.0	0.5	1.0	1.0	1.0	1.0	0.9
Barium (Ba)	0.6	1.1	1.1	0.5	0.8	0.6	0.7	1.0	0.9	0.9
Beryllium (Be)	0.2	1.0	1.5	0.3	1.0	0.2	1.0	1.1	0.3	2.0
Bismuth (Bi)	0.1	1.0	1.0	0.1	1.0	0.1	1.0	1.0	0.1	1.0
Boron (B)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Cadmium (Cd)	1.0	1.0	0.8	0.9	0.7	1.0	1.0	0.2	0.9	0.8
Calcium (Ca)	1.0	2.1	1.1	0.6	0.8	0.8	0.9	1.0	0.8	0.8
Chromium (Cr)	1.0	1.0	1.4	0.9	0.7	1.0	1.0	1.2	1.1	1.1
Cobalt (Co)	1.0	1.0	1.3	0.8	0.7	1.0	1.1	1.0	1.0	0.9
Copper (Cu)	1.2	1.0	0.9	1.1	0.3	1.3	0.7	0.9	1.4	0.7
Iron (Fe)	1.7	1.0	2.3	0.5	0.3	4.2	1.8	1.0	1.7	1.2
Lead (Pb)	1.1	1.0	0.9	0.8	0.7	3.1	1.3	0.9	1.9	1.1
Lithium (Li)	1.0	1.0	0.4	0.3	0.2	1.0	1.0	0.2	0.3	0.4
Magnesium (Mg)	1.0	2.0	1.1	0.7	0.9	0.7	0.9	1.1	0.8	0.9
Manganese (Mn)	1.9	5.2	0.4	0.3	0.3	6.0	2.7	0.6	1.8	1.4
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0
Molybdenum (Mo)	0.6	1.3	1.1	0.6	0.7	0.7	0.9	1.2	0.9	0.8
Nickel (Ni)	1.0	1.0	0.9	0.9	0.8	1.1	1.0	1.0	1.1	1.0
Potassium (K)	0.5	0.9	1.1	0.7	1.0	0.5	0.6	1.1	1.0	1.1
Selenium (Se)	0.1	1.0	2.8	0.1	1.8	0.1	1.0	1.2	0.1	1.9
Silicon (Si)	1.4	1.9	1.1	0.9	0.9	1.4	1.3	1.1	1.1	1.2
Silver (Ag)	10	1.0	1.6	19	1.8	RDL	1.0	1.2	RDL	2.3
Sodium (Na)	0.8	2.4	1.1	0.9	1.0	0.9	1.0	1.1	1.0	0.8
Strontium (Sr)	0.6	1.3	1.1	0.7	0.8	0.6	0.7	0.8	0.7	0.7
Thallium (Tl)	0.1	1.0	1.6	0.1	1.0	0.1	1.0	1.1	0.2	2.1
Tin (Sn)	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.4	0.1	0.1
Titanium (Ti)	0.2	1.0	1.0	0.2	1.0	0.6	1.1	1.0	0.6	1.1
Uranium (U)	1.6	5.5	1.1	0.5	0.6	1.4	1.4	1.1	0.8	0.5
Vanadium (V)	0.5	1.0	1.0	0.5	0.5	0.5	1.0	1.0	0.5	1.0
Zinc (Zn)	1.0	1.0	1.6	1.6	RDL	1.0	1.0	1.7	1.4	1.4

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference ot baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.75: Dissolved metal concentrations at Mary Lake north basin water quality monitoring stations, Mary River Project CREMP, 2017

	Parameters	Units	Winter Sampling Event						Summer Sampling Event						Fall Sampling Event					
			BL0-01-A bottom 12-Apr-2017	BL0-01-A surface 12-Apr-2017	BL0-01 bottom 12-Apr-2017	BL0-01 surface 12-Apr-2017	BL0-01-B bottom 12-Apr-2017	BL0-01-B surface 12-Apr-2017	BL0-01-A bottom 30-Jul-2017	BL0-01-A surface 30-Jul-2017	BL0-01 bottom 30-Jul-2017	BL0-01 surface 30-Jul-2017	BL0-01-B bottom 30-Jul-2017	BL0-01-B surface 30-Jul-2017	BLO-01-A bottom 30-Aug-2017	BLO-01-A surface 30-Aug-2017	BLO-01 bottom 30-Aug-2017	BLO-01 surface 30-Aug-2017	BLO-01-B bottom 30-Aug-2017	BLO-01-B surface 30-Aug-2017
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.011	<0.0030	0.0059	0.0064	0.0063	0.0058	0.0059	0.0051	0.0041	0.0051	0.0049	0.0043	0.0047	0.0047
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.0133	0.01250	0.0125	0.0133	0.0130	0.013	0.00358	0.00348	0.00358	0.00345	0.00356	0.00352	0.00713	0.00725	0.00722	0.00708	0.00718	0.00721
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	26.4	26.6	25.3	26.8	27.4	26.7	6.92	6.84	7.00	7.08	7.10	7.30	15.1	14.4	14.9	14.8	14.4	14.2
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.00022	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00059	0.00106	0.00107	0.00112	0.00114	0.0012	0.00063	0.00051	0.00051	0.00053	0.00052	0.00052	0.00079	0.00082	0.00078	0.00080	0.00082	0.00083
	Iron (Fe)	mg/L	0.071	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.0012	0.0013	<0.0010	0.00140	0.0015	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0011	0.0011	0.0010	<0.0010
	Magnesium (Mg)	mg/L	15.8	15.9	15.5	16.3	16.3	16.1	4.32	4.19	4.24	4.17	4.35	4.26	9.16	8.83	8.99	8.79	8.72	8.70
	Manganese (Mn)	mg/L	0.003170	0.000288	0.00052	0.00056	0.00154	0.000971	0.000480	0.00046	0.00043	0.00045	0.00039	0.00042	0.00150	0.00202	0.00195	0.00187	0.00204	0.00218
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000048	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.000267	0.000307	0.000308	0.000349	0.000253	0.000334	0.000071	0.000073	0.000069	0.000070	0.000070	0.000072	0.000152	0.000173	0.000166	0.000165	0.000168	0.000171
	Nickel (Ni)	mg/L	0.00078	0.00065	0.000610	0.000710	0.00070	0.00072	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	1.28	1.33	1.30	1.39	1.39	1.4	0.43	0.42	0.43	0.42	0.43	0.42	0.80	0.81	0.81	0.80	0.82	0.82
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	2.23	1.25	1.25	1.25	1.28	1.32	0.49	0.49	0.49	0.48	0.50	0.50	0.78	0.75	0.78	0.76	0.74	0.73
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	4.51	4.75	4.54	4.86	4.85	4.84	0.730	0.732	0.739	0.738	0.748	0.737	1.94	2.01	1.98	2.00	2.05	2.03
	Strontium (Sr)	mg/L	0.0165	0.0177	0.0172	0.0185	0.0179	0.0172	0.00450	0.00448	0.00458	0.00464	0.00462	0.00474	0.0099	0.0096	0.0099	0.0098	0.0097	0.0096
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00113	0.00101	0.00125	0.00136	0.00241	0.00356	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.00250	0.00327	0.00338	0.00348	0.00345	0.0034	0.000355	0.000354	0.000381	0.000388	0.000379	0.000384	0.00151	0.00138	0.00137	0.00141	0.00136	0.00138
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.76: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Mary Lake and Reference Lake 3 in 2017, and at Mary Lake Between 2017 and the Baseline Period

Dissolved Metal	Mary Lake North Basin					Mary Lake South Basin				
	2017 vs Reference Lake 3		2017 vs Baseline			2017 vs Reference Lake 3		2017 vs Baseline		
	Summer	Fall	Winter	Summer	Fall	Summer	Fall	Winter	Summer	Fall
Aluminum (Al)	2.0	1.5	0.4	0.5	1.0	3.9	2.6	0.4	1.0	1.6
Antimony (Sb)	1.0	1.0	0.8	0.8	1.0	1.0	1.0	0.8	0.8	1.0
Arsenic (As)	1.0	1.0	0.8	0.9	1.0	1.0	1.0	0.8	0.9	1.0
Barium (Ba)	0.5	1.1	1.4	0.4	1.6	0.5	0.6	0.6	0.4	0.8
Beryllium (Be)	1.0	1.0	1.0	1.4	2.1	1.0	1.0	1.0	1.4	2.1
Bismuth (Bi)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Boron (B)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Cadmium (Cd)	1.0	1.0	0.8	0.5	1.0	1.0	1.0	0.8	0.5	1.0
Calcium (Ca)	1.0	2.1	1.5	0.4	1.0	0.8	0.9	0.5	0.3	0.4
Chromium (Cr)	1.0	1.0	1.3	1.7	2.1	1.0	1.0	1.9	1.7	2.1
Cobalt (Co)	1.0	1.0	0.9	0.8	1.0	1.0	1.0	0.8	0.8	1.0
Copper (Cu)	0.6	1.0	0.7	0.4	1.1	0.7	0.6	0.5	0.4	0.7
Iron (Fe)	1.0	1.0	1.1	1.0	1.8	1.0	1.0	0.9	1.0	1.8
Lead (Pb)	1.0	1.0	1.0	0.8	1.0	1.0	1.0	1.0	0.8	1.0
Lithium (Li)	1.0	1.1	0.3	0.3	0.5	1.0	1.0	0.2	0.3	0.4
Magnesium (Mg)	1.0	2.1	1.6	0.4	1.0	0.7	0.9	0.6	0.3	0.4
Manganese (Mn)	1.8	11	0.9	0.3	0.4	4.2	1.9	0.4	0.7	0.1
Mercury (Hg)	1.0	1.0	1.6	1.0	1.0	1.0	1.0	1.2	1.0	1.0
Molybdenum (Mo)	0.5	1.5	1.2	0.3	0.9	0.7	0.9	0.7	0.4	0.6
Nickel (Ni)	1.0	1.0	1.1	0.7	0.9	1.0	1.0	1.0	0.7	0.9
Potassium (K)	0.5	1.0	1.6	0.5	1.1	0.5	0.6	0.9	0.5	0.7
Selenium (Se)	1.0	1.0	RDL	RDL	RDL	1.0	1.0	RDL	RDL	RDL
Silicon (Si)	1.2	1.9	1.6	0.5	0.8	1.0	1.0	0.6	0.5	0.5
Silver (Ag)	1.0	1.0	0.2	1.8	2.5	1.0	1.0	0.2	1.8	2.5
Sodium (Na)	0.8	2.3	2.8	0.3	0.9	0.9	0.9	0.9	0.4	0.4
Strontium (Sr)	0.6	1.2	1.6	0.4	1.0	0.5	0.6	0.7	0.4	0.5
Thallium (Tl)	1.0	1.0	1.0	1.4	2.5	1.0	1.0	1.0	1.4	2.5
Tin (Sn)	1.0	1.0	0.5	0.2	0.4	1.0	1.0	0.3	0.2	0.4
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Uranium (U)	1.4	5.5	1.6	0.2	0.9	1.1	1.3	0.4	0.1	0.2
Vanadium (V)	1.0	1.0	0.8	0.9	1.0	1.0	1.0	0.8	0.9	1.0
Zinc (Zn)	1.0	1.0	1.6	1.3	1.2	1.0	1.0	1.7	1.3	1.2

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference ot baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration≥ 10 times higher than respective mean reference or baseline period value).

Note: RDL = Reportable Detection Limit

Table C.77: Spearman's Rank Correlation Coefficients for Mary Lake North Basin (BLO) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Conventional Parameters										Total Metals										
	Conduct-ivity	Hardness	Total Dissolved Solids	Turbidity	Alkalinity	Nitrate	Dissolved Organic Carbon	Total Phosphorus	Chloride	Sulphate	Aluminum	Barium	Copper	Manganese	Molybdenum	Potassium	Silicon	Silver	Sodium	Strontium	Uranium
Conductivity	1	0.989	0.941	-0.836	0.940	0.944	0.933	-0.160	0.950	0.885	-0.900	0.941	0.287	0.431	0.914	0.887	0.943	-0.820	0.917	0.932	0.970
Hardness	0.989	1	0.927	-0.845	0.927	0.946	0.938	-0.148	0.963	0.894	-0.921	0.947	0.279	0.442	0.916	0.889	0.947	-0.821	0.906	0.936	0.956
Total Dissolved Solids	0.941	0.927	1	-0.777	0.948	0.928	0.920	-0.131	0.912	0.875	-0.905	0.916	0.238	0.432	0.904	0.882	0.900	-0.768	0.927	0.914	0.913
Turbidity	-0.836	-0.845	-0.777	1	-0.793	-0.888	-0.775	0.453	-0.869	-0.941	0.837	-0.754	-0.352	-0.354	-0.815	-0.792	-0.743	0.767	-0.834	-0.748	-0.834
Alkalinity	0.940	0.927	0.948	-0.793	1	1	0.910	-0.117	0.914	0.861	-0.892	0.883	0.262	0.463	0.871	0.902	0.921	-0.774	0.879	0.897	0.931
Nitrate	0.944	0.946	0.928	-0.888	1	1	0.899	-0.255	0.967	0.944	-0.943	0.906	0.293	0.376	0.893	0.882	0.910	-0.811	0.925	0.894	0.929
Dissolved Organic Carbon	0.933	0.938	0.920	-0.775	0.910	0.899	1	-0.217	0.896	0.810	-0.921	0.938	0.181	0.570	0.948	0.935	0.944	-0.823	0.930	0.933	0.908
Total Phosphorus	-0.160	-0.148	-0.131	0.453	-0.117	-0.255	-0.217	1	-0.246	-0.368	0.248	-0.157	-0.123	-0.189	-0.311	-0.303	-0.086	0.378	-0.298	-0.149	-0.233
Chloride	0.950	0.963	0.912	-0.869	0.914	0.967	0.896	-0.246	1	0.936	-0.954	0.906	0.307	0.374	0.879	0.880	0.880	-0.813	0.882	0.894	0.929
Sulphate	0.885	0.894	0.875	-0.941	0.861	0.944	0.810	-0.368	0.936	1	-0.899	0.801	0.326	0.310	0.844	0.813	0.789	-0.785	0.855	0.795	0.856
Aluminum (total)	-0.900	-0.921	-0.905	0.837	-0.892	-0.943	-0.921	0.248	-0.954	-0.899	1	-0.895	-0.178	-0.460	-0.866	-0.859	-0.883	0.799	-0.856	-0.875	-0.860
Barium (total)	0.941	0.947	0.916	-0.754	0.883	0.906	0.938	-0.157	0.906	0.801	-0.895	1	0.171	0.525	0.920	0.901	0.959	-0.831	0.922	0.978	0.920
Copper (total)	0.287	0.279	0.238	-0.352	0.262	0.293	0.181	-0.123	0.307	0.326	-0.178	0.171	1	-0.568	0.327	0.314	0.149	0.135	0.329	0.225	0.327
Manganese (total)	0.431	0.442	0.432	-0.354	0.463	0.376	0.570	-0.189	0.374	0.310	-0.460	0.525	-0.568	1	0.462	0.485	0.549	-0.756	0.435	0.531	0.439
Molybdenum (total)	0.914	0.916	0.904	-0.815	0.871	0.893	0.948	-0.311	0.879	0.844	-0.866	0.920	0.327	0.462	1	0.966	0.896	-0.822	0.967	0.934	0.902
Potassium (total)	0.887	0.889	0.882	-0.792	0.902	0.882	0.935	-0.303	0.880	0.813	-0.859	0.901	0.314	0.485	0.966	1	0.886	-0.814	0.945	0.912	0.911
Silicon (total)	0.943	0.947	0.900	-0.743	0.921	0.910	0.944	-0.086	0.880	0.789	-0.883	0.959	0.149	0.549	0.896	0.886	1	-0.823	0.897	0.958	0.914
Silver (total)	-0.820	-0.821	-0.768	0.767	-0.774	-0.811	-0.823	0.378	-0.813	-0.785	0.799	-0.831	0.135	-0.756	-0.822	-0.814	-0.823	1	-0.802	-0.834	-0.805
Sodium (total)	0.917	0.906	0.927	-0.834	0.879	0.925	0.930	-0.298	0.882	0.855	-0.856	0.922	0.329	0.435	0.967	0.945	0.897	-0.802	1	0.926	0.924
Strontium (total)	0.932	0.936	0.914	-0.748	0.897	0.894	0.933	-0.149	0.894	0.795	-0.875	0.978	0.225	0.531	0.934	0.912	0.958	-0.834	0.926	1	0.904
Uranium (total)	0.970	0.956	0.913	-0.834	0.931	0.929	0.908	-0.233	0.929	0.856	-0.860	0.920	0.327	0.439	0.902	0.911	0.914	-0.805	0.924	0.904	1
Aluminum (dissolved)	-0.670	-0.636	-0.738	0.568	-0.666	-0.751	-0.613	0.394	-0.710	-0.680	0.677	-0.697	-0.011	-0.357	-0.599	-0.590	-0.645	0.680	-0.681	-0.684	-0.669
Barium (dissolved)	0.892	0.902	0.919	-0.747	0.919	0.877	0.958	-0.217	0.881	0.816	-0.915	0.913	0.184	0.545	0.928	0.925	0.900	-0.792	0.880	0.914	0.862
Copper (dissolved)	0.807	0.816	0.797	-0.847	0.783	0.811	0.784	-0.484	0.845	0.865	-0.775	0.754	0.406	0.379	0.885	0.881	0.702	-0.776	0.857	0.779	0.854
Manganese (dissolved)	0.314	0.322	0.392	-0.214	0.399	0.252	0.466	-0.139	0.286	0.248	-0.391	0.425	-0.584	0.893	0.383	0.429	0.420	-0.645	0.341	0.436	0.308
Molybdenum (dissolved)	0.869	0.856	0.872	-0.797	0.895	0.896	0.907	-0.446	0.883	0.842	-0.880	0.866	0.292	0.452	0.933	0.956	0.861	-0.824	0.911	0.886	0.875
Potassium (dissolved)	0.892	0.905	0.910	-0.834	0.889	0.891	0.939	-0.322	0.896	0.853	-0.883	0.899	0.346	0.487	0.969	0.959	0.864	-0.796	0.947	0.922	0.898
Sodium (dissolved)	0.912	0.911	0.880	-0.851	0.908	0.889	0.942	-0.341	0.895	0.827	-0.869	0.874	0.330	0.519	0.920	0.937	0.871	-0.793	0.920	0.884	0.942
Strontium (dissolved)	0.982	0.981	0.925	-0.869	0.927	0.962	0.925	-0.205	0.975	0.920	-0.939	0.903	0.292	0.403	0.888	0.866	0.912	-0.810	0.895	0.893	0.950
Uranium (dissolved)	0.971	0.953	0.933	-0.836	0.943	0.929	0.897	-0.234	0.935	0.882	-0.887	0.906	0.321	0.419	0.889	0.885	0.899	-0.791	0.900	0.893	0.985

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 18.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.77: Spearman's Rank Correlation Coefficients for Mary Lake North Basin (BLO) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Dissolved Metals								
	Aluminum	Barium	Copper	Manganese	Molybdenum	Potassium	Sodium	Strontium	Uranium
Conductivity	-0.670	0.892	0.807	0.314	0.869	0.892	0.912	0.982	0.971
Hardness	-0.636	0.902	0.816	0.322	0.856	0.905	0.911	0.981	0.953
Total Dissolved Solids	-0.738	0.919	0.797	0.392	0.872	0.910	0.880	0.925	0.933
Turbidity	0.568	-0.747	-0.847	-0.214	-0.797	-0.834	-0.851	-0.869	-0.836
Alkalinity	-0.666	0.919	0.783	0.399	0.895	0.889	0.908	0.927	0.943
Nitrate	-0.751	0.877	0.811	0.252	0.896	0.891	0.889	0.962	0.929
Dissolved Organic Carbon	-0.613	0.958	0.784	0.466	0.907	0.939	0.942	0.925	0.897
Total Phosphorus	0.394	-0.217	-0.484	-0.139	-0.446	-0.322	-0.341	-0.205	-0.234
Chloride	-0.710	0.881	0.845	0.286	0.883	0.896	0.895	0.975	0.935
Sulphate	-0.680	0.816	0.865	0.248	0.842	0.853	0.827	0.920	0.882
Aluminum (total)	0.677	-0.915	-0.775	-0.391	-0.880	-0.883	-0.869	-0.939	-0.887
Barium (total)	-0.697	0.913	0.754	0.425	0.866	0.899	0.874	0.903	0.906
Copper (total)	-0.011	0.184	0.406	-0.584	0.292	0.346	0.330	0.292	0.321
Manganese (total)	-0.357	0.545	0.379	0.893	0.452	0.487	0.519	0.403	0.419
Molybdenum (total)	-0.599	0.928	0.885	0.383	0.933	0.969	0.920	0.888	0.889
Potassium (total)	-0.590	0.925	0.881	0.429	0.956	0.959	0.937	0.866	0.885
Silicon (total)	-0.645	0.900	0.702	0.420	0.861	0.864	0.871	0.912	0.899
Silver (total)	0.680	-0.792	-0.776	-0.645	-0.824	-0.796	-0.793	-0.810	-0.791
Sodium (total)	-0.681	0.880	0.857	0.341	0.911	0.947	0.920	0.895	0.900
Strontium (total)	-0.684	0.914	0.779	0.436	0.886	0.922	0.884	0.893	0.893
Uranium (total)	-0.669	0.862	0.854	0.308	0.875	0.898	0.942	0.950	0.985
Aluminum (dissolved)	1	-0.628	-0.544	-0.260	-0.718	-0.617	-0.612	-0.670	-0.675
Barium (dissolved)	-0.628	1	0.783	0.483	0.915	0.944	0.905	0.875	0.871
Copper (dissolved)	-0.544	0.783	1	0.352	0.854	0.905	0.869	0.816	0.857
Manganese (dissolved)	-0.260	0.483	0.352	1	0.399	0.398	0.366	0.284	0.329
Molybdenum (dissolved)	-0.718	0.915	0.854	0.399	1	0.922	0.906	0.865	0.873
Potassium (dissolved)	-0.617	0.944	0.905	0.398	0.922	1	0.959	0.882	0.886
Sodium (dissolved)	-0.612	0.905	0.869	0.366	0.906	0.959	1	0.912	0.919
Strontium (dissolved)	-0.670	0.875	0.816	0.284	0.865	0.882	0.912	1	0.958
Uranium (dissolved)	-0.675	0.871	0.857	0.329	0.873	0.886	0.919	0.958	1

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 18.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.78: Water chemistry at Mary Lake south basin (BLO) water quality monitoring stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Winter Sampling Event													
					BL0-05-A bottom 15/Apr/17	BL0-05-A surface 15/Apr/17	BL0-05 bottom 15/Apr/17	BL0-05 surface 15/Apr/17	BL0-05-B bottom 15/Apr/17	BL0-05-B surface 15/Apr/17	BL0-03 bottom 14/Apr/17	BL0-03 surface 14/Apr/17	BL0-04 bottom 14/Apr/17	BL0-04 surface 14/Apr/17	BL0-09 bottom 14/Apr/17	BL0-09 surface 14/Apr/17	BL0-06 bottom 15/Apr/17	BL0-06 surface 15/Apr/17
Conventionals	Conductivity (lab)	umho/cm	-	-	89	94	87	93	100	100	82	91	83	100	85	93	96	96
	pH (lab)	pH	6.5 - 9.0	-	7.68	7.64	7.64	7.63	7.60	7.64	7.63	7.64	7.51	7.62	7.30	7.65	7.54	7.62
	Hardness (as $CaCO_3$)	mg/L	-	-	44	47	44	46	50	51	41	45	42	52	43	49	48	49
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.1	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	41	43	42	42	62	61	51	54	49	57	68	53	43	57
	Turbidity	NTU	-	-	0.2	0.2	0.3	0.1	0.2	0.2	0.1	0.1	0.3	0.1	0.4	0.1	0.2	0.1
	Alkalinity (as $CaCO_3$)	mg/L	-	-	44	45	45	47	48	49	39	46	43	52	33	42	46	45
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	0.035	0.028	0.036	0.034	0.024	0.029	0.028	0.031	0.042	0.036	0.069	0.033	0.035	0.043
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.3	1.3	1.2	<1.0	1.4	1.4	1.3	1.6	1.3	1.6	1.1	1.0	1.3	1.5
	Total Organic Carbon	mg/L	-	-	1.2	1.3	1.2	1.3	1.6	1.6	1.4	1.4	1.3	1.5	1.4	<1.0	1.4	1.5
	Total Phosphorus	mg/L	0.020[α]	-	0.0076	0.0037	0.0042	0.0046	0.0046	0.0055	<0.0030	0.0032	<0.0030	0.0031	0.0050	0.0049	<0.0030	0.0051
	Phenols	mg/L	0.004[α]	-	0.0011	<0.0010	0.0011	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	2.1	1.9	2.0	2.2	2.4	2.4	1.9	2.1	2.0	2.5	2.3	2.3	2.3	2.3
	Sulphate (SO_4)	mg/L	218[β]	218	1.2	1.0	1.1	1.3	1.4	1.4	1.0	1.1	1.1	1.3	1.1	1.3	1.3	1.3
Total Metals	Aluminum (Al)	mg/L	0.100	0.130	0.005	0.006	0.010	0.005		0.005	0.005	0.004	0.009	0.004	0.011	0.004	0.006	0.005
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0053	0.0055	0.0052	0.0054		0.0056	0.0047	0.0052	0.0051	0.0060	0.0055	0.0055	0.0057	0.0056
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	9	10	9	10		10	8	9	8	10	9	10	10	9
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0007	0.0007	0.0008	0.0007		0.0007	0.0006	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0007
	Iron (Fe)	mg/L	0.30	0.326	<0.030	<0.030	<0.030	<0.030		<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	5.5	5.8	5.4	6.0		5.8	5.3	5.5	5.2	6.2	5.4	5.8	6.0	5.9
	Manganese (Mn)	mg/L	0.935[β]	-	0.0005	0.0004	0.0018	0.0003		0.0006	0.0005	0.0004	0.0005	0.0003	0.0009	0.0004	0.0006	0.0004
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.00014	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00017	0.00019	0.00017	0.00018		0.00017	0.00014	0.00016	0.00015	0.00018	0.00016	0.00019	0.00019	0.00018
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.71	0.77	0.69	0.76		0.76	0.65	0.72	0.67	0.79	0.67	0.76	0.75	0.77
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000		<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.52	0.53	0.58	0.53		0.54	0.50	0.52	0.59	0.54	0.79	0.52	0.54	0.54
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.5	1.5	1.4	1.5		1.5	1.3	1.5	1.4	1.7	1.5	1.5	1.6	1.6
	Strontium (Sr)	mg/L	-	-	0.00733	0.00774	0.00702	0.00757		0.00813	0.00655	0.00720	0.00677	0.00791	0.00684	0.0079	0.00822	0.00747
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	0.00054	0.00055	0.00058	0.00082		0.00058	0.00078	0.00124	0.00069	<0.00010	0.00152	0.00159	0.00084	0.00089
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	<0.0100	<0.0100		<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0009	0.0009	0.0008	0.0009		0.0009	0.0007	0.0008	0.0008	0.0010	0.0007	0.0009	0.0009	0.0009
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intinsik (2013) using baseline water quality data specific to Mary Lake.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.78: Water chemistry at Mary Lake south basin (BLO) water quality monitoring stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Summer Sampling Event													
					BL0-05-A bottom 1/Aug/17	BL0-05-A surface 1/Aug/17	BL0-05 bottom 1/Aug/17	BL0-05 surface 1/Aug/17	BL0-05-B bottom 1/Aug/17	BL0-05-B surface 1/Aug/17	BL0-03 bottom 1/Aug/17	BL0-03 surface 1/Aug/17	BL0-04 bottom 1/Aug/17	BL0-04 surface 1/Aug/17	BL0-09 bottom 1/Aug/17	BL0-09 surface 1/Aug/17	BL0-06 bottom 1/Aug/17	BL0-06 surface 1/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	-	60	59	59	57	57	59	57	58	57	57	57	56	56	56
	pH (lab)	pH	6.5 - 9.0	-	7.44	7.37	7.45	7.42	7.49	7.51	7.50	7.55	7.53	7.43	7.52	7.51	7.41	7.54
	Hardness (as $CaCO_3$)	mg/L	-	-	28	27	27	27	26	27	26	27	26	26	27	26	26	26
	Total Suspended Solids (TSS)	mg/L	-	-	3.6	2.8	4.4	2.4	3.2	2.8	<2.0	<2.0	9.2	6.4	7.2	2.8	5.6	5.2
	Total Dissolved Solids (TDS)	mg/L	-	-	33	40	44	33	30	57	35	37	270	25	50	65	52	70
	Turbidity	NTU	-	-	5.7	5.2	6.6	4.0	4.0	3.6	3.5	1.4	10.1	6.3	11.1	11.5	7.4	6.7
	Alkalinity (as $CaCO_3$)	mg/L	-	-	32	33	29	30	32	32	27	26	28	29	32	32	32	33
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.3	1.6	1.2	1.4	1.3	1.2	1.6	1.3	1.2	1.4	1.3	1.2	1.2	1.2
	Total Organic Carbon	mg/L	-	-	1.3	1.4	1.4	1.4	1.6	1.5	1.4	1.4	1.4	1.3	1.4	1.4	1.3	1.3
	Total Phosphorus	mg/L	0.020[α]	-	0.0079	0.0084	0.0092	0.0090	0.0092	0.0069	0.0078	0.0056	0.0132	0.0098	0.0126	0.0078	0.0154	0.0099
	Phenols	mg/L	0.004[α]	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	1.3	1.3	1.3	1.3	1.4	1.3	1.3	1.3	1.3	1.4	1.3	1.4	1.3	1.4
	Sulphate (SO_4)	mg/L	218[β]	218	0.7	0.6	0.8	0.6	0.6	0.5	0.7	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Total Metals	Aluminum (Al)	mg/L	0.100	0.13	0.099	***0.146***	***0.153***	0.085	0.080	0.068	0.074	0.033	***0.189***	0.114	***0.162***	0.080	0.114	0.114
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0042	0.0042	0.0045	0.0038	0.0036	0.0037	0.0034	0.0031	0.0052	0.0042	0.0047	0.0038	0.0041	0.0041
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	5	5	6	5	5	5	5	5	5	5	5	5	5	5
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00013	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	<0.0010	<0.0010	0.0012	0.0021	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)	mg/L	0.30	0.326	0.110	0.147	0.171	0.099	0.103	0.083	0.091	<0.050	0.228	0.139	0.195	0.089	0.141	0.136
	Lead (Pb)	mg/L	0.001	0.001	0.000137	0.000156	0.000190	0.000124	0.000119	0.000102	0.000107	<0.000050	0.000274	0.000183	0.000272	0.000108	0.000189	0.000178
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	3.2	3.3	3.3	3.0	3.1	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.1
	Manganese (Mn)	mg/L	0.935[β]	-	0.0032	0.0037	0.0049	0.0032	0.0031	0.0027	0.0032	0.0019	0.0058	0.0041	0.0059	0.0031	0.0042	0.0042
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00011	0.00011	0.00011	0.00010	0.00009	0.00011	0.00009	0.00008	0.00008	0.00008	0.00008	0.00009	0.00008	0.00008
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	0.00056	0.00062	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00069	0.00058	0.00070	<0.00050	<0.00050	0.00052
	Potassium (K)	mg/L	-	-	0.51	0.52	0.54	0.49	0.48	0.48	0.47	0.44	0.53	0.50	0.53	0.49	0.50	0.50
	Selenium (Se)	mg/L	0.001	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	0.64	0.71	0.75	0.57	0.53	0.52	0.48	0.43	0.74	0.63	0.66	0.51	0.61	0.58
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8
	Strontium (Sr)	mg/L	-	-	0.00460	0.00460	0.00480	0.00430	0.00430	0.00430	0.00410	0.00395	0.00450	0.00430	0.00440	0.00420	0.00440	0.00420
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	0.0054	0.0074	0.0091	0.0048	0.0048	0.0039	0.0040	0.0014	0.0109	0.0068	0.0090	0.0042	0.0066	0.0065
	Uranium (U)	mg/L	0.015	-	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intinsik (2013) using baseline water quality data specific to Mary Lake.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.78: Water chemistry at Mary Lake south basin (BLO) water quality monitoring stations, Mary River Project CREMP, 2017

Parameters		Units	Water Quality Guideline (WQG)[a]	AEMP Benchmark[b]	Fall Sampling Event													
					BL0-05-A bottom 28/Aug/17	BL0-05-A surface 28/Aug/17	BL0-05 bottom 29/Aug/17	BL0-05 surface 29/Aug/17	BL0-05-B bottom 29/Aug/17	BL0-05-B surface 29/Aug/17	BL0-03 bottom 29/Aug/17	BL0-03 surface 29/Aug/17	BL0-04 bottom 29/Aug/17	BL0-04 surface 29/Aug/17	BL0-09 bottom 29/Aug/17	BL0-09 surface 29/Aug/17	BL0-06 bottom 29/Aug/17	BL0-06 surface 29/Aug/17
Conventionals	Conductivity (lab)	umho/cm	-	-	67	71	76	66	73	66	64	65	69	67	62	66	65	65
	pH (lab)	pH	6.5 - 9.0	-	7.67	7.43	7.81	7.69	7.74	7.73	7.70	7.72	7.71	7.59	7.64	7.69	7.71	7.73
	Hardness (as $CaCO_3$)	mg/L	-	-	30	31	34	30	31	30	29	30	32	30	29	30	29	30
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	7.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	28	39	36	40	34	36	35	37	34	37	37	40	27	28
	Turbidity	NTU	-	-	1.8	2.0	11.4	1.6	1.9	1.4	0.7	0.7	2.0	1.3	2.8	1.4	1.4	1.3
	Alkalinity (as $CaCO_3$)	mg/L	-	-	34	27	32	33	29	26	30	28	31	30	24	25	28	28
Nutrients and Organics	Total Ammonia	mg/L	variable[c]	0.855	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	0.15	<0.15	<0.15	0.16	0.18	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	<1.0	1.2	1.1	1.2	1.1	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.3	1.2
	Total Organic Carbon	mg/L	-	-	1.2	1.2	1.4	1.2	1.2	1.2	1.2	1.3	1.2	1.2	1.1	1.2	1.2	1.3
	Total Phosphorus	mg/L	0.020[α]	-	<0.0030	0.0183	0.0116	0.0043	0.0034	0.0033	<0.0030	0.0038	0.0053	0.0047	0.0038	0.0041	0.0041	0.0038
	Phenols	mg/L	0.004[α]	-	0.0014	0.0069	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0016	<0.0010	0.0014	<0.0010	0.0010	<0.0010	<0.0010
Anions	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	1.5	1.3	1.8	1.6	1.7	1.6	1.4	1.3	1.7	1.5	1.3	1.6	1.6	1.6
	Sulphate (SO_4)	mg/L	218[β]	218	1.0	0.9	1.8	1.0	1.3	1.1	0.8	0.7	1.3	1.0	0.8	1.1	1.0	1.0
Total Metals	Aluminum (Al)	mg/L	0.100	0.13	0.058	0.044	***0.241***	0.026	0.051	0.056	0.020	0.028	0.066	0.036	0.058	0.054	0.051	0.049
	Antimony (Sb)	mg/L	0.020[α]	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.005	0.005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0042	0.0041	0.0071	0.0039	0.0049	0.0042	0.0036	0.0036	0.0045	0.0044	0.0046	0.0041	0.0041	0.0041
	Beryllium (Be)	mg/L	0.011[α]	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	-	-	6	6	7	6	6	6	6	6	6	6	6	6	6	6
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Cobalt (Co)	mg/L	0.0009[α]	0.004	<0.00010	<0.00010	0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.0006	0.0006	0.0008	0.0007	<0.0005	0.0006	<0.0005	0.0005	0.0006	<0.0005	<0.0005	0.0006	0.0006	0.0006
	Iron (Fe)	mg/L	0.30	0.326	0.048	0.033	0.306	<0.030	<0.030	0.040	<0.030	<0.030	0.058	<0.030	0.032	0.038	0.033	0.035
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	0.000235	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000060	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	3.8	3.8	4.6	3.9	4.4	3.8	3.6	3.7	4.0	4.2	3.9	3.8	3.7	3.7
	Manganese (Mn)	mg/L	0.935[β]	-	0.0022	0.0013	0.0085	0.0011	0.0006	0.0012	0.0009	0.0009	0.0018	0.0005	0.0007	0.0012	0.0012	0.0012
	Mercury (Hg)	mg/L	0.000026	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)	mg/L	0.073	-	0.00011	0.00011	0.00010	0.00010	0.00014	0.00011	0.00009	0.00009	0.00012	0.00013	0.00013	0.00011	0.00011	0.00011
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	0.00064	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.55	0.54	0.73	0.52	0.63	0.53	0.47	0.48	0.56	0.60	0.60	0.54	0.53	0.53
	Selenium (Se)	mg/L	0.001	-	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000	<0.001000
	Silicon (Si)	mg/L	-	-	0.53	0.48	0.78	0.42	0.51	0.52	0.42	0.43	0.56	0.49	0.59	0.52	0.51	0.50
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	0.9	0.8	1.0	0.8	1.0	0.8	0.8	0.8	0.9	0.9	0.9	0.8	0.8	0.8
	Strontium (Sr)	mg/L	-	-	0.005	0.005	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	<0.0100	<0.0100	0.0170	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Uranium (U)	mg/L	0.015	-	0.0004	0.0004	0.0006	0.0004	0.0002	0.0004	0.0003	0.0003	0.0005	0.0002	0.0002	0.0004	0.0004	0.0004
	Vanadium (V)	mg/L	0.006[α]	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[a] Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

[b] AEMP Water Quality Benchmarks developed by Intinsik (2013) using baseline water quality data specific to Mary Lake.

Indicates parameter concentration above applicable Water Quality Guideline.

BOLD Indicates parameter concentration above the AEMP benchmark.

Table C.79: Dissolved Metal Concentrations at Mary Lake South Basin Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Winter Sampling Event														Summer Sampling Event						
			BL0-05-A bottom 15-Apr-2017	BL0-05-A surface 15-Apr-2017	BL0-05 bottom 15-Apr-2017	BL0-05 surface 15-Apr-2017	BL0-05-B bottom 15-Apr-2017	BL0-05-B surface 15-Apr-2017	BL0-03 bottom 14-Apr-2017	BL0-03 surface 14-Apr-2017	BL0-04 bottom 14-Apr-2017	BL0-04 surface 14-Apr-2017	BL0-09 bottom 14-Apr-2017	BL0-09 surface 14-Apr-2017	BL0-06 bottom 15-Apr-2017	BL0-06 surface 15-Apr-2017	BL0-05-A bottom 1-Aug-2017	BL0-05-A surface 1-Aug-2017	BL0-05 bottom 1-Aug-2017	BL0-05 surface 1-Aug-2017	BL0-05-B bottom 1-Aug-2017	BL0-05-B surface 1-Aug-2017	BL0-03 bottom 1-Aug-2017
Dissolved Metals	Aluminum (Al)	mg/L	0.00390	0.00430	0.00410	<0.0030	0.00370	0.00540	0.0034	0.0035	0.0038	0.0045	0.0061	0.0039	0.0031	0.0039	0.0134	0.0136	0.0139	0.0099	0.0128	0.0127	0.0071
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00491	0.00551	0.00502	0.00486	0.00574	0.00605	0.00461	0.00502	0.00485	0.00601	0.00530	0.00574	0.00551	0.00546	0.00332	0.00348	0.00347	0.00330	0.00310	0.00327	0.00309
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	8.78	9.53	8.86	9.49	9.83	10.40	8.01	8.99	8.7	10.50	8.48	9.9	9.73	9.92	5.58	5.62	5.52	5.35	5.26	5.31	5.23
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00181	<0.00050	<0.00050	<0.00050	<0.00050	0.00258	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00068	0.00071	0.00064	0.00066	0.00077	0.00079	0.00056	0.00061	0.00205	0.00071	0.00060	0.00070	0.00071	0.00069	0.00067	0.00052	0.00056	0.0005	0.00052	0.00073	0.00057
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	5.28	5.64	5.41	5.41	6.18	6.00	5.09	5.59	5.07	6.24	5.29	6.03	5.85	5.97	3.36	3.27	3.33	3.34	3.10	3.23	3.19
	Manganese (Mn)	mg/L	0.000306	0.000323	0.001340	0.000262	0.000670	0.000412	0.000315	0.000296	0.00030	0.000456	0.000759	0.00030	0.000528	0.000271	0.000885	0.000838	0.001690	0.000839	0.001920	0.001080	0.000770
	Mercury (Hg)	mg/L	<0.000010	0.00002	0.000012	0.000012	0.000018	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.000167	0.000180	0.000159	0.000189	0.000210	0.000200	0.000139	0.000161	0.000149	0.000226	0.000160	0.000193	0.000187	0.000189	0.000122	0.000117	0.000126	0.000105	0.000090	0.000106	0.000092
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.001450	0.000510	<0.00050	<0.00050	<0.00050	0.00142	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.680	0.760	0.690	0.710	0.800	0.820	0.64	0.73	0.66	0.83	0.68	0.80	0.76	0.76	0.50	0.48	0.49	0.48	0.47	0.47	0.46
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.500	0.530	0.560	0.520	0.530	0.540	0.50	0.53	0.55	0.56	0.83	0.56	0.54	0.52	0.47	0.46	0.46	0.40	0.40	0.41	0.36
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.40	1.47	1.44	1.45	1.62	1.62	1.30	1.46	1.36	1.66	1.50	1.64	1.56	1.52	0.796	0.780	0.803	0.822	0.805	0.803	0.803
	Strontium (Sr)	mg/L	0.00694	0.00736	0.00709	0.00753	0.00804	0.00878	0.00651	0.00717	0.00687	0.00881	0.00693	0.0084	0.00777	0.00813	0.00443	0.00442	0.00444	0.00421	0.00416	0.00421	0.00395
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00117	0.00151	0.0011	0.00094	0.00107	0.00086	0.00036	0.0002	0.00050	0.00034	0.00095	0.00046	0.00112	0.00143	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000840	0.000920	0.000805	0.000940	0.000965	0.000979	0.000697	0.000798	0.000743	0.000920	0.000636	0.000923	0.000874	0.000931	0.000296	0.000299	0.000314	0.000306	0.000311	0.000308	0.000304
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0053	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.79: Dissolved Metal Concentrations at Mary Lake South Basin Water Quality Monitoring Stations, Mary River Project CREMP, 2017

	Parameters	Units	Summer Sampling Event							Fall Sampling Event													
			BL0-03 surface 1-Aug-2017	BL0-04 bottom 1-Aug-2017	BL0-04 surface 1-Aug-2017	BL0-09 bottom 1-Aug-2017	BL0-09 surface 1-Aug-2017	BL0-06 bottom 1-Aug-2017	BL0-06 surface 1-Aug-2017	BL0-05-A bottom 28-Aug-2017	BL0-05-A surface 28-Aug-2017	BL0-05 bottom 29-Aug-2017	BL0-05 surface 29-Aug-2017	BL0-05-B bottom 29-Aug-2017	BL0-05-B surface 29-Aug-2017	BL0-03 bottom 29-Aug-2017	BL0-03 surface 29-Aug-2017	BL0-04 bottom 29-Aug-2017	BL0-04 surface 29-Aug-2017	BL0-09 bottom 29-Aug-2017	BL0-09 surface 29-Aug-2017	BL0-06 bottom 29-Aug-2017	BL0-06 surface 29-Aug-2017
Dissolved Metals	Aluminum (Al)	mg/L	0.0060	0.0164	0.0109	0.0134	0.0094	0.0114	0.0124	0.0080	0.0073	0.0070	0.0078	0.0082	0.0076	0.0060	0.0062	0.0092	0.0077	0.0084	0.0082	0.0080	0.0086
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00304	0.00325	0.00314	0.00330	0.00321	0.00321	0.00333	0.00387	0.00386	0.00423	0.00372	0.00374	0.00375	0.00343	0.00350	0.00403	0.00366	0.00366	0.00370	0.00362	0.00375
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	5.51	5.26	5.21	5.29	5.26	5.19	5.12	5.93	6.15	6.84	5.84	6.19	6.13	5.90	6.00	6.3	6.02	5.70	6.07	6.03	6.02
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00055	0.00065	0.00065	0.00054	<0.00050	0.00054	<0.00050	<0.00050	0.00059	0.00056	<0.00050	0.00052	<0.00050	<0.00050	<0.00050	0.00062	0.0005	0.00053	0.0005	<0.00050	0.0005
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	3.24	3.18	3.14	3.23	3.07	3.14	3.12	3.77	3.80	4.17	3.71	3.76	3.61	3.50	3.64	3.86	3.71	3.54	3.67	3.42	3.67
	Manganese (Mn)	mg/L	0.000657	0.000903	0.00076	0.000977	0.000791	0.000920	0.000961	0.00086	0.00039	0.00100	0.00022	0.00028	0.00025	0.00013	0.00020	0.00028	0.00023	0.00017	0.00024	0.00022	0.00026
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.000079	0.000110	0.000099	0.000106	0.000100	0.000105	0.000103	0.000121	0.000112	0.000116	0.000123	0.000121	0.000094	0.000077	0.000076	0.000104	0.000098	0.000091	0.000101	0.000097	0.000102
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.44	0.48	0.48	0.49	0.48	0.48	0.47	0.55	0.52	0.57	0.53	0.50	0.49	0.46	0.46	0.54	0.50	0.51	0.51	0.49	0.51
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.37	0.41	0.40	0.42	0.39	0.41	0.41	0.42	0.40	0.45	0.41	0.41	0.40	0.38	0.38	0.44	0.39	0.43	0.40	0.40	0.40
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	0.753	0.794	0.807	0.806	0.809	0.810	0.799	0.87	0.84	0.92	0.846	0.83	0.81	0.754	0.759	0.88	0.81	0.807	0.833	0.80	0.82
	Strontium (Sr)	mg/L	0.00392	0.00422	0.00409	0.00416	0.00411	0.00404	0.00407	0.00472	0.00488	0.00588	0.00474	0.00501	0.00499	0.00449	0.00449	0.0052	0.00481	0.00464	0.00490	0.00490	0.00487
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000292	0.000295	0.000301	0.000291	0.000304	0.000303	0.000301	0.000227	0.000356	0.000465	0.000207	0.000400	0.000373	0.000298	0.000309	0.000414	0.000336	0.000303	0.000352	0.000340	0.000356
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.80: Spearman's Rank Correlation Coefficients for Mary Lake South Basin (BLO) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Conventional Parameters										Total Metals											
	Conduct-ivity	Hardness	Total Suspended Solids	Total Dissolved Solids	Turbidity	Alkalinity	Dissolved Organic Carbon	Total Phosphorus	Chloride	Sulphate	Aluminum	Barium	Copper	Iron	Manganese	Molybdenum	Potassium	Silicon	Sodium	Strontium	Tin	Uranium
Conductivity	1	0.986	-0.643	0.246	-0.839	0.642	0.053	-0.550	0.836	0.886	-0.822	0.741	-0.539	-0.777	-0.797	0.889	0.893	-0.075	0.908	0.954	0.723	0.735
Hardness	0.986	1	-0.620	0.276	-0.843	0.646	0.027	-0.543	0.840	0.877	-0.832	0.739	-0.540	-0.782	-0.804	0.870	0.890	-0.071	0.913	0.952	0.729	0.745
Total Suspended Solids	-0.643	-0.620	1	0.119	0.757	-0.120	0.000	0.749	-0.465	-0.545	0.758	-0.087	0.748	0.812	0.755	-0.552	-0.381	0.575	-0.571	-0.514	-0.348	-0.185
Total Dissolved Solids	0.246	0.276	0.119	1	-0.216	0.526	0.086	0.094	0.347	0.127	-0.259	0.447	0.163	-0.172	-0.191	0.263	0.350	0.252	0.341	0.256	0.482	0.452
Turbidity	-0.839	-0.843	0.757	-0.216	1	-1	-0.175	0.694	-0.746	-0.642	0.968	-0.434	0.559	0.897	0.921	-0.766	-0.640	0.357	-0.759	-0.765	-0.729	-0.567
Alkalinity	0.642	0.646	-0.120	0.526	-1	1	0.271	-0.229	0.712	0.495	-0.548	0.640	-0.129	-0.443	-0.457	0.623	0.626	0.231	0.636	0.627	0.702	0.695
Dissolved Organic Carbon	0.053	0.027	0.000	0.086	-0.175	0.271	1	0.046	0.076	-0.083	-0.096	-0.024	0.327	0.022	-0.038	0.002	-0.056	0.030	-0.080	-0.031	0.098	0.138
Total Phosphorus	-0.550	-0.543	0.749	0.094	0.694	-0.229	0.046	1	-0.478	-0.467	0.661	-0.180	0.671	0.733	0.723	-0.527	-0.379	0.398	-0.518	-0.524	-0.352	-0.189
Chloride	0.836	0.840	-0.465	0.347	-0.746	0.712	0.076	-0.478	1	0.840	-0.737	0.700	-0.406	-0.666	-0.685	0.727	0.785	-0.027	0.856	0.844	0.732	0.761
Sulphate	0.886	0.877	-0.545	0.127	-0.642	0.495	-0.083	-0.467	0.840	1	-0.621	0.718	-0.571	-0.625	-0.630	0.738	0.835	-0.004	0.856	0.887	0.538	0.631
Aluminum (total)	-0.822	-0.832	0.758	-0.259	0.968	-0.548	-0.096	0.661	-0.737	-0.621	1	-0.401	0.566	0.937	0.933	-0.751	-0.618	0.427	-0.765	-0.731	-0.741	-0.539
Barium (total)	0.741	0.739	-0.087	0.447	-0.434	0.640	-0.024	-0.180	0.700	0.718	-0.401	1	-0.154	-0.343	-0.425	0.712	0.912	0.502	0.767	0.818	0.651	0.782
Copper (total)	-0.539	-0.540	0.748	0.163	0.559	-0.129	0.327	0.671	-0.406	-0.571	0.566	-0.154	1	0.713	0.625	-0.367	-0.314	0.496	-0.507	-0.489	-0.275	-0.174
Iron (total)	-0.777	-0.782	0.812	-0.172	0.897	-0.443	0.022	0.733	-0.666	-0.625	0.937	-0.343	0.713	1	0.930	-0.714	-0.565	0.461	-0.739	-0.674	-0.641	-0.364
Manganese (total)	-0.797	-0.804	0.755	-0.191	0.921	-0.457	-0.038	0.723	-0.685	-0.630	0.933	-0.425	0.625	0.930	1	-0.784	-0.658	0.399	-0.785	-0.725	-0.644	-0.445
Molybdenum (total)	0.889	0.870	-0.552	0.263	-0.766	0.623	0.002	-0.527	0.727	0.738	-0.751	0.712	-0.367	-0.714	-0.784	1	0.865	0.023	0.869	0.880	0.737	0.645
Potassium (total)	0.893	0.890	-0.381	0.350	-0.640	0.626	-0.056	-0.379	0.785	0.835	-0.618	0.912	-0.314	-0.565	-0.658	0.865	1	0.223	0.917	0.934	0.695	0.797
Silicon (total)	-0.075	-0.071	0.575	0.252	0.357	0.231	0.030	0.398	-0.027	-0.004	0.427	0.502	0.496	0.461	0.399	0.023	0.223	1	-0.016	0.084	0.098	0.282
Sodium (total)	0.908	0.913	-0.571	0.341	-0.759	0.636	-0.080	-0.518	0.856	0.856	-0.765	0.767	-0.507	-0.739	-0.785	0.869	0.917	-0.016	1	0.907	0.731	0.714
Strontium (total)	0.954	0.952	-0.514	0.256	-0.765	0.627	-0.031	-0.524	0.844	0.887	-0.731	0.818	-0.489	-0.674	-0.725	0.880	0.934	0.084	0.907	1	0.730	0.821
Tin (total)	0.723	0.729	-0.348	0.482	-0.729	0.702	0.098	-0.352	0.732	0.538	-0.741	0.651	-0.275	-0.641	-0.644	0.737	0.695	0.098	0.731	0.730	1	0.719
Uranium (total)	0.735	0.745	-0.185	0.452	-0.567	0.695	0.138	-0.189	0.761	0.631	-0.539	0.782	-0.174	-0.364	-0.445	0.645	0.797	0.282	0.714	0.821	0.719	1
Aluminum (dissolved)	-0.818	-0.814	0.693	-0.226	0.872	-0.545	-0.115	0.594	-0.742	-0.672	0.888	-0.461	0.532	0.816	0.794	-0.655	-0.629	0.336	-0.760	-0.711	-0.759	-0.586
Barium (dissolved)	0.961	0.970	-0.553	0.334	-0.780	0.676	-0.007	-0.518	0.844	0.876	-0.755	0.791	-0.515	-0.712	-0.734	0.874	0.924	0.050	0.928	0.969	0.729	0.788
Copper (dissolved)	0.570	0.550	-0.059	0.444	-0.423	0.561	0.285	0.000	0.482	0.397	-0.394	0.627	0.060	-0.246	-0.345	0.588	0.562	0.333	0.459	0.531	0.592	0.630
Manganese (dissolved)	-0.362	-0.374	0.705	0.213	0.530	0.168	0.137	0.610	-0.233	-0.383	0.539	0.031	0.768	0.642	0.666	-0.257	-0.207	0.573	-0.329	-0.321	-0.124	0.011
Molybdenum (dissolved)	0.768	0.758	-0.158	0.540	-0.551	0.837	0.166	-0.176	0.704	0.628	-0.543	0.802	-0.152	-0.431	-0.478	0.773	0.804	0.308	0.692	0.782	0.725	0.814
Potassium (dissolved)	0.909	0.915	-0.430	0.350	-0.690	0.710	0.040	-0.398	0.818	0.821	-0.680	0.841	-0.328	-0.603	-0.667	0.866	0.950	0.168	0.891	0.939	0.727	0.831
Silicon (dissolved)	0.709	0.716	-0.113	0.518	-0.505	0.797	0.088	-0.224	0.647	0.593	-0.461	0.854	-0.132	-0.376	-0.422	0.754	0.800	0.528	0.691	0.772	0.744	0.772
Sodium (dissolved)	0.851	0.866	-0.414	0.368	-0.669	0.715	0.042	-0.348	0.871	0.788	-0.681	0.757	-0.328	-0.603	-0.645	0.807	0.868	0.099	0.889	0.859	0.734	0.803
Strontium (dissolved)	0.968	0.973	-0.560	0.290	-0.810	0.633	0.018	-0.534	0.867	0.900	-0.779	0.785	-0.521	-0.736	-0.780	0.886	0.921	0.006	0.921	0.983	0.726	0.780
Tin (dissolved)	0.803	0.801	-0.415	0.494	-0.775	0.784	0.246	-0.358	0.794	0.610	-0.768	0.721	-0.237	-0.676	-0.689	0.801	0.770	0.122	0.794	0.794	0.914	0.793
Uranium (dissolved)	0.844	0.854	-0.454	0.332	-0.734	0.576	0.113	-0.340	0.833	0.801	-0.704	0.690	-0.296	-0.621	-0.698	0.820	0.822	0.009	0.868	0.853	0.737	0.732

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 42.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

Table C.80: Spearman's Rank Correlation Coefficients for Mary Lake South Basin (BLO) Water Quality Data Collected in Winter, Summer and Fall 2017[a]

Parameters	Dissolved Metals										
	Aluminum	Barium	Copper	Manganese	Molybdenum	Potassium	Silicon	Sodium	Strontium	Tin	Uranium
Conductivity	-0.818	0.961	0.570	-0.362	0.768	0.909	0.709	0.851	0.968	0.803	0.844
Hardness	-0.814	0.970	0.550	-0.374	0.758	0.915	0.716	0.866	0.973	0.801	0.854
Total Suspended Solids	0.693	-0.553	-0.059	0.705	-0.158	-0.430	-0.113	-0.414	-0.560	-0.415	-0.454
Total Dissolved Solids	-0.226	0.334	0.444	0.213	0.540	0.350	0.518	0.368	0.290	0.494	0.332
Turbidity	0.872	-0.780	-0.423	0.530	-0.551	-0.690	-0.505	-0.669	-0.810	-0.775	-0.734
Alkalinity	-0.545	0.676	0.561	0.168	0.837	0.710	0.797	0.715	0.633	0.784	0.576
Dissolved Organic Carbon	-0.115	-0.007	0.285	0.137	0.166	0.040	0.088	0.042	0.018	0.246	0.113
Total Phosphorus	0.594	-0.518	0.000	0.610	-0.176	-0.398	-0.224	-0.348	-0.534	-0.358	-0.340
Chloride	-0.742	0.844	0.482	-0.233	0.704	0.818	0.647	0.871	0.867	0.794	0.833
Sulphate	-0.672	0.876	0.397	-0.383	0.628	0.821	0.593	0.788	0.900	0.610	0.801
Aluminum (total)	0.888	-0.755	-0.394	0.539	-0.543	-0.680	-0.461	-0.681	-0.779	-0.768	-0.704
Barium (total)	-0.461	0.791	0.627	0.031	0.802	0.841	0.854	0.757	0.785	0.721	0.690
Copper (total)	0.532	-0.515	0.060	0.768	-0.152	-0.328	-0.132	-0.328	-0.521	-0.237	-0.296
Iron (total)	0.816	-0.712	-0.246	0.642	-0.431	-0.603	-0.376	-0.603	-0.736	-0.676	-0.621
Manganese (total)	0.794	-0.734	-0.345	0.666	-0.478	-0.667	-0.422	-0.645	-0.780	-0.689	-0.698
Molybdenum (total)	-0.655	0.874	0.588	-0.257	0.773	0.866	0.754	0.807	0.886	0.801	0.820
Potassium (total)	-0.629	0.924	0.562	-0.207	0.804	0.950	0.800	0.868	0.921	0.770	0.822
Silicon (total)	0.336	0.050	0.333	0.573	0.308	0.168	0.528	0.099	0.006	0.122	0.009
Sodium (total)	-0.760	0.928	0.459	-0.329	0.692	0.891	0.691	0.889	0.921	0.794	0.868
Strontium (total)	-0.711	0.969	0.531	-0.321	0.782	0.939	0.772	0.859	0.983	0.794	0.853
Tin (total)	-0.759	0.729	0.592	-0.124	0.725	0.727	0.744	0.734	0.726	0.914	0.737
Uranium (total)	-0.586	0.788	0.630	0.011	0.814	0.831	0.772	0.803	0.780	0.793	0.732
Aluminum (dissolved)	1	-0.738	-0.425	0.421	-0.516	-0.665	-0.466	-0.690	-0.752	-0.781	-0.727
Barium (dissolved)	-0.738	1	0.513	-0.308	0.791	0.943	0.779	0.885	0.971	0.798	0.837
Copper (dissolved)	-0.425	0.513	1	0.188	0.700	0.605	0.700	0.569	0.540	0.692	0.610
Manganese (dissolved)	0.421	-0.308	0.188	1	0.119	-0.194	0.149	-0.131	-0.371	-0.084	-0.214
Molybdenum (dissolved)	-0.516	0.791	0.700	0.119	1	0.860	0.891	0.811	0.764	0.795	0.671
Potassium (dissolved)	-0.665	0.943	0.605	-0.194	0.860	1	0.832	0.938	0.925	0.796	0.789
Silicon (dissolved)	-0.466	0.779	0.700	0.149	0.891	1	1	0.747	0.743	0.788	0.640
Sodium (dissolved)	-0.690	0.885	0.569	-0.131	0.811	0.938	0.747	1	0.861	0.792	0.816
Strontium (dissolved)	-0.752	0.971	0.540	-0.371	0.764	0.925	0.743	0.861	1	0.794	0.884
Tin (dissolved)	-0.781	0.798	0.692	-0.084	0.795	0.796	0.788	0.792	0.794	1	0.805
Uranium (dissolved)	-0.727	0.837	0.610	-0.214	0.671	0.789	0.640	0.816	0.884	0.805	1

[a] Correlation matrix included only those parameters with≥75% of values above laboratory reportable detection limits (RDL). Sample size (n) totalled 42.

Indicates strong positive correlation (i.e., Spearman's rho≥ 0.7) between parameter pairings.

Indicates strong negative correlation (i.e., Spearman's rho≤ -0.7) between parameter pairings.

APPENDIX D

SEDIMENT QUALITY DATA

Table D.1: Deposited Sediment Field Observations and Collection Details at Unnamed Reference Creek Benthic Stations[a], Mary River Project CREMP, August 2017

Station	Visually Assessed Texture Observations	Location of Sampling	Presence of Silt Precipitate
REF-CRK-1	medium (sized) sand	in-stream channel	none observed
REF-CRK-2	medium (sized) sand	in-stream channel	none observed
REF-CRK-3	medium (sized) sand	in-stream channel	none observed
REF-CRK-4	medium (sized) sand	in-stream channel	none observed
REF-CRK-5	medium (sized) sand	in-stream channel	none observed

[a] Deposited sediment samples were collected using a stainless steel spoon.

Table D.2: Deposited Sediment Total Organic Carbon and Metal Concentrations at Unnamed Reference Creek (REF-CRK) Benthic Stations, Mary River Project CREMP, August 2017

Parameter	Units	Sediment Quality Guideline (SQG)[a]	Unnamed Reference Creek Station					Study Area Summary Statistics		
			REF-CRK-B1	REF-CRK-B2	REF-CRK-B3	REF-CRK-B4	REF-CRK-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	medium sand	medium sand	medium sand	medium sand	medium sand	-	-	-
Total Organic Carbon	%	10[α]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Aluminum (Al)	mg/kg	-	602	310	302	481	395	418	126	56
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.00	0.00
Arsenic (As)	mg/kg	17	0.13	<0.10	<0.10	0.14	0.12	0.12	0.02	0.01
Barium (Ba)	mg/kg	-	2	1	1	2	2	2	0.3	0.2
Beryllium (Be)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0	0
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0	0
Calcium (Ca)	mg/kg	-	224	216	147	212	269	214	44	20
Chromium (Cr)	mg/kg	90	1.5	1.0	1.1	1.5	1.9	1.4	0.4	0.2
Cobalt (Co)	mg/kg	-	0.41	0.2	0.22	0.3	0.4	0.3	0.09	0.04
Copper (Cu)	mg/kg	197	0.7	<0.50	<0.50	2	0.6	0.8	0.5	0.2
Iron (Fe)	mg/kg	40,000[α]	1,310	978	897	976	2,040	1,240	475	212
Lead (Pb)	mg/kg	91.3	0.9	0.6	0.6	0.7	0.9	0.7	0.16	0.07
Lithium (Li)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Magnesium (Mg)	mg/kg	-	490	232	219	409	313	333	116	52
Manganese (Mn)	mg/kg	1,100[α,β]	13	7	7	11	10	10	2.4	1.1
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Nickel (Ni)	mg/kg	75[α,β]	1.0	0.6	0.5	1.0	0.9	0.8	0.21	0.10
Phosphorus (P)	mg/kg	2,000[α]	54	53	<50	60	89	61	16.0	7.1
Potassium (K)	mg/kg	-	130	<100	<100	<100	<100	106	13	6
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Sodium (Na)	mg/kg	-	<50	<50	<50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	1.3	1.0	1.0	1.3	1.4	1.2	0.16	0.07
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0	0
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	54	16	31	30	49	36	16	7
Uranium (U)	mg/kg	-	0.30	0.1	0.1	0.2	0.3	0.2	0.08	0.04
Vanadium (V)	mg/kg	-	1.9	1.4	1.6	1.4	3.0	1.9	0.7	0.3
Zinc (Zn)	mg/kg	315	2.1	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Zirconium (Zr)	mg/kg	-	1.2	<1.0	<1.0	1.1	<1.0	1.1	0.1	0.0

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.3: Field Observations of Sediment Properties at Reference Lake 3 (REF-03) Benthic Stations [a], Mary River Project CREMP, August 2017

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia[b]	Plant or Algal Presence
REF-03-1	8.5	gray-brown silt with some fine sand; no precipitate layer observed	none detected	sparse moss growth
REF-03-2	9.4	thin orange-brown precipitate layer over brown-gray silt	none detected	sparse moss growth
REF-03-3	10.3	thin orange-brown precipitate layer over medium red-brown sandy-silt	none detected	none observed
REF-03-4	9.3	medium brown coloured silt over gray-brown silt; no precipitate layer	none detected	none observed
REF-03-5	11.2	thin iron oxide precipitate layer over gray-brown silt	none detected	sparse moss growth
REF-03-6	19.5	medium orange-brown coloured silt; no precipitate layer observed	none detected	none observed
REF-03-7	24.2	medium orange-brown coloured silt; no precipitate layer observed	none detected	none observed
REF-03-8	18.5	orange-brown coloured silt with some fine sand, no precipitate layer observed	none detected	none observed
REF-03-9	20.1	thin orange-brown precipitate layer over medium brown silt	none detected	none observed
REF-03-10	20.5	red-brown silt; no precipitate layer observed	none detected	none observed

[a] Sediment particle size and benthic invertebrate community samples were collected by Petite Ponar.
[b] Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

Table D.4: Observations from Sediment Cores Collected at Reference Lake 3 (REF-03), Mary River Project CREMP, August 2017

Sample Station	Station Depth (m)	Station Type	Core #	Core Length (cm)	Surficial Substrate (top 2 cm) Texture Description
REF-03-1	8.0	Littoral	1	22.0	Loam
			2	24.0	
			3	20.0	
REF-03-6	20.0	Profundal	1	17.0	Loam
			2	10.0	
			3	12.0	
REF-03-2	9.4	Littoral	1	-	Sandy loam
			2	-	
			3	-	
REF-03-7	24.0	Profundal	1	7.0	Silt loam
			2	6.0	
			3	6.0	
REF-03-3	10.2	Littoral	1	11.0	Silt loam
			2	15.0	
			3	17.0	
REF-03-8	18.5	Profundal	1	-	Silt loam / Loam
			2	-	
			3	-	
REF-03-4	9.3	Littoral	1	-	Sandy loam
			2	-	
			3	-	
REF-03-9	20.1	Profundal	1	-	Silt loam
			2	-	
			3	-	
REF-03-5	11.1	Littoral	1	21.0	Loam
			2	19.0	
			3	14.0	
REF-03-10	19.5	Profundal	1	18.0	Sandy loam
			2	21.0	
			3	17.0	
Ref-03-DUP (duplicate of REF-03-10)	19.5	Profundal	1	17.0	Sandy loam
			2	21.0	
			3	6.0	

Table D.5: Statistical Comparison of Substrate Physical Properties between Littoral and Profundal Sediment Stations of Individual Study Lakes, Mary River Project CREMP, August 2015

Lake	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Station Type	N	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Camp Lake	Sand (% by weight)	NO	0.528	β	Littoral	5	58.3	18.1	8.1	41.8	85.4
					Profundal	9	52.9	22.0	7.3	33.8	92.0
	Silt (% by weight)	NO	0.876	α	Littoral	5	39.1	16.5	7.4	14.1	54.4
					Profundal	9	40.7	18.8	6.3	7.1	60.0
	Clay (% by weight)	YES	0.077	α	Littoral	5	2.6	1.6	0.7	0.5	4.6
					Profundal	9	6.4	4.1	1.4	0.4	13.0
	TOC (%)	-	-	-	Littoral	1	3.4	.	.	3.4	3.4
					Profundal	9	1.3	0.6	0.2	0.2	2.1
Sheardown Lake NW	Sand (% by weight)	NO	0.165	γ	Littoral	7	44.2	15.4	5.8	32.2	76.9
					Profundal	7	36.7	27.5	10.4	16.7	96.2
	Silt (% by weight)	NO	0.318	γ	Littoral	7	46.2	12.7	4.8	20.5	57.1
					Profundal	7	48.0	20.2	7.6	3.7	62.4
	Clay (% by weight)	NO	0.137	α	Littoral	7	9.6	3.6	1.4	2.6	13.2
					Profundal	7	15.3	8.7	3.3	0.1	26.4
	TOC (%)	NO	0.343	β	Littoral	4	2.5	2.0	1.0	0.2	5.1
					Profundal	4	1.5	0.2	0.1	1.4	1.8
Sheardown Lake SE	Sand (% by weight)	NO	0.221	α	Littoral	5	13.6	4.0	1.8	8.8	19.3
					Profundal	5	17.6	5.5	2.4	12.0	24.6
	Silt (% by weight)	NO	0.512	δ	Littoral	5	68.2	2.6	1.2	64.5	70.3
					Profundal	5	66.3	5.5	2.5	59.7	72.7
	Clay (% by weight)	NO	0.458	δ	Littoral	5	18.2	5.8	2.6	10.8	25.0
					Profundal	5	16.1	0.6	0.3	15.3	16.6
	TOC (%)	-	-	-	Littoral	3	1.2	0.4	0.2	0.9	1.7
					Profundal	2	0.9	0.0	0.0	0.9	0.9
Mary Lake	Sand (% by weight)	NO	0.897	β	Littoral	4	31.6	39.5	19.8	7.0	90.4
					Profundal	11	26.8	24.4	7.4	7.5	90.9
	Silt (% by weight)	NO	0.939	δ	Littoral	4	46.1	26.4	13.2	8.5	69.8
					Profundal	11	47.0	16.6	5.0	6.6	64.8
	Clay (% by weight)	NO	0.657	δ	Littoral	4	22.3	18.8	9.4	1.1	38.9
					Profundal	11	26.3	13.5	4.1	2.6	43.3
	TOC (%)	-	-	-	Littoral	2	1.1	0.2	0.2	0.9	1.3
					Profundal	8	0.8	0.2	0.1	0.6	1.2

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - single factor ANOVA test results confirmed using Mann-Whitney U-test; and, δ - single-factor ANOVA test results confirmed using t-test assuming unequal variance.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table D.6: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Reference Lake 3 (REF-03) Sediment Stations, Mary River Project CREMP, August 2017

Parameter		Units	Sediment Quality Guideline (SQG)[a]	Reference Lake 3 Station										Study Area Summary Statistics		
				REF-03-1 (littoral)	REF-03-6 (profundal)	REF-03-2 (littoral)	REF-03-7 (profundal)	REF-03-3 (littoral)	REF-03-8 (profundal)	REF-03-4 (littoral)	REF-03-9 (profundal)	REF-03-5 (littoral)	REF-03-10 (profundal)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	46.5	45.3	58.0	15.6	25.6	39.2	59.9	22.4	42.0	56.0	41.0	15.5	4.89
	Silt	%	-	43.7	42.5	32.8	62.4	62.2	49.6	35.4	61.4	47.4	35.3	47.3	11.48	3.63
	Clay	%	-	9.80	12.2	9.2	22.0	12.20	11.2	4.70	16.2	10.60	8.8	11.7	4.66	1.47
	Moisture	%	-	89.1	86.1	91.3	54.4	68.0	76.6	70.7	77.5	88.2	85.3	79	11.69	3.70
	Total Organic Carbon	%	10[α]	6.06	4.43	7.23	1.81	3.59	3.03	2.74	4.13	4.71	4.39	4.21	1.58	0.501
Metals	Aluminum (Al)	mg/kg	-	14,400	26,000	14,200	16,400	16,500	21,000	12,400	24,300	16,100	22,450	18,375	4,694	1,484
	Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
	Arsenic (As)	mg/kg	17	2.34	5.50	3.01	4.41	3.65	4.41	2.08	4.87	5.67	4.69	4.06	1.25	0.396
	Barium (Ba)	mg/kg	-	120	158	133	115	105.0	133	77.4	142	129.0	140	125	22.4	7.09
	Beryllium (Be)	mg/kg	-	0.54	1.00	0.58	0.66	0.65	0.80	0.50	0.91	0.58	0.87	0.71	0.17	0.055
	Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.0000	0.0000
	Boron (B)	mg/kg	-	10.8	18.8	13.8	11.0	13.3	16.0	9.7	18.7	13.1	17.8	14.3	3.36	1.06
	Cadmium (Cd)	mg/kg	3.5	0.152	0.181	0.298	0.269	0.180	0.131	0.105	0.158	0.173	0.161	0.18	0.059	0.019
	Calcium (Ca)	mg/kg	-	5,570	6,050	5,260	3,970	4,430	4,880	3,490	5,770	4,530	5,555	4,951	835	264.0
	Chromium (Cr)	mg/kg	90	56.5	84.3	48.0	48.5	53.9	65.4	38.2	79.1	59.1	72.2	60.5	14.6	4.63
	Cobalt (Co)	mg/kg	-	9.03	19.0	10.00	12.2	12.1	15.1	9.1	17.3	12.9	16.2	13.3	3.49	1.10
	Copper (Cu)	mg/kg	197	59.6	107.0	84.2	57	61.9	87	52.8	97.2	64.8	89.5	76.1	19.1	6.04
	Iron (Fe)	mg/kg	40,000[α]	23,900	55,400	45,800	34,600	35,200	45,700	31,100	50,400	73,800	47,100	44,300	14,181	4,485
	Lead (Pb)	mg/kg	91.3	12.5	19.7	11.9	13.6	13.4	15.8	10.6	18.0	13.7	17.3	14.6	2.92	0.92
	Lithium (Li)	mg/kg	-	23.3	39.8	23.7	27.7	26.5	33.5	21.2	37.8	25.2	35.4	29.4	6.64	2.10
	Magnesium (Mg)	mg/kg	-	11,600	17,500	9,450	11,000	11,000	13,500	7,830	16,200	11,400	14,900	12,438	3,038	961
	Manganese (Mn)	mg/kg	1,100[α,β]	306	1,340	718	1,500	1,010	1,220	609	1,140	554	1,130	953	386.0	122.1
	Mercury (Hg)	mg/kg	0.486	0.0613	0.0661	0.0528	0.0238	0.0325	0.0407	0.0182	0.0701	0.0554	0.0599	0.0481	0.0182	0.00575
	Molybdenum (Mo)	mg/kg	-	1.04	3.08	4.08	3.52	2.84	2.92	2.68	2.53	6.85	2.41	3.19	1.51	0.477
	Nickel (Ni)	mg/kg	75[α,β]	41.3	57.9	38.3	41.0	40.9	44.2	28.8	53.1	41.6	49.3	43.6	8.15	2.58
	Phosphorus (P)	mg/kg	2,000[α]	726	1,200	830	897	859	1,010	760	1,160	2,020	1,060	1,052	376.3	119.0
	Potassium (K)	mg/kg	-	3,380	6,580	3,750	4,470	4,360	5,360	3,210	6,200	4,070	5,750	4,713	1,190	376.4
	Selenium (Se)	mg/kg	-	0.58	0.79	0.92	<0.20	0.44	0.41	0.26	0.79	0.86	0.71	0.60	0.26	0.081
	Silver (Ag)	mg/kg	-	0.13	0.24	0.15	0.12	<0.10	0.16	<0.10	0.25	0.15	0.22	0.16	0.056	0.018
	Sodium (Na)	mg/kg	-	262	473	301	290	300	366	218	472	340	431	345	88	28.0
	Strontium (Sr)	mg/kg	-	9.9	14.3	10.9	9.9	10.2	12.0	8.3	13.8	10.6	13.1	11.3	1.94	0.61
	Sulphur (S)	mg/kg	-	1100	1400	1500	<1000	<1000	<1000	<1000	1200	1000	1050	1,125.0	184.5	58.3
	Thallium (Tl)	mg/kg	-	0.334	0.762	0.333	0.561	0.422	0.579	0.226	0.695	0.415	0.676	0.500	0.180	0.0569
	Tin (Sn)	mg/kg	-	2.6	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.1	0.19	0.060
	Titanium (Ti)	mg/kg	-	936	1,380	903	1,110	1,060	1,220	917	1,420	1,170	1,265	1,138	187	59.0
	Uranium (U)	mg/kg	-	9.20	27.1	12.1	15.0	12.2	27.6	8.02	23.8	13.6	24.1	17.3	7.55	2.39
	Vanadium (V)	mg/kg	-	47.1	77.7	45.4	54.7	52.0	63.9	41.8	71.5	52.6	67.2	57.4	12.0	3.80
	Zinc (Zn)	mg/kg	315	66.9	107	68.5	67	69.7	89	58.2	99.0	73.3	92	79	16.4	5.18
	Zirconium (Zr)	mg/kg	-	5.5	3.6	3.9	3.8	3.1	3.0	3.1	3.4	3.8	3.2	3.6	0.7	0.2

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.7: Deposited Sediment Field Sampling Observations at the Camp Lake Tributary 1 and 2 Benthic Stations[a], Mary River Project CREMP, August 2017

Study Area	Station	Texture of Collected Sediment	Predominant Collection Location	Silt Presence[b]
Camp Lake Tributary 1 Upstream (North Branch; CLT1 US)	CLT1 US-1	coarse sand	shoreline/bank	none observed
	CLT1 US-2	coarse sand	shoreline/bank	none observed
	CLT1 US-3	coarse sand	shoreline/bank	none observed
	CLT1 US-4	coarse sand (some fine sand)	shoreline/bank	none observed
	CLT1 US-5	coarse sand	shoreline/bank	none observed
Camp Lake Tributary 1 Downstream (Lower Main Stem; CLT1 DS)	CLT1 DS-1	coarse to fine sand	in-stream under large cobble/boulders	present (thin film)
	CLT1 DS-2	coarse sand	in-stream under large cobble/boulders	present (thin film)
	CLT1 DS-3	coarse sand	in-stream under large cobble/boulders	present (thin film)
	CLT1 DS-4	coarse sand	in-stream under large cobble/boulders	present (thin film)
	CLT1 DS-5	coarse sand-gravel mix	in-stream under large cobble/boulders	present (thin film)
Camp Lake Tributary 2 Upstream (CLT2 US)	CLT2 US-1	very coarse sand	shoreline/bank and in-stream under rocks	none observed
	CLT2 US-2	coarse sand	shoreline/bank and in-stream under rocks	none observed
	CLT2 US-3	coarse sand	shoreline/bank and in-stream under rocks	none observed
	CLT2 US-4	coarse sand	shoreline/bank and in-stream under rocks	none observed
	CLT2 US-5	coarse sand	shoreline/bank and in-stream under rocks	present (thin film)
Camp Lake Tributary 2 Downstream (CLT2 DS)	CLT2 DS-1	coarse sand	shoreline/bank and in-stream under rocks	none observed
	CLT2 DS-2	very coarse sand	shoreline/bank and in-stream under rocks	none observed
	CLT2 DS-3	coarse sand	in-stream under large cobble/boulders	none observed
	CLT2 DS-4	coarse sand	shoreline/bank and in-stream under rocks	none observed
	CLT2 DS-5	coarse sand	shoreline/bank and in-stream under rocks	none observed

[a] Sediment samples collected using a stainless steel scoop directly from the streambed or shoreline, as available.
[b] Evidence of silt precipitate included fine material present on the surface of in-stream substrate and/or as interstitial deposits not otherwise expected to occur at such habitat.

Table D.8: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 1 Upstream (CLT1-US) Benthic Stations, Mary River Project CREMP, August 2017

Parameter	Units	Sediment Quality Guideline (SQG)[a]	Camp Lake Tributary 1 Upstream Station					Study Area Summary Statistics		
			CLT1-US-1	CLT1-US-2	CLT1-US-3	CLT1-US-4	CLT1-US-5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	coarse sand	coarse sand	coarse sand	fine-coarse sand	coarse sand	-	-	-
Total Organic Carbon	%	10[α]	0.40	0.32	0.27	0.34	0.73	0.41	0.18	0.082
Aluminum (Al)	mg/kg	-	8,080	4,630	3,960	7,510	9,940	6,824	2,489	1,113
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.80	0.63	0.44	0.61	0.77	0.65	0.14	0.06
Barium (Ba)	mg/kg	-	18	12	9	17	22	16	5.1	2.3
Beryllium (Be)	mg/kg	-	0.32	0.18	0.16	0.28	0.42	0.27	0.11	0.05
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	0.22	0.20	0.0089	0.0040
Boron (B)	mg/kg	-	9.8	6.9	5.1	9.4	16.5	9.5	4.34	1.94
Cadmium (Cd)	mg/kg	3.5	0.042	0.040	0.026	0.046	0.063	0.04	0.013	0.006
Calcium (Ca)	mg/kg	-	2,730	1,760	3,130	2,660	3,130	2,682	560	250
Chromium (Cr)	mg/kg	90	33.0	21.1	21.8	33.9	34.9	28.9	6.9	3.1
Cobalt (Co)	mg/kg	-	6.71	4.4	3.67	6.1	7.8	5.7	1.68	0.75
Copper (Cu)	mg/kg	197	16.0	13.0	21.5	17	21.5	17.7	3.7	1.7
Iron (Fe)	mg/kg	40,000[α]	16,700	12,200	11,700	14,100	17,700	14,480	2,663	1,191
Lead (Pb)	mg/kg	91.3	4.5	3.0	2.9	4.1	5.0	3.9	0.92	0.41
Lithium (Li)	mg/kg	-	14.0	8.0	7.0	13.2	20.8	12.6	5.52	2.47
Magnesium (Mg)	mg/kg	-	9,150	5,100	5,470	8,630	12,200	8,110	2,920	1,306
Manganese (Mn)	mg/kg	1,100[α,β]	151	92	90	140	199	134	45.4	20.3
Mercury (Hg)	mg/kg	0.486	0.0065	0.0057	0.0063	0.0054	0.0095	0.0067	0.0016	0.0007
Molybdenum (Mo)	mg/kg	-	0.19	0.11	<0.10	0.13	0.21	0.15	0.05	0.02
Nickel (Ni)	mg/kg	75[α,β]	22.0	13.4	12.0	20.2	25.4	18.6	5.72	2.56
Phosphorus (P)	mg/kg	2,000[α]	262	235	140	243	257	227	50.0	22.4
Potassium (K)	mg/kg	-	1,480	890	690	1,310	2,180	1,310	580	259
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Sodium (Na)	mg/kg	-	71	54	<50	67	94	67	17	8
Strontium (Sr)	mg/kg	-	3.2	2.4	2.2	2.8	3.0	2.7	0.40	0.18
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	0.113	0.067	0.055	0.100	0.134	0.094	0.033	0.015
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	526	317	283	457	399	396	100	45
Uranium (U)	mg/kg	-	0.81	0.6	0.5	0.8	1.1	0.8	0.23	0.10
Vanadium (V)	mg/kg	-	28.9	22.5	20.5	27.7	31.6	26.2	4.6	2.1
Zinc (Zn)	mg/kg	315	18.2	11	9.5	17	21.5	15	5.1	2.3
Zirconium (Zr)	mg/kg	-	2.3	1.2	1.2	1.8	2.9	1.9	0.7	0.3

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.9: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 1 Downstream (CLT1-DS) Benthic Stations, Mary River Project CREMP, August 2017

Parameter	Units	Sediment Quality Guideline (SQG)[a]	Camp Lake Tributary 1 Downstream Station					Study Area Summary Statistics		
			CLT1-DS-1	CLT1-DS-2	CLT1-DS-3	CLT1-DS-4	CLT1-DS-5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	fine-coarse sand	coarse sand	coarse sand	coarse sand	very coarse sand	-	-	-
Total Organic Carbon	%	10[α]	0.36	0.41	0.17	<0.10	<0.10	0.23	0.15	0.066
Aluminum (Al)	mg/kg	-	6,540	6,370	4,560	2,700	1,960	4,426	2,081	931
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.76	0.74	0.54	0.41	0.59	0.61	0.15	0.07
Barium (Ba)	mg/kg	-	36	32	27	15	10	24	11.0	4.9
Beryllium (Be)	mg/kg	-	0.24	0.26	0.15	<0.10	<0.10	0.17	0.08	0.03
Bismuth (Bi)	mg/kg	-	0.24	0.45	0.2	<0.20	<0.20	0.26	0.1087	0.0486
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	0.00	0.00
Cadmium (Cd)	mg/kg	3.5	0.074	0.054	0.064	0.064	0.050	0.06	0.009	0.004
Calcium (Ca)	mg/kg	-	3,130	4,080	2,150	1,240	1,320	2,384	1,217	544
Chromium (Cr)	mg/kg	90	20.1	22.8	16.8	11.4	21.1	18.4	4.5	2.0
Cobalt (Co)	mg/kg	-	5.53	5.5	4.15	2.3	2.9	4.1	1.46	0.65
Copper (Cu)	mg/kg	197	16.3	12.5	18.1	16	5.2	13.5	5.1	2.3
Iron (Fe)	mg/kg	40,000[α]	30,600	21,800	24,000	13,800	26,000	23,240	6,196	2,771
Lead (Pb)	mg/kg	91.3	7.9	4.4	6.1	2.4	4.5	5.1	2.08	0.93
Lithium (Li)	mg/kg	-	7.4	7.2	5.6	3.3	3.0	5.3	2.09	0.93
Magnesium (Mg)	mg/kg	-	7,080	8,230	4,810	2,860	2,290	5,054	2,584	1,156
Manganese (Mn)	mg/kg	1,100[α,β]	276	273	196	106	126	195	79.6	35.6
Mercury (Hg)	mg/kg	0.486	<0.0050	0.0066	<0.0050	<0.0050	<0.0050	0.0053	0.0007	0.0003
Molybdenum (Mo)	mg/kg	-	1.04	0.69	0.72	1.93	1.13	1.10	0.50	0.22
Nickel (Ni)	mg/kg	75[α,β]	16.5	21.9	13.6	8.2	11.4	14.3	5.22	2.33
Phosphorus (P)	mg/kg	2,000[α]	260	274	240	101	175	210	71.8	32.1
Potassium (K)	mg/kg	-	2,590	2,210	1,930	1,160	670	1,712	784	350
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.00	0.00
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.000	0.000
Sodium (Na)	mg/kg	-	54	57	83	<50	<50	59	14	6
Strontium (Sr)	mg/kg	-	3.2	3.9	2.7	1.9	2.2	2.8	0.83	0.37
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	0.131	0.134	0.095	0.054	<0.050	0.093	0.040	0.018
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	438	422	341	203	175	316	122	54
Uranium (U)	mg/kg	-	1.2	1.2	0.7	0.5	0.6	0.8	0.4	0.2
Vanadium (V)	mg/kg	-	21.3	19.3	16.1	10.1	20.4	17.4	4.5	2.0
Zinc (Zn)	mg/kg	315	29.4	28.2	20.8	13.8	13.8	21.2	7.5	3.4
Zirconium (Zr)	mg/kg	-	2.6	2.4	2.2	1.8	1.7	2.1	0.4	0.2

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.10: Magnitude of Elevation in Deposited Sediment Metal Concentrations between Camp Lake Tributary Study Areas and Average Lotic Reference Area Data, Mary River Project CREMP, August 2017

Parameter	Units	Reference Area Data		Camp Lake Tributary 1		Camp Lake Tributary 2	
		Reference Creek (REF-CRK)	Mary River Reference (GO-09)	CLT1-US Magnitude of Difference	CLT1-DS Magnitude of Difference	CLT2-US Magnitude of Difference	CLT2-DS Magnitude of Difference
Total Organic Carbon	%	<0.10	<0.10	4.1	2.3	1.1	1.2
Aluminum (Al)	mg/kg	418	763	12.6	8.2	3.1	3.1
Antimony (Sb)	mg/kg	<0.10	<0.10	1.0	1.0	1.0	1.0
Arsenic (As)	mg/kg	0.12	0.16	4.8	4.5	2.6	2.7
Barium (Ba)	mg/kg	2	4	6.6	10.0	2.4	2.3
Beryllium (Be)	mg/kg	<0.10	<0.10	2.7	1.7	1.0	1.0
Bismuth (Bi)	mg/kg	<0.20	<0.20	1.0	1.3	1.0	1.0
Boron (B)	mg/kg	<5.0	<5.0	1.9	1.0	1.0	1.0
Cadmium (Cd)	mg/kg	<0.020	<0.020	2.2	3.1	1.0	1.1
Calcium (Ca)	mg/kg	214	842	7.9	7.0	4.5	4.5
Chromium (Cr)	mg/kg	1.4	3.4	14.5	9.3	4.8	6.1
Cobalt (Co)	mg/kg	0.3	0.7	13.3	9.5	4.3	4.6
Copper (Cu)	mg/kg	0.8	1.3	17.9	13.7	4.5	6.6
Iron (Fe)	mg/kg	1,240	2,826	8.4	13.5	3.0	4.8
Lead (Pb)	mg/kg	0.7	1.1	4.4	5.7	1.7	1.8
Lithium (Li)	mg/kg	<2.0	2.2	6.0	2.5	1.5	1.6
Magnesium (Mg)	mg/kg	333	826	17.1	10.7	5.1	5.1
Manganese (Mn)	mg/kg	10	22	10.1	14.6	4.4	4.4
Mercury (Hg)	mg/kg	<0.0050	<0.0050	1.3	1.1	1.0	1.0
Molybdenum (Mo)	mg/kg	<0.10	0.11	1.4	10.6	1.0	1.0
Nickel (Ni)	mg/kg	0.8	1.9	17.0	13.1	5.4	5.9
Phosphorus (P)	mg/kg	61	113	2.9	2.6	1.5	1.6
Potassium (K)	mg/kg	106	168	10.1	13.2	3.0	3.0
Selenium (Se)	mg/kg	<0.20	<0.20	1.0	1.0	1.0	1.0
Silver (Ag)	mg/kg	<0.10	<0.10	1.0	1.0	1.0	1.0
Sodium (Na)	mg/kg	<50	<50	1.3	1.2	1.0	1.0
Strontium (Sr)	mg/kg	1.2	1.9	1.9	1.9	1.2	1.2
Sulphur (S)	mg/kg	<1,000	<1,000	1.0	1.0	1.0	1.0
Thallium (Tl)	mg/kg	<0.050	<0.050	1.9	1.9	1.0	1.0
Tin (Sn)	mg/kg	<2.0	<2.0	1.0	1.0	1.0	1.0
Titanium (Ti)	mg/kg	36	109	7.4	5.9	2.5	2.7
Uranium (U)	mg/kg	0.2	0.3	3.1	3.4	0.9	1.1
Vanadium (V)	mg/kg	1.9	5.0	9.6	6.4	3.1	4.9
Zinc (Zn)	mg/kg	<2.0	4	5.9	8.1	1.6	3.1
Zirconium (Zr)	mg/kg	1.1	1.7	1.5	1.7	1.1	1.2

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference creek value).
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference creek value).
Denotes highly elevated (mean concentration greater than 10 times higher than respective mean reference creek value).

Table D.11: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 2 Upstream (CLT2-US) Benthic Stations, Mary River Project CREMP, August 2017

Parameter	Units	Sediment Quality Guideline (SQG)[a]	Camp Lake Tributary 2 Upstream Station					Study Area Summary Statistics		
			CLT2-US-B1	CLT2-US-B2	CLT2-US-B3	CLT2-US-B4	CLT2-US-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	very coarse sand	coarse sand	coarse sand	coarse sand	coarse sand	-	-	-
Total Organic Carbon	%	10[α]	<0.10	<0.10	<0.10	0.13	0.10	0.11	0.01	0.006
Aluminum (Al)	mg/kg	-	1,400	1,710	1,440	2,180	1,590	1,664	314	140
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.28	0.29	0.38	0.45	0.33	0.35	0.07	0.03
Barium (Ba)	mg/kg	-	5	6	5	8	6	6	1.1	0.5
Beryllium (Be)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.00	0	0
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	<0.020	<0.020	<0.020	<0.02	0	0
Calcium (Ca)	mg/kg	-	1,110	1,310	1,390	2,420	1,440	1,534	511	229
Chromium (Cr)	mg/kg	90	8.8	9.1	8.7	13.1	7.8	9.5	2.1	0.9
Cobalt (Co)	mg/kg	-	1.67	1.8	1.57	2.5	1.7	1.8	0.37	0.17
Copper (Cu)	mg/kg	197	3.6	4.8	4.1	4	5.5	4.5	0.7	0.3
Iron (Fe)	mg/kg	40,000[α]	4,700	4,590	3,980	8,220	3,950	5,088	1,784	798
Lead (Pb)	mg/kg	91.3	1.3	1.4	1.3	2.2	1.4	1.5	0.38	0.17
Lithium (Li)	mg/kg	-	2.9	3.1	2.8	3.8	2.9	3.1	0.41	0.18
Magnesium (Mg)	mg/kg	-	1,930	2,330	2,130	3,350	2,270	2,402	552	247
Manganese (Mn)	mg/kg	1,100[α,β]	52	54	48	80	58	58	12.4	5.6
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	<0.10	<0.10	<0.10	0.10	<0.10	0.10	0.00	0.00
Nickel (Ni)	mg/kg	75[α,β]	5.2	5.6	5.8	7.9	5.2	5.9	1.13	0.51
Phosphorus (P)	mg/kg	2,000[α]	111	100	113	148	112	117	18.2	8.1
Potassium (K)	mg/kg	-	330	400	350	500	380	392	66	30
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Sodium (Na)	mg/kg	-	<50	<50	<50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	1.5	1.7	1.7	2.2	1.7	1.8	0.28	0.12
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	0	0
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	110	127	115	199	135	137	36	16
Uranium (U)	mg/kg	-	0.19	0.2	0.2	0.3	0.2	0.2	0.05	0.02
Vanadium (V)	mg/kg	-	7.5	8.4	6.9	11.8	7.6	8.4	2.0	0.9
Zinc (Zn)	mg/kg	315	3.9	4	3.3	6	3.8	4	0.9	0.4
Zirconium (Zr)	mg/kg	-	1.2	1.4	1.4	1.7	1.3	1.4	0.2	0.1

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.12: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 2 Downstream (CLT2-DS) Benthic Stations, Mary River Project CREMP, August 2017

Parameter	Units	Sediment Quality Guideline (SQG)[a]	Camp Lake Tributary 2 Downstream Station					Study Area Summary Statistics		
			CLT2-DS-1	CLT2-DS-2	CLT2-DS-3	CLT2-DS-4	CLT2-DS-5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	coarse sand	very coarse sand	coarse sand	coarse sand	coarse sand	-	-	-
Total Organic Carbon	%	10[α]	<0.10	0.14	<0.10	0.17	<0.10	0.12	0.03	0.014
Aluminum (Al)	mg/kg	-	1,540	1,890	1,070	2,390	1,360	1,650	509	228
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.40	0.32	0.29	0.55	0.26	0.36	0.12	0.05
Barium (Ba)	mg/kg	-	5.3	5.8	4.0	7.6	4.9	5.5	1.4	0.6
Beryllium (Be)	mg/kg	-	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	0	0
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0	0
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	<0.020	0.026	<0.020	0.02	0.003	0.001
Calcium (Ca)	mg/kg	-	1,250	1,410	870	2,820	1,330	1,536	747	334
Chromium (Cr)	mg/kg	90	8.9	10.3	7.3	28.1	6.8	12.3	9.0	4.0
Cobalt (Co)	mg/kg	-	1.6	2.0	1.2	3.6	1.5	2.0	0.9	0.4
Copper (Cu)	mg/kg	197	4.3	3.6	2.4	5	17.3	6.5	6.1	2.7
Iron (Fe)	mg/kg	40,000[α]	4,590	5,330	3,720	23,000	4,630	8,254	8,263	3,695
Lead (Pb)	mg/kg	91.3	1.4	1.4	1.3	2.5	1.2	1.6	0.5	0.2
Lithium (Li)	mg/kg	-	3.3	3.8	2.2	4.6	2.7	3.3	0.9	0.4
Magnesium (Mg)	mg/kg	-	2,120	2,720	1,410	3,820	1,970	2,408	917	410
Manganese (Mn)	mg/kg	1,100[α,β]	52	58	39	94	51	59	21	9
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	<0.10	<0.10	<0.10	0.11	<0.10	0.10	0.004	0.002
Nickel (Ni)	mg/kg	75[α,β]	4.9	6.3	3.9	12.3	4.8	6.4	3.39	1.52
Phosphorus (P)	mg/kg	2,000[α]	90	123	67	214	157	130	57.9	25.9
Potassium (K)	mg/kg	-	390	430	250	540	320	386	110	49
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Sodium (Na)	mg/kg	-	<50	<50	<50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	1.9	1.7	1.4	2.5	1.6	1.8	0.42	0.19
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0	0
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	117	149	121	235	108	146	52	23
Uranium (U)	mg/kg	-	0.22	0.23	0.15	0.49	0.25	0.27	0.13	0.06
Vanadium (V)	mg/kg	-	7.9	9.9	7.7	33.8	7.7	13.4	11.4	5.1
Zinc (Zn)	mg/kg	315	5.8	8	4.8	15	7.1	8	4.1	1.8
Zirconium (Zr)	mg/kg	-	1.3	1.4	1.0	2.1	1.7	1.5	0.4	0.2

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.13: Field Observations of Sediment Properties at Camp Lake (JLO) Benthic Stations[a], Mary River Project CREMP, August 2017

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia[b]	Plant or Algal Presence
JLO-02	12.4	gray-brown silt, fine sand; some reddish-brown material at sediment surface	none detected	none observed
JLO-01	16.5	brown-red silt	none detected	globular algae (sparse)
JLO-21	9.9	thin reddish layer over gray-brown silty loam with some fine sand	none detected	globular algae (common)
JLO-20	6.3	thin layer of reddish material over gray-brown material; mainly fine sand with silt, but some coarse sand present	none detected	globular algae (common)
JLO-19	7.0	reddish-brown layer (0.5 cm thick) at surface transitioning to gray-brown fine sand with embedded organics	none detected	none observed
JLO-07	35.1	brown-gray sandy-silt	none detected	none observed
JLO-18	11.5	reddish-brown layer (0.5 cm thick) at surface transitioning to grey-brown fine sand with embedded organics	none detected	none observed
JLO-16	16.5	medium brown-gray fine sand-silt	none detected	none observed
JLO-11	33.0	medium brown silt with some fine sand	none detected	none observed
JLO-12	16.2	brown-red at surface with dark reddish/brown ferricrete-like layer at 2 cm depth, overlying medium gray-brown fine-medium grained sand	none detected	none observed

[a] Sediment particle size and benthic invertebrate community samples were collected by Petite-Ponar.

[b] Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

Table D.14: Observations from Sediment Cores Collected at Camp Lake (JLO), Mary River Project CREMP, August 2017

Sample Station	Station Depth (m)	Station Type	Core #	Core Length (cm)	Surface (Top 2 cm) Description
JLO-02	11.3	Littoral	1	18	Sandy loam
			2	17	
			3	18	
JLO-01	16.5	Profundal	1	12	Silt loam / Sandy loam
			2	10	
			3	16	
JLO-14	26.1	Profundal	1	20	Sandy loam
			2	16	
			3	16	
JLO-17	14.4	Profundal	1	20	Silt loam
			2	22	
			3	16	
JLO-07	32.8	Profundal	1	11	Sandy loam
			2	20	
			3	10	
JLO-16	16.1	Profundal	1	8	Sand
			2	10	
			3	11	
JLO-15	17.3	Profundal	1	15	Sandy loam
			2	9	
			3	10	
JLO-11	28.8	Profundal	1	12	Sandy loam
			2	17	
			3	19	
JLO-13	16.6	Profundal	1	19	Silt loam / Sandy loam
			2	21	
			3	15	
JLO-12	16.2	Profundal	1	5	Loamy sand
			2	5	
			3	6	
JLO-DUP (duplicate of JLO-01)	16.4	Profundal	1	14	Sandy loam
			2	10	
			3	10	

Table D.15: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Camp Lake (JLO) Sediment Stations, Mary River Project CREMP, August 2017

	Parameter	Units	Sediment Quality Guideline (SQG)[a]	AEMP Benchmark[b]	Camp Lake Stations										Study Area Summary Statistics		
					JLO-02 (littoral)	JLO-01 (profundal)	JLO-14 (profundal)	JLO-17 (profundal)	JLO-07 (profundal)	JLO-16 (profundal)	JLO-15 (profundal)	JLO-11 (profundal)	JLO-13 (profundal)	JLO-12 (profundal)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	51	48	57	43	63	87	60	56	46	77	59	14	4.4
	Silt	%	-	-	46	48	40	55	33	12	37	40	50	22	38	13	4.2
	Clay	%	-	-	2.9	4.6	4	2.3	4	1.2	2.9	4.4	4.4	1.4	3.1	1.2	0.4
	Moisture	%	-	-	72	65	77	73	80	23	44	62	68	44	61	18	5.70
	Total Organic Carbon	%	10[α]	-	2.62	1.41	2.21	2.09	2.35	0.29	0.91	1.36	1.27	0.63	1.51	0.78	0.247
Metals	Aluminum (Al)	mg/kg	-	-	15,000	17,100	17,200	16,100	18,300	4,830	12,700	14,500	15,900	8,540	14,017	4,258	1,347
	Antimony (Sb)	mg/kg	-	-	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.103	0.009	0.003
	Arsenic (As)	mg/kg	17	5.9	***9.9***	4.8	***16.0***	***17.5***	3.8	0.8	3.3	***6.4***	5.0	2.6	***7.0***	5.7	1.8
	Barium (Ba)	mg/kg	-	-	163	75	111	217	80.1	22.4	52.6	122.0	82	49.8	98	58.0	18.4
	Beryllium (Be)	mg/kg	-	-	0.80	0.93	0.94	0.84	0.95	0.23	0.69	0.78	0.91	0.45	0.75	0.24	0.075
	Bismuth (Bi)	mg/kg	-	-	0.28	0.26	0.29	0.25	0.41	<0.20	<0.20	0.21	0.23	<0.20	0.25	0.065	0.020
	Boron (B)	mg/kg	-	-	16.8	22.1	21.5	20.9	24.4	7.6	19.1	17.8	23.0	10.7	18.4	5.43	1.72
	Cadmium (Cd)	mg/kg	3.5	1.5	0.203	0.155	0.186	0.219	0.157	0.044	0.109	0.136	0.128	0.066	0.14	0.056	0.018
	Calcium (Ca)	mg/kg	-	-	4,560	4,005	4,520	4,600	4,390	14,900	3,230	3,990	3,890	2,380	5,047	3,531	1,116.5
	Chromium (Cr)	mg/kg	90	98	69.1	73	76	72.0	80.6	32.6	57.8	63.5	67.1	39.8	63.1	15.6	4.93
	Cobalt (Co)	mg/kg	-	-	21.3	18.3	22.2	21.9	15.8	5.49	13.8	18.9	18.0	9.37	16.5	5.54	1.75
	Copper (Cu)	mg/kg	197	50	44.5	45	***50***	46.3	***54.0***	11.7	33.2	36.3	40.2	20.1	38.2	13.4	4.23
	Iron (Fe)	mg/kg	40,000[α]	52,400	***61,600***	33,200	***93,300***	***62,100***	38,300	11,700	26,100	52,300	36,700	25,200	44,050	23,703	7,495
	Lead (Pb)	mg/kg	91.3	35	17.5	20.1	21.8	20.0	23.5	4.87	13.5	15.7	18.3	8.82	16.4	5.87	1.86
	Lithium (Li)	mg/kg	-	-	26.2	30.9	32.1	29.2	33.0	8.6	22.5	26.2	28.8	14.8	25.2	7.91	2.50
	Magnesium (Mg)	mg/kg	-	-	13,800	13,350	13,800	13,300	14,700	14,200	11,100	11,600	11,900	7,410	12,516	2,148	679
	Manganese (Mn)	mg/kg	1,100[α,β]	4,370	1,960	984	741	4,350	360	147	741		2,930	1,470	1,520	1,365.9	455.3
	Mercury (Hg)	mg/kg	0.486	0.17	0.0483	0.0326	0.0585	0.0447	0.0613	<0.0050	0.0186	0.0269	0.0328	0.0139	0.0343	0.0189	0.00596
	Molybdenum (Mo)	mg/kg	-	-	2.29	0.78	1.76	5.09	0.72	0.24	0.55	1.39	1.10	0.50	1.44	1.43	0.451
	Nickel (Ni)	mg/kg	75[α,β]	72	***77.0***	66.1	70.4	***74***	66.5	33.2	51.4	60.1	61	36.4	59.6	15.0	4.73
	Phosphorus (P)	mg/kg	2,000[α]	1,580	***1,690***	972	***3,260***	***2,440***	1,220	469	781	1,430	1,010	811	1,408	856	271
	Potassium (K)	mg/kg	-	-	3,670	4,630	4,420	4,220	4,940	1,400	3,190	3,650	4,550	2,220	3,689	1,138	360
	Selenium (Se)	mg/kg	-	-	0.46	0.27	0.66	0.45	0.48	<0.20	<0.20	0.34	0.24	<0.20	0.35	0.16	0.050
	Silver (Ag)	mg/kg	-	-	0.12	0.12	0.15	0.12	0.18	<0.10	<0.10	<0.10	0.10	<0.10	0.12	0.027	0.009
	Sodium (Na)	mg/kg	-	-	174	198	255	199	410	80	148	201	184	97	195	92	29
	Strontium (Sr)	mg/kg	-	-	8.1	11.2	13.2	9.8	19.5	8.1	8.4	9.7	11.2	6.01	10.5	3.75	1.19
	Sulphur (S)	mg/kg	-	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
	Thallium (Tl)	mg/kg	-	-	0.458	0.49	0.45	0.529	0.427	0.100	0.316	0.393	0.448	0.212	0.382	0.135	0.0426
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
	Titanium (Ti)	mg/kg	-	-	884	868	818	838	944	369	732	796	829	506	758	181	57.2
	Uranium (U)	mg/kg	-	-	5.4	4.8	7.0	5.21	6.29	0.99	3.73	4.44	4.28	2.12	4.43	1.81	0.572
	Vanadium (V)	mg/kg	-	-	57.0	61.8	63.4	60.1	62.2	18.9	47.1	51.6	57.2	31.5	51.1	14.8	4.69
	Zinc (Zn)	mg/kg	315	135	57.6	56.4	61.9	56.1	64.3	17.7	43.4	48.5	52.0	29.2	48.7	14.9	4.70
	Zirconium (Zr)	mg/kg	-	-	6.6	5.0	4.7	4.2	7.9	4.9	3.6	4.8	4.0	2.4	4.8	1.5	0.48

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Camp Lake.

Shaded cell: Indicates parameter concentration above Sediment Quality Guideline (SQG).

BOLD: Indicates parameter concentration above the AEMP Benchmark.

Table D.16: Magnitude of Elevation in Sediment Metal Concentrations between Camp Lake and Reference Lake 3 2017 Data, and between Camp Lake 2017 and Baseline Data, Mary River Project CREMP, 2017

Parameter	Camp Lake 2017 versus Reference Lake 3 2017				Camp Lake 2017 versus Baseline Period			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Camp Lake Baseline Concentration (mg/kg)	Magnitude of Elevation	Camp Lake Baseline Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	14,720	1.0	22,140	0.6	18,267	0.8	15,175	0.9
Antimony (Sb)	<0.10	1.3	0.10	1.0	1.0	0.1	1.0	0.1
Arsenic (As)	3.4	3.0	4.8	1.4	2.8	3.5	3.5	1.9
Barium (Ba)	113	1.4	138	0.7	105	1.6	68	1.3
Beryllium (Be)	0.6	1.4	0.9	0.9	1.0	0.8	1.0	0.7
Bismuth (Bi)	<0.20	1.4	0.20	1.2	-	-	-	-
Boron (B)	12.1	1.4	16.6	1.1	1	22.9	2	10.1
Cadmium (Cd)	0.2	1.1	0.2	0.7	0.5	0.4	0.5	0.3
Calcium (Ca)	4,656	1.0	5,262	1.0	3,130	1.5	2,857	1.8
Chromium (Cr)	51	1.4	70	0.9	81	0.9	71	0.9
Cobalt (Co)	11	2.0	16	1.0	18	1.2	17	1.0
Copper (Cu)	65	0.7	88	0.4	45	1.0	40	0.9
Iron (Fe)	41,960	1.5	46,740	0.9	36,133	1.7	33,206	1.3
Lead (Pb)	12	1.4	17	1.0	18	1.0	19	0.9
Lithium (Li)	24	1.1	35	0.7	-	-	-	-
Magnesium (Mg)	10,256	1.3	14,660	0.8	13,967	1.0	10,113	1.2
Manganese (Mn)	639	3.1	1,266	1.2	699	2.8	942	1.6
Mercury (Hg)	0.0440	1.1	0.0528	0.6	0.100	0.5	0.100	0.3
Molybdenum (Mo)	3.498	0.7	2.898	0.5	1.0	2.3	1.0	1.3
Nickel (Ni)	38	2.0	49	1.2	67	1.1	63	0.9
Phosphorus (P)	1,039	1.6	1,073	1.3	800	2.1	1,125	1.2
Potassium (K)	3,754	1.0	5,694	0.6	3,450	1.1	3,771	1.0
Selenium (Se)	0.6	0.8	0.6	0.6	1.0	0.5	1.0	0.3
Silver (Ag)	0.1	1.0	0.2	0.6	0.3	0.4	0.3	0.3
Sodium (Na)	284	0.6	410	0.5	279	0.6	254	0.8
Strontium (Sr)	10	0.8	13	0.8	9.3	0.9	12.0	0.9
Sulphur (S)	1,120	0.9	1,140	0.9	-	-	-	-
Thallium (Tl)	0.346	1.3	0.657	0.6	1.0	0.5	1.0	0.4
Tin (Sn)	2	0.9	2	1.0	-	-	-	-
Titanium (Ti)	997	0.9	1,288	0.6	-	-	-	-
Uranium (U)	11	0.5	23	0.2	-	-	-	-
Vanadium (V)	48	1.2	67	0.7	69	0.8	57	0.9
Zinc (Zn)	67	0.9	91	0.5	67	0.9	57	0.8
Zirconium (Zr)	3.9	1.7	3.4	1.4	-	-	-	-

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective mean reference area value or baseline period value, as applicable).
Denotes high elevation (mean parameter concentration is≥ 10 times higher than respective mean reference area value or baseline period value, as applicable).

Table D.17: Magnitude of Elevation in Sediment Metal Concentrations between Camp Lake 2015 and 2017 Data, and between Camp Lake 2016 and 2017 Data

Parameter	Camp Lake 2017 versus Initial Year of Mine Operation (2015)				Camp Lake 2017 versus Second Year of Mine Operation (2016)			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Camp Lake 2015 Concentration (mg/kg)	Magnitude of Elevation	Camp Lake 2015 Concentration (mg/kg)	Magnitude of Elevation	Camp Lake 2016 Concentration (mg/kg)	Magnitude of Elevation	Camp Lake 2016 Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	15,900	0.9	15,430	0.9	13,460	1.1	18,900	0.7
Antimony (Sb)	0.1	1.3	0.1	1.0	0.1	1.2	0.1	1.0
Arsenic (As)	14.6	0.7	6.6	1.0	8.7	1.1	8.9	0.7
Barium (Ba)	174	0.9	99	0.9	128	1.3	126	0.7
Beryllium (Be)	0.8	1.0	0.9	0.9	0.8	1.0	1.0	0.7
Bismuth (Bi)	0.3	0.9	0.3	0.9	0.3	0.9	0.3	0.8
Boron (B)	24	0.7	23	0.8	21	0.8	28	0.7
Cadmium (Cd)	0.4	0.6	0.2	0.9	0.2	1.0	0.2	0.8
Calcium (Ca)	6,310	0.7	5,759	0.9	4,404	1.0	4,540	1.1
Chromium (Cr)	73	0.9	67	0.9	57	1.2	76	0.8
Cobalt (Co)	22	1.0	17	0.9	17	1.3	20	0.8
Copper (Cu)	57	0.8	39	1.0	38	1.2	50	0.8
Iron (Fe)	62,300	1.0	44,161	1.0	48,150	1.3	61,633	0.7
Lead (Pb)	21	0.8	20	0.8	20	0.9	24	0.7
Lithium (Li)	28.1	0.9	28.4	0.9	26	1.0	35	0.7
Magnesium (Mg)	13,600	1.0	12,638	1.0	10,792	1.3	13,567	0.9
Manganese (Mn)	1,900	1.0	2,476	0.6	2,583	0.8	2,307	0.6
Mercury (Hg)	0.058	0.8	0.036	0.9	0.0	1.3	0.1	0.6
Molybdenum (Mo)	2.6	0.9	1.8	0.7	2.6	0.9	1.8	0.8
Nickel (Ni)	84	0.9	62	0.9	65	1.2	70	0.8
Phosphorus (P)	1750.0	1.0	1,471	0.9	1,521	1.1	2,137	0.6
Potassium (K)	4,090	0.9	4,010	0.9	3,383	1.1	4,773	0.8
Selenium (Se)	0.6	0.8	0.4	0.9	0.4	1.2	0.5	0.6
Silver (Ag)	0.2	0.8	0.1	0.9	0.1	1.1	0.2	0.8
Sodium (Na)	184	0.9	193	1.0	152	1.1	274	0.7
Strontium (Sr)	11.1	0.7	13.4	0.8	8.9	0.9	15	0.7
Sulphur (S)	5000	0.2	5000	0.2	5,000	0.2	5,000	0.2
Thallium (Tl)	0.7	0.7	0.5	0.8	0.5	1.0	0.5	0.7
Tin (Sn)	2.0	1.0	2.0	1.0	5.7	0.4	3.3	0.6
Titanium (Ti)	893	1.0	760	1.0	733	1.2	877	0.8
Uranium (U)	9.7	0.6	5.7	0.8	5.0	1.1	7.2	0.6
Vanadium (V)	61	0.9	53	0.9	48	1.2	63	0.8
Zinc (Zn)	61	0.9	52	0.9	47	1.2	62	0.8
Zirconium (Zr)	8	0.8	5	0.9	4.1	1.6	5.2	0.9

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective mean reference area value or baseline period value, as applicable).
Denotes high elevation (mean parameter concentration is≥ 10 times higher than respective mean reference area value or baseline period value, as applicable).

Table D.18: Magnitude of Elevation in Sediment Metal Concentrations between Camp Lake and Camp Lake Tributary 1, and between Camp Lake and Camp Lake Tributary 2, Using Data Collected in 2017

Parameter	Camp Lake 2017 versus Camp Lake Tributary 1 Upstream (CLT1-US)			Camp Lake 2017 versus Camp Lake Tributary 1 Downstream (CLT1-DS)			Camp Lake 2017 versus Camp Lake Tributary 2 Upstream (CLT2-US)			Camp Lake 2017 versus Camp Lake Tributary 2 Downstream (CLT2-DS)		
	CLT1-US Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations	CLT1-DS Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations	CLT2-US Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations	CLT2-DS Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations
Aluminum (Al)	6,824	2.2	2.0	4,426	3.4	3.1	1,664	9.0	8.4	1,650	9.1	8.4
Antimony (Sb)	<0.10	1.3	1.0	<0.10	1.3	1.0	<0.10	1.3	1.0	<0.10	1.3	1.0
Arsenic (As)	0.7	15.3	10.3	0.6	16.3	11.0	0.3	28.7	19.3	0.4	27.3	18.3
Barium (Ba)	16	10.4	5.8	24	6.8	3.8	6	28.4	15.7	5	29.7	16.4
Beryllium (Be)	0.3	2.9	2.7	0.2	4.7	4.4	0.1	8.0	7.5	0.1	7.8	7.3
Bismuth (Bi)	0.2	1.4	1.2	0.3	1.1	1.0	0.2	1.4	1.2	0.2	1.4	1.2
Boron (B)	10	1.8	1.9	5	3.4	3.7	5	3.4	3.7	5	3.4	3.7
Cadmium (Cd)	0.0	4.7	3.1	0.1	3.3	2.2	0.0	10.2	6.7	0.0	9.6	6.3
Calcium (Ca)	2,682	1.7	1.9	2,384	1.9	2.1	1,534	3.0	3.3	1,536	3.0	3.3
Chromium (Cr)	29	2.4	2.2	18	3.7	3.4	9	7.3	6.6	12	5.6	5.1
Cobalt (Co)	6	3.7	2.8	4	5.2	3.9	2	11.7	8.7	2	10.8	8.1
Copper (Cu)	18	2.5	2.1	14	3.3	2.8	4	10.0	8.4	7	6.8	5.7
Iron (Fe)	14,480	4.3	2.9	23,240	2.7	1.8	5,088	12.1	8.3	8,254	7.5	5.1
Lead (Pb)	4	4.5	4.2	5	3.5	3.2	2	11.6	10.8	2	11.1	10.3
Lithium (Li)	12.6	2.1	2.0	5	4.9	4.7	3.1	8.5	8.1	3	7.9	7.6
Magnesium (Mg)	8,110	1.7	1.5	5,054	2.7	2.4	2,402	5.7	5.2	2,408	5.7	5.1
Manganese (Mn)	134	14.6	10.9	195	10.0	7.5	58	33.6	25.1	59	33.4	24.9
Mercury (Hg)	0.007	7.2	4.9	0.0	9.1	6.1	0.005	9.7	6.5	0.0	9.7	6.5
Molybdenum (Mo)	0.1	15.5	9.1	1.1	2.1	1.2	0.1	22.9	13.5	0.1	22.5	13.2
Nickel (Ni)	19	4.1	3.1	14	5.4	4.0	6	13.0	9.7	6	12.0	9.0
Phosphorus (P)	227.4	7.4	6.1	210	8.0	6.6	116.8	14.5	11.8	130	13.0	10.6
Potassium (K)	1,310	2.8	2.8	1,712	2.1	2.2	392	9.4	9.4	386	9.5	9.6
Selenium (Se)	0.2	2.3	1.7	0.2	2.3	1.7	0.2	2.3	1.7	0.2	2.3	1.7
Silver (Ag)	0.1	1.2	1.2	0.1	1.2	1.2	0.1	1.2	1.2	0.1	1.2	1.2
Sodium (Na)	67	2.6	2.9	59	3.0	3.3	50	3.5	3.9	50	3.5	3.9
Strontium (Sr)	2.7	3.0	4.0	2.8	2.9	3.9	1.8	4.6	6.1	1.8	4.5	6.0
Sulphur (S)	<1000	1.0	1.0	<1000	1.0	1.0	<1000	1.0	1.0	<1000	1.0	1.0
Thallium (Tl)	0.1	4.9	4.0	0.1	4.9	4.0	0.1	9.2	7.5	0.1	9.2	7.5
Tin (Sn)	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0	2.0	1.0	1.0
Titanium (Ti)	396	2.2	1.9	316	2.8	2.4	137	6.4	5.4	146	6.1	5.1
Uranium (U)	0.8	7.2	5.7	0.8	6.5	5.2	0.2	24.1	19.1	0.3	20.4	16.2
Vanadium (V)	26	2.2	1.9	17	3.3	2.9	8	6.8	6.0	13	4.2	3.8
Zinc (Zn)	15	3.7	3.1	21	2.7	2.3	4	13.7	11.4	8	7.1	5.9
Zirconium (Zr)	2	3.5	2.5	2.1	3.1	2.2	1	4.7	3.3	1.5	4.4	3.1

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective mean reference area value or baseline period value, as applicable).
Denotes high elevation (mean parameter concentration is ≥ 10 times higher than respective mean reference area value or baseline period value, as applicable).

Table D.19: Deposited Sediment Field Sampling Observations at Sheardown Lake Tributary 1 and 12 Benthic Stations[a], Mary River Project CREMP, August 2017

Study Area	Station	Texture of Collected Sediment	Predominant Collection Location	Silt Presence[b]
Sheardown Lake Tributary 1 (SDLT1)	SDLT1-1	red-brown silt	shoreline/bank	precipitate and deposits
	SDLT1-2	red-brown silt	shoreline/bank, in-stream between rocks	precipitate and deposits
	SDLT1-3	red-brown silt	shoreline/bank, in-stream between rocks	precipitate and deposits
	SDLT1-4	red-brown silt	shoreline/bank	precipitate and deposits
	SDLT1-5	red-brown silt	in-stream under large cobble/boulders	precipitate and deposits
Sheardown Lake Tributary 12 (SDLT12)	SDLT12-1	red-brown silt	in-stream between and under rocks	precipitate and deposits
	SDLT1-2	red-brown silt	in-stream between and under rocks	precipitate and deposits
	SDLT1-3	red-brown silt	in-stream between and under rocks	precipitate and deposits

[a] Sediment samples collected using a stainless steel scoop directly from the streambed or shoreline, as available.

[b] Evidence of silt precipitate included fine material present on the surface of in-stream substrate and/or as interstitial deposits not otherwise expected to occur at such habitat.

Table D.20: Deposited Sediment Total Organic Carbon and Metal Concentrations at Sheardown Lake Tributary 1 (SDLT1) Benthic Stations, Mary River Project CREMP, August 2017

Parameter	Units	Sediment Quality Guideline (SQG)[a]	Sheardown Lake Tributary 1 Station					Study Area Summary Statistics		
			SDLT1-B1	SDLT1-B2	SDLT1-B3	SDLT1-B4	SDLT1-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	red-brown silt	red-brown silt	red-brown silt	red-brown silt	red-brown silt	-	-	-
Total Organic Carbon	%	10[α]	0.63	0.61	0.75	0.56	0.65	0.64	0.07	0.031
Aluminum (Al)	mg/kg	-	15,000	19,100	18,300	15,700	8,730	15,366	4,088	1,828
Antimony (Sb)	mg/kg	-	0.14	<0.10	0.13	0.18	<0.10	0.13	0.03	0.01
Arsenic (As)	mg/kg	17	2.83	2.50	2.71	4.09	1.58	2.74	0.90	0.40
Barium (Ba)	mg/kg	-	88	105	100	66	48	81	24.0	10.7
Beryllium (Be)	mg/kg	-	0.66	0.74	0.76	0.92	0.43	0.70	0.18	0.08
Bismuth (Bi)	mg/kg	-	0.7	0.8	0.95	0.75	0.34	0.71	0.2260	0.1011
Boron (B)	mg/kg	-	5.9	7.8	7.7	6.7	7.5	7.1	0.81	0.36
Cadmium (Cd)	mg/kg	3.5	0.262	0.272	0.342	0.210	0.314	0.28	0.051	0.023
Calcium (Ca)	mg/kg	-	3,110	4,020	4,160	2,310	7,670	4,254	2,051	917
Chromium (Cr)	mg/kg	90	31.1	38.0	36.4	37.4	24.8	33.5	5.6	2.5
Cobalt (Co)	mg/kg	-	14.00	14.2	14.60	18.2	8.0	13.8	3.68	1.65
Copper (Cu)	mg/kg	197	44.7	44.4	48.3	41	27.1	41.0	8.2	3.7
Iron (Fe)	mg/kg	40,000[α]	203,000	137,000	150,000	227,000	58,000	155,000	65,662	29,365
Lead (Pb)	mg/kg	91.3	23.8	26.3	35.4	21.9	10.4	23.6	9.00	4.02
Lithium (Li)	mg/kg	-	15.9	18.6	18.0	16.5	10.2	15.8	3.34	1.49
Magnesium (Mg)	mg/kg	-	12,000	16,500	15,800	12,100	11,300	13,540	2,415	1,080
Manganese (Mn)	mg/kg	1,100[α,β]	820	766	829	960	524	780	159.8	71.5
Mercury (Hg)	mg/kg	0.486	0.0077	0.0091	0.0125	0.0113	0.0113	0.0104	0.0019	0.0009
Molybdenum (Mo)	mg/kg	-	5.83	6.50	5.44	7.19	1.92	5.38	2.04	0.91
Nickel (Ni)	mg/kg	75[α,β]	32.4	34.7	36.7	42.8	27.5	34.8	5.63	2.52
Phosphorus (P)	mg/kg	2,000[α]	416	486	449	408	291	410	73.3	32.8
Potassium (K)	mg/kg	-	6,270	7,930	7,300	4,660	2,880	5,808	2,051	917
Selenium (Se)	mg/kg	-	0.26	0.27	0.34	0.32	0.33	0.30	0.04	0.02
Silver (Ag)	mg/kg	-	0.23	0.27	0.49	0.20	0.11	0.26	0.141	0.063
Sodium (Na)	mg/kg	-	104	156	147	93	86	117	32	14
Strontium (Sr)	mg/kg	-	3.3	3.9	4.1	3.2	4.8	3.9	0.68	0.30
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	0.319	0.380	0.357	0.249	0.205	0.302	0.074	0.033
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0.0	0.0
Titanium (Ti)	mg/kg	-	943	1,140	1,070	715	518	877	258	115
Uranium (U)	mg/kg	-	2.79	3.6	3.8	3.8	2.0	3.2	0.77	0.34
Vanadium (V)	mg/kg	-	26.3	34.2	32.5	25.4	23.9	28.5	4.6	2.1
Zinc (Zn)	mg/kg	315	78.8	100	113.0	76	69.6	87	18.3	8.2
Zirconium (Zr)	mg/kg	-	6.0	8.2	8.1	6.6	4.1	6.6	1.69	0.76

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.21: Magnitude of Elevation in Deposited Sediment Metal Concentrations at the Sheardown Lake Tributaries Compared to Average Lotic Reference Area Data, Mary River Project CREMP, August 2017

Parameter	Units	Reference Area Data		Sheardown Lake Tributary 1 (SDLT1) Magnitude of Elevation	Sheardown Lake Tributary 12 (SDLT12) Magnitude of Elevation	Sheardown Lake Tributary 9 (SDLT9) Magnitude of Elevation
		Reference Creek (REF-CRK)	Mary River Reference (GO-09)			
Total Organic Carbon	%	<0.10	<0.10	6.4	4.6	6.3
Aluminum (Al)	mg/kg	418	763	28.4	17.5	4.7
Antimony (Sb)	mg/kg	<0.10	<0.10	1.3	1.9	1.0
Arsenic (As)	mg/kg	0.12	0.16	20.4	21.4	4.7
Barium (Ba)	mg/kg	2	4	34.0	13.6	4.6
Beryllium (Be)	mg/kg	<0.10	<0.10	7.0	7.2	1.2
Bismuth (Bi)	mg/kg	<0.20	<0.20	3.5	2.8	1.0
Boron (B)	mg/kg	<5.0	<5.0	1.4	1.0	1.0
Cadmium (Cd)	mg/kg	<0.020	<0.020	14.0	4.7	1.8
Calcium (Ca)	mg/kg	214	842	12.5	4.2	4.9
Chromium (Cr)	mg/kg	1.4	3.4	16.8	16.6	6.8
Cobalt (Co)	mg/kg	0.3	0.7	32.1	36.4	5.5
Copper (Cu)	mg/kg	0.8	1.3	41.6	36.9	7.3
Iron (Fe)	mg/kg	1,240	2,826	89.9	158.2	8.7
Lead (Pb)	mg/kg	0.7	1.1	26.7	16.1	4.1
Lithium (Li)	mg/kg	<2.0	2.2	7.5	4.9	1.8
Magnesium (Mg)	mg/kg	333	826	28.6	15.3	5.4
Manganese (Mn)	mg/kg	10	22	58.4	79.1	9.0
Mercury (Hg)	mg/kg	<0.0050	<0.0050	2.1	1.1	2.1
Molybdenum (Mo)	mg/kg	<0.10	0.11	51.8	50.8	4.1
Nickel (Ni)	mg/kg	0.8	1.9	31.9	31.9	9.8
Phosphorus (P)	mg/kg	61	113	5.2	4.9	4.0
Potassium (K)	mg/kg	106	168	44.7	17.1	4.5
Selenium (Se)	mg/kg	<0.20	<0.20	1.5	1.2	1.1
Silver (Ag)	mg/kg	<0.10	<0.10	2.6	1.9	1.0
Sodium (Na)	mg/kg	<50	<50	2.3	1.0	1.0
Strontium (Sr)	mg/kg	1.2	1.9	2.6	1.5	1.8
Sulphur (S)	mg/kg	<1,000	<1,000	1.0	1.0	1.0
Thallium (Tl)	mg/kg	<0.050	<0.050	6.0	2.7	1.3
Tin (Sn)	mg/kg	<2.0	<2.0	1.0	1.0	1.0
Titanium (Ti)	mg/kg	36	109	16.3	7.1	4.6
Uranium (U)	mg/kg	0.2	0.3	13.1	11.6	2.4
Vanadium (V)	mg/kg	1.9	5.0	10.4	6.6	4.7
Zinc (Zn)	mg/kg	<2.0	4	33.6	16.7	4.3
Zirconium (Zr)	mg/kg	1.1	1.7	5.1	3.0	0.8

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference creek value).
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference creek value).
Denotes highly elevated (mean concentration ≥10 times higher than respective mean reference creek value).

Table D.22: Deposited Sediment Total Organic Carbon and Metal Concentrations at Sheardown Lake Tributary 12 (SDLT12) Benthic Stations, Mary River Project CREMP, August 2017

Parameter	Units	Sediment Quality Guideline (SQG)[a]	Sheardown Lake Tributary 12 Station			Study Area Summary Statistics		
			SDLT12-B1	SDLT12-B2	SDLT12-B3	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	red-brown silt	red-brown silt	red-brown silt	-	-	-
Total Organic Carbon	%	10[α]	0.60	0.47	0.31	0.46	0.15	0.065
Aluminum (Al)	mg/kg	-	11,300	8,830	8,220	9,450	1,631	729
Antimony (Sb)	mg/kg	-	0.2	0.17	0.19	0.19	0.02	0.01
Arsenic (As)	mg/kg	17	3.71	3.00	1.93	2.88	0.90	0.40
Barium (Ba)	mg/kg	-	40	34	25	33	7.7	3.4
Beryllium (Be)	mg/kg	-	0.85	0.74	0.58	0.72	0.14	0.06
Bismuth (Bi)	mg/kg	-	0.62	0.69	0.34	0.55	0.1852	0.0828
Boron (B)	mg/kg	-	5.7	<5.0	<5.0	5.2	0.40	0.18
Cadmium (Cd)	mg/kg	3.5	0.113	0.122	0.049	0.09	0.040	0.018
Calcium (Ca)	mg/kg	-	1,870	1,020	1,410	1,433	425	190
Chromium (Cr)	mg/kg	90	37.5	29.6	32.4	33.2	4.0	1.8
Cobalt (Co)	mg/kg	-	17.30	15.2	14.40	15.6	1.50	0.67
Copper (Cu)	mg/kg	197	46.6	37.4	25.3	36.4	10.7	4.8
Iron (Fe)	mg/kg	40,000[α]	330,000	293,000	195,000	272,667	69,759	31,197
Lead (Pb)	mg/kg	91.3	18.0	16.9	7.8	14.2	5.62	2.51
Lithium (Li)	mg/kg	-	11.3	8.8	10.6	10.2	1.29	0.58
Magnesium (Mg)	mg/kg	-	8,710	6,120	6,880	7,237	1,331	595
Manganese (Mn)	mg/kg	1,100[α,β]	1,020	918	1,230	1,056	159.1	71.1
Mercury (Hg)	mg/kg	0.486	0.0060	<0.0050	<0.0050	0.0053	0.0006	0.0003
Molybdenum (Mo)	mg/kg	-	7.27	5.42	3.15	5.28	2.06	0.92
Nickel (Ni)	mg/kg	75[α,β]	40.6	33.9	30.1	34.9	5.32	2.38
Phosphorus (P)	mg/kg	2,000[α]	418	363	382	388	27.9	12.5
Potassium (K)	mg/kg	-	2,550	2,150	1,970	2,223	297	133
Selenium (Se)	mg/kg	-	0.29	0.21	0.21	0.24	0.05	0.02
Silver (Ag)	mg/kg	-	0.23	0.25	<0.10	0.19	0.081	0.036
Sodium (Na)	mg/kg	-	50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	2.5	1.8	2.4	2.3	0.36	0.16
Sulphur (S)	mg/kg	-	<1000	<1000	<1000	<1,000	0	0
Thallium (Tl)	mg/kg	-	0.165	0.140	0.102	0.136	0.032	0.014
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	436	351	360	382	47	21
Uranium (U)	mg/kg	-	2.95	2.6	2.9	2.8	0.19	0.09
Vanadium (V)	mg/kg	-	20.1	15.2	18.6	18.0	2.5	1.1
Zinc (Zn)	mg/kg	315	51.9	46	32.4	44	10.0	4.5
Zirconium (Zr)	mg/kg	-	4.4	3.5	3.8	3.9	0.5	0.2

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.23: Deposited Sediment Total Organic Carbon and Metal Concentrations at Sheardown Lake Tributary 9 (SDLT9) Benthic Stations, Mary River Project CREMP, August 2017

Analyte	Units	Sediment Quality Guideline (SQG)[a]	Sheardown Lake Tributary 9 Station					Study Area Summary Statistics		
			SDLT9-B1	SDLT9-B2	SDLT9-B3	SDLT9-B4	SDLT9-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	sand	sand	sand	sand	sand	-	-	-
Total Organic Carbon	%	10[α]	0.62	0.52	0.52	0.60	0.87	0.63	0.14	0.064
Aluminum (Al)	mg/kg	-	2,020	1,570	2,740	3,270	3,090	2,538	722	323
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.62	0.50	0.69	0.71	0.66	0.64	0.08	0.04
Barium (Ba)	mg/kg	-	9	7	11	14	14	11	3.1	1.4
Beryllium (Be)	mg/kg	-	0.11	<0.10	0.13	0.14	0.13	0.12	0.02	0.01
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	5.4	<5.0	<5.0	<5.0	<5.0	5.1	0.18	0.08
Cadmium (Cd)	mg/kg	3.5	0.041	<0.020	0.034	0.039	0.047	0.04	0.010	0.005
Calcium (Ca)	mg/kg	-	2,100	1,070	1,440	2,010	1,680	1,660	422	189
Chromium (Cr)	mg/kg	90	13.7	12.6	13.6	14.1	13.6	13.5	0.6	0.2
Cobalt (Co)	mg/kg	-	1.73	1.7	2.54	3.0	2.9	2.4	0.62	0.28
Copper (Cu)	mg/kg	197	9.7	3.8	7.1	8	8.1	7.2	2.2	1.0
Iron (Fe)	mg/kg	40,000[α]	11,800	10,100	13,200	23,400	16,500	15,000	5,251	2,348
Lead (Pb)	mg/kg	91.3	4.3	2.3	3.4	4.0	4.1	3.6	0.80	0.36
Lithium (Li)	mg/kg	-	3.6	2.7	4.1	4.5	4.4	3.9	0.74	0.33
Magnesium (Mg)	mg/kg	-	1,780	1,530	2,750	3,610	3,190	2,572	895	400
Manganese (Mn)	mg/kg	1,100[α,β]	63	68	137	174	161	121	52.2	23.3
Mercury (Hg)	mg/kg	0.486	0.0257	<0.0050	0.0077	0.0060	0.0072	0.0103	0.0087	0.0039
Molybdenum (Mo)	mg/kg	-	0.24	0.12	0.38	0.75	0.64	0.43	0.27	0.12
Nickel (Ni)	mg/kg	75[α,β]	10.1	7.1	11.2	12.0	13.3	10.7	2.35	1.05
Phosphorus (P)	mg/kg	2,000[α]	463	277	326	284	255	321	83.4	37.3
Potassium (K)	mg/kg	-	480	300	600	790	740	582	199	89
Selenium (Se)	mg/kg	-	0.26	<0.20	<0.20	<0.20	<0.20	0.21	0.03	0.01
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Sodium (Na)	mg/kg	-	<50	<50	<50	56	<50	51	3	1
Strontium (Sr)	mg/kg	-	3.2	2.3	2.6	2.6	2.4	2.6	0.38	0.17
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	0.060	<0.050	0.069	0.066	0.074	0.064	0.009	0.004
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	214	199	265	271	286	247	38	17
Uranium (U)	mg/kg	-	0.81	0.4	0.5	0.6	0.6	0.6	0.14	0.06
Vanadium (V)	mg/kg	-	14.9	14.3	11.7	12.4	11.3	12.9	1.6	0.7
Zinc (Zn)	mg/kg	315	9.2	8	11.2	14	14.4	11	2.9	1.3
Zirconium (Zr)	mg/kg	-	1.1	<1.0	<1.0	<1.0	<1.0	1.0	0.04	0.02

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.24: Field Observations of Sediment Properties at Sheardown Lake Northwest (DLO-01) Benthic Stations [a], Mary River Project CREMP, August 2017

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia[b]	Plant or Algal Presence
DLO-01-9	7.8	~ 1 mm layer of iron oxide precipitate over medium brown silt	none detected	decaying macrophytes (*Chara* sp. or moss), globular algae (common)
DLO-01-4	7.8	some iron oxide particulate over medium brown-gray silt	none detected	aquatic moss (sparse), globular algae (common)
DLO-01-3	8.3	medium dark brown-gray silt; no iron oxide precipitate	none detected	*Chara* sp. present (common)
DLO-01-11	8.6	thin iron oxide precipitate over brown silt	none detected	*Chara* sp. and aquatic moss (sparse), globular algae (sparse)
DLO-01-10	8.3	thin layer of reddish-brown iron oxide precipitate over sand-silt	none detected	aquatic moss (common), globular algae (sparse)
DLO-01-5	24.0	some iron oxide speckling at surface overlying gray-brown silt	none detected	globular algae (common)
DLO-01-14	24.2	thin reddish-brown layer over gray-brown silt with some intermixed sand; ferricrete-like layer present	none detected	globular algae (sparse)
DLO-01-15	22.5	reddish-brown silt with some (minor) sand	none detected	none observed
DLO-01-2	20.0	reddish-brown silt with some (minor) sand	none detected	globular algae (sparse)
DLO-01-12	15.0	reddish-brown, compact sand	none detected	none observed

[a] Sediment particle size and benthic invertebrate community samples were collected by Petite-Ponar.

[b] Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

Table D.25: Observations from Sediment Cores Collected at Sheardown Lake NW (DLO-01), Mary River Project CREMP, August 2017

Sample Station	Station Depth (m)	Station Type	Core #	Core Length (cm)	Surface (Top 2 cm) Description
DLO-01-05	23.2	Profundal	1	15.0	Silt loam
			2	16.0	
			3	20.0	
DD-HAB 9-STN2	10.5	Littoral	1	18.0	Sandy loam
			2	12.0	
			3	20.0	
DLO-01-08	12.1	Littoral	1	8.0	Silt loam
			2	10.0	
			3	15.0	
DLO-01-01	22.0	Profundal	1	10.0	Silt loam
			2	8.0	
			3	7.0	
DLO-01-13	17.8	Profundal	1	12.0	Silt loam
			2	16.0	
			3	10.0	
DLO-01-2	16.8	Profundal	1	18.0	Silt loam
			2	21.0	
			3	18.0	
DLO-01-9	7.7	Littoral	1	14.0	Loam
			2	16.0	
			3	15.0	
DLO-01-10	7.8	Littoral	1	-	Sand
			2	-	
			3	-	
DLO-01-DUP (duplicate of DLO-01-2)	16.8	Profundal	1	10.0	Silt loam
			2	11.0	
			3	16.0	

Table D.26: Sediment Particle Size, Total Organic Carbon, Metal Concentrations at Sheardown Lake Northwest (DLO-01) Sediment Stations, Mary River Project CREMP, August 2017

Parameter		Units	Sediment Quality Guideline (SQG)[a]	AEMP Benchmark[b]	Sheardown Lake Northwest Stations													Study Area Summary Statistics		
					DLO-01-5 (profundal)	DLO-01-14 (profundal)	DLO-01-15 (profundal)	DD-HAB 9-STN2 (littoral)	DLO-01-8 (littoral)	DLO-01 (profundal)	DLO-01-13 (profundal)	DLO-01-2 (profundal)	DLO-01-12 (profundal)	DLO-01-9 (littoral)	DLO-01-4 (littoral)	DLO-01-3 (littoral)	DLO-01-11 (littoral)	DLO-01-10 (littoral)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	12	16	24	62	34	10	15	15	25	52	42	47	35	91	36	29	10.4
	Silt	%	-	-	67	64	57	30	53	66	65	74	64	37	45	44	56	9	50	23	8.1
	Clay	%	-	-	21	20	20	8	13	24	20	11	11	12	13	9	10	<1.0	14	7.7	2.7
	Moisture	%	-	-	67	75	69	67	62	70	69	69	61	76	81	72	71	21	63	17	6.1
	Total Organic Carbon	%	10[α]	-	1.87	2.23	1.41	3.47	1.52	1.42	1.39	1.29	1.19	5.40	4.16	3.2	2.13	0.56	2.11	1.57	0.554
Metals	Aluminum (Al)	mg/kg	-	-	22,600			17,700	21,200	23,200	23,400	19,600		20,500				3,330	18,941	6,597	2,332
	Antimony (Sb)	mg/kg	-	-	<0.10			<0.10	<0.10	<0.10	<0.10	<0.10		0.12				<0.10	0.10	0.0071	0.0025
	Arsenic (As)	mg/kg	17	6.2	***6.77***			***8.65***	3.92	4.34	4.17	4.25		***7.91***				0.62	5.08	2.59	0.92
	Barium (Ba)	mg/kg	-	-	111.0			162	98	101.0	100.0	139		122				14.00	106	43.2	15.3
	Beryllium (Be)	mg/kg	-	-	1.07			0.89	1.03	1.19	1.16	0.94		1.01				0.16	0.931	0.328	0.116
	Bismuth (Bi)	mg/kg	-	-	0.29			0.30	0.48	0.26	0.24	0.22		0.23				<0.20	0.28	0.089	0.031
	Boron (B)	mg/kg	-	-	35.9			29.8	35.7	35.3	37.6	26.2		34.1				5.8	30.0	10.49	3.71
	Cadmium (Cd)	mg/kg	3.5	1.5	0.238			0.465	0.391	0.263	0.275	0.261		0.539				0.026	0.307	0.158	0.0558
	Calcium (Ca)	mg/kg	-	-	4,370			5,010	4,160	4,480	4,590	4,950		6,340				1,380	4,410	1,397	493.9
	Chromium (Cr)	mg/kg	90	97	87.6			70.2	78.8	85.2	86.1	78.9		77.1				17.30	72.6	23.1	8.16
	Cobalt (Co)	mg/kg	-	-	18.4			14.3	16.8	17.2	17.3	16.6		17.8				2.65	15.1	5.19	1.83
	Copper (Cu)	mg/kg	197	58	46.8			54.5	45.2	51.1	48.6	42.4		***67.3***				5.69	45.2	17.70	6.26
	Iron (Fe)	mg/kg	40,000[α]	52,200	51,500			***71,700***	38,400	41,400	40,900	41,950		***66,500***				8,690	45,130	19,340	6,838
	Lead (Pb)	mg/kg	91.3	35	23.2			20.8	19.9	22.7	22.0	19.6		20.2				3.78	19.0	6.30	2.23
	Lithium (Li)	mg/kg	-	-	38.1			28.3	35.1	40.3	39.2	33.3		32.9				5.7	31.6	11.2	3.95
	Magnesium (Mg)	mg/kg	-	-	14,900			12,200	13,300	14,700	14,800	13,550		13,800				2,710	12,495	4,058	1,435
	Manganese (Mn)	mg/kg	1,100[α,β]	4,530	1,520			662	1,430	1,130	1,100	***9,805***		469				94	2,026	3,180	1,124
	Mercury (Hg)	mg/kg	0.486	0.17	0.0520			0.0508	0.0292	0.0347	0.0343	0.0342		0.057				0.005	0.0372	0.0166	0.00586
	Molybdenum (Mo)	mg/kg	-	-	2.42			6.14	2.9	1.71	1.70	8.67		8.09				0.43	4.01	3.16	1.12
	Nickel (Ni)	mg/kg	75[α,β]	77	73.0			74	***79.2***	68.9	70.1	69		***104***				13.70	69.0	25.2	8.89
	Phosphorus (P)	mg/kg	2,000[α]	1,958	1,360			1,400	866	902	917	934		978				387	968	315	112
	Potassium (K)	mg/kg	-	-	6,110			4,780	5,710	6,150	6,220	5,105		5,600				870	5,068	1,772	627
	Selenium (Se)	mg/kg	-	-	0.42			0.60	0.32	0.26	0.29	0.34		0.70				<0.20	0.39	0.17	0.061
	Silver (Ag)	mg/kg	-	-	0.18			0.17	0.14	0.19	0.17	0.14		0.19				<0.10	0.16	0.031	0.011
	Sodium (Na)	mg/kg	-	-	361			276	277	315	328	287		333				63	280	92.6	32.7
	Strontium (Sr)	mg/kg	-	-	12.7			10.6	10.9	12.0	12.3	11.1		12.1				4.47	10.8	2.65	0.94
	Sulphur (S)	mg/kg	-	-	<1,000			<1,000	<1,000	<1,000	<1,000	<1,000		1700				<1,000	1,087.5	247.5	78.3
	Thallium (Tl)	mg/kg	-	-	0.549			0.489	0.558	0.575	0.578	0.581		0.652				0.069	0.506	0.182	0.0645
	Tin (Sn)	mg/kg	-	-	<2.0			<2.0	<2.0	<2.0	<2.0	<2.0		<2.0				<2.0	<2.0	0	0
	Titanium (Ti)	mg/kg	-	-	1,380			1,120	1,230	1,300	1,350	1,220		1,280				304	1,148	351	124
	Uranium (U)	mg/kg	-	-	7.6			9.1	5.53	8.60	7.88	6.50		13.8				1.130	7.52	3.57	1.26
	Vanadium (V)	mg/kg	-	-	64.8			54.4	60.1	65.6	65.7	59.0		63.0				11.80	55.5	18.1	6.40
	Zinc (Zn)	mg/kg	315	123	72.1			66.5	67.9	74.3	75.1	67.6		73.2				14.2	63.9	20.3	7.19
	Zirconium (Zr)	mg/kg	-	-	10.0			11.0	5.8	7.8	7.7	6.8		19.8				3.2	9.0	4.98	1.76

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Sheardown Lake Northwest.

Indicates parameter concentration above Sediment Quality Guideline (SQG).

BOLD5 Indicates parameter concentration above the AEMP Benchmark.

Table D.27: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake NW and Reference Lake 3 2017 Data, and between Sheardown Lake NW 2017 and Baseline Data, Mary River Project CREMP, 2017

Parameter	Sheardown Lake NW versus Reference Lake 3 in 2017				Sheardown Lake NW 2017 versus Baseline Period			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake NW Baseline Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake NW Baseline Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	14,720	1.1	22,140	1.0	11,792	1.3	17,745	1.3
Antimony (Sb)	<0.10	1.1	<0.10	1.0	1.0	0.1	1.0	0.1
Arsenic (As)	3.4	1.6	4.8	1.0	3.0	1.8	3.2	1.5
Barium (Ba)	113	0.9	138	0.8	78	1.3	93	1.2
Beryllium (Be)	0.6	1.4	0.9	1.3	1.0	0.8	1.0	1.1
Bismuth (Bi)	<0.20	1.5	0.20	1.3	-	-	-	-
Boron (B)	12.1	2.2	16.6	2.0	3	9.2	3	10.9
Cadmium (Cd)	0.2	2.0	0.2	1.4	0.5	0.7	0.5	0.5
Calcium (Ca)	4,656	0.9	5,262	0.9	2,697	1.6	3,558	1.3
Chromium (Cr)	51	1.2	70	1.2	53	1.2	81	1.0
Cobalt (Co)	11	1.2	16	1.1	10	1.2	15	1.1
Copper (Cu)	65	0.7	88	0.5	33	1.3	48	1.0
Iron (Fe)	41,960	1.1	46,740	0.9	28,120	1.6	40,382	1.1
Lead (Pb)	12	1.3	17	1.3	13	1.3	20	1.1
Lithium (Li)	24	1.1	35	1.1	-	-	-	-
Magnesium (Mg)	10,256	1.0	14,660	1.0	7,448	1.4	11,498	1.3
Manganese (Mn)	639	1.0	1,266	2.7	756	0.9	2,164	1.6
Mercury (Hg)	0.0440	0.8	0.0528	0.7	0.100	0.4	0.100	0.4
Molybdenum (Mo)	3.498	1.3	2.898	1.3	3.4	1.3	3.5	1.0
Nickel (Ni)	38	1.8	49	1.4	49	1.4	69	1.0
Phosphorus (P)	1,039	0.9	1,073	1.0	863	1.1	1,400	0.7
Potassium (K)	3,754	1.1	5,694	1.0	2,681	1.6	4,612	1.3
Selenium (Se)	0.6	0.7	0.6	0.6	1.0	0.5	1.0	0.3
Silver (Ag)	0.1	1.2	0.2	0.9	0.3	0.6	0.3	0.6
Sodium (Na)	284	0.8	410	0.8	249	1.0	342	0.9
Strontium (Sr)	10.0	1.0	12.7	0.9	7.2	1.3	11.4	1.1
Sulphur (S)	1,120	1.0	1,140	0.9	-	-	-	-
Thallium (Tl)	0.346	1.3	0.657	0.9	1.0	0.4	1.0	0.6
Tin (Sn)	<2	0.9	<2	1.0	-	-	-	-
Titanium (Ti)	997	1.0	1,288	1.0	-	-	-	-
Uranium (U)	11	0.7	23	0.3	-	-	-	-
Vanadium (V)	48	1.0	67	0.9	37	1.3	58	1.1
Zinc (Zn)	67	0.8	91	0.8	51	1.1	76	1.0
Zirconium (Zr)	3.9	2.6	3.4	2.4	-	-	-	-

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective mean reference area value or baseline period value, as applicable).
Denotes high elevation (mean parameter concentration is≥ 10 times higher than respective mean reference area value or baseline period value, as applicable).

Table D.28: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake NW 2015 and 2017 Data, and between Sheardown Lake NW 2016 and 2017 Data

Parameter	Sheardown Lake NW 2017 versus Initial Year of Mine Operation (2015)				Sheardown Lake NW 2017 versus Second Year of Mine Operation (2016)			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Sheardown Lake NW 2015 Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake NW 2015 Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake NW 2016 Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake NW 2016 Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	15,205	1.0	21,000	1.1	15,620	1.0	21,217	1.0
Antimony (Sb)	0.1	1.1	0.1	1.0	0.1	1.1	0.1	1.0
Arsenic (As)	6.9	0.8	5.1	0.9	8.0	0.7	4.3	1.1
Barium (Ba)	140	0.7	100	1.1	196	0.5	101	1.1
Beryllium (Be)	0.8	0.9	1.1	1.0	0.8	0.9	1.1	1.0
Bismuth (Bi)	0.3	1.1	0.3	0.8	0.2	1.3	0.3	0.9
Boron (B)	25	1.0	32	1.1	24	1.1	31	1.1
Cadmium (Cd)	0.4	1.0	0.3	1.0	0.3	1.3	0.3	1.0
Calcium (Ca)	4,411	1.0	4,595	1.0	4,494	0.9	4,402	1.0
Chromium (Cr)	60	1.0	81	1.0	62	1.0	78	1.1
Cobalt (Co)	14	0.9	17	1.0	13	1.0	16	1.1
Copper (Cu)	45	1.0	47	1.0	43	1.0	47	1.0
Iron (Fe)	57,810	0.8	43,375	1.0	58,740	0.8	40,333	1.1
Lead (Pb)	19	0.9	24	0.9	20	0.8	31	0.7
Lithium (Li)	26.6	1.0	36.2	1.0	28	0.9	39	1.0
Magnesium (Mg)	10,250	1.0	13,750	1.1	10,896	1.0	13,517	1.1
Manganese (Mn)	1,496	0.4	2,707	1.3	2,503	0.3	1,435	2.4
Mercury (Hg)	0.039	0.9	0.041	1.0	0.0	0.9	0.0	0.9
Molybdenum (Mo)	9.6	0.5	3.8	1.0	8.8	0.5	3.0	1.2
Nickel (Ni)	70	1.0	70	1.0	66	1.0	68	1.0
Phosphorus (P)	1,020	0.9	1,007	1.0	1,410	0.6	891	1.2
Potassium (K)	3,889	1.1	5,458	1.1	3,806	1.1	5,255	1.1
Selenium (Se)	0.5	0.9	0.4	0.8	0.4	1.1	0.4	0.8
Silver (Ag)	0.2	0.9	0.2	0.9	0.1	1.2	0.2	0.9
Sodium (Na)	233	1.0	306	1.1	231	1.0	301	1.1
Strontium (Sr)	10.7	0.9	13.0	0.9	10	1.0	12	1.0
Sulphur (S)	5,000	0.2	5,000	0.2	5,000	0.2	5,000	0.2
Thallium (Tl)	0.5	0.8	0.7	0.9	0.4	1.0	0.6	1.0
Tin (Sn)	2.0	1.0	2.0	1.0	4.6	0.4	13	0.2
Titanium (Ti)	889	1.1	1,235	1.1	968	1.0	1,257	1.0
Uranium (U)	8.9	0.8	9.2	0.8	8.2	0.9	8.3	0.9
Vanadium (V)	47	1.0	61	1.0	47	1.0	60	1.1
Zinc (Zn)	59	0.9	76	1.0	57	1.0	73	1.0
Zirconium (Zr)	11	0.9	10	0.8	10	1.0	9.4	0.9

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective mean reference area value or baseline period value, as applicable).
Denotes high elevation (mean parameter concentration is≥ 10 times higher than respective mean reference area value or baseline period value, as applicable).

Table D.29: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake NW and Sheardown Lake Tributaries 1 and 12 Using Data Collected in 2017

Parameter	Sheardown Lake NW 2017 versus Sheardown Lake Tributary 1 (SDLT1)			Sheardown Lake NW 2017 versus Sheardown Lake Tributary 12 (SDLT12)		
	SDLT1 Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations	SDLT12 Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations
Aluminum (Al)	15,366	1.0	1.4	9,450	1.7	2.3
Antimony (Sb)	0.13	0.8	0.8	0.19	0.6	0.5
Arsenic (As)	2.7	1.9	1.8	2.9	1.8	1.7
Barium (Ba)	81	1.2	1.4	33	3.0	3.5
Beryllium (Be)	0.7	1.1	1.6	0.7	1.1	1.5
Bismuth (Bi)	0.7	0.4	0.4	0.6	0.6	0.5
Boron (B)	7	3.7	4.7	5	5.0	6.4
Cadmium (Cd)	0.3	1.3	0.9	0.1	3.8	2.7
Calcium (Ca)	4,254	1.0	1.1	1,433	2.9	3.2
Chromium (Cr)	34	1.8	2.5	33	1.8	2.5
Cobalt (Co)	14	0.9	1.3	16	0.8	1.1
Copper (Cu)	41	1.1	1.2	36	1.2	1.3
Iron (Fe)	155,000	0.3	0.3	272,667	0.2	0.2
Lead (Pb)	24	0.7	0.9	14	1.1	1.5
Lithium (Li)	15.8	1.6	2.4	10	2.5	3.7
Magnesium (Mg)	13,540	0.8	1.1	7,237	1.5	2.0
Manganese (Mn)	780	0.9	4.3	1,056	0.6	3.2
Mercury (Hg)	0.010	3.4	3.7	0.005	6.7	7.3
Molybdenum (Mo)	5.4	0.8	0.7	5.3	0.8	0.7
Nickel (Ni)	35	1.9	2.0	35	1.9	2.0
Phosphorus (P)	410.0	2.2	2.5	388	2.3	2.7
Potassium (K)	5,808	0.7	1.0	2,223	1.9	2.7
Selenium (Se)	0.3	1.5	1.1	0.2	1.9	1.4
Silver (Ag)	0.3	0.6	0.7	0.2	0.8	0.9
Sodium (Na)	117	2.0	2.8	50	4.7	6.5
Strontium (Sr)	3.9	2.5	3.1	2.3	4.2	5.3
Sulphur (S)	<1000	1.2	1.0	<1000	1.2	1.0
Thallium (Tl)	0.3	1.5	1.9	0.1	3.3	4.2
Tin (Sn)	2.0	1.0	1.0	2.0	1.0	1.0
Titanium (Ti)	877	1.1	1.5	382	2.6	3.4
Uranium (U)	3.2	2.3	2.4	2.8	2.6	2.7
Vanadium (V)	28	1.7	2.2	18	2.6	3.5
Zinc (Zn)	87	0.6	0.8	44	1.3	1.7
Zirconium (Zr)	7	1.5	1.2	3.9	2.6	2.1

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than at respective tributary).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than at respective tributary).
Denotes high elevation (mean parameter concentration is ≥ 10 times higher than at respective tributary).

Table D.30: Field Observations of Sediment Properties at Sheardown Lake Southeast (DLO-02) Benthic Stations[a], Mary River Project CREMP, August 2017

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia[b]	Plant or Algal Presence
DLO-02-11	8.0	reddish iron oxide and/or black oxidized layer (<0.5 cm thick) at surface overlying gray-brown silt	black oxidized layer (possibly due to decaying vegetation)	*Chara* sp. (common), globular algae (sparse)
DLO-02-10	7.5	gray-brown silt	none detected	*Chara* sp. (common), globular algae (sparse)
DLO-02-4	8.8	reddish-brown silt layer (~1 cm) over medium brown silt	none detected	globular algae (sparse)
DLO-02-9	9.7	reddish-brown layer (~ 1 cm) over medium brown silt	none detected	globular algae (sparse)
DLO-02-1	11.5	dark brown, compact silt	none detected	globular algae (sparse)
DLO-02-12	10.5	reddish layer (~1 cm thick) over medium brown silt	none detected	globular algae (sparse)
DLO-02-8	12.5	reddish-brown layer (~ 1 cm) over medium brown silt	none detected	globular algae (sparse)
DLO-02-13	13.2	thin red-brown layer (~1 cm) over dark brown silt	none detected	globular algae (sparse)
DLO-02-2	12.5	dark brown silt	none detected	none observed
DLO-02-3	13.5	dark brown silt	none detected	globular algae (sparse)

[a] Sediment particle size and benthic invertebrate community samples were collected by Petite-Ponar.

[b] Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

Table D.31: Observations from Sediment Cores Collected at Sheardown Lake SE (DLO-02), Mary River Project CREMP, August 2017

Sample Station	Station Depth (m)	Station Type	Core #	Core Length (cm)	Surface (Top 2 cm) Description
DLO-02-1	11.5	Littoral	1	6.0	Silt loam
			2	7.0	
			3	5.0	
DLO-02-11	7.8	Littoral	1	7.0	Silt
			2	10.0	
			3	12.0	
DLO-02-4	8.5	Littoral	1	10.0	Silty clay loam
			2	11.0	
			3	14.0	
DLO-02-2	13.4	Profundal	1	6.0	Silt loam
			2	7.0	
			3	7.0	
DLO-02-3	13.0	Profundal	1	7.0	Silt loam
			2	10.0	
			3	8.0	
DLO-02-DUP (duplicate of DLO-02-1)	11.5	Littoral	1	7.0	Silt loam
			2	8.0	
			3	8.0	

Table D.32: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Sheardown Lake Southeast (DLO-02) Sediment Stations, Mary River Project CREMP, August 2017

Parameter		Units	Sediment Quality Guideline (SQG)[a]	AEMP Benchmark[b]	Sheardown Lake Southeast Basin Station										Study Area Summary Statistics		
					DLO-02-1 (littoral)	DLO-02-11 (littoral)	DLO-02-10 (littoral)	DLO-02-4 (littoral)	DLO-02-12 (profundal)	DLO-02-9 (littoral)	DLO-02-8 (profundal)	DLO-02-13 (profundal)	DLO-02-2 (profundal)	DLO-02-3 (profundal)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	13	6	9	9	4	8	14	6	13	17	12	4.3	1.9
	Silt	%	-	-	76	90	74	62	82	79	67	78	72	68	74	10.3	4.6
	Clay	%	-	-	11	4	17	29	14	13	19	16	15	15	15	8.9	4.0
	Moisture	%	-	-	44	55	67	55	64	63	58	65	50	42	49	6.1	2.7
	Total Organic Carbon	%	10[α]	-	1.03	1.33	1.48	1.20	1.1	1.09	0.98	1.1	1.12	1.02	1.14	0.13	0.058
Metals	Aluminum (Al)	mg/kg	-	-	15,550	17,900		17,300					18,300	18,600	17,530	1,209	541
	Antimony (Sb)	mg/kg	-	-	<0.10	<0.10		<0.10					<0.10	<0.10	<0.10	0	0
	Arsenic (As)	mg/kg	17	5.9	2.57	***6.18***		5.75					2.45	3.66	4.12	1.75	0.785
	Barium (Ba)	mg/kg	-	-	76.0	141.0		114					80.2	93.3	100.9	26.9	12.01
	Beryllium (Be)	mg/kg	-	-	0.71	0.85		0.82					0.85	0.85	0.82	0.06	0.027
	Bismuth (Bi)	mg/kg	-	-	<0.20	0.22		0.23					<0.20	<0.20	0.21	0.0141	0.0063
	Boron (B)	mg/kg	-	-	18.6	22.4		23.1					27.1	27.4	23.7	3.67	1.64
	Cadmium (Cd)	mg/kg	3.5	1.5	0.108	0.133		0.125					0.118	0.119	0.121	0.0094	0.00421
	Calcium (Ca)	mg/kg	-	-	6,115	5,890		6,210					6,690	5,760	6,133	359	160.4
	Chromium (Cr)	mg/kg	90	79	70.1	***82.0***		***83.7***					76.7	***79.9***	78.5	5.4	2.41
	Cobalt (Co)	mg/kg	-	-	12.9	15.1		14.0					13.5	14.4	14.0	0.86	0.383
	Copper (Cu)	mg/kg	110	56	26.0	30.1		29.1					28.7	28.3	28.4	1.54	0.69
	Iron (Fe)	mg/kg	40,000[α]	34,400	***35,700***	***51,500***		***47,400***					***37,000***	***41,300***	***42,580***	6,762	3,024
	Lead (Pb)	mg/kg	91.3	35	14.2	17.6		16.9					15.9	15.8	16.1	1.29	0.58
	Lithium (Li)	mg/kg	-	-	27.4	32.1		30.7					31.6	31.9	30.7	1.96	0.88
	Magnesium (Mg)	mg/kg	-	-	13,500	14,400		14,600					14,900	14,400	14,360	522	234
	Manganese (Mn)	mg/kg	1,100[α,β]	657	527	***2,560***		***1,430***					469	***1,170***	***1,231***	849	380
	Mercury (Hg)	mg/kg	0.486	0.17	0.0258	0.0296		0.0232					0.0307	0.0291	0.0277	0.00311	0.001390
	Molybdenum (Mo)	mg/kg	-	-	0.98	2.60		1.73					0.8	1.37	1.50	0.71	0.317
	Nickel (Ni)	mg/kg	75[α,β]	66	54.3	***66.8***		66					55.3	59.4	60.4	5.86	2.62
	Phosphorus (P)	mg/kg	2,000[α]	1,278	944	***1,300***		***1,320***					969	1,130	1,133	177	79.3
	Potassium (K)	mg/kg	-	-	3,895	4,600		4,450					4,750	4,810	4,501	366	163.9
	Selenium (Se)	mg/kg	-	-	<0.20	0.21		<0.20					0.20	0.25	0.21	0.022	0.0097
	Silver (Ag)	mg/kg	-	-	0.11	0.11		0.11					0.13	0.11	0.11	0.009	0.0040
	Sodium (Na)	mg/kg	-	-	246	292		285					306	319	290	27.7	12.4
	Strontium (Sr)	mg/kg	-	-	9.8	11.1		11.1					11.6	12.0	11.1	0.849	0.380
	Sulphur (S)	mg/kg	-	-	<1,000	<1,000		<1,000					<1,000	<1,000	<1,000	0	0
	Thallium (Tl)	mg/kg	-	-	0.333	0.417		0.405					0.370	0.374	0.380	0.0331	0.0148
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0		<2.0					<2.0	<2.0	<2.0	0	0
	Titanium (Ti)	mg/kg	-	-	1,210	1,250		1,260					1,410	1,500	1,326	123	55.2
	Uranium (U)	mg/kg	-	-	4.60	5.11		4.42					5.0	5.05	4.84	0.310	0.138
	Vanadium (V)	mg/kg	-	-	47.3	53.5		52.4					52.9	55.0	52.2	2.92	1.31
	Zinc (Zn)	mg/kg	315	135	53.6	60.8		57.5					59.1	60.1	58.2	2.86	1.28
	Zirconium (Zr)	mg/kg	-	-	17.1	14.3		14.5					21.3	18.4	17.1	2.91	1.30

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Sheardown Lake Southeast.

Indicates parameter concentration above Sediment Quality Guideline (SQG).

BOLD Indicates parameter concentration above the AEMP Benchmark.

Table D.33: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake SE and Reference Lake 3 2017 Data, and between Sheardown Lake SE 2017 and Baseline Data, Mary River Project CREMP, 2017

Parameter	Sheardown Lake SE versus Reference Lake 3 in 2017				Sheardown Lake SE 2017 versus Baseline Period			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake SE Baseline Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake SE Baseline Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	14,720	1.1	22,140	0.8	14,950	1.1	13,133	1.4
Antimony (Sb)	<0.10	1.0	<0.10	1.0	1.0	0.1	1.0	0.1
Arsenic (As)	3.4	1.4	4.8	0.6	1.9	2.6	1.5	2.0
Barium (Ba)	113	1.0	138	0.6	81	1.4	64	1.4
Beryllium (Be)	0.6	1.4	0.9	1.0	1.0	0.8	1.0	0.9
Bismuth (Bi)	<0.20	1.1	0.20	1.0	-	-	-	-
Boron (B)	12.1	1.8	16.6	1.6	2.5	8.5	1.4	20.2
Cadmium (Cd)	0.2	0.7	0.2	0.7	0.5	0.2	0.6	0.2
Calcium (Ca)	4,656	1.3	5,262	1.2	6,310	1.0	8,925	0.7
Chromium (Cr)	51	1.5	70	1.1	78	1.0	72	1.1
Cobalt (Co)	11	1.3	16	0.9	13	1.1	12	1.2
Copper (Cu)	65	0.4	88	0.3	30	1.0	25	1.2
Iron (Fe)	41,960	1.1	46,740	0.8	32,284	1.4	29,117	1.3
Lead (Pb)	12	1.3	17	0.9	17	1.0	14	1.2
Lithium (Li)	24	1.3	35	0.9	-	-	-	-
Magnesium (Mg)	10,256	1.4	14,660	1.0	12,634	1.1	13,742	1.1
Manganese (Mn)	639	2.4	1,266	0.6	462	3.3	410	2.0
Mercury (Hg)	0.0440	0.6	0.0528	0.6	0.100	0.3	0.100	0.3
Molybdenum (Mo)	3.498	0.5	2.898	0.4	1.5	1.2	1.0	1.1
Nickel (Ni)	38	1.6	49	1.2	62	1.0	62	0.9
Phosphorus (P)	1,039	1.1	1,073	1.0	1,150	1.0	950	1.1
Potassium (K)	3,754	1.1	5,694	0.8	3,947	1.1	3,317	1.4
Selenium (Se)	0.6	0.3	0.6	0.4	1.0	0.2	1.0	0.2
Silver (Ag)	0.1	0.9	0.2	0.6	0.4	0.3	0.3	0.4
Sodium (Na)	284	1.0	410	0.8	353	0.8	330	0.9
Strontium (Sr)	10.0	1.1	12.7	0.9	16.0	0.7	11.0	1.1
Sulphur (S)	1,120	0.9	1,140	0.9	-	-	-	-
Thallium (Tl)	0.346	1.1	0.657	0.6	1.0	0.4	1.0	0.4
Tin (Sn)	<2	0.9	<2	1.0	-	-	-	-
Titanium (Ti)	997	1.2	1,288	1.1	-	-	-	-
Uranium (U)	11	0.4	23	0.2	-	-	-	-
Vanadium (V)	48	1.1	67	0.8	52	1.0	44	1.2
Zinc (Zn)	67	0.9	91	0.7	51	1.1	51	1.2

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective mean reference area value or baseline period value, as applicable).
Denotes high elevation (mean parameter concentration is≥ 10 times higher than respective mean reference area value or baseline period value, as applicable).

Table D.34: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake SE 2015 and 2017 Data, and between Sheardown Lake SE 2016 and 2017 Data

Parameter	Sheardown Lake SE 2017 versus Initial Year of Mine Operation (2015)				Sheardown Lake NW 2017 versus Second Year of Mine Operation (2016)	
	Littoral Stations		Profundal Stations		Littoral Stations	
	Sheardown Lake SE 2015 Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake SE 2015 Concentration (mg/kg)	Magnitude of Elevation	Sheardown Lake NW 2016 Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	18,467	0.9	18,600	1.0	15,933	1.1
Antimony (Sb)	0.1	1.0	0.1	1.0	0.1	1.0
Arsenic (As)	4.7	1.0	2.7	1.1	4.2	1.2
Barium (Ba)	95	1.2	75	1.2	81	1.4
Beryllium (Be)	0.9	0.9	0.9	1.0	0.7	1.1
Bismuth (Bi)	0.3	0.9	0.2	0.9	0.3	0.6
Boron (B)	27	0.8	27	1.0	20	1.0
Cadmium (Cd)	0.1	1.1	0.1	1.2	0.1	1.2
Calcium (Ca)	5,933	1.0	6,745	0.9	5,350	1.1
Chromium (Cr)	84	0.9	79	1.0	72	1.1
Cobalt (Co)	15	0.9	14	1.0	13	1.1
Copper (Cu)	30	1.0	29	1.0	26	1.1
Iron (Fe)	44,300	1.0	34,350	1.1	40,233	1.1
Lead (Pb)	19	0.8	19	0.8	23	0.7
Lithium (Li)	32.7	0.9	32.3	1.0	30	1.0
Magnesium (Mg)	14,233	1.0	14,425	1.0	12,800	1.1
Manganese (Mn)	1,048	1.4	444	1.8	931	1.6
Mercury (Hg)	0.025	1.1	0.026	1.2	0.0	1.1
Molybdenum (Mo	1.7	1.0	0.9	1.3	1.5	1.2
Nickel (Ni)	68	0.9	59	1.0	57	1.1
Phosphorus (P)	1,076	1.1	912	1.2	998	1.2
Potassium (K)	4,647	0.9	4,503	1.1	3,787	1.1
Selenium (Se)	0.2	0.9	0.2	1.0	0.2	1.0
Silver (Ag)	0.1	0.8	0.1	0.8	0.1	1.0
Sodium (Na)	299	0.9	293	1.1	257	1.1
Strontium (Sr)	13.1	0.8	13.5	0.9	10	1.1
Sulphur (S)	5,000	0.2	5,000	0.2	5,000	0.2
Thallium (Tl)	0.5	0.8	0.4	0.8	0.4	1.0
Tin (Sn)	2.0	1.0	2.0	1.0	13.4	0.1
Titanium (Ti)	1,380	0.9	1,418	1.0	1,167	1.1
Uranium (U)	6.3	0.7	6.4	0.8	5.0	0.9
Vanadium (V)	55	0.9	54	1.0	47	1.1
Zinc (Zn)	62	0.9	62	1.0	51	1.1
Zirconium (Zr)	22	0.7	23	0.9	16	1.0

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective previous study year).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective previous study year).
Denotes high elevation (mean parameter concentration is ≥ 10 times higher than respective previous study year).

Table D.35: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake SE and Sheardown Lake Tributary 9 and Mary River Using Data Collected in 2017

Parameter	Sheardown Lake SE 2017 versus Sheardown Lake Tributary 9 (SDLT9)			Sheardown Lake NW 2017 versus Mary River (EO-20)		
	SDLT9 Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations	EO-20 Concentration (mg/kg)	Magnitude of Elevation for Littoral Station	Magnitude of Elevation for Profundal Stations
Aluminum (Al)	2,538	6.7	7.3	2,034	8.3	9.1
Antimony (Sb)	<0.10	1.0	1.0	<0.10	1.0	1.0
Arsenic (As)	0.6	7.6	4.8	0.5	10.5	6.7
Barium (Ba)	11	10.0	7.9	9	12.5	9.8
Beryllium (Be)	0.1	6.5	7.0	0.1	6.4	6.9
Bismuth (Bi)	0.2	1.1	1.0	<0.2	1.1	1.0
Boron (B)	5	4.2	5.4	5	4.1	5.2
Cadmium (Cd)	0.036	3.4	3.3	0.023	5.4	5.2
Calcium (Ca)	1,660	3.7	3.8	3,094	2.0	2.0
Chromium (Cr)	14	5.8	5.8	23	3.4	3.4
Cobalt (Co)	2	5.9	5.9	3	4.8	4.8
Copper (Cu)	7	3.9	3.9	6	4.9	4.9
Iron (Fe)	15,000	3.0	2.6	15,518	2.9	2.5
Lead (Pb)	4	4.5	4.4	2	7.0	6.8
Lithium (Li)	3.9	7.8	8.2	5	6.2	6.5
Magnesium (Mg)	2,572	5.5	5.7	3,617	3.9	4.0
Manganese (Mn)	121	12.5	6.8	85	17.7	9.6
Mercury (Hg)	0.010	2.5	2.9	<0.005	5.2	6.0
Molybdenum (Mo)	0.4	4.2	2.6	0.2	10.9	6.8
Nickel (Ni)	11	5.8	5.3	15	4.1	3.7
Phosphorus (P)	321	3.7	3.3	316	3.8	3.3
Potassium (K)	582	7.4	8.2	466	9.3	10.3
Selenium (Se)	0.2	0.9	1.1	0.2	1.0	1.1
Silver (Ag)	0.1	1.1	1.2	0.1	1.1	1.2
Sodium (Na)	51	5.4	6.1	59	4.7	5.3
Strontium (Sr)	2.6	4.1	4.5	3.6	2.9	3.3
Sulphur (S)	<1000	1.0	1.0	<1000	1.0	1.0
Thallium (Tl)	0.1	6.0	5.8	0.1	7.0	6.7
Tin (Sn)	2.0	1.0	1.0	<2.0	1.0	1.0
Titanium (Ti)	247	5.0	5.9	304	4.1	4.8
Uranium (U)	0.6	7.9	8.4	0.8	5.9	6.3
Vanadium (V)	13	4.0	4.2	25	2.0	2.2
Zinc (Zn)	11	5.1	5.3	9	6.3	6.5
Zirconium (Zr)	1	15.0	19.5	2.8	5.5	7.1

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than average at respective tributary/river area).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than average at respective tributary/river area).
Denotes high elevation (mean parameter concentration is ≥ 10 times higher than average at respective tributary/river area).

Table D.36: Deposited Sediment Field Sampling Observations at Mary River Study Area Benthic Stations[a], Mary River Project CREMP, August 2017

Study Area	Station	Texture of Collected Sediment	Predominant Collection Location	Silt Presence[b]
GO-09 Upstream Reference	GO-09-1	coarse sand	in-stream behind boulders	none observed
	GO-09-2	coarse sand	in-stream behind boulders	none observed
	GO-09-3	coarse sand	in-stream behind boulders	none observed
	GO-09-4	coarse sand	in-stream behind boulders	none observed
	GO-09-5	coarse sand	in-stream behind boulders	none observed
GO-03 Upstream	GO-03-1	medium to coarse sand	shoreline/bank	precipitate
	GO-03-2	medium to coarse sand	shoreline/bank	precipitate
	GO-03-3	very coarse sand	shoreline/bank	none observed
	GO-03-4	medium (sized) sand	in-stream pool habitat	none observed
	GO-03-5	coarse sand	shoreline/bank	none observed
EO-01 Upper Mine-Exposed	EO-01-1	very coarse sand	shoreline/bank	none observed
	EO-01-2	very coarse sand	shoreline/bank	none observed
	EO-01-3	very coarse sand	shoreline/bank	none observed
	EO-01-4	very coarse sand	in-stream behind boulders	none observed
	EO-01-5	very coarse sand	in-stream behind boulders	none observed
EO-20 Middle Mine-Exposed	EO-20-1	medium to coarse sand	shoreline/bank	none observed
	EO-20-2	medium to coarse sand	shoreline/bank	none observed
	EO-20-3	coarse sand	shoreline/bank; some behind boulders	none observed
	EO-20-4	very coarse sand	in-stream behind boulders	none observed
	EO-20-5	medium to coarse sand	shoreline/bank; some behind boulders	none observed
CO-05 Lower Mine-Exposed	CO-05-1	medium (sized) sand	in-stream bed material	none observed
	CO-05-2	medium (sized) sand	in-stream bed material	none observed
	CO-05-3	medium (sized) sand	in-stream bed material	none observed
	CO-05-4	medium (sized) sand	in-stream bed material	none observed
	CO-05-5	medium (sized) sand	in-stream bed material	none observed

[a] Sediment samples collected using a stainless steel scoop directly from the streambed or shoreline, as available.
[b] Silt observations described as fine material present on the surface of in-stream substrate and/or as interstitial deposits, occurring unusually.

Table D.37: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River GO-09 Reference Benthic Stations, Mary River Project CREMP, August 2017

Analyte	Units	Sediment Quality Guideline (SQG)[a]	Mary River GO-09 Reference Station					Study Area Summary Statistics		
			GO-09-B1	GO-09-B2	GO-09-B3	GO-09-B4	GO-09-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	coarse sand	coarse sand	coarse sand	coarse sand	coarse sand	-	-	-
Total Organic Carbon	%	10[α]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Aluminum (Al)	mg/kg	-	799	571	637	1,220	589	763	271	121
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.00	0.00
Arsenic (As)	mg/kg	17	0.17	0.13	0.13	0.18	0.17	0.16	0.02	0.01
Barium (Ba)	mg/kg	-	4	3	3	6	2.9	4	1.2	0.5
Beryllium (Be)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0	0
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0	0
Calcium (Ca)	mg/kg	-	713	739	547	1,730	481	842	508	227
Chromium (Cr)	mg/kg	90	3.8	4.2	2.0	4.2	3.0	3.4	1.0	0.4
Cobalt (Co)	mg/kg	-	0.76	0.7	0.48	0.9	0.5	0.7	0.19	0.08
Copper (Cu)	mg/kg	197	1.6	1.0	1.0	2	0.8	1.3	0.5	0.2
Iron (Fe)	mg/kg	40,000[α]	3,230	4,680	1,290	2,810	2,120	2,826	1,271	568
Lead (Pb)	mg/kg	91.3	1.3	1.1	1.0	1.2	1.0	1.1	0.13	0.06
Lithium (Li)	mg/kg	-	<2.0	<2.0	<2.0	3.1	<2.0	2.2	0.49	0.22
Magnesium (Mg)	mg/kg	-	694	531	617	1,750	536	826	521	233
Manganese (Mn)	mg/kg	1,100[α,β]	24	19	17	33	16	22	7.1	3.2
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	0.13	0.11	<0.10	<0.10	<0.10	0.11	0.01	0.01
Nickel (Ni)	mg/kg	75[α,β]	1.9	1.6	1.3	3.1	1.4	1.9	0.71	0.32
Phosphorus (P)	mg/kg	2,000[α]	132	170	56	138	67	113	49.0	21.9
Potassium (K)	mg/kg	-	170	120	140	300	110	168	77	35
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.00	0.00
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.000	0.000
Sodium (Na)	mg/kg	-	<50	<50	<50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	1.9	2.1	1.6	2.3	1.7	1.9	0.31	0.14
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0	0
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	115	100	112	145	74	109	26	12
Uranium (U)	mg/kg	-	0.30	0.3	0.3	0.4	0.3	0.3	0.03	0.01
Vanadium (V)	mg/kg	-	6.1	8.2	2.3	4.8	3.8	5.0	2.2	1.0
Zinc (Zn)	mg/kg	315	4.9	3	2.8	5	2.5	4	1.3	0.6
Zirconium (Zr)	mg/kg	-	2.0	1.5	1.5	1.9	1.4	1.7	0.3	0.1

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.38: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River GO-03 Upstream Benthic Stations, Mary River Project CREMP, August 2017

Analyte	Units	Sediment Quality Guideline (SQG)[a]	Mary River CO-03 Upstream Station					Study Area Summary Statistics		
			GO-03-B1	GO-03-B2	GO-03-B3	GO-03-B4	GO-03-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	med-coarse sand	med-coarse sand	very coarse sand	medium sand	coarse sand	-	-	-
Total Organic Carbon	%	10[α]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Aluminum (Al)	mg/kg	-	696	786	783	736	948	790	96	43
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.12	0.17	0.16	0.16	0.16	0.15	0.02	0.01
Barium (Ba)	mg/kg	-	3	4	4	3	4.3	4	0.4	0.2
Beryllium (Be)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0	0
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.000	0.000
Calcium (Ca)	mg/kg	-	513	661	549	705	665	619	83	37
Chromium (Cr)	mg/kg	90	2.0	2.4	4.4	5.1	3.4	3.4	1.3	0.6
Cobalt (Co)	mg/kg	-	0.49	0.6	0.76	0.8	0.8	0.7	0.14	0.06
Copper (Cu)	mg/kg	197	1.2	1.0	1.4	2	1.2	1.4	0.4	0.2
Iron (Fe)	mg/kg	40,000[α]	1,290	1,870	4,090	4,920	2,410	2,916	1,532	685
Lead (Pb)	mg/kg	91.3	0.8	1.2	1.2	1.5	1.3	1.2	0.23	0.10
Lithium (Li)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Magnesium (Mg)	mg/kg	-	627	668	676	597	840	682	94	42
Manganese (Mn)	mg/kg	1,100[α,β]	16	19	21	23	24	21	3.3	1.5
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.00	0.00
Nickel (Ni)	mg/kg	75[α,β]	1.3	1.7	2.0	1.8	2.0	1.8	0.29	0.13
Phosphorus (P)	mg/kg	2,000[α]	69	141	105	185	107	121	43.7	19.6
Potassium (K)	mg/kg	-	160	160	160	160	190	166	13	6
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Sodium (Na)	mg/kg	-	<50	<50	<50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	1.8	2.1	1.8	2.1	2.0	1.9	0.18	0.08
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0	0
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	87	102	111	136	135	114	21	10
Uranium (U)	mg/kg	-	0.27	0.3	0.3	0.4	0.3	0.3	0.03	0.01
Vanadium (V)	mg/kg	-	2.2	3.2	6.9	9.7	4.1	5.2	3.1	1.4
Zinc (Zn)	mg/kg	315	2.0	3	3.3	3	3.7	3	0.6	0.3
Zirconium (Zr)	mg/kg	-	1.4	1.7	1.7	1.8	1.9	1.7	0.2	0.1

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.39: Magnitude of Elevation in Deposited Sediment Metal Concentrations at Mary River Upper and Mine-Exposed Study Areas Compared to Reference Area Data, Mary River Project CREMP, August 2017

Parameter	Units	Mary River Reference (GO-09)	Upstream (GO-03)	Upper Mine-Exposed (EO-01)	Middle Mine-Exposed (EO-20)	Lower Mine-Exposed (CO-05)
Total Organic Carbon	%	<0.10	1.0	1.0	1.0	1.0
Aluminum (Al)	mg/kg	763	1.0	2.3	2.7	1.7
Antimony (Sb)	mg/kg	<0.10	1.0	1.0	1.0	1.0
Arsenic (As)	mg/kg	0.16	1.0	3.2	2.9	2.0
Barium (Ba)	mg/kg	4	1.0	2.4	2.4	1.4
Beryllium (Be)	mg/kg	<0.10	1.0	1.0	1.2	1.0
Bismuth (Bi)	mg/kg	<0.20	1.0	1.0	1.0	1.0
Boron (B)	mg/kg	<5.0	1.0	1.0	1.0	1.0
Cadmium (Cd)	mg/kg	<0.020	1.0	1.0	1.1	1.0
Calcium (Ca)	mg/kg	842	0.7	2.1	3.7	1.3
Chromium (Cr)	mg/kg	3.4	1.0	3.8	6.7	4.0
Cobalt (Co)	mg/kg	0.7	1.0	2.8	4.3	2.5
Copper (Cu)	mg/kg	1.3	1.1	2.0	4.5	3.1
Iron (Fe)	mg/kg	2,826	1.0	3.0	5.5	2.7
Lead (Pb)	mg/kg	1.1	1.1	1.5	2.1	1.5
Lithium (Li)	mg/kg	2.2	0.9	1.6	2.2	1.6
Magnesium (Mg)	mg/kg	826	0.8	2.7	4.4	2.3
Manganese (Mn)	mg/kg	22	0.9	2.7	3.9	2.3
Mercury (Hg)	mg/kg	<0.0050	1.0	1.0	1.0	1.0
Molybdenum (Mo)	mg/kg	0.11	0.9	1.1	1.5	0.9
Nickel (Ni)	mg/kg	1.9	0.9	4.2	8.3	5.5
Phosphorus (P)	mg/kg	113	1.1	2.1	2.8	1.9
Potassium (K)	mg/kg	168	1.0	2.9	2.8	1.4
Selenium (Se)	mg/kg	<0.20	1.0	1.0	1.0	1.0
Silver (Ag)	mg/kg	<0.10	1.0	1.0	1.0	1.0
Sodium (Na)	mg/kg	<50	1.0	1.0	1.2	1.0
Strontium (Sr)	mg/kg	1.9	1.0	1.6	1.9	1.3
Sulphur (S)	mg/kg	<1,000	1.0	1.0	1.0	1.0
Thallium (Tl)	mg/kg	<0.050	1.0	1.0	1.1	1.0
Tin (Sn)	mg/kg	<2.0	1.0	1.0	1.0	1.0
Titanium (Ti)	mg/kg	109	1.0	1.8	2.8	1.8
Uranium (U)	mg/kg	0.3	1.0	1.5	2.7	1.6
Vanadium (V)	mg/kg	5.0	1.0	2.5	5.0	2.6
Zinc (Zn)	mg/kg	4	0.8	1.7	2.5	1.5
Zirconium (Zr)	mg/kg	1.7	1.0	1.3	1.7	1.2

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference area value).
Denotes moderate elevation (concentration 5 to 10 times higher than respective mean reference area value).
Denotes highly elevated (mean concentration ≥10 times higher than respective mean reference area value).

Table D.40: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River EO-01 Mine-Exposed Benthic Stations, Mary River Project CREMP, August 2017

Analyte	Units	Sediment Quality Guideline (SQG)[a]	Mary River Mine-Exposed Area Station					Study Area Summary Statistics		
			EO-01-B1	EO-01-B2	EO-01-B3	EO-01-B4	EO-01-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	very coarse sand	very coarse sand	very coarse sand	very coarse sand	very coarse sand	-	-	-
Total Organic Carbon	%	10[α]	0.11	<0.10	<0.10	<0.10	<0.10	0.10	0.00	0.002
Aluminum (Al)	mg/kg	-	2,710	2,470	745	1,010	2,020	1,791	875	391
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.37	0.34	0.22	0.20	1.40	0.51	0.51	0.23
Barium (Ba)	mg/kg	-	14	13	3	5	8.2	9	4.8	2.1
Beryllium (Be)	mg/kg	-	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	0	0
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0	0
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0	0
Calcium (Ca)	mg/kg	-	2,700	2,030	685	864	2,470	1,750	924	413
Chromium (Cr)	mg/kg	90	16.1	10.1	11.0	9.1	19.0	13.1	4.3	1.9
Cobalt (Co)	mg/kg	-	2.69	2.1	1.18	1.1	2.2	1.9	0.69	0.31
Copper (Cu)	mg/kg	197	3.3	2.8	1.1	2	3.1	2.5	0.9	0.4
Iron (Fe)	mg/kg	40,000[α]	14,400	6,740	8,490	5,680	7,360	8,534	3,433	1,535
Lead (Pb)	mg/kg	91.3	2.4	2.0	1.1	1.3	1.6	1.7	0.51	0.23
Lithium (Li)	mg/kg	-	4.4	4.4	<2.0	2.3	4.6	3.5	1.28	0.57
Magnesium (Mg)	mg/kg	-	3,270	2,840	691	1,070	3,390	2,252	1,276	571
Manganese (Mn)	mg/kg	1,100[α,β]	87	68	37	35	68	59	22.4	10.0
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	0.18	0.11	<0.10	<0.10	<0.10	0.12	0.03	0.02
Nickel (Ni)	mg/kg	75[α,β]	9.2	8.5	4.1	4.3	13.2	7.8	3.79	1.70
Phosphorus (P)	mg/kg	2,000[α]	380	269	180	136	216	236	94.0	42.0
Potassium (K)	mg/kg	-	840	730	150	230	450	480	302	135
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.00	0.00
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.000	0.000
Sodium (Na)	mg/kg	-	<50	<50	<50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	3.3	3.1	2.1	2.2	5.0	3.1	1.16	0.52
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	0.053	0.052	<0.050	<0.050	<0.050	0.051	0.001	0.001
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	276	249	130	117	232	201	72	32
Uranium (U)	mg/kg	-	0.65	0.5	0.3	0.3	0.4	0.4	0.15	0.07
Vanadium (V)	mg/kg	-	20.0	9.1	14.4	8.8	11.1	12.7	4.7	2.1
Zinc (Zn)	mg/kg	315	9.0	8.0	2.9	3.6	7.9	6.3	2.8	1.3
Zirconium (Zr)	mg/kg	-	2.6	2.7	1.6	1.8	2.3	2.2	0.5	0.2

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.41: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River EO-20 Mine-Exposed Benthic Stations, Mary River Project CREMP, August 2017

Analyte	Units	Sediment Quality Guideline (SQG)[a]	Mary River Mine-Exposed Area Station					Study Area Summary Statistics		
			EO-20-B1	EO-20-B2	EO-20-B3	EO-20-B4	EO-20-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	med-coarse sand	med-coarse sand	coarse sand	very coarse sand	med-coarse sand	-	-	-
Total Organic Carbon	%	10[α]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Aluminum (Al)	mg/kg	-	1,120	884	4,380	847	2,940	2,034	1,573	703
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.36	0.34	0.71	0.29	0.59	0.46	0.18	0.08
Barium (Ba)	mg/kg	-	5	4	19	4	12.0	9	6.4	2.9
Beryllium (Be)	mg/kg	-	<0.10	<0.10	0.19	<0.10	0.13	0.12	0.04	0.02
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	6.0	<5.0	<5.0	5.2	0.45	0.20
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	0.031	<0.020	0.022	0.02	0.005	0.002
Calcium (Ca)	mg/kg	-	1,900	1,070	7,040	739	4,720	3,094	2,706	1,210
Chromium (Cr)	mg/kg	90	26.0	21.8	36.0	8.4	23.5	23.1	9.9	4.4
Cobalt (Co)	mg/kg	-	2.69	2.4	4.82	1.2	3.4	2.9	1.34	0.60
Copper (Cu)	mg/kg	197	2.3	16.4	4.8	1	4.1	5.8	6.1	2.7
Iron (Fe)	mg/kg	40,000[α]	28,400	19,000	12,800	6,090	11,300	15,518	8,546	3,822
Lead (Pb)	mg/kg	91.3	2.2	2.2	3.3	1.5	2.4	2.3	0.66	0.29
Lithium (Li)	mg/kg	-	2.4	<2.0	10.7	<2.0	7.3	4.9	3.95	1.77
Magnesium (Mg)	mg/kg	-	1,370	922	9,080	925	5,790	3,617	3,678	1,645
Manganese (Mn)	mg/kg	1,100[α,β]	68	56	146	31	125	85	48.4	21.7
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	0.11	<0.10	0.25	<0.10	0.25	0.16	0.08	0.04
Nickel (Ni)	mg/kg	75[α,β]	6.6	8.3	35.4	5.2	21.2	15.3	12.89	5.77
Phosphorus (P)	mg/kg	2,000[α]	356	308	517	124	276	316	141.9	63.5
Potassium (K)	mg/kg	-	250	180	1,110	160	630	466	407	182
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.00	0.00
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.000	0.000
Sodium (Na)	mg/kg	-	<50	<50	80	<50	63	59	13	6
Strontium (Sr)	mg/kg	-	2.9	2.5	6.0	2.3	4.6	3.6	1.59	0.71
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	<0.050	<0.050	0.076	<0.050	<0.050	0.055	0.012	0.005
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	204	200	507	139	471	304	171	77
Uranium (U)	mg/kg	-	0.68	0.6	1.1	0.9	0.7	0.8	0.22	0.10
Vanadium (V)	mg/kg	-	44.4	34.6	18.4	10.1	17.4	25.0	14.1	6.3
Zinc (Zn)	mg/kg	315	5.6	5	18.8	3	13.6	9	6.8	3.0
Zirconium (Zr)	mg/kg	-	2.2	1.9	4.5	1.8	3.5	2.8	1.2	0.5

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.42: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River Downstream (CO-05) Benthic Stations, Mary River Project CREMP, August 2017

Analyte	Units	Sediment Quality Guideline (SQG)[a]	Mary River Downstream Mine-Exposed Area Station					Study Area Summary Statistics		
			CO-05-B1	CO-05-B2	CO-05-B3	CO-05-B4	CO-05-B5	Mean	Standard Deviation	Standard Error
Substrate Description	-	-	medium sand	medium sand	medium sand	medium sand	medium sand	-	-	-
Total Organic Carbon	%	10[α]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Aluminum (Al)	mg/kg	-	672	599	1,140	1,920	2,180	1,302	719	322
Antimony (Sb)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Arsenic (As)	mg/kg	17	0.39	0.19	0.27	0.38	0.33	0.31	0.08	0.04
Barium (Ba)	mg/kg	-	4	3	5	7	7.5	5	2.2	1.0
Beryllium (Be)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	0.11	0.10	0.004	0.002
Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Boron (B)	mg/kg	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0	0
Cadmium (Cd)	mg/kg	3.5	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0	0
Calcium (Ca)	mg/kg	-	818	314	818	1,660	1,670	1,056	593	265
Chromium (Cr)	mg/kg	90	25.2	2.8	6.9	15.3	18.0	13.7	8.9	4.0
Cobalt (Co)	mg/kg	-	2.04	0.5	1.25	2.2	2.4	1.7	0.80	0.36
Copper (Cu)	mg/kg	197	12.2	0.9	1.7	2	2.6	3.9	4.7	2.1
Iron (Fe)	mg/kg	40,000[α]	23,100	1,390	3,060	5,290	5,790	7,726	8,774	3,924
Lead (Pb)	mg/kg	91.3	2.1	0.8	1.4	2.2	1.8	1.6	0.58	0.26
Lithium (Li)	mg/kg	-	<2.0	<2.0	2.7	5.0	6.0	3.5	1.85	0.83
Magnesium (Mg)	mg/kg	-	591	550	1,660	3,170	3,500	1,894	1,393	623
Manganese (Mn)	mg/kg	1,100[α,β]	47	26	40	60	73	49	18.0	8.0
Mercury (Hg)	mg/kg	0.486	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0	0
Molybdenum (Mo)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Nickel (Ni)	mg/kg	75[α,β]	6.7	3.1	8.3	16.2	17.0	10.3	6.09	2.72
Phosphorus (P)	mg/kg	2,000[α]	260	<50	155	325	277	213	110.4	49.4
Potassium (K)	mg/kg	-	120	100	200	350	410	236	138	62
Selenium (Se)	mg/kg	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0	0
Silver (Ag)	mg/kg	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0
Sodium (Na)	mg/kg	-	<50	<50	<50	<50	<50	<50	0	0
Strontium (Sr)	mg/kg	-	2.5	1.6	2.3	3.1	3.1	2.5	0.64	0.29
Sulphur (S)	mg/kg	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	0	0
Thallium (Tl)	mg/kg	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0	0
Tin (Sn)	mg/kg	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	0	0
Titanium (Ti)	mg/kg	-	196	79	162	250	281	194	79	35
Uranium (U)	mg/kg	-	0.59	0.2	0.4	0.6	0.6	0.5	0.19	0.08
Vanadium (V)	mg/kg	-	38.6	2.3	4.8	9.2	9.9	12.9	14.7	6.6
Zinc (Zn)	mg/kg	315	4.4	2	4.2	8	8.4	5	2.6	1.2
Zirconium (Zr)	mg/kg	-	2.0	1.3	1.6	2.4	2.6	2.0	0.5	0.2

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Table D.43: Field Observations of Sediment Properties at Mary Lake (BLO) Benthic Stations[a], Mary River Project CREMP, August 2017

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia[b]	Plant or Algal Presence
BLO-01	9.8	medium brown silt over gray-brown compact silt	none detected	none observed
BLO-11	9.1	medium gray-brown silty sand	none detected	aquatic moss (common)
BLO-7	12.0	iron oxide over medium brown silt	none detected	none observed
BLO-6	6.6	medium brown silt with some fine sand; no precipitate layer observed	none detected	none observed
BLO-3	15.0	sand; no precipitate layer observed	none detected	none observed
BLO-15	29.0	orangish brown silt; black streaking at 1 cm depth in sediment	black streaking at 1 cm depth in sediment	aquatic moss (sparse)
BLO-14	20.0	orangish brown silt; some minor black streaking in sediment	minor black streaking in sediment	none observed
BLO-13	22.0	medium brown silt	none detected	none observed
BLO-4	22.0	medium brown silt	none detected	none observed
BLO-5	21.5	medium brown silt with some sand	none detected	none observed

[a] Sediment particle size and benthic invertebrate community samples were collected by Petite-Ponar.

[b] Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

Table D.44: Observations from Sediment Cores Collected at Mary Lake (BLO), Mary River Project CREMP, August 2017

Sample Station	Station Depth (m)	Station Type	Core #	Core Length (cm)	Surface (Top 2 cm) Description
BLO-01	9.8	Littoral	1	14.0	Silt loam
			2	16.0	
			3	21.0	
BLO-16	30.5	Profundal	1	22.0	Clay loam
			2	24.0	
			3	18.0	
BLO-03	16.0	Profundal	1	12.0	Loamy sand
			2	10.0	
			3	13.0	
BLO-14	20.0	Profundal	1	10.0	Silty clay / Clay
			2	15.0	
			3	12.0	
BLO-12	20.0	Profundal	1	10.0	Silt loam
			2	12.0	
			3	10.0	
BLO-04	19.5	Profundal	1	13.0	Silt loam
			2	14.0	
			3	12.0	
BLO-10	9.8	Profundal	1	14.0	Silty clay loam
			2	16.0	
			3	21.0	
BLO-09	30.0	Profundal	1	12.0	Silty clay loam
			2	16.0	
			3	10.0	
BLO-08	25.8	Profundal	1	12.0	Silty clay loam
			2	8.0	
			3	10.0	
BLO-06	5.5	Littoral	1	8.0	Silty clay loam
			2	7.0	
			3	9.0	
BLO-DUP (duplicate of BLO-04)	19.5	Profundal	1	11.0	Silty clay loam
			2	18.0	
			3	15.0	

Table D.45: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Mary Lake (BLO) Sediment Stations, Mary River Project CREMP, August 2017

	Analyte	Units	Sediment Quality Guideline (SQG)[a]	AEMP Benchmark[b]	Mary Lake Stations														Study Area Summary Statistics		
					BLO-01 (littoral)	BLO-16 (profundal)	BLO-03 (profundal)	BLO-15 (profundal)	BLO-14 (profundal)	BLO-05 (profundal)	BLO-11 (littoral)	BLO-12 (profundal)	BLO-13 (profundal)	BLO-04 (profundal)	BLO-10 (profundal)	BLO-09 (profundal)	BLO-08 (profundal)	BLO-07 (littoral)	BLO-06 (littoral)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	17	22	87	13	16	49	78	18	6	14	5	4.0	2.6	7.9	11.3	20	24	7.7
	Silt	%	-	-	74	48	10.0	47	39	45	19	68	71	65	62	67	67	59	56	55	19	6.0
	Clay	%	-	-	10	30	3.3	40	45	7	3	14	23	21	33	30	31	33	33	25	13	4.0
	Moisture	%	-	-	48	56	19	65	57	29	21	46	56	47	48	56	51	70	48	47	10.7	3.4
	Total Organic Carbon	%	10[α]	-	1.38	1.30	0.48	0.96	0.97	0.74	0.50	0.85	0.8	0.64	0.85	0.90	0.96	1.07	0.78	0.91	0.27	0.086
Metals	Aluminum (Al)	mg/kg	-	-	14,900	24,700	5,570		27,400			18,300		18,800	24,200	24,300	27,400		21,200	20,677	6,693	2,117
	Antimony (Sb)	mg/kg	-	-	<0.10	<0.10	<0.10		<0.10			<0.10		<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	0	0
	Arsenic (As)	mg/kg	17	5.9	4.48	5.74	1.19		3.80			2.55		2.50	3.17	3.29	3.86		2.77	3.33	1.24	0.39
	Barium (Ba)	mg/kg	-	-	85	117	26		111			73.6		79.5	104	112	107		88	90.3	27.3	8.62
	Beryllium (Be)	mg/kg	-	-	0.77	1.16	0.25		1.30			0.86		0.87	1.13	1.11	1.26		1.01	0.97	0.308	0.0975
	Bismuth (Bi)	mg/kg	-	-	<0.20	0.23	<0.20		0.23			<0.20		<0.20	0.22	0.26	0.27		<0.20	0.22	0.026	0.008
	Boron (B)	mg/kg	-	-	19.4	36.8	10.9		39.8			26.0		25.2	31.2	34.9	40.1		27.9	29.2	9.34	2.95
	Cadmium (Cd)	mg/kg	3.5	1.5	0.112	0.190	0.043		0.167			0.1190		0.114	0.148	0.181	0.174		0.098	0.135	0.0459	0.01450
	Calcium (Ca)	mg/kg	-	-	8,550	3,720	1,150		4,350			4,360		4,165	4,420	4,640	5,090		3,850	4,430	1,799	569.0
	Chromium (Cr)	mg/kg	90	98	65.4	87.3	20.5		88.6			74.3		71.2	87.1	93	***105***		74.8	76.8	23.0	7.28
	Cobalt (Co)	mg/kg	-	-	14.2	16.7	4.6		17.8			13.6		13.2	16.8	17.5	19.2		14.5	14.8	4.12	1.302
	Copper (Cu)	mg/kg	110	50	29.1	36	7.8		36.6			26.1		25.7	33.4	34.6	38.2		28.2	29.6	8.91	2.82
	Iron (Fe)	mg/kg	40,000[α]	52,400	34,800	48,400	14,400		43,900			33,200		33,000	40,900	40,300	45,100		35,400	36,940	9,533	3,014
	Lead (Pb)	mg/kg	91.3	35	14.6	23.9	5.3		24.9			15.9		16.9	22.2	22.2	25.3		18.3	19.0	6.15	1.94
	Lithium (Li)	mg/kg	-	-	29.2	44.0	10.0		48.8			32.6		33.8	43.5	43.3	47.5		37.9	37.1	11.6	3.65
	Magnesium (Mg)	mg/kg	-	-	15,000	16,300	3,740		17,400			13,600		13,200	16,700	16,800	18,900		13,700	14,534	4,220	1,335
	Manganese (Mn)	mg/kg	1,100[α,β]	4,370	1,270	624	1,120		760			1,360		559	677		1,870		554	977	456	152
	Mercury (Hg)	mg/kg	0.486	0.17	0.0328	0.0752	0.0197		0.0667			0.0420		0.0347	0.0568	0.0691	0.0686		0.0218	0.0487	0.0210	0.00664
	Molybdenum (Mo)	mg/kg	-	-	0.71	0.95	0.37		0.65			0.76		0.62	0.68	1.28	0.94		0.55	0.75	0.25	0.08
	Nickel (Ni)	mg/kg	75[α,β]	72	54.5	61.7	15.3		59.1			53.9		47.7	59.3	68	***73.8***		49.8	54.3	15.8	5.00
	Phosphorus (P)	mg/kg	2,000[α]	1,580	1,060	1,200	323		788			860		759	777	827	931		679	820	233	74
	Potassium (K)	mg/kg	-	-	3,640	6,520	1,490		7,190			4,690		4,995	6,440	6,410	7,320		5,530	5,423	1,805	571
	Selenium (Se)	mg/kg	-	-	<0.20	0.28	<0.20		0.33			<0.20		<0.20	0.22	0.24	0.26		<0.20	0.23	0.045	0.014
	Silver (Ag)	mg/kg	-	-	<0.10	0.15	<0.10		0.15			0.11		0.12	0.15	0.15	0.17		<0.10	0.13	0.027	0.008
	Sodium (Na)	mg/kg	-	-	258	432	91		425			314		332	398	428	464		323	346	111.3	35.2
	Strontium (Sr)	mg/kg	-	-	11.5	17.6	4.3		15.7			11.3		11.7	13.5	15.0	16.7		11.9	12.9	3.80	1.202
	Sulphur (S)	mg/kg	-	-	<1,000	<1,000	<1,000		<1,000			<1,000		<1,000	<1,000	<1,000	<1,000		<1,000	<1,000	0	0
	Thallium (Tl)	mg/kg	-	-	0.325	0.51	0.128		0.588			0.382		0.412	0.533	0.541	0.578		0.470	0.447	0.141	0.0447
	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0		<2.0			<2.0		<2.0	<2.0	<2.0	<2.0		<2.0	<2.0	0.000	0.000
	Titanium (Ti)	mg/kg	-	-	985	1,420	371		1,620			1,340		1,405	1,640	1,580	1,780		1,410	1,355	408	129
	Uranium (U)	mg/kg	-	-	3.85	8.71	2.25		9.0			6.30		6.50	8.5	8.35	8.7		5.1	6.71	2.34	0.742
	Vanadium (V)	mg/kg	-	-	50.1	70.8	17.0		74.2			53.0		55.0	68.5	67.4	75.5		60.2	59.2	17.3	5.48
	Zinc (Zn)	mg/kg	315	135	52	77	18.7		85.3			59.7		61.4	78.5	77.4	86		66.4	66.2	20.2	6.38
	Zirconium (Zr)	mg/kg	-	-	9.7	22.7	4.3		24.7			17.1		20.1	25.2	20.1	25.3		15.3	18.4	7.02	2.22

[a] Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Mary Lake.

Indicates parameter concentration above Sediment Quality Guideline (SQG).

BOLD Indicates parameter concentration above the AEMP Benchmark.

Table D.46: Magnitude of Elevation in Sediment Metal Concentrations between Mary Lake and Reference Lake 3 2017 Data, and between Mary Lake 2017 and Baseline Data, Mary River Project CREMP, 2017

Parameter	Mary Lake versus Reference Lake 3 in 2017				Mary Lake 2017 versus Baseline Period			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Reference Lake Concentration (mg/kg)	Magnitude of Elevation	Mary Lake Baseline Concentration (mg/kg)	Magnitude of Elevation	Mary Lake Baseline Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	14,720	1.2	22,140	1.0	18,267	1.0	17,000	1.3
Antimony (Sb)	<0.10	1.0	0.10	1.0	1.0	0.1	1.0	0.1
Arsenic (As)	3.4	1.1	4.8	0.7	2.8	1.3	3.7	0.9
Barium (Ba)	113	0.8	138	0.7	105	0.8	76	1.2
Beryllium (Be)	0.6	1.6	0.9	1.2	1.0	0.9	1.0	1.0
Bismuth (Bi)	<0.20	1.0	0.20	1.1	-	-	-	-
Boron (B)	12.1	1.9	16.6	1.8	1	32.3	2	14.7
Cadmium (Cd)	0.2	0.6	0.2	0.8	0.5	0.2	0.5	0.3
Calcium (Ca)	4,656	1.3	5,262	0.8	3,130	2.0	2,934	1.4
Chromium (Cr)	51	1.4	70	1.1	81	0.9	76	1.0
Cobalt (Co)	11	1.4	16	0.9	18	0.8	18	0.8
Copper (Cu)	65	0.4	88	0.3	45	0.6	44	0.7
Iron (Fe)	41,960	0.8	46,740	0.8	36,133	1.0	35,654	1.0
Lead (Pb)	12	1.3	17	1.2	18	0.9	21	0.9
Lithium (Li)	24	1.4	35	1.1	-	-	-	-
Magnesium (Mg)	10,256	1.4	14,660	1.0	13,967	1.0	10,903	1.3
Manganese (Mn)	639	1.4	1,266	0.8	699	1.3	991	1.0
Mercury (Hg)	0.0440	0.6	0.0528	1.0	0.100	0.3	0.100	0.5
Molybdenum (Mo)	3.498	0.2	2.898	0.3	1.0	0.6	1.0	0.8
Nickel (Ni)	38	1.4	49	1.1	67	0.8	65	0.8
Phosphorus (P)	1,039	0.8	1,073	0.8	800	1.1	1,325	0.6
Potassium (K)	3,754	1.2	5,694	1.0	3,450	1.3	4,287	1.3
Selenium (Se)	0.6	0.3	0.6	0.4	1.0	0.2	1.0	0.2
Silver (Ag)	0.1	0.8	0.2	0.7	0.3	0.4	0.4	0.4
Sodium (Na)	284	1.0	410	0.9	279	1.0	284	1.3
Strontium (Sr)	10.0	1.2	12.7	1.0	9.3	1.3	13.3	1.0
Sulphur (S)	1,120	0.9	1,140	0.9	-	-	-	-
Thallium (Tl)	0.346	1.1	0.657	0.7	1.0	0.4	1.0	0.5
Tin (Sn)	2	0.9	2	1.0	-	-	-	-
Titanium (Ti)	997	1.2	1,288	1.1	-	-	-	-
Uranium (U)	11	0.4	23	0.3	-	-	-	-
Vanadium (V)	48	1.2	67	0.9	69	0.8	63	1.0
Zinc (Zn)	67	0.9	91	0.7	67	0.9	64	1.1

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective mean reference area value or baseline period value, as applicable).
Denotes high levitation (mean parameter concentration is≥ 10 times higher than respective mean reference area value or baseline period value, as applicable).

Table D.47: Magnitude of Elevation in Sediment Metal Concentrations between Mary Lake 2015 and 2017 Data, and between Mary Lake 2016 and 2017 Data, Mary River Project CREMP

Parameter	Mary Lake 2017 versus Initial Year of Mine Operation (2015)				Mary Lake 2017 versus Second Year of Mine Operation (2016)			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Mary Lake 2015 Concentration (mg/kg)	Magnitude of Elevation	Mary Lake 2015 Concentration (mg/kg)	Magnitude of Elevation	Mary Lake 2016 Concentration (mg/kg)	Magnitude of Elevation	Mary Lake 2016 Concentration (mg/kg)	Magnitude of Elevation
Aluminum (Al)	21,300	0.8	24,913	0.9	19,333	0.9	21,533	1.0
Antimony (Sb)	0.1	1.0	0.1	1.0	0.1	1.0	0.1	1.0
Arsenic (As)	4.9	0.7	5.2	0.6	3.7	1.0	3.5	0.9
Barium (Ba)	94	0.9	98	0.9	88	1.0	89	1.0
Beryllium (Be)	1.1	0.8	1.2	0.8	1.0	0.9	1.1	0.9
Bismuth (Bi)	0.2	0.8	0.3	0.8	0.2	0.9	0.2	0.9
Boron (B)	33	0.7	36	0.8	27	0.9	30	1.0
Cadmium (Cd)	0.1	0.9	0.1	1.0	0.1	0.9	0.1	1.1
Calcium (Ca)	6,995	0.9	4,583	0.9	5,930	1.0	4,603	0.9
Chromium (Cr)	79	0.9	92	0.9	74	1.0	81	1.0
Cobalt (Co)	16	0.9	18	0.8	15	1.0	15	1.0
Copper (Cu)	31	0.9	34	0.9	28	1.0	30	1.0
Iron (Fe)	38,750	0.9	43,019	0.9	35,525	1.0	36,400	1.0
Lead (Pb)	22	0.7	25	0.8	22	0.7	25	0.8
Lithium (Li)	42.3	0.8	47.0	0.8	38	0.9	40	1.0
Magnesium (Mg)	15,750	0.9	16,063	0.9	14,517	1.0	14,633	1.0
Manganese (Mn)	1,222	0.7	1,681	0.6	1,690	0.5	1,047	1.0
Mercury (Hg)	0.035	0.8	0.050	1.1	0.0	0.7	0.1	1.0
Molybdenum (Mo)	0.8	0.8	1.0	0.8	0.8	0.8	0.9	0.8
Nickel (Ni)	58	0.9	66	0.8	55	0.9	60	0.9
Phosphorus (P)	947	0.9	984	0.8	919	0.9	865	0.9
Potassium (K)	5,400	0.8	6,237	0.9	4,668	1.0	5,210	1.1
Selenium (Se)	0.2	0.9	0.2	1.0	0.2	1.0	0.2	1.1
Silver (Ag)	0.1	0.7	0.2	0.8	0.1	0.9	0.1	1.0
Sodium (Na)	331	0.9	382	0.9	298	1.0	331	1.1
Strontium (Sr)	15.3	0.8	16.4	0.8	13	0.9	14	1.0
Sulphur (S)	5,000	0.2	5,000	0.2	5,000	0.2	5,000	0.2
Thallium (Tl)	0.5	0.7	0.6	0.7	0.5	0.9	0.5	0.9
Tin (Sn)	2.0	1.0	2.0	1.0	6.5	0.3	8.3	0.2
Titanium (Ti)	1,401	0.9	1,565	0.9	1,339	0.9	1,407	1.0
Uranium (U)	7.4	0.6	9.7	0.8	7.0	0.6	8.6	0.8
Vanadium (V)	61	0.9	68	0.9	55	1.0	59	1.0
Zinc (Zn)	71	0.8	82	0.8	65	0.9	70	1.0

Denotes slight elevation (mean parameter concentration is 3 to 5 times higher than respective average value from previous study).
Denotes moderate elevation (mean parameter concentration 5 to 10 times higher than respective average value from previous study).
Denotes high elevation (mean parameter concentration is≥ 10 times higher than respective average value from previous study).

APPENDIX E

PHYTOPLANKTON DATA

Table E.1: Phytoplankton Monitoring Data (i.e., chlorophyll a and phaeophytin a concentrations) Collected at Lotic Reference Stations, the Camp Lake Tributaries, Sheardown Lake Tributary 1 and the Tom River, Mary River Project CREMP, 2017

Station		Reference Creek Stations				Camp Lake Tributary 1 (CLT1)						Camp Lake Tributary 2	Camp Lake Outlet	Sheardown Lake Tributary 1 (SDLT1)		Tom River
						North Branch		Main Stem								
		CLT-REF3	CLT-REF4	MRY-REF2	MRY-REF3	L1-08	L1-02	L2-03	L1-09	L1-05	L0-01	K0-01	J0-01	D1-05	D1-00	I0-01
Sample Collection Date	Spring	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17	9-Jul-17	9-Jul-17	7-Jul-17	7-Jul-17	7-Jul-17	7-Jul-17	7-Jul-17	9-Jul-17	9-Jul-17	9-Jul-17	7-Jul-17
	Summer	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	28-Jul-17	28-Jul-17	28-Jul-17	28-Jul-17	28-Jul-17	27-Jul-17	10-Aug-17	28-Jul-17	28-Jul-17	27-Jul-17
	Fall	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	1-Sep-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	27-Aug-17	1-Sep-17	28-Aug and 1-Sep, 2017	28-Aug and 1-Sep, 2017	27-Aug-17
Chlorophyll a (µg/L)	Spring	0.15	0.17	0.19	0.11	<0.10	0.24	0.43	0.24	0.23	0.19	0.11	-	0.24	0.63	0.13
	Summer	0.17	0.19	0.14	0.13	0.11	0.19	1.31	0.38	0.21	0.38	0.13	0.61	0.16	0.24	0.12
	Fall	0.39	0.63	0.48	0.56	<0.10	0.59	0.79	0.77	1.44	0.78	1.04	1.01	0.18	0.26	0.94
	Average	0.24	0.33	0.27	0.27	0.10	0.34	0.84	0.46	0.63	0.45	0.43	0.81	0.19	0.38	0.40
	Standard Deviation	0.13	0.26	0.18	0.25	0.01	0.22	0.44	0.27	0.70	0.30	0.53	0.28	0.04	0.22	0.47
	Standard Error	0.08	0.15	0.11	0.15	0.00	0.13	0.26	0.16	0.41	0.17	0.31	0.16	0.02	0.13	0.27
Phaeophytin a (µg/L)	Spring	0.18	0.18	0.28	0.13	0.17	0.25	0.37	0.27	0.24	0.27	0.21	-	0.30	0.38	0.19
	Summer	0.32	0.25	0.38	1.00	0.24	0.40	0.93	0.38	0.39	0.66	0.26	0.55	0.32	0.37	0.31
	Fall	0.34	0.32	0.31	0.52	0.18	0.41	0.40	0.43	0.67	0.38	0.42	0.46	0.17	0.26	0.46
	Average	0.28	0.25	0.32	0.55	0.20	0.35	0.57	0.36	0.43	0.44	0.30	0.51	0.26	0.34	0.32
	Standard Deviation	0.09	0.07	0.05	0.44	0.04	0.09	0.32	0.08	0.22	0.20	0.11	0.06	0.08	0.07	0.14
	Standard Error	0.05	0.04	0.03	0.25	0.02	0.05	0.18	0.05	0.13	0.12	0.06	0.04	0.05	0.04	0.08

Table E.2: Chlorophyll a Concentration (mg/L) Data Summary and Statistical Comparison Results between Camp Lake Tributary 1 Main Stem Stations and Lotic Reference Creek Stations for Spring, Summer and Fall Sampling Events in 2017

Season	Two-Sample Comparison			Study Area	Mean (n = 4)	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test					Lower Bound	Upper Bound		
Spring	YES	0.0455	β	Reference	0.155	0.034	0.017	0.101	0.209	0.110	0.190
				CLT1 Main Stem	0.273	0.107	0.054	0.102	0.443	0.190	0.430
Summer	YES	0.0371	β	Reference	0.158	0.028	0.014	0.114	0.201	0.130	0.190
				CLT1 Main Stem	0.570	0.500	0.250	-0.225	1.365	0.210	1.310
Fall	YES	0.0197	β , ζ	Reference	0.515	0.103	0.052	0.350	0.680	0.390	0.630
				CLT1 Main Stem	0.945	0.330	0.165	0.420	1.470	0.770	1.440

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table E.3: Phytoplankton Monitoring Data (i.e., chlorophyll a and phaeophytin a concentrations) Collected at Reference Lake 3 (REF-03), Mary River Project CREMP, 2017

Analyte		Chlorophyll a (µg/L)						Phaeophytin a (µg/L)					
Station		REF3-01	REF3-02	REF3-03	Average	Standard Deviation	Standard Error	REF3-01	REF3-02	REF3-03	Average	Standard Deviation	Standard Error
Sample Collection Date	Summer	12-Aug-17	12-Aug-17	12-Aug-17	-	-	-	12-Aug-17	12-Aug-17	12-Aug-17	-	-	-
	Fall	2-Sep-17	2-Sep-17	2-Sep-17	-	-	-	2-Sep-17	2-Sep-17	2-Sep-17	-	-	-
Summer	Surface	0.58	0.59	0.6	0.59	0.01	0.01	0.495	0.46	0.46	0.47	0.02	0.01
	Bottom	0.55	0.88	0.61	0.68	0.18	0.10	0.44	0.62	0.56	0.54	0.09	0.05
	Average	0.56	0.74	0.61	0.63	0.09	0.05	0.47	0.54	0.51	0.51	0.04	0.02
Fall	Surface	0.91	0.93	0.94	0.93	0.02	0.01	0.57	0.50	0.44	0.50	0.07	0.04
	Bottom	0.96	0.87	0.87	0.90	0.05	0.03	0.5	0.59	0.51	0.53	0.05	0.03
	Average	0.94	0.90	0.91	0.91	0.02	0.01	0.54	0.55	0.48	0.52	0.04	0.02

Table E.4: Statistical Comparisons of Chlorophyll a Concentrations Among Years at Reference Lake 3, Mary River Project CREMP

Season	Overall 3-group Comparison			Summary		Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Years?	p-value	Statistical Treatment[b]	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Summer	YES	0.03355	α	2015	0.90	2015	2016	NO	0.9640	Tukey's
				2016	0.92	2015	2017	YES	0.0588	
				2017	0.63	2016	2017	YES	0.0428	
Fall	NO	0.26054	α	2015	1.06	2015	2016	NO	0.5996	Tamhane's
				2016	0.74	2015	2017	NO	0.9138	
				2017	0.91	2016	2017	NO	0.1224	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Kruskal-Wallis H-test (multiple group comparison) or Mann-Whitney U-test (pair-wise comparison), as appropriate.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table E.5: Phytoplankton Monitoring Data (i.e., chlorophyll a and phaeophytin a concentrations) Collected at Camp Lake (JLO), Mary River Project CREMP, 2017

Analyte		Chlorophyll a (µg/L)							
Station		JL0-02	JL0-10	JL0-01	JL0-07	JL0-09	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	11-Apr-17	11-Apr-17	14-Apr-17	11-Apr-17	11-Apr-17	-	-	-
	Summer	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	-	-	-
	Fall	26-Aug-17	25-Aug-17	26-Aug-17	26-Aug-17	25-Aug-17	-	-	-
Winter	Surface	0.58	0.36	0.46	0.32	0.34	0.41	0.11	0.05
	Bottom	0.42	0.21	0.15	0.22	<0.10	0.22	0.12	0.05
	Average	0.50	0.29	0.31	0.27	0.22	0.32	0.11	0.05
Summer	Surface	1.14	1.33	1.26	1.40	1.18	1.26	0.11	0.05
	Bottom	1.07	1.52	1.07	1.39	1.07	1.22	0.22	0.10
	Average	1.11	1.43	1.17	1.40	1.13	1.24	0.15	0.07
Fall	Surface	1.27	0.96	1.31	1.18	0.82	1.11	0.21	0.09
	Bottom	1.22	1.18	1.45	1.29	1.19	1.27	0.11	0.05
	Average	1.25	1.07	1.38	1.24	1.01	1.19	0.15	0.07

Analyte		Phaeophytin a (µg/L)							
Station		JL0-02	JL0-10	JL0-01	JL0-07	JL0-09	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	11-Apr-17	11-Apr-17	14-Apr-17	11-Apr-17	11-Apr-17	-	-	-
	Summer	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	24-Jul-17	-	-	-
	Fall	26-Aug-17	25-Aug-17	26-Aug-17	26-Aug-17	25-Aug-17	-	-	-
Winter	Surface	0.60	0.32	0.34	0.27	0.33	0.37	0.13	0.06
	Bottom	0.39	0.23	0.19	0.19	0.18	0.24	0.09	0.04
	Average	0.50	0.28	0.27	0.23	0.26	0.30	0.11	0.05
Summer	Surface	0.80	0.83	0.69	0.84	1.02	0.84	0.12	0.05
	Bottom	0.80	0.86	0.86	0.88	0.86	0.85	0.03	0.01
	Average	0.80	0.85	0.78	0.86	0.94	0.84	0.06	0.03
Fall	Surface	0.66	0.41	0.60	0.61	0.35	0.53	0.14	0.06
	Bottom	0.56	0.54	0.65	0.74	0.45	0.59	0.11	0.05
	Average	0.61	0.48	0.63	0.68	0.40	0.56	0.11	0.05

Table E.6: Statistical Comparisons of Chlorophyll a Concentrations Among Winter, Spring, Summer and/or Fall Sampling Events at Mine-Exposed and Reference Creek and Lake Study Areas, Mary River Project CREMP, 2017

Study Area	Overall 3-group Comparison			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Seasons?	p-value	Statistical Test[b]	(I) Season	(J) Season	Significant Difference Between 2 Seasons?	p-value	Statistical Test
Reference Creek Stations	YES	0.00003	ANOVA[a]	Spring	Summer	NO	0.9993	Tamhane's[a]
				Spring	Fall	YES	0.0112	
				Summer	Fall	YES	0.0133	
Mary River GO-09 Reference Stations	NO	0.32438	ANOVA[a]	Spring	Summer	NO	0.3755	Tukey's[a]
				Spring	Fall	NO	0.9990	
				Summer	Fall	NO	0.3943	
Reference Lake 3	-	-	-	Winter	Summer	not applicable		ANOVA[a]
				Winter	Fall	not applicable		
				Summer	Fall	YES	0.0062	
Camp Lake	YES	0.00000	ANOVA[a]	Winter	Summer	YES	0.0000	Tukey's[a]
				Winter	Fall	YES	0.0000	
				Summer	Fall	NO	0.7987	
Sheardown Lake NW	YES	0.00007	ANOVA[a]	Winter	Summer	YES	0.0087	Tukey's[a]
				Winter	Fall	YES	0.0000	
				Summer	Fall	YES	0.0372	
Sheardown Lake SE	NO	0.64976	ANOVA[a]	Winter	Summer	NO	1.0000	Tamhane's[a]
				Winter	Fall	NO	0.8771	
				Summer	Fall	NO	0.3770	
Mary Lake North Basin	YES	0.00009	ANOVA[a]	Winter	Summer	NO	0.2734	Tamhane's[a]
				Winter	Fall	YES	0.0159	
				Summer	Fall	YES	0.0407	
Mary Lake South Basin	YES	0.00039	ANOVA[b]	Winter	Summer	YES	0.0014	Tukey's[b]
				Winter	Fall	YES	0.0006	
				Summer	Fall	NO	0.9670	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Statistical tests include Analysis of Variance (ANOVA) and Kruskal Wallis H-test (KW H-test).

[c] Untransformed data, normally distributed, used for the analysis

[d] Log-transformed data, normally distributed, used for the analysis.

[e] Kruskal-Wallis H-test used to validate results of ANOVA three-group comparison.

[f] Mann-Whitney U-test used to validate results of post-hoc tests for all pair-wise comparisons.

Table E.7: Summary Data and Statistical Results for Chlorophyll a Concentration (mg/L) Comparisons between Individual Mine-Exposed Lakes and Reference Lake 3 for Summer Sampling, Mary River Project CREMP, 2017

Study Lake	Comparison to Reference				Number of Stations (n)	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test	Magnitude of Difference					Lower Bound	Upper Bound		
Reference Lake 03	-	-	-	-	3	0.63	0.09	0.05	0.41	0.86	0.56	0.74
Camp Lake	YES	0.0009	α	6.8	5	1.24	0.15	0.07	1.05	1.43	1.11	1.43
Sheardown Lake NW	YES	0.0002	α	6.5	6	1.22	0.13	0.05	1.09	1.35	1.09	1.40
Sheardown Lake SE	YES	0.0003	α	8.1	5	1.37	0.16	0.07	1.17	1.56	1.14	1.56
Mary Lake North	YES	0.0022	α	-4.1	3	0.27	0.02	0.01	0.22	0.31	0.26	0.29
Mary Lake South	YES	0.0203	α	-2.9	7	0.80	0.08	0.03	0.73	0.88	0.67	0.94

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Mann-Whitney U-test; δ - data exhibit unequal variance; test results validated using t-test assuming unequal variance

[b] Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table E.8: Summary Data and Statistical Results for Chlorophyll a Concentration (mg/L) Comparisons between Individual Mine-Exposed Lakes and Reference Lake 3 for Fall Sampling, Mary River Project CREMP, 2017

Study Lake	Comparison to Reference				Number of Stations (n)	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test	Magnitude of Difference					Lower Bound	Upper Bound		
Reference Lake 03	-	-	-	-	3	0.91	0.02	0.01	0.87	0.96	0.90	0.94
Camp Lake	YES	0.0221	α , δ	14.4	5	1.19	0.15	0.07	1.00	1.37	1.01	1.38
Sheardown Lake NW	YES	0.0018	α , δ	34.2	6	1.56	0.22	0.09	1.33	1.79	1.37	1.92
Sheardown Lake SE	YES	0.0000	α , δ	30.8	5	1.50	0.08	0.03	1.40	1.59	1.42	1.60
Mary Lake North	NO	0.9214	α , δ	-	3	0.91	0.14	0.08	0.57	1.24	0.81	1.06
Mary Lake South	YES	0.0333	α , γ	-2.9	7	0.75	0.08	0.03	0.68	0.82	0.70	0.91

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Mann-Whitney U-test; δ - data exhibit unequal variance; test results validated using t-test assuming unequal variance

[b] Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table E.9: Statistical Comparisons of Chlorophyll a Concentrations Among Years at Camp Lake, Mary River Project CREMP

Season	Overall 4-group Comparison			Summary		Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Years?	p-value	Statistical Treatment[b]	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test[b]
Winter	YES	0.0001	β , γ	2014	0.275	2014	2015	YES	0.001	Tukey's (β , γ)
				2015	0.742	2014	2016	YES	0.002	
				2016	0.646	2014	2017	NO	0.791	
				2017	0.316	2015	2016	NO	0.891	
						2015	2017	YES	0.002	
						2016	2017	YES	0.008	
Summer	NO	0.2144	β , γ	2014	1.050	2014	2015	NO	0.998	Tamhane's (β , γ)
				2015	1.262	2014	2016	NO	0.994	
				2016	1.503	2014	2017	NO	0.998	
				2017	1.243	2015	2016	NO	0.698	
						2015	2017	NO	1.000	
						2016	2017	NO	0.624	
Fall	YES	0.0124	α	2014	1.590	2014	2015	NO	0.237	Tamhane's (α)
				2015	0.651	2014	2016	NO	0.704	
				2016	1.063	2014	2017	NO	0.867	
				2017	1.187	2015	2016	YES	0.059	
						2015	2017	YES	0.003	
						2016	2017	NO	0.903	
Annual	NO	0.4212	β , γ	2014	1.014	2014	2015	NO	0.976	Tamhane's (β , γ)
				2015	0.885	2014	2016	NO	0.798	
				2016	1.070	2014	2017	NO	0.999	
				2017	0.915	2015	2016	NO	0.785	
						2015	2017	NO	0.998	
						2016	2017	NO	0.771	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Kruskal-Wallis H-test (multiple group comparison) or Mann-Whitney U-test (pair-wise comparison), as appropriate.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table E.10: Phytoplankton Monitoring Data (i.e., chlorophyll a and phaeophytin a concentrations) Collected at Sheardown Lake Northwest (DLO-01), Mary River Project CREMP, 2017

Analyte		Chlorophyll a (µg/L)								
Station		DD-HAB 9-STN1	DL0-01-5	DL0-01-1	DL0-01-4	DL0-01-2	DL0-01-7	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	17-Apr-17	17-Apr-17	17-Apr-17	16-Apr-17	16-Apr-17	16-Apr-17	-	-	-
	Summer	21-Jul-17	22-Jul-17	22-Jul-17	21-Jul-17	23-Jul-17	23-Jul-17	-	-	-
	Fall	21-Aug-17	21-Aug-17	26-Aug-17	20-Aug-17	20-Aug-17	20-Aug-17	-	-	-
Winter	Surface	0.74	0.69	1.25	0.83	1.16	0.91	0.93	0.23	0.09
	Bottom	0.63	0.15	0.22	1.64	0.39	0.87	0.65	0.55	0.23
	Average	0.69	0.42	0.74	1.24	0.78	0.89	0.79	0.27	0.11
Summer	Surface	1.23	1.12	1.10	1.18	1.44	1.49	1.26	0.17	0.07
	Bottom	1.27	1.05	1.22	1.03	1.21	1.31	1.18	0.12	0.05
	Average	1.25	1.09	1.16	1.11	1.33	1.40	1.22	0.13	0.05
Fall	Surface	1.83	1.67	1.50	1.33	1.58	1.10	1.50	0.26	0.11
	Bottom	1.68	2.16	1.45	1.51	1.28	1.63	1.62	0.30	0.12
	Average	1.76	1.92	1.48	1.42	1.43	1.37	1.56	0.22	0.09

Analyte		Phaeophytin a (µg/L)								
Station		DD-HAB 9-STN1	DL0-01-5	DL0-01-1	DL0-01-4	DL0-01-2	DL0-01-7	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	17-Apr-17	17-Apr-17	17-Apr-17	16-Apr-17	16-Apr-17	16-Apr-17	-	-	-
	Summer	21-Jul-17	22-Jul-17	22-Jul-17	21-Jul-17	23-Jul-17	23-Jul-17	-	-	-
	Fall	21-Aug-17	21-Aug-17	26-Aug-17	20-Aug-17	20-Aug-17	20-Aug-17	-	-	-
Winter	Surface	0.53	0.37	0.59	0.59	0.39	0.51	0.50	0.10	0.04
	Bottom	0.43	0.22	0.26	0.98	0.32	0.46	0.45	0.28	0.11
	Average	0.48	0.30	0.43	0.79	0.36	0.49	0.47	0.17	0.07
Summer	Surface	0.66	1.05	0.82	0.89	1.05	0.83	0.88	0.15	0.06
	Bottom	0.78	0.83	0.93	0.89	0.94	0.88	0.87	0.06	0.02
	Average	0.72	0.94	0.88	0.89	1.00	0.85	0.88	0.09	0.04
Fall	Surface	0.57	0.61	0.64	0.88	0.76	0.63	0.68	0.12	0.05
	Bottom	1.13	0.86	0.76	0.84	0.72	0.74	0.84	0.15	0.06
	Average	0.85	0.74	0.70	0.86	0.74	0.69	0.76	0.08	0.03

Table E.11: Statistical Comparisons of Chlorophyll a Concentrations Among Years at Sheardown Lake NW, Mary River Project CREMP

Season	Overall 4-group Comparison			Summary		Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Years?	p-value	Statistical Treatment[b]	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test[b]
Winter	YES	0.0049	β	2014	2.550	2014	2015	NO	0.113	Tukey's (β)
				2015	1.104	2014	2016	YES	0.014	
				2016	0.874	2014	2017	YES	0.006	
				2017	0.790	2015	2016	NO	0.736	
						2015	2017	NO	0.500	
						2016	2017	NO	0.978	
Summer	YES	0.0010	α	2014	2.425	2014	2015	YES	0.016	Tukey's (α)
				2015	1.512	2014	2016	NO	0.709	
				2016	2.131	2014	2017	YES	0.001	
				2017	1.220	2015	2016	NO	0.142	
						2015	2017	NO	0.714	
						2016	2017	YES	0.016	
Fall	YES	0.0018	β	2014	0.800	2014	2015	NO	0.159	Tamhane's (β)
				2015	1.611	2014	2016	NO	0.186	
				2016	1.526	2014	2017	NO	0.171	
				2017	1.560	2015	2016	NO	1.000	
						2015	2017	NO	1.000	
						2016	2017	NO	1.000	
Annual	NO	0.3985	β	2014	1.925	2014	2015	NO	0.999	Tamhane's (β)
				2015	1.409	2014	2016	NO	1.000	
				2016	1.510	2014	2017	NO	0.731	
				2017	1.190	2015	2016	NO	1.000	
						2015	2017	NO	0.315	
						2016	2017	NO	0.571	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Kruskal-Wallis H-test (multiple group comparison) or Mann-Whitney U-test (pair-wise comparison), as appropriate.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table E.12: Phytoplankton Monitoring Data (i.e., chlorophyll a and phaeophytin a concentrations) Collected at Sheardown Lake SE (DLO-02), Mary River Project CREMP, 2017

Analyte		Chlorophyll a (µg/L)							
Station		DL0-02-06	DL0-02-07	DL0-02-4	DL0-02-8	DL0-02-03	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	13-Apr-17	13-Apr-17	13-Apr-17	13-Apr-17	13-Apr-17	-	-	-
	Summer	23-Jul-17	23-Jul-17	23-Jul-17	23-Jul-17	23-Jul-17	-	-	-
	Fall	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	-	-	-
Winter	Surface	0.90	1.18	1.08	2.45	2.34	1.59	0.74	0.33
	Bottom	0.55	-	2.14	1.05	0.72	1.12	0.71	0.36
	Average	0.73	1.18	1.61	1.75	1.53	1.36	0.41	0.18
Summer	Surface	1.25	1.38	1.44	1.58	1.14	1.36	0.17	0.08
	Bottom	1.02	-	1.42	1.54	1.51	1.37	0.24	0.12
	Average	1.14	1.38	1.43	1.56	1.33	1.37	0.16	0.07
Fall	Surface	1.69	1.54	1.64	1.60	1.51	1.60	0.07	0.03
	Bottom	1.24	1.29	1.55	1.51	1.39	1.40	0.13	0.06
	Average	1.47	1.42	1.60	1.56	1.45	1.50	0.08	0.03

Analyte		Phaeophytin a (µg/L)							
Station		DL0-02-06	DL0-02-07	DL0-02-4	DL0-02-8	DL0-02-03	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	13-Apr-17	13-Apr-17	13-Apr-17	13-Apr-17	13-Apr-17	-	-	-
	Summer	23-Jul-17	23-Jul-17	23-Jul-17	23-Jul-17	23-Jul-17	-	-	-
	Fall	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	21-Aug-17	-	-	-
Winter	Surface	0.57	0.66	0.75	1.15	1.17	0.86	0.28	0.13
	Bottom	0.37	-	1.06	0.73	0.48	0.66	0.31	0.15
	Average	0.47	0.66	0.90	0.94	0.83	0.76	0.19	0.09
Summer	Surface	0.87	0.73	1.01	1.02	0.76	0.88	0.14	0.06
	Bottom	0.83	-	0.96	0.97	0.76	0.88	0.10	0.05
	Average	0.85	0.73	0.99	1.00	0.76	0.86	0.12	0.06
Fall	Surface	0.81	0.65	0.64	1.13	0.75	0.80	0.20	0.09
	Bottom	0.64	0.58	0.66	0.75	0.68	0.66	0.06	0.03
	Average	0.73	0.62	0.65	0.94	0.72	0.73	0.13	0.06

Table E.13: Statistical Comparisons of Chlorophyll a Concentrations Among Years at Sheardown Lake SE, Mary River Project CREMP

Season	Overall 4-group Comparison			Summary		Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Years?	p-value	Statistical Treatment[b]	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test[b]
Winter	YES	0.0534	β	2014	2.670	2014	2015	NO	0.156	Tukey's (β)
						2014	2016	NO	0.510	
				2015	1.576	2014	2017	YES	0.044	
						2015	2016	NO	0.842	
				2016	1.903	2015	2017	NO	0.901	
				2017	1.359	2016	2017	NO	0.454	
Summer	YES	0.0000	α	2014	0.203	2014	2015	YES	0.000	Tamhane's (α)
						2014	2016	YES	0.001	
				2015	0.914	2014	2017	YES	0.000	
						2015	2016	YES	0.011	
				2016	1.509	2015	2017	YES	0.008	
				2017	1.366	2016	2017	NO	0.830	
Fall	YES	0.0269	α	2014	1.540	2014	2015	NO	0.984	Tamhane's (α)
						2014	2016	NO	0.629	
				2015	0.922	2014	2017	NO	1.000	
						2015	2016	YES	0.026	
				2016	2.869	2015	2017	YES	0.000	
				2017	1.496	2016	2017	YES	0.080	
Annual	YES	0.0034	γ	2014	1.471	2014	2015	NO	0.683	Mann-Whitney (γ)
						2014	2016	NO	0.126	
				2015	1.160	2014	2017	NO	0.461	
						2015	2016	YES	0.000	
				2016	2.094	2015	2017	YES	0.010	
				2017	1.407	2016	2017	YES	0.009	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Kruskal-Wallis H-test (multiple group comparison) or Mann-Whitney U-test (pair-wise comparison), as appropriate.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table E.14: Phytoplankton Monitoring Data (i.e., chlorophyll a and phaeophytin a concentrations) Collected at the Mary River, Mary River Project CREMP, 2017

Station		Upstream Reference			Upstream Mine-Exposed							Downstream Mine-Exposed		
		G0-09-A	G0-09	G0-09-B	G0-03	G0-01	F0-01	E0-10	E0-03	E0-20	E0-21	C0-10	C0-05	C0-01
Sample Collection Date	Spring	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17	8-Jul-17	-	8-Jul-17	8-Jul-17	8-Jul-17	-	-	8-Jul-17
	Summer	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17	10-Aug-17
	Fall	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	1-Sep-17	1-Sep-17	1-Sep-17	1-Sep-17	1-Sep-17	1-Sep-17	29-Aug-17	27-Aug-17	27-Aug-17
Chlorophyll a (µg/L)	Spring	0.23	0.45	0.21	0.14	0.15	<0.10	-	0.15	0.14	0.13	-	-	0.19
	Summer	0.24	0.19	0.12	0.15	0.13	0.12	0.15	0.12	0.17	0.10	0.18	0.22	0.18
	Fall	0.38	0.23	0.27	0.23	-	-	-	-	-	-	0.27	0.36	0.49
	Average	0.28	0.29	0.20	0.17	0.14	0.11	0.15	0.14	0.16	0.12	0.23	0.29	0.29
	Standard Deviation	0.08	0.14	0.08	0.05	0.01	0.01	-	0.02	0.02	0.02	0.06	0.10	0.18
	Standard Error	0.05	0.08	0.04	0.03	0.010	0.01	-	0.02	0.02	0.02	0.05	0.07	0.10
Phaeophytin a (µg/L)	Spring	0.17	0.38	0.19	0.25	0.24	0.17	-	0.17	0.23	0.25	-	-	0.30
	Summer	0.28	0.23	0.16	0.52	0.30	0.25	0.62	0.31	<1.00	0.42	0.52	0.30	0.26
	Fall	0.35	0.28	0.29	0.29	-	-	-	-	-	-	0.28	0.33	0.40
	Average	0.27	0.30	0.21	0.35	0.27	0.21	0.62	0.24	0.62	0.34	0.40	0.32	0.32
	Standard Deviation	0.09	0.08	0.07	0.15	0.04	0.06	-	0.10	0.54	0.12	0.17	0.02	0.07
	Standard Error	0.05	0.04	0.04	0.08	0.03	0.04	-	0.070	0.39	0.09	0.12	0.02	0.04

Table E.15: Phytoplankton Monitoring Data (i.e., chlorophyll a and phaeophytin a concentrations) Collected at Mary Lake (north and south basins; BLO), Mary River Project CREMP, 2017

Analyte		Chlorophyll a (µg/L)												
Station		Mary Lake North			Mary Lake South							Average	Standard Deviation	Standard Error
		BL0-01A	BL0-01	BL0-01B	BL0-05-A	BL0-05	BL0-05-B	BL0-03	BL0-04	BL0-09	BL0-06			
Sample Collection Date	Winter	12-Apr-17	12-Apr-17	12-Apr-17	15-Apr-17	15-Apr-17	15-Apr-17	14-Apr-17	14-Apr-17	14-Apr-17	15-Apr-17	-	-	-
	Summer	30-Jul-17	30-Jul-17	30-Jul-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	-	-	-
	Fall	30-Aug-17	30-Aug-17	30-Aug-17	28-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	-	-	-
Winter	Surface	0.14	0.36	0.20	0.15	0.55	0.89	0.51	0.30	0.61	0.54	0.43	0.24	0.08
	Bottom	<0.10	<0.10	0.17	<0.10	<0.10	0.67	<0.10	<0.10	<0.10	0.19	0.17	0.18	0.06
	Average	0.12	0.23	0.19	0.13	0.33	0.78	0.31	0.20	0.36	0.37	0.30	0.19	0.06
Summer	Surface	0.23	0.27	0.27	0.58	0.95	0.71	0.76	0.87	1.08	0.78	0.65	0.30	0.10
	Bottom	0.28	0.25	0.30	0.76	0.75	0.83	0.89	0.69	0.80	0.79	0.63	0.25	0.08
	Average	0.26	0.26	0.29	0.67	0.85	0.77	0.82	0.78	0.94	0.79	0.64	0.27	0.08
Fall	Surface	1.06	0.73	1.04	0.70	0.76	0.71	0.68	0.71	0.73	0.69	0.78	0.14	0.05
	Bottom	0.64	0.88	1.08	0.71	0.84	0.68	0.77	0.73	1.08	0.71	0.81	0.16	0.05
	Average	0.85	0.81	1.06	0.71	0.80	0.70	0.73	0.72	0.91	0.70	0.80	0.12	0.04

Analyte		Phaeophytin a (µg/L)												
Station		Mary Lake North			Mary Lake South							Average	Standard Deviation	Standard Error
		BL0-01-A	BL0-01	BL0-01-B	BL0-05-A	BL0-05	BL0-05-B	BL0-03	BL0-04	BL0-09	BL0-06			
Sample Collection Date	Winter	12-Apr-17	12-Apr-17	12-Apr-17	15-Apr-17	15-Apr-17	15-Apr-17	14-Apr-17	14-Apr-17	14-Apr-17	15-Apr-17	-	-	-
	Summer	30-Jul-17	30-Jul-17	30-Jul-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	1-Aug-17	-	-	-
	Fall	30-Aug-17	30-Aug-17	30-Aug-17	28-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	29-Aug-17	-	-	-
Winter	Surface	0.19	<0.10	0.24	0.19	0.42	0.74	0.37	0.27	0.48	0.39	0.34	0.18	0.06
	Bottom	0.16	0.17	0.22	0.19	0.21	0.51	0.16	0.15	0.15	0.22	0.21	0.11	0.03
	Average	0.18	0.14	0.23	0.19	0.32	0.63	0.27	0.21	0.32	0.31	0.28	0.14	0.04
Summer	Surface	0.47	<1.00	<1.00	1.22	0.79	0.57	1.20	1.23	0.93	0.54	0.90	0.29	0.09
	Bottom	0.45	0.35	<1.00	<1.00	0.62	0.71	<1.00	<1.00	0.58	0.16	0.69	0.31	0.10
	Average	0.46	0.68	1.00	1.11	0.71	0.64	1.10	1.12	0.76	0.35	0.79	0.28	0.09
Fall	Surface	0.55	0.43	0.55	0.56	0.55	0.63	0.67	0.62	0.64	0.68	0.59	0.08	0.02
	Bottom	0.34	0.48	0.55	0.56	0.57	0.56	0.68	0.69	1.01	0.60	0.60	0.17	0.05
	Average	0.45	0.46	0.55	0.56	0.56	0.60	0.68	0.66	0.83	0.64	0.60	0.11	0.04

Table E.16: Statistical Comparisons of Chlorophyll a Concentrations Among Years at Mary Lake North, Mary River Project CREMP

Season	Overall 4-group Comparison			Summary		Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Years?	p-value	Statistical Treatment[b]	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test[b]
Winter	NO	0.4281	β , γ	2014	0.585	2014	2015	NO	1.000	Tamhane's (β , γ)
				2015	0.6525	2014	2016	NO	0.932	
				2016	0.183	2014	2017	NO	0.914	
				2017	0.178	2015	2016	NO	0.821	
						2015	2017	NO	0.787	
						2016	2017	NO	1.000	
Summer	YES	0.1032	α	2014	0.917	2014	2015	NO	0.991	Tukey's (α)
				2015	0.827	2014	2016	NO	0.866	
				2016	1.159	2014	2017	NO	0.243	
				2017	0.266	2015	2016	NO	0.724	
						2015	2017	NO	0.348	
						2016	2017	YES	0.084	
Fall	YES	0.0154	α	2014	0.517	2014	2015	NO	0.831	Tukey's (α)
				2015	0.623	2014	2016	YES	0.022	
				2016	0.997	2014	2017	YES	0.059	
				2017	0.905	2015	2016	YES	0.070	
						2015	2017	NO	0.193	
						2016	2017	NO	0.883	
Annual	NO	0.2695	β , γ	2014	0.673	2014	2015	NO	0.931	Tukey's (β , γ)
				2015	0.701	2014	2016	NO	0.803	
				2016	0.854	2014	2017	NO	0.757	
				2017	0.450	2015	2016	NO	0.988	
						2015	2017	NO	0.399	
						2016	2017	NO	0.265	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Kruskal-Wallis H-test (multiple group comparison) or Mann-Whitney U-test (pair-wise comparison), as appropriate.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table E.17: Statistical Comparisons of Chlorophyll a Concentrations Among Years at Mary Lake South, Mary River Project CREMP

Season	Overall 4-group Comparison			Summary		Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Years?	p-value	Statistical Treatment[b]	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test[b]
Winter	NO	0.3108	β , γ	2014	0.879	2014	2015	NO	0.816	Tukey's (β , γ)
				2015	0.646	2014	2016	NO	0.786	
				2016	0.306	2014	2017	NO	0.935	
				2017	0.351	2015	2016	NO	0.292	
						2015	2017	NO	0.473	
						2016	2017	NO	0.985	
Summer	NO	0.3211	α	2014	0.864	2014	2015	NO	1.000	Tamhane's (α)
				2015	0.789	2014	2016	NO	0.951	
				2016	1.076	2014	2017	NO	1.000	
				2017	0.803	2015	2016	NO	0.023	
						2015	2017	NO	1.000	
						2016	2017	YES	0.027	
Fall	NO	0.4617	β , γ	2014	0.750	2014	2015	NO	0.801	Tamhane's (β , γ)
				2015	0.895	2014	2016	NO	1.000	
				2016	0.752	2014	2017	NO	0.999	
				2017	0.750	2015	2016	NO	0.661	
						2015	2017	NO	0.143	
						2016	2017	NO	1.000	
Annual	NO	0.6227	β , γ	2014	0.831	2014	2015	NO	1.000	Tamhane's (β , γ)
				2015	0.777	2014	2016	NO	0.994	
				2016	0.711	2014	2017	NO	0.912	
				2017	0.634	2015	2016	NO	0.985	
						2015	2017	NO	0.311	
						2016	2017	NO	0.968	

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log transformed, single factor ANOVA test conducted; γ - data non-normal, test results validated using Kruskal-Wallis H-test (multiple group comparison) or Mann-Whitney U-test (pair-wise comparison), as appropriate.

Shaded values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

APPENDIX F

BENTHIC INVERTEBRATE COMMUNITY DATA

Table F.1: Summary of Habitat Features at Camp Lake Tributary and Unnamed Reference Creek Study Areas Evaluated for the 2017 Mary River Project CREMP Benthic Invertebrate Community Assessment

Habitat Characteristic		Reference Creek	Camp Lake Tributary 1		Camp Lake Tributary 2	
		REF-CRK	CLT-1-US	CLT-1-DS	CLT-2-US	CLT-2-DS
Mean Width (m)	Wetted	11.1	4.5	6.6	9.0	5.0
Mean Depth (m)	Average	0.09	0.09	0.10	0.12	0.10
Mean Velocity (m/s)	Average	0.28	0.36	0.44	0.32	0.26
Stream Morphology	% Pool	8	5	0	3	0
	% Rapid	0	5	0	50	0
	% Riffle	83	85	100	45	90
	% Run	10	5	0	3	10
Substrate (% areal coverage)		3% boulder 32% cobble 48% pebble 10% gravel 7% sand	8% boulder 78% cobble 10 % pebble 5% gravel	5% boulder 77% cobble 17% pebble	35% boulder 60% cobble 5% pebble trace % gravel	0% boulder 75% cobble 10% pebble 10% gravel 5% sand
Mean Substrate Size (mm)		47	86	86	132	56
Aquatic Vegetation (% areal coverage)	Bryophyte Coverage	trace	trace (<5%)	trace (<5%)	trace	none observed
	Periphyton Coverage	28%	<5%	<5%	trace	none observed
	Periphyton Description	Rock noticeably slippery, green algae present (1-5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)
Functional Instream Cover (% areal coverage)		5% deep pool	trace boulder trace undercut banks	trace boulder	5% boulder 5% deep pool	trace undercut banks

Table F.2: Replicate Grab Data for Benthic Invertebrate Community Samples Collected at the Unnamed Reference Creek and Camp Lake Tributaries, Mary River Project CREMP, August 2017

Study Area	Station	Water Depth (cm)			Water Velocity (m/s)			Substrate Size[a] (mm)			Embeddedness			In-Stream Vegetation			Algae Presence		
		Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3
Unnamed Reference Creek	REF-CRK-B1	8	6	9	0.39	0.44	0.44	56.9	42.0	62.3	25%	13%	25%	scarce	scarce	scarce	scarce	scarce	scarce
	REF-CRK-B2	8	8	6	0.47	0.47	0.46	70.8	60.8	58.6	25%	25%	38%	common	scarce	common	common	scarce	common
	REF-CRK-B3	10	10	9	0.49	0.59	0.57	67.8	50.0	48.0	25%	13%	38%	scarce	scarce	none	scarce	scarce	scarce
	REF-CRK-B4	11	11	9	0.51	0.38	0.39	64.1	50.0	51.6	13%	13%	25%	none	none	none	scarce	scarce	common
	REF-CRK-B5	7	7	8	0.42	0.41	0.53	69.6	56.8	46.5	37%	25%	25%	none	none	none	common	common	common
Camp Lake Tributary 1 Upstream	CLT-1-US-B1	8	7	7	0.44	0.49	0.46	66.5	85.2	81.4	50%	75%	50%	scarce	common	common	scarce	scarce	scarce
	CLT-1-US-B2	7	8	8	0.44	0.38	0.53	85.2	97.7	86.6	50%	68%	75%	scarce	scarce	scarce	scarce	scarce	scarce
	CLT-1-US-B3	8	9	10	0.54	0.47	0.45	59.5	88.6	89.5	50%	68%	75%	none	none	none	common	common	common
	CLT-1-US-B4	10	9	8	0.41	0.44	0.43	72.1	56.4	60.4	50%	75%	50%	scarce	scarce	scarce	common	common	common
	CLT-1-US-B5	9	5	7	0.50	0.54	0.36	94.8	51.6	77.6	75%	50%	68%	scarce	scarce	scarce	common	common	common
Camp Lake Tributary 1 Downstream	CLT-1-DS-B1	11	9	8	0.58	0.48	0.49	49.8	55.0	78.0	25%	38%	50%	none	scarce	none	scarce	scarce	scarce
	CLT-1-DS-B2	9	10	8	0.53	0.47	0.41	71.3	83.2	66.4	25%	38%	38%	scarce	scarce	scarce	scarce	scarce	scarce
	CLT-1-DS-B3	12	8	10	0.56	0.55	0.36	92.8	91.5	93.3	38%	25%	38%	scarce	scarce	scarce	scarce	scarce	scarce
	CLT-1-DS-B4	14	12	11	0.48	0.58	0.54	65.8	73.6	61.6	50%	38%	38%	scarce	scarce	scarce	scarce	scarce	scarce
	CLT-1-DS-B5	14	14	15	0.43	0.44	0.36	65.0	64.7	80.6	50%	25%	38%	scarce	none	none	scarce	scarce	scarce
Camp Lake Tributary 2 Upstream	CLT-2-US-B1	7	12	14	0.55	0.55	0.41	82.8	64.8	65.0	25%	25%	25%	none	none	none	scarce	scarce	scarce
	CLT-2-US-B2	8	19	4	0.58	0.56	0.38	55.1	74.3	49.3	50%	75%	38%	none	none	none	scarce	none	common
	CLT-2-US-B3	9	10	9	0.51	0.56	0.59	52.6	74.6	62.4	50%	50%	75%	none	none	none	scarce	scarce	scarce
	CLT-2-US-B4	8	7	7	0.49	0.49	0.42	73.0	55.0	53.3	75%	25%	50%	scarce	none	none	scarce	scarce	scarce
	CLT-2-US-B5	8	6	8	0.50	0.42	0.42	58.4	55.9	59.1	68%	50%	68%	none	none	none	scarce	scarce	scarce
Camp Lake Tributary 2 Downstream	CLT-2-DS-B1	7	10	8	0.39	0.49	0.39	68.5	66.5	67.0	38%	75%	75%	none	scarce	none	scarce	scarce	scarce
	CLT-2-DS-B2	8	12	8	0.56	0.42	0.39	49.4	50.0	55.6	75%	75%	50%	none	none	scarce	none	none	none
	CLT-2-DS-B3	9	12	8	0.47	0.46	0.46	58.9	57.1	68.4	50%	38%	50%	none	none	none	none	none	none
	CLT-2-DS-B4	8	7	7	0.42	0.51	0.42	54.1	67.3	62.9	50%	68%	50%	none	none	none	none	none	none
	CLT-2-DS-B5	8	10	8	0.52	0.40	0.44	49.1	63.4	68.7	68%	50%	50%	none	none	none	none	none	none

[a] Substrate measurements taken from the intermediate axis of each individual particle observed within the Surber sampler area as viewed from the surface prior to sampling. Sample size ranged from 4 - 9 per replicate grab, with a mean of 7.1 for the CLT stations in 2017.

Table F.3: Replicate Station Habitat Feature Summary Statistics for the Camp Lake Tributary Benthic Stations, Mary River Project CREMP, August 2017

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Depth (cm)	Unnamed Reference Creek	8.5	1.4	0.6	6.7	10.2	7.3	10.3
	CLT1-US North Branch	8.0	0.9	0.4	6.8	9.2	7.0	9.0
	CLT1-DS Lower Main Stem	11.0	2.3	1.0	8.2	13.8	9.0	14.3
	CLT2-US Upstream	9.1	1.7	0.8	7.0	11.2	7.3	11.0
	CLT2-DS Downstream	8.7	0.9	0.4	7.5	9.8	7.3	9.7
Water Velocity (cm/s)	Unnamed Reference Creek	46.4	5.1	2.3	40.0	52.8	42.3	55.0
	CLT1-US North Branch	45.9	2.2	1.0	43.1	48.6	42.7	48.7
	CLT1-DS Lower Main Stem	48.4	4.8	2.1	42.4	54.4	41.0	53.3
	CLT2-US Upstream	49.5	4.1	1.8	44.4	54.6	44.7	55.3
	CLT2-DS Downstream	44.9	1.5	0.7	43.0	46.8	42.3	46.3
Substrate Size (mm diameter)	Unnamed Reference Creek	57.0	3.8	1.7	52.3	61.8	53.7	63.4
	CLT1-US North Branch	76.9	9.6	4.3	64.9	88.8	63.0	89.8
	CLT1-DS Lower Main Stem	72.8	12.0	5.3	58.0	87.7	60.9	92.5
	CLT2-US Upstream	62.4	5.1	2.3	56.0	68.7	57.8	70.8
	CLT2-DS Downstream	60.5	5.6	2.5	53.5	67.4	51.7	67.3
Substrate Embeddedness (%)	Unnamed Reference Creek	24	5	2	17	31	17	29
	CLT1-US North Branch	62	3	1	58	66	58	64
	CLT1-DS Lower Main Stem	37	3	2	33	41	34	42
	CLT2-US Upstream	50	15	7	32	68	25	62
	CLT2-DS Downstream	57	8	4	48	67	46	67

Note: Five stations were sampled at each study area.

Table F.4: Benthic Station Habitat Feature Statistical Comparisons among Camp Lake Tributary 1 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2017

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	P-value	Statistical Test[b]	(I) Area	(J) Area	Significant Difference Between 2 Areas?	P-value	Statistical Test
Water Depth (cm)	YES	0.0289	α	Unnamed Reference Creek	CLT1 Upstream	NO	0.9154	Tamhane's
				Unnamed Reference Creek	CLT1 Downstream	NO	0.2067	
				CLT1 Upstream	CLT1 Downstream	NO	0.1118	
Water Velocity (cm/s)	NO	0.6231	α	Unnamed Reference Creek	CLT1 Upstream	NO	0.9786	Tukey's HSD
				Unnamed Reference Creek	CLT1 Downstream	NO	0.7435	
				CLT1 Upstream	CLT1 Downstream	NO	0.6260	
Substrate Size (mm diameter)	YES	0.0118	α	Unnamed Reference Creek	CLT1 Upstream	YES	0.0128	Tukey's HSD
				Unnamed Reference Creek	CLT1 Downstream	YES	0.0446	
				CLT1 Upstream	CLT1 Downstream	NO	0.7690	
Substrate Embeddedness (%)	YES	0.0018	γ	Unnamed Reference Creek	CLT1 Upstream	YES	0.0079	Mann-Whitney U-test
				Unnamed Reference Creek	CLT1 Downstream	YES	0.0079	
				CLT1 Upstream	CLT1 Downstream	YES	0.0079	

Note: Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Kruskal-Wallis H-test (multiple group) or Mann-Whitney U-test (pair-wise) conducted on non-normal data; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table F.5: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Unnamed Reference Creek Study Area, August 2017

Taxa	Study Area	Unnamed Reference Creek				
	Replicate Station	B1	B2	B3	B4	B5
ROUNDWORMS						
P. Nemata		90	488	230	25	100
ANNELIDS						
P. Annelida						
WORMS						
Cl. Oligochaeta						
F. Enchytraeidae		-	-	36	-	29
ARTHROPODS						
P. Arthropoda						
MITES						
Cl. Arachnida						
O. Acarina		-	**43**	-	-	**4**
F. Sperchonidae						
Sperchon		79	258	50	43	18
HARPACTICOIDS						
O. Harpacticoida		-	-	-	-	-
SEED SHRIMPS						
Cl. Ostracoda		36	43	22	50	61
SPRINGTAILS						
Cl. Entognatha						
O. Collembola		7	-	-	-	-
INSECTS						
Cl. Insecta						
MAYFLIES						
O. Ephemeroptera						
F. Baetidae						
Acentrella feropagus		158	187	287	158	147
STONEFLIES						
O. Plecoptera						
F. Capniidae						
immature		7	-	-	-	-
TRUE FLIES						
O. Diptera						
BITING-MIDGE						
F. Ceratopogonidae						
Culicoides		-	-	-	4	-
MIDGES						
F. Chironomidae						
chironomid pupae		**72**	**258**	**86**	**54**	**32**
S.F. Chironominae						
Micropsectra		-	-	-	-	-
Rheotanytarsus		-	29	-	7	-
S.F. Diamesinae						
Diamesa		14	-	14	-	29
Pseudokiefferiella		14	718	50	4	-
S.F. Orthocladiinae						
Cardiocladius		-	-	-	-	-
Chaetocladius		-	-	7	-	-
Corynoneura		-	-	-	-	-
Cricotopus		18	560	65	11	7
Cricotopus/Orthocladius		7	187	14	4	18
Eukiefferiella		32	187	72	86	54
Hydrobaenus		-	57	7	-	4
Hydrosmittia		-	29	14	-	-
Krenosmittia		-	-	-	-	-
Limnophyes		43	129	57	43	133
Metriocnemus		-	43	-	-	-
Orthocladius (Euorthocladius)		25	129	-	18	22

Table F.5: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Unnamed Reference Creek Study Area, August 2017

Taxa	Study Area	Unnamed Reference Creek				
	Replicate Station	B1	B2	B3	B4	B5
Parakiefferiella		-	-	-	-	-
Parametriocnemus		-	-	-	-	-
Paraphaenocladius		-	14	-	-	18
Thienemanniella		-	273	14	25	7
Tokunagaia		-	29	14	-	-
Tvetenia		111	230	43	47	50
indeterminate		-	**43**	-	-	-
S.F. Tanypodinae						
Thienemannimyia complex		7	-	-	-	4
F. Empididae						
Clinocera		11	29	7	4	7
pupae		-	**29**	-	-	-
F. Muscidae		-	4	-	-	-
F. Simuliidae						
Gymnopais		14	14	7	7	4
Metacnephia		230	703	258	90	144
Prosimulium		32	502	445	133	79
indeterminate		**7**	-	-	-	-
F. Tipulidae						
Tipula		7	14	7	4	14
Number of Organisms (No. organisms per m^2)		1,021	5,229	1,806	817	985
Richness (total number of taxa)[a]		20	24	22	19	21
Simpson's Evenness (E)		0.927	0.951	0.909	0.938	0.949
Bray-Curtis Index		0.173	0.664	0.287	0.190	0.210
Percent Composition						
% Nemata		8.8%	9.3%	12.7%	3.1%	10.2%
% Oligochaeta		0.0%	0.0%	2.0%	0.0%	2.9%
% Hydracarina		7.7%	5.8%	2.8%	5.3%	2.2%
% Ostracods		3.5%	0.8%	1.2%	6.1%	6.2%
% Ephemeroptera		15.5%	3.6%	15.9%	19.3%	14.9%
% Chironomids		33.6%	55.7%	25.3%	36.6%	38.4%
% Metal Sensitive Chironmids		3.5%	15.7%	4.4%	1.7%	3.2%
% Simuliidae		27.7%	23.3%	39.3%	28.2%	23.0%
% Tipulidae		0.7%	0.3%	0.4%	0.5%	1.4%
Functional Feeding Group Composition						
% Collector - Gatherers		58.1%	52.8%	51.8%	61.8%	69.3%
% Filterers		27.7%	23.9%	39.3%	29.3%	23.0%
% Shredders		4.5%	16.3%	5.8%	2.7%	4.3%
Habitat Preference Group Composition						
% Clingers		39.7%	46.8%	47.8%	37.2%	28.8%
% Sprawlers		50.1%	42.6%	37.0%	58.8%	56.6%
% Burrowers		9.5%	10.5%	15.1%	4.0%	14.5%

[a] Bold entries excluded from taxa count

Table F.6: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 1 Study Areas, August 2017

Taxa	Study Area	North Branch Upstream (CLT1-US)					Lower Main Stem (CLT1-DS)				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS											
P. Nemata		57	25	57	86	25	4	100	179	7	86
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		4	43	7	7	7	18	172	43	29	172
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina		22	14	-	14	14	-	-	-	-	-
F. Sperchonidae											
Sperchon		50	68	100	108	86	39	115	50	25	57
HARPACTICOIDS											
O. Harpacticoida		-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS											
Cl. Ostracoda		-	-	-	-	-	-	-	-	-	-
SPRINGTAILS											
Cl. Entognatha											
O. Collembola		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
MAYFLIES											
O. Ephemeroptera											
F. Baetidae											
Acentrella feropagus		7	25	14	7	11	4	-	-	11	-
STONEFLIES											
O. Plecoptera											
F. Capniidae											
immature		-	-	-	-	-	-	-	-	-	-
TRUE FLIES											
O. Diptera											
BITING-MIDGE											
F. Ceratopogonidae											
Culicoides		-	-	-	-	-	-	-	-	-	-
MIDGES											
F. Chironomidae											
chironomid pupae		68	54	57	65	83	68	158	144	39	144
S.F. Chironominae											
Micropsectra		-	-	7	-	-	-	-	-	-	-
Rheotanytarsus		-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae											
Diamesa		14	32	43	-	7	7	-	-	-	14
Pseudokiefferiella		68	39	144	7	61	7	29	14	14	-
S.F. Orthocladiinae											
Cardiocladius		-	-	-	-	7	-	-	-	-	-
Chaetocladius		-	-	-	-	-	-	-	-	-	-
Corynoneura		-	-	-	-	-	-	-	-	-	-
Cricotopus		104	187	179	309	194	111	402	201	104	287
Cricotopus/Orthocladius		248	287	280	301	269	11	258	93	29	187
Eukiefferiella		-	7	-	-	7	4	-	7	-	-
Hydrobaenus		-	32	29	-	14	11	57	-	65	29
Hydrosmittia		54	32	86	86	97	122	804	488	294	660
Krenosmittia		43	14	29	36	39	68	72	14	72	43
Limnophyes		36	14	14	29	7	32	43	22	29	100
Metriocnemus		-	-	-	-	-	-	-	-	-	-
Orthocladius (Euorthocladius)		36	115	50	43	54	22	-	22	22	86

Table F.6: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 1 Study Areas, August 2017

Taxa	Study Area	North Branch Upstream (CLT1-US)					Lower Main Stem (CLT1-DS)				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
Parakiefferiella		-	-	-	-	-	-	29	14	7	29
Parametriocnemus		-	-	-	-	-	-	43	-	-	-
Paraphaenocladius		-	-	-	-	-	-	-	-	-	-
Thienemanniella		43	61	72	14	54	25	29	14	104	14
Tokunagaia		7	7	29	-	-	-	-	14	-	-
Tvetenia		36	32	36	29	32	7	43	14	-	43
indeterminate		-	7	-	7	-	-	-	-	-	-
S.F. Tanypodinae											
Thienemannimyia complex		-	7	-	-	-	-	-	-	-	-
F. Empididae											
Clinocera		14	22	29	36	61	14	-	-	7	29
pupae		-	-	-	-	-	-	-	-	-	-
F. Muscidae		-	-	-	-	-	-	-	-	-	-
F. Simuliidae											
Gymnopais		-	-	-	-	11	-	-	-	-	-
Metacnephia		-	-	-	7	7	4	-	-	-	-
Prosimulium		-	7	43	-	7	4	-	-	4	-
indeterminate		-	-	-	-	-	-	-	-	-	-
F. Tipulidae											
Tipula		93	126	86	97	115	57	11	54	29	61
Number of Organisms (No. organisms per m^2)		1,004	1,257	1,391	1,288	1,269	639	2,365	1,387	891	2,041
Richness (total number of taxa)[a]		17	21	20	16	22	20	15	16	17	16
Simpson's Evenness (E)		0.933	0.925	0.948	0.895	0.926	0.920	0.860	0.829	0.882	0.878
Bray-Curtis Index		0.691	0.746	0.716	0.735	0.759	0.748	0.808	0.755	0.806	0.766
Percent Composition											
% Nemata		5.7%	2.0%	4.1%	6.7%	2.0%	0.6%	4.2%	12.9%	0.8%	4.2%
% Oligochaeta		0.4%	3.4%	0.5%	0.5%	0.6%	2.8%	7.3%	3.1%	3.3%	8.4%
% Hydracarina		7.2%	6.5%	7.2%	9.5%	7.9%	6.1%	4.9%	3.6%	2.8%	2.8%
% Ostracods		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Ephemeroptera		0.7%	2.0%	1.0%	0.5%	0.9%	0.6%	0.0%	0.0%	1.2%	0.0%
% Chironomids		75.4%	73.7%	75.8%	71.9%	72.9%	77.5%	83.2%	76.5%	87.4%	80.2%
% Metal Sensitive Chironmids		9.0%	6.0%	14.7%	0.6%	5.9%	2.5%	1.4%	1.2%	1.7%	0.7%
% Simuliidae		0.0%	0.6%	3.1%	0.5%	2.0%	1.3%	0.0%	0.0%	0.4%	0.0%
% Tipulidae		9.3%	10.0%	6.2%	7.5%	9.1%	8.9%	0.5%	3.9%	3.3%	3.0%
Functional Feeding Group Composition											
% Collector - Gatherers		43.7%	40.0%	46.2%	28.3%	35.6%	59.3%	64.4%	67.9%	76.9%	67.3%
% Filterers		0.0%	0.6%	3.6%	0.5%	2.0%	1.3%	0.0%	0.0%	0.4%	0.0%
% Shredders		47.7%	50.6%	41.0%	58.9%	49.1%	31.1%	30.8%	28.5%	19.1%	28.5%
Habitat Preference Group Composition											
% Clingers		47.0%	49.4%	47.2%	64.2%	54.7%	31.8%	35.2%	28.2%	19.9%	29.7%
% Sprawlers		37.6%	35.2%	42.1%	21.0%	33.1%	55.9%	52.9%	51.9%	72.8%	54.7%
% Burrowers		15.3%	15.4%	10.8%	14.8%	12.2%	12.4%	12.0%	19.9%	7.3%	15.6%

[a] Bold entries excluded from taxa count

Table F.7: Benthic Invertebrate Community Summary Statistics for Camp Lake Tributary 1 Study Areas, Mary River Project CREMP, August 2017

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Density (no. organisms / m^2)	Unnamed Reference Creek	1,972	1,861	832	-339	4,282	817	5,229
	CLT1 Upstream	1,242	143	64	1,064	1,419	1,004	1,391
	CLT1 Downstream	1,465	735	329	552	2,377	639	2,365
Richness (Number of Taxa)	Unnamed Reference Creek	21.2	1.9	0.9	18.8	23.6	19.0	24.0
	CLT1 Upstream	19.2	2.6	1.2	16.0	22.4	16.0	22.0
	CLT1 Downstream	16.8	1.9	0.9	14.4	19.2	15.0	20.0
Simpson's Evenness	Unnamed Reference Creek	0.935	0.017	0.008	0.913	0.956	0.909	0.951
	CLT1 Upstream	0.925	0.019	0.009	0.901	0.949	0.895	0.948
	CLT1 Downstream	0.874	0.033	0.015	0.833	0.915	0.829	0.920
Bray-Curtis Index	Unnamed Reference Creek	0.305	0.205	0.092	0.050	0.560	0.173	0.664
	CLT1 Upstream	0.729	0.027	0.012	0.696	0.762	0.691	0.759
	CLT1 Downstream	0.777	0.029	0.013	0.741	0.812	0.748	0.808
Nemata (% of community)	Unnamed Reference Creek	8.8%	3.5%	1.6%	4.4%	13.2%	3.1%	12.7%
	CLT1 Upstream	4.1%	2.1%	1.0%	1.5%	6.7%	2.0%	6.7%
	CLT1 Downstream	4.5%	5.0%	2.2%	-1.7%	10.7%	0.6%	12.9%
Oligochaeta (% of community)	Unnamed Reference Creek	1.0%	1.4%	0.6%	-0.7%	2.7%	0.0%	2.9%
	CLT1 Upstream	1.1%	1.3%	0.6%	-0.5%	2.7%	0.4%	3.4%
	CLT1 Downstream	5.0%	2.7%	1.2%	1.7%	8.3%	2.8%	8.4%
Hydracarina (% of community)	Unnamed Reference Creek	4.8%	2.3%	1.0%	2.0%	7.6%	2.2%	7.7%
	CLT1 Upstream	7.7%	1.1%	0.5%	6.2%	9.1%	6.5%	9.5%
	CLT1 Downstream	4.0%	1.4%	0.6%	2.3%	5.8%	2.8%	6.1%
Ostracoda (% of community)	Unnamed Reference Creek	3.6%	2.6%	1.2%	0.4%	6.8%	0.8%	6.2%
	CLT1 Upstream	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	CLT1 Downstream	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ephemeroptera (% of community)	Unnamed Reference Creek	13.8%	6.0%	2.7%	6.4%	21.3%	3.6%	19.3%
	CLT1 Upstream	1.0%	0.6%	0.3%	0.3%	1.7%	0.5%	2.0%
	CLT1 Downstream	0.4%	0.5%	0.2%	-0.3%	1.0%	0.0%	1.2%
Chironomidae (% of community)	Unnamed Reference Creek	37.9%	11.1%	5.0%	24.1%	51.7%	25.3%	55.7%
	CLT1 Upstream	73.9%	1.7%	0.7%	71.9%	76.0%	71.9%	75.8%
	CLT1 Downstream	81.0%	4.4%	2.0%	75.4%	86.5%	76.5%	87.4%
Metal-Sensitive Chironomidae (% of community)	Unnamed Reference Creek	5.7%	5.7%	2.5%	-1.3%	12.7%	1.7%	15.7%
	CLT1 Upstream	7.2%	5.2%	2.3%	0.8%	13.6%	0.6%	14.7%
	CLT1 Downstream	1.5%	0.7%	0.3%	0.7%	2.3%	0.7%	2.5%
Simuliidae (% of community)	Unnamed Reference Creek	28.3%	6.6%	3.0%	20.1%	36.5%	23.0%	39.3%
	CLT1 Upstream	1.2%	1.3%	0.6%	-0.3%	2.8%	0.0%	3.1%
	CLT1 Downstream	0.3%	0.6%	0.3%	-0.4%	1.0%	0.0%	1.3%
Tipulidae (% of community)	Unnamed Reference Creek	0.7%	0.4%	0.2%	0.1%	1.2%	0.3%	1.4%
	CLT1 Upstream	8.4%	1.5%	0.7%	6.5%	10.3%	6.2%	10.0%
	CLT1 Downstream	3.9%	3.1%	1.4%	0.1%	7.7%	0.5%	8.9%
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	58.8%	7.2%	3.2%	49.9%	67.6%	51.8%	69.3%
	CLT1 Upstream	38.8%	7.1%	3.2%	30.0%	47.6%	28.3%	46.2%
	CLT1 Downstream	67.2%	6.4%	2.9%	59.2%	75.1%	59.3%	76.9%
Filterer FFG (% of community)	Unnamed Reference Creek	28.6%	6.5%	2.9%	20.6%	36.7%	23.0%	39.3%
	CLT1 Upstream	1.3%	1.5%	0.7%	-0.5%	3.2%	0.0%	3.6%
	CLT1 Downstream	0.3%	0.6%	0.3%	-0.4%	1.0%	0.0%	1.3%
Shredder FFG (% of community)	Unnamed Reference Creek	6.7%	5.5%	2.4%	-0.1%	13.5%	2.7%	16.3%
	CLT1 Upstream	49.5%	6.4%	2.9%	41.5%	57.4%	41.0%	58.9%
	CLT1 Downstream	27.6%	4.9%	2.2%	21.5%	33.7%	19.1%	31.1%
Clinger HPG (% of community)	Unnamed Reference Creek	40.1%	7.8%	3.5%	30.4%	49.7%	28.8%	47.8%
	CLT1 Upstream	52.5%	7.2%	3.2%	43.5%	61.5%	47.0%	64.2%
	CLT1 Downstream	29.0%	5.7%	2.6%	21.9%	36.0%	19.9%	35.2%
Sprawler HPG (% of community)	Unnamed Reference Creek	49.0%	9.2%	4.1%	37.6%	60.5%	37.0%	58.8%
	CLT1 Upstream	33.8%	7.9%	3.5%	24.0%	43.6%	21.0%	42.1%
	CLT1 Downstream	57.6%	8.6%	3.9%	46.9%	68.3%	51.9%	72.8%
Burrower HPG (% of community)	Unnamed Reference Creek	10.7%	4.5%	2.0%	5.2%	16.3%	4.0%	15.1%
	CLT1 Upstream	13.7%	2.1%	0.9%	11.1%	16.3%	10.8%	15.4%
	CLT1 Downstream	13.4%	4.7%	2.1%	7.6%	19.2%	7.3%	19.9%

Table F.8: Benthic Invertebrate Community Absolute Density Statistical Comparison Results among Camp Lake Tributary 1 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2017

Metric	Data Transformation	Overall 3-Area Comparison		Pair-wise, post-hoc comparisons[a]				
		Significant Difference Among Areas?	P-value	Study Area	Mean	Standard Deviation	Magnitude of Difference (SD)	Pairwise Comparison
Nemata (No. per m^2)	square root	NO	0.1887	Reference Creek	187	184	-	a
				CLT1 Upstream	50	26	-0.7	a
				CLT1 Downstream	75	73	-0.6	a
Oligochaeta (No. per m^2)	none	YES	0.0461	Reference Creek	13	18	-	a
				CLT1 Upstream	14	16	0.0	a
				CLT1 Downstream	87	78	4.1	b
Hydracarina (No. per m^2)	log	NO	0.3552	Reference Creek	99	115	-	a
				CLT1 Upstream	95	19	0.0	a
				CLT1 Downstream	57	34	-0.4	a
Ephemeroptera (No. per m^2)	log(X+1)	YES	< 0.001	Reference Creek	187	58	-	a
				CLT1 Upstream	13	7	-3.0	b
				CLT1 Downstream	3	5	-3.2	c
Chironomidae (No. per m^2)	log	NO	0.2780	Reference Creek	878	1140	-	a
				CLT1 Upstream	918	106	0.0	a
				CLT1 Downstream	1188	606	0.3	a
Metal Sensitive Chironomidae (No. per m^2)	log	NO	0.1850	Reference Creek	196	349	-	a
				CLT1 Upstream	91	71	-0.3	a
				CLT1 Downstream	19	7	-0.5	a
Simuliidae (No. per m^2)	fourth root	YES	< 0.001	Reference Creek	534	433	-	a
				CLT1 Upstream	16	18	-1.2	b
				CLT1 Downstream	2	4	-1.2	b
Tipulidae (No. per m^2)	none	YES	< 0.001	Reference Creek	9	5	-	a
				CLT1 Upstream	103	17	20.7	b
				CLT1 Downstream	42	22	7.3	c
Collector-Gatherer FFG (No. per m^2)	log	NO	0.1383	Reference Creek	1096	945	-	a
				CLT1 Upstream	480	103	-0.7	a
				CLT1 Downstream	980	474	-0.1	a
Filterer FFG (No. per m^2)	log(X+1)	YES	< 0.001	Reference Creek	542	444	-	a
				CLT1 Upstream	18	20	-1.2	b
				CLT1 Downstream	2	4	-1.2	b
Shredder FFG (No. per m^2)	log	YES	0.0120	Reference Creek	213	359	-	a
				CLT1 Upstream	613	102	1.1	b
				CLT1 Downstream	415	241	0.6	b
Clinger HPG (No. per m^2)	log	NO	0.3952	Reference Creek	861	918	-	a
				CLT1 Upstream	654	128	-0.2	a
				CLT1 Downstream	442	278	-0.5	a
Sprawler HPG (No. per m^2)	log	NO	0.1308	Reference Creek	890	753	-	a
				CLT1 Upstream	419	114	-0.6	a
				CLT1 Downstream	818	363	-0.1	a
Burrower HPG (No. per m^2)	fourth root	NO	0.9876	Reference Creek	219	205	-	a
				CLT1 Upstream	169	21	-0.2	a
				CLT1 Downstream	204	122	-0.1	a

Indicates a statisitically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of reference mean, suggesting an ecologically meaningful difference in endpoint value between study areas.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.9: Statistical Comparison of Benthic Metrics at Camp Lake Tributary 1 North Branch (CLT1 US) Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007, 2011) for the Mary River Project CREMP

Metric	Data Transform-ation	Overall 5-Year Comparison		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2011	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	NO	0.1536	2007	3	505	330	-	-3.2	a	Tamhane's
				2011	3	949	139	1.3	-	a	
				2015	5	1,446	836	2.9	3.6	a	
				2016	5	1,610	806	3.4	4.8	a	
				2017	5	1,242	143	2.2	2.1	a	
Richness (No. of Taxa)	none	YES	0.0268	2007	3	13.7	2.3	-	-0.3	a	Tukey's HSD
				2011	3	14.3	2.1	0.3	-	a,b	
				2015	5	15.0	2.7	0.6	0.3	a,b	
				2016	5	14.0	2.6	0.1	-0.2	a	
				2017	5	19.2	2.6	2.4	2.3	b	
Simpson's Evenness	none	YES	0.0004	2007	3	0.749	0.082	-	-3.0	a	Tukey's HSD
				2011	3	0.874	0.042	1.5	-	b	
				2015	5	0.899	0.037	1.8	0.6	b	
				2016	5	0.908	0.032	1.9	0.8	b	
				2017	5	0.925	0.019	2.1	1.2	b	
Nemata (% of community)	none	YES	0.0020	2007	3	0.1	0.3	-	-0.7	a	Tamhane's
				2011	3	0.7	0.8	2.1	-	a,b	
				2015	5	1.7	0.7	6.0	1.3	b	
				2016	5	1.3	0.5	4.5	0.8	b	
				2017	5	4.1	2.1	15.4	4.4	a,b	
Oligochaeta (% of community)	none	NO	0.9122	2007	3	1.5	2.1	-	1.4	a	Tamhane's
				2011	3	0.7	0.5	-0.3	-	a	
				2015	5	1.4	1.3	0.0	1.3	a	
				2016	5	1.5	0.6	0.0	1.5	a	
				2017	5	1.1	1.3	-0.2	0.7	a	
Hydracarina (% of community)	none	YES	0.0001	2007	3	0.8	1.0	-	-2.0	a	Tamhane's
				2011	3	14.4	6.7	13.3	-	a,b	
				2015	5	2.3	1.7	1.5	-1.8	a	
				2016	5	9.8	3.2	8.8	-0.7	b	
				2017	5	7.6	1.1	6.7	-1.0	b	
Chironomidae (% of community)	none	YES	0.0323	2007	3	88.1	7.1	-	2.3	a	Tukey's HSD
				2011	3	76.3	5.1	-1.7	-	a,b	
				2015	5	75.6	7.5	-1.8	-0.1	a,b	
				2016	5	68.6	10.6	-2.7	-1.5	b	
				2017	5	74.0	1.7	-2.0	-0.5	a,b	
Metal Sensitive Taxa (% of community)	none	NO	0.7141	2007	3	3.7	3.6	-	-1.1	a	Tukey's HSD
				2011	3	10.8	6.6	2.0	-	a	
				2015	5	12.7	14.0	2.5	0.3	a	
				2016	5	9.1	9.0	1.5	-0.3	a	
				2017	5	7.2	5.2	1.0	-0.5	a	
Tipulidae (% of community)	none	NO	0.1009	2007	3	8.9	4.1	-	0.9	a	Tukey's HSD
				2011	3	6.9	2.1	-0.5	-	a	
				2015	5	16.8	4.7	2.0	4.6	a	
				2016	5	16.9	11.8	2.0	4.7	a	
				2017	5	8.4	1.5	-0.1	0.7	a	
Collector-Gatherer FFG (% of community)	none	YES	0.0022	2007	3	72.6	11.0	-	2.2	a	Tukey's HSD
				2011	3	41.4	14.1	-2.8	-	b	
				2015	5	50.2	7.3	-2.0	0.6	b	
				2016	5	40.8	11.4	-2.9	0.0	b	
				2017	5	38.8	7.1	-3.1	-0.2	b	
Filterer FFG (% of community)	none	NO	0.1128	2007	3	0.3	0.3	-	nc	a	Tamhane's
				2011	3	0.0	0.0	-1.2	-	a	
				2015	5	0.0	0.0	-1.2	nc	a	
				2016	5	0.5	0.6	0.9	nc	a	
				2017	5	1.3	1.5	3.9	nc	a	
Shredder FFG (% of community)	none	YES	0.0258	2007	3	23.1	8.8	-	-1.2	a	Tukey's HSD
				2011	3	40.1	14.3	1.9	-	a,b	
				2015	5	46.1	7.3	2.6	0.4	b	
				2016	5	47.8	14.0	2.8	0.5	b	
				2017	5	49.5	6.4	3.0	0.7	b	

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.10: Statistical Comparison of Benthic Metrics at Camp Lake Tributary 1 Lower Main Stem (CLT1 DS) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007, 2011) for the Mary River Project CREMP

Metric	Data Transformation	Overall 5-Year Comparison		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2011	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	NO	0.3886	2007	3	754	573	-	-0.8	a	Tukey's HSD
				2011	3	898	183	0.3	-	a	
				2015	5	1,301	479	1.0	2.2	a	
				2016	5	1,143	443	0.7	1.3	a	
				2017	5	1,465	735	1.2	3.1	a	
Richness (No. of Taxa)	none	NO	0.1619	2007	3	20.3	6.0	-	1.1	a	Tukey's HSD
				2011	3	15.3	4.5	-0.8	-	a	
				2015	5	14.6	1.1	-1.0	-0.2	a	
				2016	5	17.0	1.6	-0.6	0.4	a	
				2017	5	16.8	1.9	-0.6	0.3	a	
Simpson's Evenness	none	NO	0.9523	2007	3	0.864	0.040	-	0.0	a	Tukey's HSD
				2011	3	0.864	0.026	0.0	-	a	
				2015	5	0.889	0.043	0.6	1.0	a	
				2016	5	0.864	0.095	0.0	0.0	a	
				2017	5	0.874	0.033	0.2	0.4	a	
Nemata (% of community)	logit	YES	0.0943	2007	3	1.0	1.3	-	1.7	a	Tamhane's
				2011	3	0.4	0.4	-0.5	-	a	
				2015	5	3.2	2.6	1.6	7.7	a	
				2016	5	4.5	4.1	2.6	11.3	a	
				2017	5	4.6	5.0	2.6	11.5	a	
Oligochaeta (% of community)	logit	NO	0.1043	2007	3	7.3	6.2	-	3.9	a	Tamhane's
				2011	3	1.1	1.6	-1.0	-	a	
				2015	5	5.6	3.1	-0.3	2.9	a	
				2016	5	9.7	3.7	0.4	5.5	a	
				2017	5	5.0	2.7	-0.4	2.5	a	
Hydracarina (% of community)	logit	YES	0.0265	2007	3	2.9	1.4	-	-3.4	a	Tamhane's
				2011	3	24.7	6.4	15.4	-	b	
				2015	5	1.7	1.6	-0.8	-3.6	a,b,c	
				2016	5	4.6	0.8	1.2	-3.1	c	
				2017	5	4.0	1.4	0.8	-3.2	c	
Chironomidae (% of community)	logit	YES	0.0064	2007	3	80.8	8.5	-	1.7	a,c	Tukey's HSD
				2011	3	65.3	9.0	-1.8	-	b	
				2015	5	85.2	4.0	0.5	2.2	a	
				2016	5	73.9	5.9	-0.8	1.0	b,c	
				2017	5	80.9	4.5	0.0	1.7	a	
Metal Sensitive Taxa (% of community)	logit	NO	0.4584	2007	3	15.1	10.2	-	1.0	a	Tamhane's
				2011	3	7.6	7.3	-0.7	-	a	
				2015	5	4.4	3.5	-1.1	-0.4	a	
				2016	5	3.8	3.3	-1.1	-0.5	a	
				2017	5	1.5	0.7	-1.3	-0.8	a	
Tipulidae (% of community)	logit	NO	0.1594	2007	3	6.4	2.6	-	-0.6	a	Tukey's HSD
				2011	3	8.4	3.2	0.7	-	a	
				2015	5	3.1	1.0	-1.3	-1.6	a	
				2016	5	6.1	3.4	-0.1	-0.7	a	
				2017	5	3.9	3.1	-1.0	-1.4	a	
Collector-Gatherer FFG (% of community)	logit	YES	0.0018	2007	3	51.7	24.3	-	1.5	a,c	Tukey's HSD
				2011	3	35.6	10.5	-0.7	-	a	
				2015	5	78.4	9.5	1.1	4.1	b,c	
				2016	5	73.8	9.9	0.9	3.7	c	
				2017	5	67.2	6.4	0.6	3.0	c	
Filterer FFG (% of community)	logit	NO	0.3384	2007	3	10.2	13.1	-	37.4	a	Tukey's HSD
				2011	3	0.3	0.3	-0.8	-	a	
				2015	5	0.2	0.5	-0.8	-0.3	a	
				2016	5	1.3	1.5	-0.7	3.8	a	
				2017	5	0.3	0.5	-0.8	0.2	a	
Shredder FFG (% of community)	logit	YES	0.0275	2007	3	22.1	3.1	-	-3.7	a,b	Tukey's HSD
				2011	3	38.9	4.5	5.5	-	a	
				2015	5	19.3	9.0	-0.9	-4.3	b	
				2016	5	19.6	9.5	-0.8	-4.2	b	
				2017	5	27.6	4.9	1.8	-2.5	a,b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.11: Benthic Station Habitat Feature Statistical Comparisons among Camp Lake Tributary 2 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2017

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	P-value	Statistical Test[b]	(I) Area	(J) Area	Significant Difference Between 2 Areas?	P-value	Statistical Test
Water Depth (cm)	NO	0.7868	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.7754	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	NO	0.9716	
				CLT2 Upstream	CLT2 Downstream	NO	0.8918	
Water Velocity (cm/s)	NO	0.2048	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.4374	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	NO	0.8256	
				CLT2 Upstream	CLT2 Downstream	NO	0.1911	
Substrate Size (mm diameter)	NO	0.2623	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.2420	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	NO	0.5331	
				CLT2 Upstream	CLT2 Downstream	NO	0.8173	
Substrate Embeddedness (%)	YES	0.0005	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0043	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0006	
				CLT2 Upstream	CLT2 Downstream	NO	0.4861	

Note: Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Kruskal-Wallis H-test (multiple group) or Mann-Whitney U-test (pair-wise) conducted on non-normal data; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table F.12: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 2 Study Areas, August 2017

Taxa	Study Area	Upstream (CLT2-US)					Downstream (CLT2-DS)				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS											
P. Nemata		-	-	-	7	4	7	47	-	4	-
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		29	4	-	-	-	-	14	-	22	7
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina		-	-	-	-	-	-	-	-	-	4
F. Sperchonidae											
Sperchon		25	7	25	25	7	25	7	-	-	7
HARPACTICOIDS											
O. Harpacticoida		-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS											
Cl. Ostracoda		-	-	-	-	-	-	-	-	-	-
SPRINGTAILS											
Cl. Entognatha											
O. Collembola		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
MAYFLIES											
O. Ephemeroptera											
F. Baetidae											
Acentrella feropagus		4	7	-	-	-	4	4	-	-	4
STONEFLIES											
O. Plecoptera											
F. Capniidae											
immature		-	-	-	-	-	-	-	-	-	-
TRUE FLIES											
O. Diptera											
BITING-MIDGE											
F. Ceratopogonidae											
Culicoides		-	4	-	-	-	-	-	-	-	-
MIDGES											
F. Chironomidae											
chironomid pupae		**18**	**61**	**39**	**18**	**32**	**32**	**47**	**14**	**22**	**54**
S.F. Chironominae											
Micropsectra		-	-	-	-	-	-	-	-	-	-
Rheotanytarsus		-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae											
Diamesa		22	25	39	39	25	18	61	25	22	-
Pseudokiefferiella		11	7	-	7	11	4	32	-	-	7
S.F. Orthocladiinae											
Cardiocladius		-	-	-	-	-	-	-	-	-	-
Chaetocladius		-	-	-	-	-	-	-	-	-	4
Corynoneura		-	4	-	-	-	-	-	-	-	-
Cricotopus		-	7	4	14	4	25	14	7	-	4
Cricotopus/Orthocladius		-	4	-	-	14	36	47	4	-	7
Eukiefferiella		-	4	-	-	-	-	18	-	4	-
Hydrobaenus		-	-	-	4	-	-	4	-	-	-
Hydrosmittia		4	4	-	4	-	7	14	-	4	-
Krenosmittia		22	11	25	43	7	4	7	-	4	4
Limnophyes		-	-	-	7	11	-	32	-	4	-
Metriocnemus		-	-	-	4	-	-	-	-	-	-
Orthocladius (Euorthocladius)		7	11	4	7	-	14	7	-	4	4

Table F.12: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 2 Study Areas, August 2017

Taxa	Study Area	Upstream (CLT2-US)					Downstream (CLT2-DS)				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
Parakiefferiella		-	-	-	-	-	-	-	-	-	-
Parametriocnemus		-	-	-	-	-	-	-	-	-	-
Paraphaenocladius		-	-	-	-	-	-	-	-	-	-
Thienemanniella		14	-	18	4	18	54	4	-	4	-
Tokunagaia		-	-	29	7	7	4	29	14	4	4
Tvetenia		25	18	39	36	25	43	32	11	22	47
indeterminate		-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Thienemannimyia complex		-	-	-	-	-	-	-	-	-	-
F. Empididae											
Clinocera		4	4	-	7	-	4	-	4	-	-
pupae		**4**	-	4	-	-	**4**	-	-	-	-
F. Muscidae		-	-	-	-	-	-	-	-	-	-
F. Simuliidae											
Gymnopais		-	-	11	11	11	7	11	-	7	-
Metacnephia		-	4	-	-	4	-	-	-	-	-
Prosimulium		7	7	7	-	7	-	7	-	4	4
indeterminate		-	-	-	-	-	-	-	-	-	-
F. Tipulidae											
Tipula		-	-	4	7	7	-	-	-	-	7
Number of Organisms (No. organisms per m^2)		196	193	248	251	194	292	438	79	131	168
Richness (total number of taxa)[a]		12	17	12	17	15	15	19	6	13	13
Simpson's Evenness (E)		0.969	0.954	0.942	0.941	0.967	0.941	0.962	0.910	0.927	0.827
Bray-Curtis Index		0.802	0.797	0.789	0.762	0.762	0.717	0.669	0.915	0.864	0.807
Percent Composition											
% Nemata		0.0%	0.0%	0.0%	2.8%	2.1%	2.4%	10.7%	0.0%	3.1%	0.0%
% Oligochaeta		14.8%	2.1%	0.0%	0.0%	0.0%	0.0%	3.2%	0.0%	16.8%	4.2%
% Hydracarina		12.8%	3.6%	10.1%	10.0%	3.6%	8.6%	1.6%	0.0%	0.0%	6.5%
% Ostracods		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Ephemeroptera		2.0%	3.6%	0.0%	0.0%	0.0%	1.4%	0.9%	0.0%	0.0%	2.4%
% Chironomids		62.8%	80.8%	79.4%	77.3%	79.4%	82.5%	79.5%	94.9%	71.8%	80.4%
% Metal Sensitive Chironmids		19.9%	26.9%	19.8%	20.3%	23.2%	8.9%	24.7%	38.0%	22.1%	7.1%
% Simuliidae		3.6%	5.7%	7.3%	4.4%	11.3%	2.4%	4.1%	0.0%	8.4%	2.4%
% Tipulidae		0.0%	0.0%	1.6%	2.8%	3.6%	0.0%	0.0%	0.0%	0.0%	4.2%
Functional Feeding Group Composition											
% Collector - Gatherers		79.6%	77.2%	77.4%	74.1%	69.6%	62.0%	78.3%	77.2%	91.6%	76.2%
% Filterers		3.6%	5.7%	7.3%	4.4%	11.3%	2.4%	4.1%	0.0%	8.4%	2.4%
% Shredders		0.0%	9.3%	3.6%	8.8%	15.5%	24.3%	16.0%	17.7%	0.0%	14.9%
Habitat Preference Group Composition											
% Clingers		20.4%	20.7%	21.0%	23.1%	26.8%	38.0%	21.7%	22.8%	8.4%	19.6%
% Sprawlers		64.8%	75.1%	77.4%	69.7%	67.5%	59.6%	64.4%	77.2%	71.8%	72.0%
% Burrowers		14.8%	4.1%	1.6%	7.2%	5.7%	2.4%	13.9%	0.0%	19.8%	8.3%

[a] Bold entries excluded from taxa count

Table F.13: Benthic Invertebrate Community Summary Statistics for Camp Lake Tributary 2 Study Areas, Mary River Project CREMP, August 2017

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Density (no. organisms / m^2)	Unnamed Reference Creek	1,972	1,861	832	-339	4,282	817	5,229
	CLT1 Upstream	216	30	14	179	254	193	251
	CLT1 Downstream	222	144	64	43	401	79	438
Richness (Number of Taxa)	Unnamed Reference Creek	21.2	1.9	0.9	18.8	23.6	19.0	24.0
	CLT1 Upstream	14.6	2.5	1.1	11.5	17.7	12.0	17.0
	CLT1 Downstream	13.2	4.7	2.1	7.3	19.1	6.0	19.0
Simpson's Evenness	Unnamed Reference Creek	0.935	0.017	0.008	0.913	0.956	0.909	0.951
	CLT1 Upstream	0.955	0.013	0.006	0.938	0.971	0.941	0.969
	CLT1 Downstream	0.913	0.052	0.023	0.849	0.978	0.827	0.962
Bray-Curtis Index	Unnamed Reference Creek	0.305	0.205	0.092	0.050	0.560	0.173	0.664
	CLT1 Upstream	0.782	0.019	0.009	0.759	0.806	0.762	0.802
	CLT1 Downstream	0.794	0.102	0.046	0.668	0.921	0.669	0.915
Nemata (% of community)	Unnamed Reference Creek	8.8%	3.5%	1.6%	4.4%	13.2%	3.1%	12.7%
	CLT1 Upstream	1.0%	1.4%	0.6%	-0.7%	2.7%	0.0%	2.8%
	CLT1 Downstream	3.2%	4.4%	2.0%	-2.2%	8.7%	0.0%	10.7%
Oligochaeta (% of community)	Unnamed Reference Creek	1.0%	1.4%	0.6%	-0.7%	2.7%	0.0%	2.9%
	CLT1 Upstream	3.4%	6.4%	2.9%	-4.6%	11.4%	0.0%	14.8%
	CLT1 Downstream	4.8%	6.9%	3.1%	-3.8%	13.5%	0.0%	16.8%
Hydracarina (% of community)	Unnamed Reference Creek	4.8%	2.3%	1.0%	2.0%	7.6%	2.2%	7.7%
	CLT1 Upstream	8.0%	4.2%	1.9%	2.8%	13.2%	3.6%	12.8%
	CLT1 Downstream	3.3%	4.0%	1.8%	-1.6%	8.3%	0.0%	8.6%
Ostracoda (% of community)	Unnamed Reference Creek	3.6%	2.6%	1.2%	0.4%	6.8%	0.8%	6.2%
	CLT1 Upstream	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	CLT1 Downstream	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ephemeroptera (% of community)	Unnamed Reference Creek	13.8%	6.0%	2.7%	6.4%	21.3%	3.6%	19.3%
	CLT1 Upstream	1.1%	1.6%	0.7%	-0.9%	3.1%	0.0%	3.6%
	CLT1 Downstream	0.9%	1.0%	0.5%	-0.3%	2.2%	0.0%	2.4%
Chironomidae (% of community)	Unnamed Reference Creek	37.9%	11.1%	5.0%	24.1%	51.7%	25.3%	55.7%
	CLT1 Upstream	75.9%	7.5%	3.3%	66.7%	85.2%	62.8%	80.8%
	CLT1 Downstream	81.8%	8.4%	3.7%	71.4%	92.2%	71.8%	94.9%
Metal-Sensitive Chironomidae (% of community)	Unnamed Reference Creek	5.7%	5.7%	2.5%	-1.3%	12.7%	1.7%	15.7%
	CLT1 Upstream	22.0%	3.1%	1.4%	18.2%	25.8%	19.8%	26.9%
	CLT1 Downstream	20.2%	12.6%	5.7%	4.5%	35.9%	7.1%	38.0%
Simuliidae (% of community)	Unnamed Reference Creek	28.3%	6.6%	3.0%	20.1%	36.5%	23.0%	39.3%
	CLT1 Upstream	6.5%	3.0%	1.4%	2.7%	10.2%	3.6%	11.3%
	CLT1 Downstream	3.5%	3.1%	1.4%	-0.4%	7.3%	0.0%	8.4%
Tipulidae (% of community)	Unnamed Reference Creek	0.7%	0.4%	0.2%	0.1%	1.2%	0.3%	1.4%
	CLT1 Upstream	1.6%	1.6%	0.7%	-0.4%	3.6%	0.0%	3.6%
	CLT1 Downstream	0.8%	1.9%	0.8%	-1.5%	3.2%	0.0%	4.2%
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	58.8%	7.2%	3.2%	49.9%	67.6%	51.8%	69.3%
	CLT1 Upstream	75.6%	3.9%	1.7%	70.8%	80.4%	69.6%	79.6%
	CLT1 Downstream	77.1%	10.5%	4.7%	64.0%	90.1%	62.0%	91.6%
Filterer FFG (% of community)	Unnamed Reference Creek	28.6%	6.5%	2.9%	20.6%	36.7%	23.0%	39.3%
	CLT1 Upstream	6.5%	3.0%	1.4%	2.7%	10.2%	3.6%	11.3%
	CLT1 Downstream	3.5%	3.1%	1.4%	-0.4%	7.3%	0.0%	8.4%
Shredder FFG (% of community)	Unnamed Reference Creek	6.7%	5.5%	2.4%	-0.1%	13.5%	2.7%	16.3%
	CLT1 Upstream	7.4%	5.9%	2.6%	0.1%	14.8%	0.0%	15.5%
	CLT1 Downstream	14.6%	8.9%	4.0%	3.5%	25.7%	0.0%	24.3%
Clinger HPG (% of community)	Unnamed Reference Creek	40.1%	7.8%	3.5%	30.4%	49.7%	28.8%	47.8%
	CLT1 Upstream	22.4%	2.7%	1.2%	19.1%	25.7%	20.4%	26.8%
	CLT1 Downstream	22.1%	10.6%	4.7%	9.0%	35.2%	8.4%	38.0%
Sprawler HPG (% of community)	Unnamed Reference Creek	49.0%	9.2%	4.1%	37.6%	60.5%	37.0%	58.8%
	CLT1 Upstream	70.9%	5.2%	2.3%	64.4%	77.4%	64.8%	77.4%
	CLT1 Downstream	69.0%	7.0%	3.1%	60.4%	77.6%	59.6%	77.2%
Burrower HPG (% of community)	Unnamed Reference Creek	10.7%	4.5%	2.0%	5.2%	16.3%	4.0%	15.1%
	CLT1 Upstream	6.7%	5.0%	2.2%	0.5%	12.9%	1.6%	14.8%
	CLT1 Downstream	8.9%	8.1%	3.6%	-1.2%	19.0%	0.0%	19.8%

Table F.14: Benthic Invertebrate Community Absolute Density Statistical Comparison Results among Camp Lake Tributary 2 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2017

Metric	Data Transform-ation	Overall 3-Area Comparison		Pair-wise, post-hoc comparisons[a]				
		Significant Difference Among Areas?	P-value	Study Area	Mean	Standard Deviation	Magnitude of Difference (SD)	Pairwise Comparison
Nemata (No. per m^2)	none (MW)	YES	0.0094	Reference Creek	187	184	-	a
				CLT2 Upstream	2	3	-1.0	b
				CLT2 Downstream	12	20	-1.0	b
Oligochaeta (No. per m^2)	none (MW)	NO	0.8681	Reference Creek	13	18	-	a
				CLT2 Upstream	7	13	-0.4	a
				CLT2 Downstream	9	9	-0.2	a
Hydracarina (No. per m^2)	none (MW)	YES	0.0202	Reference Creek	99	115	-	a
				CLT2 Upstream	18	10	-0.7	b
				CLT2 Downstream	9	10	-0.8	b
Ephemeroptera (No. per m^2)	none (MW)	YES	0.0069	Reference Creek	187	58	-	a
				CLT2 Upstream	2	3	-3.2	b
				CLT2 Downstream	2	2	-3.2	b
Chironomidae (No. per m^2)	none (MW)	YES	0.0189	Reference Creek	878	1140	-	a
				CLT2 Upstream	165	31	-0.6	b
				CLT2 Downstream	179	114	-0.6	b
Metal Sensitive Taxa (No. per m^2)	none (MW)	NO	0.2491	Reference Creek	196	349	-	a
				CLT2 Upstream	47	5	-0.4	a
				CLT2 Downstream	41	38	-0.4	a
Simuliidae (No. per m^2)	none (MW)	YES	0.0057	Reference Creek	534	433	-	a
				CLT2 Upstream	14	6	-1.2	b
				CLT2 Downstream	8	7	-1.2	b
Collector-Gatherer FFG (No. per m^2)	none (MW)	YES	0.0075	Reference Creek	1096	945	-	a
				CLT2 Upstream	164	24	-1.0	b
				CLT2 Downstream	167	107	-1.0	b
Filterer FFG (No. per m^2)	none (MW)	YES	0.0057	Reference Creek	542	444	-	a
				CLT2 Upstream	14	6	-1.2	b
				CLT2 Downstream	8	7	-1.2	b
Shredder FFG (No. per m^2)	none (MW)	YES	0.0816	Reference Creek	213	359	-	a
				CLT2 Upstream	16	12	-0.6	b
				CLT2 Downstream	36	33	-0.5	a,b
Clinger HPG (No. per m^2)	none (MW)	YES	0.0085	Reference Creek	861	918	-	a
				CLT2 Upstream	48	8	-0.9	b
				CLT2 Downstream	54	46	-0.9	b
Sprawler HPG (No. per m^2)	none (MW)	YES	0.0075	Reference Creek	890	753	-	a
				CLT2 Upstream	154	28	-1.0	b
				CLT2 Downstream	146	86	-1.0	b
Burrower HPG (No. per m^2)	none (MW)	YES	0.0132	Reference Creek	219	205	-	a
				CLT2 Upstream	14	10	-1.0	b
				CLT2 Downstream	22	24	-1.0	b

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of reference mean, suggesting an ecologically meaningful difference in endpoint value relative to the reference area.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.15: Statistical Comparison of Benthic Metrics at Camp Lake Tributary 2 Upstream (CLT2 US) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0273	2007	3	364	205	-	a,b	Tamhane's
				2015	5	741	416	1.8	a,b	
				2016	5	412	100	0.2	a	
				2017	5	216	30	-0.7	b	
Richness (No. of Taxa)	none	YES	0.0015	2007	3	12.7	2.1	-	a	Tukey's HSD
				2015	5	20.8	1.8	3.9	b	
				2016	5	17.2	2.9	2.2	b,c	
				2017	5	14.6	2.5	0.9	a,c	
Simpson's Evenness	none	YES	0.0000	2007	3	0.825	0.008	-	a	Tukey's HSD
				2015	5	0.922	0.025	11.8	b,c	
				2016	5	0.898	0.035	9.0	b	
				2017	5	0.955	0.013	15.8	c	
Nemata (% of community)	none	NO	0.9868	2007	3	1.1	0.6	-	a	Tukey's HSD
				2015	5	0.9	0.9	-0.5	a	
				2016	5	1.0	0.8	-0.3	a	
				2017	5	1.0	1.4	-0.3	a	
Oligochaeta (% of community)	none	NO	0.7807	2007	3	2.1	0.8	-	a	Tukey's HSD
				2015	5	2.7	2.8	0.7	a	
				2016	5	4.9	3.5	3.5	a	
				2017	5	3.4	6.4	1.6	a	
Hydracarina (% of community)	none	YES	0.0074	2007	3	2.9	2.1	-	a,b	Tamhane's
				2015	5	0.9	0.7	-1.0	a	
				2016	5	5.5	2.6	1.2	b	
				2017	5	8.0	4.2	2.4	a,b	
Chironomidae (% of community)	none	NO	0.2377	2007	3	88.4	4.3	-	a	Tukey's HSD
				2015	5	80.2	8.9	-1.9	a	
				2016	5	79.5	8.5	-2.1	a	
				2017	5	75.9	7.5	-2.9	a	
Metal Sensitive Taxa (% of community)	none	YES	0.0000	2007	3	5.3	0.6	-	a	Tukey's HSD
				2015	5	10.5	5.7	8.8	a	
				2016	5	5.3	3.3	0.0	a	
				2017	5	22.0	3.1	28.3	b	
Tipulidae (% of community)	none	NO	0.1946	2007	3	5.2	2.0	-	a	Tukey's HSD
				2015	5	4.1	3.5	-0.5	a	
				2016	5	4.0	1.8	-0.6	a	
				2017	5	1.6	1.6	-1.8	a	
Collector-Gatherer FFG (% of community)	none	NO	0.1010	2007	3	68.5	6.5	-	a	Tamhane's
				2015	5	63.8	10.3	-0.7	a	
				2016	5	66.6	5.8	-0.3	a	
				2017	5	75.6	3.9	1.1	a	
Filterer FFG (% of community)	none	YES	0.0002	2007	3	0.2	0.4	-	a	Tamhane's
				2015	5	1.0	1.1	1.7	a	
				2016	5	0.2	0.4	-0.2	a	
				2017	5	6.5	3.1	14.3	b	
Shredder FFG (% of community)	none	YES	0.0001	2007	3	27.6	5.8	-	a	Tukey's HSD
				2015	5	26.2	5.8	-0.3	a	
				2016	5	25.9	4.4	-0.3	a	
				2017	5	7.4	5.9	-3.5	b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.16: Statistical Comparison of Benthic Metrics at Camp Lake Tributary 2 Downstream (CLT2 DS) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007) for the Mary River Project CREMP

Metric	Data Transform-ation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0798	2007	3	431	109	-	a	Tukey's HSD
				2015	5	447	258	0.1	a	
				2016	5	205	61	-2.1	a	
				2017	5	222	144	-1.9	a	
Richness (No. of Taxa)	none	NO	0.4616	2007	3	17.7	2.1	-	a	Tukey's HSD
				2015	5	14.2	3.3	-1.7	a	
				2016	5	14.0	4.0	-1.8	a	
				2017	5	13.2	4.7	-2.1	a	
Simpson's Evenness	none	YES	0.0563	2007	3	0.865	0.017	-	a,b	Tukey's HSD
				2015	5	0.934	0.034	4.0	a	
				2016	5	0.838	0.079	-1.5	b	
				2017	5	0.913	0.052	2.8	a,b	
Nemata (% of community)	none	NO	0.4989	2007	3	1.1	1.2	-	a	Tukey's HSD
				2015	5	4.2	2.4	2.6	a	
				2016	5	2.0	2.4	0.8	a	
				2017	5	3.2	4.4	1.8	a	
Oligochaeta (% of community)	none	NO	0.5555	2007	3	2.6	0.6	-	a	Tukey's HSD
				2015	5	8.8	12.8	10.1	a	
				2016	5	1.9	3.2	-1.1	a	
				2017	5	4.8	6.9	3.6	a	
Hydracarina (% of community)	none	YES	0.0765	2007	3	1.8	1.2	-	a,b	Tamhane's
				2015	5	0.3	0.6	-1.2	a	
				2016	5	4.5	1.9	2.2	b	
				2017	5	3.3	4.0	1.3	a,b	
Chironomidae (% of community)	none	NO	0.2573	2007	3	88.0	6.0	-	a	Tukey's HSD
				2015	5	75.6	10.4	-2.1	a	
				2016	5	82.4	6.3	-0.9	a	
				2017	5	81.8	8.4	-1.0	a	
Metal Sensitive Taxa (% of community)	none	NO	0.1120	2007	3	11.8	2.0	-	a	Tukey's HSD
				2015	5	10.6	10.6	-0.6	a	
				2016	5	5.4	0.9	-3.3	a	
				2017	5	20.2	12.6	4.3	a	
Tipulidae (% of community)	none	NO	0.1441	2007	3	6.4	6.6	-	a	Tamhane's
				2015	5	5.8	5.1	-0.1	a	
				2016	5	2.2	1.6	-0.6	a	
				2017	5	0.8	1.9	-0.9	a	
Collector-Gatherer FFG (% of community)	none	NO	0.3981	2007	3	66.4	11.0	-	a	Tukey's HSD
				2015	5	69.3	10.9	0.3	a	
				2016	5	77.6	11.6	1.0	a	
				2017	5	77.1	10.5	1.0	a	
Filterer FFG (% of community)	none	NO	0.1446	2007	3	2.7	1.9	-	a	Tukey's HSD
				2015	5	0.8	0.9	-1.0	a	
				2016	5	1.1	1.0	-0.9	a	
				2017	5	3.5	3.1	0.4	a	
Shredder FFG (% of community)	none	NO	0.2288	2007	3	21.5	5.9	-	a	Tukey's HSD
				2015	5	25.7	11.6	0.7	a	
				2016	5	13.8	10.4	-1.3	a	
				2017	5	14.6	8.9	-1.2	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.17: Statistical Comparison of Physical Sediment Quality Between Littoral and Profundal Stations of Reference Lake 3, Mary River Project CREMP, August 2017

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Habitats?	P-value	Statistical Analysis[a]	Station Type	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Sand-Sized Particles (% by weight)	NO	0.300	α	Littoral	5	46.4	13.9	6.2	25.6	59.9
				Profundal	5	35.7	16.5	7.4	15.6	56.0
Silt-Sized Particles (% by weight)	NO	0.436	β	Littoral	5	44.3	11.6	5.2	32.8	62.2
				Profundal	5	50.2	11.8	5.3	35.3	62.4
Clay-Sized Particles (% by weight)	NO	0.106	ζ	Littoral	5	9.3	2.8	1.3	4.7	12.2
				Profundal	5	14.1	5.2	2.3	8.8	22.0
Total Organic Carbon (%)	NO	0.209	α	Littoral	5	4.9	1.8	0.8	2.7	7.2
				Profundal	5	3.6	1.1	0.5	1.8	4.4

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; ζ - data fourth root transformed, single factor ANOVA test conducted; Ŧ - data square root transformed, single factor ANOVA test conducted; η - single factor ANOVA test validated using t-test assuming unequal variance; γ - data non-normal, Mann-Whitney U-test conducted.

Table F.18: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Reference Lake 3, August 2017

Taxa	Study Area	Reference Lake 03 - Littoral Stations 2017					Reference Lake 03 - Profundal Stations 2017				
	Replicate Station	REF-01	REF-02	REF-03	REF-04	REF-05	REF-06	REF-07	REF-08	REF-09	REF-10
ROUNDWORMS											
P. Nemata		9	103	34	86	17	-	-	-	-	-
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae											
Lumbriculus		9	-	-	-	-	-	-	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina											
immature		-	-	-	-	-	-	-	-	-	**9**
F. Acalyptonotidae											
Acalyptonotus		78	34	9	9	17	9	-	17	17	9
F. Hygrobatidae											
Hygrobates		-	17	9	17	-	-	-	-	-	-
F. Lebertiidae											
Lebertia		9	138	9	17	9	-	-	-	-	-
HARPACTICOIDS											
O. Harpacticoida		-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS											
Cl. Ostracoda		241	1,379	95	1,233	431	-	-	9	-	17
FAIRY SHRIMP											
O. Notostraca											
Lepidurus arcticus		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
CADDISFLIES											
O. Trichoptera											
F. Apataniidae											
Apatania		-	-	-	-	-	-	-	-	-	-
TRUE FLIES											
O. Diptera											
MIDGES											
F. Chironomidae											
chironomid pupae		-	-	**9**	**17**	**34**	-	-	-	-	-
S.F. Chironominae											
Chironomus		-	-	-	-	-	-	-	-	-	-
Micropsectra		86	190	52	9	422	17	26	-	-	-
Paratanytarsus		-	17	-	-	-	-	-	-	-	-
Sergentia		-	-	-	-	-	-	-	-	-	-
Stictochironomus		112	34	-	-	69	-	-	-	-	-
Tanytarsus		52	34	-	-	86	-	-	-	-	-
S.F. Diamesinae		-	-	-	-	-	-	-	-	-	-
Protanypus		-	17	-	-	-	9	-	9	9	-
Pseudodiamesa		26	17	-	-	9	-	-	-	9	-
S.F. Orthocladiinae											
Abiskomyia		164	483	60	388	293	26	-	69	-	17
Chaetocladius		-	-	-	-	-	-	-	-	-	-
Corynoneura		-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius		-	-	-	-	-	-	-	-	-	-
Heterotrissocladius		34	69	26	78	9	78	103	60	78	138
Mesocricotopus		-	-	-	-	-	-	-	-	-	-
Paracladius		9	34	60	43	34	-	-	-	-	-
Parakiefferiella		-	-	-	-	-	-	-	-	-	-
Psectrocladius		-	-	-	-	-	-	-	-	-	-

Table F.18: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Reference Lake 3, August 2017

Taxa	Study Area	Reference Lake 03 - Littoral Stations 2017					Reference Lake 03 - Profundal Stations 2017				
	Replicate Station	REF-01	REF-02	REF-03	REF-04	REF-05	REF-06	REF-07	REF-08	REF-09	REF-10
Zalutschia		172	52	-	34	17	-	-	9	-	-
Genus "Greenland"		-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Arctopelopia		9	-	9	-	-	-	-	-	-	-
Procladius		69	-	-	-	-	-	-	-	-	-
F. Tipulidae											
Tipula		-	-	-	-	-	-	-	-	-	-
Density (No. organisms per m^2)		1,079	2,618	372	1,931	1,447	139	129	173	113	190
Richness (total number of taxa)[a]		15	15	10	10	12	5	2	6	4	4
Simpson's Evenness (E)		0.933	0.725	0.934	0.605	0.838	0.783	0.644	0.843	0.651	0.597
Bray-Curtis Index		0.367	0.420	0.536	0.394	0.203	0.131	0.376	0.299	0.111	0.280
Percent Composition											
% Nemata		0.8%	3.9%	9.1%	4.5%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
% Hydracarina		8.1%	7.2%	7.3%	2.2%	1.8%	6.5%	0.0%	9.8%	15.0%	9.5%
% Ostracods		22.3%	52.7%	25.5%	63.9%	29.8%	0.0%	0.0%	5.2%	0.0%	8.9%
% Chironomids		67.9%	36.2%	58.1%	29.5%	67.2%	93.5%	100.0%	85.0%	85.0%	81.6%
% Metal Sensitive Chironmids		15.2%	10.5%	14.5%	0.5%	37.0%	18.7%	20.2%	5.2%	15.9%	0.0%
% Tipulidae		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Functional Feeding Group Composition											
% Collector - Gatherers		56.0%	81.6%	75.8%	95.5%	60.6%	81.3%	79.8%	85.0%	85.0%	90.5%
% Filterers		12.8%	0.09	0.15	0.00	0.36	0.12	0.20	0.00	0.00	0.00
% Shredders		15.9%	2.0%	0.0%	1.8%	1.2%	0.0%	0.0%	5.2%	0.0%	0.0%
Habitat Preference Group Composition											
% Clingers		20.9%	15.8%	21.8%	2.7%	38.1%	18.7%	20.2%	9.8%	15.0%	9.5%
% Sprawlers		67.1%	78.3%	69.1%	92.9%	55.7%	74.8%	79.8%	85.0%	77.0%	90.5%
% Burrowers		12.0%	5.9%	9.1%	4.5%	6.2%	6.5%	0.0%	5.2%	8.0%	0.0%

[a] Bold entries excluded from taxa coun

Table F.19: Statistical Comparison of Benthic Metrics at Reference Lake 3 Littoral (Shallow) Stations Among Years of Mine Operation (2015, 2016, 2017) for the Mary River Project CREMP

Metric	Data Transformation	Overall 3-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Mean	Standard Deviation	Effect Size vs. Year 2015	Effect Size vs. Year 2016	Pairwise Comparison	Statistical Test
Density (No. per m^2)	log	NO	0.3332	2015	1,278	888	-	-0.8	a	Tukey's HSD
				2016	2,390	1,396	1.3	-	a	
				2017	1,489	850	0.2	-0.6	a	
Richness (No. of Taxa)	none	NO	0.9757	2015	12.6	4.1	-	0.4	a	Tamhane's
				2016	12.2	1.1	-0.1	-	a	
				2017	12.4	2.5	0.0	0.2	a	
Simpson's Evenness	log	NO	0.4931	2015	0.865	0.052	-	0.6	a	Tukey's HSD
				2016	0.758	0.189	-2.0	-	a	
				2017	0.807	0.142	-1.1	0.3	a	
Nemata (% of community)	modified probit	NO	0.7212	2015	8.1%	7.4%	-	0.7	a	Tukey's HSD
				2016	4.0%	5.6%	-0.6	-	a	
				2017	3.9%	3.3%	-0.6	0.0	a	
Hydracarina (% of community)	none	NO	0.5870	2015	4.2%	2.7%	-	0.3	a	Tukey's HSD
				2016	3.6%	2.0%	-0.2	-	a	
				2017	5.3%	3.0%	0.4	0.9	a	
Ostracoda (% of community)	modified probit	YES	0.0587	2015	20.9%	18.5%	-	-1.5	a	Tukey's HSD
				2016	46.9%	17.5%	1.4	-	b	
				2017	38.8%	18.4%	1.0	-0.5	a,b	
Chironomidae (% of community)	none	NO	0.2208	2015	66.5%	18.9%	-	1.1	a	Tukey's HSD
				2016	45.4%	18.8%	-1.1	-	a	
				2017	51.8%	17.9%	-0.8	0.3	a	
Metal Sensitive Taxa (% of community)	none	NO	0.5767	2015	11.4%	12.6%	-	-0.9	a	Tukey's HSD
				2016	19.3%	8.3%	0.6	-	a	
				2017	15.5%	13.4%	0.3	-0.4	a	
Collector-Gatherer FFG (% of community)	none	NO	0.7031	2015	81.4%	17.1%	-	0.6	a	Tukey's HSD
				2016	75.0%	11.4%	-0.4	-	a	
				2017	73.9%	16.0%	-0.4	-0.1	a	
Filterer FFG (% of community)	none	NO	0.8070	2015	11.4%	12.6%	-	-0.6	a	Tukey's HSD
				2016	16.1%	8.4%	0.4	-	a	
				2017	14.7%	13.3%	0.3	-0.2	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of initial year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.20: Statistical Comparison of Benthic Metrics at Reference Lake 3 Profundal (Deep) Stations Among Years of Mine Operation (2015, 2016, 2017) for the Mary River Project CREMP

Metric	Data Transformation	Overall 3-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Mean	Standard Deviation	Effect Size vs. Year 2015	Effect Size vs. Year 2016	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	< 0.001	2015	180	39	-	-5.0	a	Tukey's HSD
				2016	452	55	6.9	-	b	
				2017	149	32	-0.8	-5.5	a	
Richness (No. of Taxa)	none	NO	0.1888	2015	2.8	0.8	-	-0.9	a	Tukey's HSD
				2016	4.2	1.5	1.7	-	a	
				2017	4.2	1.5	1.7	0.0	a	
Simpson's Evenness	none	YES	0.0017	2015	0.397	0.232	-	3.2	a,b	Tamhane's
				2016	0.267	0.041	-0.6	-	a	
				2017	0.704	0.105	1.3	10.6	b	
Nemata (% of community)	modified probit	YES	0.0248	2015	1.0%	2.2%	-	nc	a	Tamhane's
				2016	0.0%	0.0%	-0.4	-	b	
				2017	0.0%	0.0%	-0.4	nc	b	
Hydracarina (% of community)	modified probit	NO	0.1011	2015	1.5%	3.3%	-	-0.3	a	Tukey's HSD
				2016	2.1%	2.1%	0.2	-	a	
				2017	8.2%	5.5%	2.0	2.8	a	
Ostracoda (% of community)	modified probit	NO	0.3837	2015	9.7%	13.1%	-	2.2	a	Tukey's HSD
				2016	5.7%	1.8%	-0.3	-	a	
				2017	2.8%	4.1%	-0.5	-1.5	a	
Chironomidae (% of community)	none	NO	0.6684	2015	87.4%	12.8%	-	-1.5	a	Tukey's HSD
				2016	92.2%	3.2%	0.4	-	a	
				2017	88.8%	7.2%	0.1	-1.1	a	
Metal Sensitive Taxa (% of community)	none	YES	0.0208	2015	2.8%	2.6%	-	0.6	a	Tamhane's
				2016	1.7%	1.7%	-0.4	-	a	
				2017	12.0%	8.9%	3.6	6.0	a	
Collector-Gatherer FFG (% of community)	none	YES	< 0.001	2015	96.2%	2.8%	-	-0.3	a	Tukey's HSD
				2016	96.9%	2.1%	0.2	-	a	
				2017	84.3%	4.1%	-4.2	-6.0	b	
Filterer FFG (% of community)	modified probit	YES	0.0469	2015	1.9%	2.7%	-	nc	a	Tamhane's
				2016	0.0%	0.0%	-0.7	-	a	
				2017	6.5%	9.3%	1.7	nc	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of initial year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.21: Statistical Comparison of Physical Sediment Quality Between Camp Lake and Reference Lake 3 for Samples Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	NO	0.810	α	Reference	5	9.74	1.04	0.46	8.50	11.20
					Camp	5	9.42	2.69	1.20	6.30	12.40
	Sand-Sized Particles (% by weight)	YES	0.072	α	Reference	5	46.4	13.9	6.2	25.6	59.9
					Camp	5	66.2	16.3	7.3	50.2	89.4
	Silt-Sized Particles (% by weight)	NO	0.176	α	Reference	5	44.3	11.6	5.2	32.8	62.2
					Camp	5	31.5	15.4	6.9	9.7	46.4
	Clay-Sized Particles (% by weight)	YES	<0.001	Ŧ	Reference	5	9.3	2.8	1.3	4.7	12.2
					Camp	5	2.2	1.0	0.4	1.0	3.4
	Total Organic Carbon (%)	YES	0.004	α	Reference	5	4.9	1.8	0.8	2.7	7.2
					Camp	5	1.3	0.7	0.3	0.9	2.6
Profundal (Deep) Stations	Station Depth (m)	NO	0.714	β	Reference	5	20.56	2.17	0.97	18.50	24.20
					Camp	5	23.46	9.70	4.34	16.20	35.10
	Sand-Sized Particles (% by weight)	YES	0.028	β	Reference	5	35.7	16.5	7.4	15.6	56.0
					Camp	5	66.1	16.0	7.1	47.6	87.1
	Silt-Sized Particles (% by weight)	YES	0.056	Ŧ	Reference	5	50.2	11.8	5.3	35.3	62.4
					Camp	5	30.9	14.4	6.5	11.7	47.9
	Clay-Sized Particles (% by weight)	YES	<0.001	Ŧ	Reference	5	14.1	5.2	2.3	8.8	22.0
					Camp	5	3.0	1.6	0.7	1.2	4.6
	Total Organic Carbon (%)	YES	0.005	α	Reference	5	3.6	1.1	0.5	1.8	4.4
					Camp	5	1.2	0.8	0.4	0.3	2.4

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted; Ŧ data square root transformed, t-test conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table F.22: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake, August 2017

Taxa	Study Area	Camp Lake - Littoral Stations 2017					Camp Lake - Profundal Stations 2017				
	Replicate Station	JLO-02	JLO-21	JLO-20	JLO-19	JLO-18	JLO-16	JLO-01	JLO-07	JLO-11	JLO-12
ROUNDWORMS											
P. Nemata		-	34	172	216	276	310	60	9	-	241
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae											
Lumbriculus		-	-	-	-	-	-	-	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina											
immature		-	-	**69**	-	**103**	-	**9**	-	**17**	-
F. Acalyptonotidae											
Acalyptonotus		-	17	34	52	69	34	9	-	-	9
F. Hygrobatidae											
Hygrobates		-	17	-	9	103	-	-	-	-	9
F. Lebertiidae											
Lebertia		-	-	-	-	-	-	9	-	34	17
HARPACTICOIDS											
O. Harpacticoida		-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS											
Cl. Ostracoda		-	34	-	-	-	-	-	-	17	-
FAIRY SHRIMP											
O. Notostraca											
Lepidurus arcticus		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
CADDISFLIES											
O. Trichoptera											
F. Apataniidae											
Apatania		34	34	69	-	-	-	-	-	-	9
TRUE FLIES											
O. Diptera											
MIDGES											
F. Chironomidae											
chironomid pupae		**69**	**34**	**138**	**26**	**34**	**69**	-	**9**	**17**	-
S.F. Chironominae											
Chironomus		-	-	-	-	-	345	-	-	-	-
Micropsectra		103	1,259	2,379	1,017	690	34	103	397	862	129
Paratanytarsus		207	284	-	121	-	34	-	60	-	34
Sergentia		-	-	-	-	-	-	-	17	17	-
Stictochironomus		276	1,103	103	78	241	69	-	103	86	-
Tanytarsus		-	379	517	129	103	276	-	-	-	26
S.F. Diamesinae		-	-	-	-	-	-	-	-	-	-
Protanypus		34	60	34	17	-	-	17	9	-	17
Pseudodiamesa		-	-	-	17	-	34	9	-	-	9
S.F. Orthocladiinae											
Abiskomyia		172	474	1,000	216	379	931	17	-	103	121
Chaetocladius		-	-	-	-	-	-	-	-	-	-
Corynoneura		-	-	-	-	-	34	-	-	-	-
Cricotopus/Orthocladius		34	-	-	-	-	-	-	-	-	-
Heterotrissocladius		1,241	224	448	172	724	345	276	431	17	1,552
Mesocricotopus		-	-	-	-	-	-	-	-	-	-
Paracladius		-	-	207	172	379	34	-	-	-	-
Parakiefferiella		-	-	-	-	-	-	-	-	-	9
Psectrocladius		-	-	-	-	-	-	-	-	-	-

Table F.22: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake, August 2017

Taxa	Study Area	Camp Lake - Littoral Stations 2017					Camp Lake - Profundal Stations 2017				
	Replicate Station	JLO-02	JLO-21	JLO-20	JLO-19	JLO-18	JLO-16	JLO-01	JLO-07	JLO-11	JLO-12
Zalutschia		-	-	34	112	69	-	-	9	-	9
Genus "Greenland"		-	34	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Arctopelopia		138	345	241	34	-	-	-	9	-	9
Procladius		69	60	345	60	34	-	-	26	34	9
F. Tipulidae											
Tipula		-	-	-	-	-	-	-	-	-	-
Density (No. organisms per m^2)		2,377	4,392	5,790	2,448	3,204	2,549	509	1,079	1,204	2,209
Richness (total number of taxa)[a]		10	15	13	15	11	12	8	10	8	16
Simpson's Evenness (E)		0.751	0.878	0.831	0.844	0.938	0.861	0.740	0.763	0.521	0.520
Bray-Curtis Index		0.807	0.785	0.821	0.690	0.709	0.916	0.629	0.855	0.949	0.903
Percent Composition											
% Nemata		0.0%	0.8%	3.0%	8.8%	8.6%	12.2%	11.8%	0.8%	0.0%	10.9%
% Hydracarina		0.0%	0.8%	1.8%	2.5%	8.6%	1.3%	5.3%	0.0%	4.2%	1.6%
% Ostracods		0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%
% Chironomids		98.6%	96.9%	94.1%	88.7%	82.8%	86.5%	82.9%	99.2%	94.4%	87.1%
% Metal Sensitive Chironmids		14.9%	45.5%	51.9%	53.8%	25.1%	15.3%	25.3%	43.6%	72.7%	9.7%
% Tipulidae		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Functional Feeding Group Composition											
% Collector - Gatherers		74.7%	45.1%	34.7%	36.6%	63.1%	84.7%	74.5%	53.2%	20.2%	88.2%
% Filterers		13.4%	0.44	0.51	0.52	0.25	0.14	0.20	0.43	0.73	0.09
% Shredders		1.5%	0.0%	0.6%	4.6%	2.2%	0.0%	0.0%	0.8%	0.0%	0.4%
Habitat Preference Group Composition											
% Clingers		7.4%	39.1%	54.3%	49.9%	33.6%	13.9%	25.5%	38.6%	78.3%	9.0%
% Sprawlers		79.2%	33.4%	40.3%	37.4%	50.1%	57.2%	59.3%	50.0%	14.5%	79.3%
% Burrowers		13.4%	27.5%	5.4%	12.7%	16.2%	28.9%	15.1%	11.3%	7.2%	11.7%

[a] Bold entries excluded from taxa coun

Table F.23: Statistical Comparison of Benthic Metrics at Camp Lake Littoral (Shallow) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2013) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2013	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0159	2013	4	7,752	3,849	-	a	Tamhane's
				2015	5	3,671	1,891	-1.1	a	
				2016	5	2,639	668	-1.3	a	
				2017	5	3,642	1,449	-1.1	a	
Richness (No. of Taxa)	none	NO	0.1056	2013	4	18.0	4.4	-	a	Tukey's HSD
				2015	5	12.8	3.7	-1.2	a	
				2016	5	15.8	3.3	-0.5	a	
				2017	5	12.8	2.3	-1.2	a	
Simpson's Evenness	none	YES	0.0002	2013	4	0.893	0.054	-	a	Tamhane's
				2015	5	0.712	0.063	-3.4	b	
				2016	5	0.917	0.034	0.4	a	
				2017	5	0.848	0.068	-0.8	a	
Nemata (% of community)	modified probit	NO	0.7231	2013	4	5.6%	3.6%	-	a	Tukey's HSD
				2015	5	4.7%	4.6%	-0.2	a	
				2016	5	4.4%	4.8%	-0.3	a	
				2017	5	4.2%	4.2%	-0.4	a	
Ostracoda (% of community)	modified probit	NO	0.1229	2013	4	0.7%	0.5%	-	a	Tukey's HSD
				2015	5	0.2%	0.3%	-1.0	a	
				2016	5	1.8%	1.1%	2.5	a	
				2017	5	0.2%	0.3%	-1.1	a	
Chironomidae (% of community)	modified probit	NO	0.4153	2013	4	90.1%	4.4%	-	a	Tukey's HSD
				2015	5	93.1%	4.7%	0.7	a	
				2016	5	87.4%	7.0%	-0.6	a	
				2017	5	92.2%	6.5%	0.5	a	
Metal Sensitive Taxa (% of community)	modified probit	NO	0.9345	2013	4	30.8%	14.6%	-	a	Tukey's HSD
				2015	5	38.5%	24.5%	0.5	a	
				2016	5	29.7%	11.8%	-0.1	a	
				2017	5	38.2%	17.3%	0.5	a	
Collector-Gatherer FFG (% of community)	modified probit	NO	0.3175	2013	4	55.9%	12.4%	-	a	Tukey's HSD
				2015	5	51.1%	14.7%	-0.4	a	
				2016	5	65.7%	7.8%	0.8	a	
				2017	5	50.8%	17.4%	-0.4	a	
Filterer FFG (% of community)	modified probit	NO	0.8432	2013	4	30.8%	14.5%	-	a	Tukey's HSD
				2015	5	38.2%	24.3%	0.5	a	
				2016	5	25.0%	7.5%	-0.4	a	
				2017	5	37.3%	17.3%	0.4	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.24: Statistical Comparison of Benthic Metrics at Camp Lake Profundal (Deep) Stations Among Years of Mine Operation (2015, 2017) and Baseline (2007, 2013) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2013	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	NO	0.3007	2007	4	2,627	1,403	-	0.9	a	Tukey's HSD
				2013	5	2,140	567	-0.3	-	a	
				2015	5	1,552	1,005	-0.8	-1.0	a	
				2017	5	1,510	844	-0.8	-1.1	a	
Richness (No. of Taxa)	none	YES	0.0214	2007	4	9.0	1.7	-	-1.8	a	Tukey's HSD
				2013	5	14.2	2.9	3.0	-	b	
				2015	5	8.2	2.8	-0.5	-2.0	a	
				2017	5	10.8	3.3	1.0	-1.2	a,b	
Simpson's Evenness	none	NO	0.7081	2007	4	0.602	0.114	-	-1.0	a	Tukey's HSD
				2013	5	0.720	0.122	1.0	-	a	
				2015	5	0.604	0.283	0.0	-0.9	a	
				2017	5	0.681	0.154	0.7	-0.3	a	
Nemata (% of community)	modified probit	NO	0.8652	2007	4	3.5%	3.1%	-	-0.3	a	Tukey's HSD
				2013	5	4.4%	3.2%	0.3	-	a	
				2015	5	6.7%	10.4%	1.0	0.7	a	
				2017	5	7.1%	6.2%	1.2	0.9	a	
Ostracoda (% of community)	modified probit	NO	0.5498	2007	4	0.0%	0.1%	-	-0.8	a	Tukey's HSD
				2013	5	0.4%	0.4%	4.9	-	a	
				2015	5	0.3%	0.7%	3.6	-0.2	a	
				2017	5	0.3%	0.6%	3.3	-0.3	a	
Chironomidae (% of community)	modified probit	NO	0.7007	2007	4	94.9%	4.3%	-	0.8	a	Tukey's HSD
				2013	5	91.1%	4.7%	-0.9	-	a	
				2015	5	90.4%	11.3%	-1.1	-0.1	a	
				2017	5	90.0%	6.6%	-1.1	-0.2	a	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0241	2007	4	34.8%	4.8%	-	-0.3	a	Tukey's HSD
				2013	5	39.5%	17.2%	1.0	-	a	
				2015	5	11.7%	7.3%	-4.9	-1.6	b	
				2017	5	33.3%	25.5%	-0.3	-0.4	a,b	
Collector-Gatherer FFG (% of community)	modified probit	YES	0.0810	2007	4	64.6%	6.1%	-	0.4	a,b	Tukey's HSD
				2013	5	57.0%	19.9%	-1.3	-	a	
				2015	5	84.7%	7.3%	3.3	1.4	b	
				2017	5	64.2%	28.1%	-0.1	0.4	a,b	
Filterer FFG (% of community)	modified probit	YES	0.0371	2007	4	32.6%	4.0%	-	-0.3	a	Tamhane's
				2013	5	37.5%	16.8%	1.2	-	a	
				2015	5	11.4%	6.8%	-5.3	-1.6	b	
				2017	5	31.6%	26.4%	-0.2	-0.3	a,b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.25: Summary of Habitat Features at Sheardown Lake Tributary and Unnamed Reference Creek Study Areas Evaluated for the 2017 Mary River Project CREMP Benthic Invertebrate Community Assessment

Habitat Characteristic		Reference Creek	Sheardown Lake Tributaries		
		REF-CRK	SDLT1	SDLT12	SDLT9
Mean Width (m)	Wetted	11.1	5.3	1.5	0.8
Mean Depth (m)	Average	0.09	0.08	0.10	0.03
Mean Velocity (m/s)	Average	0.28	0.40	0.06	0.13
Stream Morphology	% Pool	8	0	20	0
	% Rapid	0	5	20	0
	% Riffle	83	85	40	50
	% Run	10	10	20	50
Substrate (% areal coverage)		3% boulder 32% cobble 48% pebble 10% gravel 7% sand	10% boulder 87% cobble 3% pebble	70% boulder 25% cobble 5% pebble trace silt	5% boulder 40% cobble 20% pebble 20% gravel 15% sand
Mean Substrate Size (mm)		47	100	219	73
Aquatic Vegetation (% areal coverage)	Bryophyte Coverage	trace	8%	none observed	3%
	Periphyton Coverage	28%	none observed	80%	70%
	Periphyton Description	Rock noticeably slippery, green algae present (1-5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)	Rocks noticeably slippery, patches of thicker green to brown algae (1-5 mm thick)	Rock noticeably slippery, green algae present (1-5 mm thick)
Functional Instream Cover (% areal coverage)		5% deep pool	2.5% boulder	1 % boulder	trace boulder 5% macrophytes

Table F.26: Replicate Grab Habitat Data for Benthic Invertebrate Community Samples Collected at the Sheardown Lake Tributaries, Mary River Project CREMP, August 2017

Study Area	Station	Water Depth (cm)			Water Velocity (m/s)			Substrate Size[a] (cm)			Embeddedness			In-Stream Vegetation			Algae Presence		
		Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3
Unnamed Reference Creek	REF-CRK-B1	8	6	9	0.39	0.44	0.44	56.9	43.3	62.3	25%	13%	25%	scarce	scarce	scarce	scarce	scarce	scarce
	REF-CRK-B2	8	8	6	0.47	0.47	0.46	85.8	58.3	58.6	25%	25%	38%	common	scarce	common	common	scarce	common
	REF-CRK-B3	10	10	9	0.49	0.59	0.57	67.8	50.0	48.0	25%	13%	38%	scarce	scarce	none	scarce	scarce	scarce
	REF-CRK-B4	11	11	9	0.51	0.38	0.39	64.1	50.0	51.6	13%	13%	25%	none	none	none	scarce	scarce	common
	REF-CRK-B5	7	7	8	0.42	0.41	0.53	69.6	56.8	46.5	25%	25%	25%	none	none	none	common	common	common
Sheardown Tributary 1 Reach 1	SDLT1 - B1	9	9	8	0.33	0.43	0.45	72.1	80.5	73.8	0%	0%	13%	common	common	common	scarce	scarce	scarce
	SDLT1 - B2	11	9	7	-	-	-	72.0	64.3	56.3	13%	25%	13%	common	scarce	scarce	common	common	common
	SDLT1 - B3	14	10	8	-	-	-	79.1	82.2	72.3	25%	25%	13%	scarce	common	scarce	common	scarce	common
	SDLT1 - B4	10	8	8	0.53	0.44	0.50	83.9	84.0	80.8	13%	25%	50%	scarce	common	scarce	scarce	scarce	scarce
	SDLT1 - B5	13	11	9	0.58	0.39	0.45	65.9	70.0	54.1	25%	25%	25%	common	scarce	scarce	none	none	none
Sheardown Tributary 9	SDLT9 - B1	2	2	2	0.22	0.17	0.18	4.4	8.3	5.8	50%	50%	50%	scarce	scarce	scarce	common	common	common
	SDLT9 - B2	2	4	4	0.18	0.31	0.20	6.6	5.7	5.4	-	-	-	scarce	scarce	scarce	common	common	common
	SDLT9 - B3	2	4	6	0.34	0.22	0.24	4.4	4.7	4.3	50%	50%	50%	scarce	scarce	scarce	common	common	common
	SDLT9 - B4	4	6	4	0.18	0.17	0.16	4.4	5.9	6.4	50%	50%	50%	scarce	scarce	scarce	common	common	common
	SDLT9 - B5	4	2	5	0.29	0.12	0.31	5.2	6.5	5.2	50%	50%	50%	scarce	scarce	scarce	common	common	common
Sheardown Tributary 12	SDLT12 - B1	2	6	2	0.17	0.18	0.16	6.2	5.6	5.0	25%	-	25%	scarce	scarce	scarce	common	common	common
	SDLT12 - B2	4	4	4	0.12	0.14	0.11	4.0	7.2	7.9	25%	50%	50%	scarce	scarce	scarce	common	common	common
	SDLT12 - B3	4	2	2	0.12	0.14	0.11	6.3	5.9	6.5	50%	50%	50%	scarce	scarce	scarce	common	common	common

[a] Substrate measurements taken from the intermediate axis of each individual particle observed within the Surber sampler area as viewed from the surface prior to sampling. Sample size ranged from 6 - 11 per replicate grab, with a mean of 8 for the SDLT stations in 2017.

Table F.27: Replicate Station Habitat Feature Summary Statistics for the Sheardown Lake Tributary Benthic Stations, Mary River Project CREMP, August 2017

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Depth (cm)	Unnamed Reference Creek	8.5	1.4	0.6	6.7	10.2	7.3	10.3
	Sheardown Tributary 1 (SDLT1)	9.6	1.1	0.5	8.2	11.0	8.7	11.0
	Sheardown Tributary 12 (SDLT12)	3.3	0.7	0.4	1.7	5.0	2.7	4.0
	Sheardown Tributary 9 (SDLT9)	3.5	1.0	0.4	2.3	4.8	2.0	4.7
Water Velocity (cm/s)	Unnamed Reference Creek	46.4	5.1	2.3	40.0	52.8	42.3	55.0
	Sheardown Tributary 1 (SDLT1)	45.6	4.6	2.7	34.1	57.0	40.3	49.0
	Sheardown Tributary 12 (SDLT12)	13.9	2.7	1.6	7.2	20.6	12.3	17.0
	Sheardown Tributary 9 (SDLT9)	21.9	3.9	1.7	17.1	26.8	17.0	26.7
Substrate Size (mm diameter)	Unnamed Reference Creek	58.0	5.5	2.5	51.1	64.8	54.1	67.6
	Sheardown Tributary 1 (SDLT1)	72.7	8.6	3.9	62.0	83.5	63.3	82.9
	Sheardown Tributary 12 (SDLT12)	60.6	4.0	2.3	50.6	70.6	56.0	63.6
	Sheardown Tributary 9 (SDLT9)	55.5	6.6	3.0	47.2	63.7	44.4	61.7
Substrate Embeddedness (%)	Unnamed Reference Creek	23	5	2	17	29	17	29
	Sheardown Tributary 1 (SDLT1)	19	10	4	7	31	4	29
	Sheardown Tributary 12 (SDLT12)	39	13	7	7	71	25	50
	Sheardown Tributary 9 (SDLT9)	48	4	2	44	53	42	50

Note: Five stations were sampled at SDLT1 and SDLT9, and three stations were sampled at SDLT12.

Table F.28: Benthic Station Habitat Feature Statistical Comparisons Between Individual Sheardown Lake Tributaries and Unnamed Reference Creek, Mary River Project CREMP, August 2017

Metric	Pair-wise comparisons[a]				
	(I) Area	(J) Area	Significant Difference Between Areas?	P-value	Statistical Test[b]
Water Depth (cm)	Unnamed Reference Creek	SDLT1	NO	0.4111	α , ζ
	Unnamed Reference Creek	SDLT12	YES	0.0001	
	Unnamed Reference Creek	SDLT9	YES	0.0000	
Water Velocity (cm/s)	Unnamed Reference Creek	SDLT1	NO	0.9930	α , ζ
	Unnamed Reference Creek	SDLT12	YES	0.0000	
	Unnamed Reference Creek	SDLT9	YES	0.0000	
Substrate Size (mm diameter)	Unnamed Reference Creek	SDLT1	YES	0.0166	β , ζ
	Unnamed Reference Creek	SDLT12	NO	0.9442	
	Unnamed Reference Creek	SDLT9	NO	0.9370	
Substrate Embeddedness (%)	Unnamed Reference Creek	SDLT1	NO	0.5476	γ
	Unnamed Reference Creek	SDLT12	NO	0.1429	
	Unnamed Reference Creek	SDLT9	YES	0.0079	

Note: Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; ζ - Tukey's HSD post-hoc test used; η - Tamhane's post-hoc test used; γ - non-parametric Kruskal Wallis (multiple group) and Mann-Whitney U-tests (pair-wise) used on untransformed data

Table F.29: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributaries 1 and 12, August 2017

Taxa	Study Area	Sheardown Lake Tributary 1 (SDLT1) - Lower Reach					Sheardown Lake Tributary 12 (SDLT12)		
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3
ROUNDWORMS									
P. Nemata		172	32	14	7	7	57	18	65
ANNELIDS									
P. Annelida									
WORMS									
Cl. Oligochaeta									
F. Enchytraeidae		86	50	115	57	90	445	108	54
F. Lumbriculidae									
Lumbriculus		-	-	7	-	4	-	-	-
ARTHROPODS									
P. Arthropoda									
MITES									
Cl. Arachnida									
O. Acarina		-	-	-	-	-	-	-	-
F. Sperchonidae									
Sperchon		86	25	115	29	18	-	-	-
HARPACTICOIDS									
O. Harpacticoida		-	-	-	-	-	-	-	-
SEED SHRIMPS									
Cl. Ostracoda		-	-	-	-	-	-	-	-
SPRINGTAILS									
Cl. Entognatha									
O. Collembola		-	-	-	-	-	-	7	7
INSECTS									
Cl. Insecta									
MAYFLIES									
O. Ephemeroptera									
F. Baetidae									
Acentrella feropagus		-	-	-	-	-	-	-	-
STONEFLIES									
O. Plecoptera									
F. Capniidae									
immature		-	-	-	-	-	-	-	-
CADDISFLIES									
O. Trichoptera									
F. Limnephilidae									
immature		-	-	-	-	-	-	-	-
TRUE FLIES									
O. Diptera									
BITING-MIDGE									
F. Ceratopogonidae									
indeterminate		-	-	-	-	-	-	-	-
Culicoides		-	-	-	-	-	-	-	-
MIDGES									
F. Chironomidae									
chironomid pupae		**86**	**32**	**22**	**43**	**29**	7	**-**	**-**
S.F. Chironominae									
Micropsectra		-	-	-	-	-	-	-	-
Paratanytarsus		-	-	-	-	-	22	14	22
Rheotanytarsus		832	36	50	144	4	-	-	-
S.F. Diamesinae									
Diamesa		-	-	-	-	-	108	100	11
Pseudokiefferiella		660	72	244	309	50	-	-	-
S.F. Orthocladiinae									
Cardiocladius		-	-	-	-	-	-	-	-
Chaetocladius		-	-	-	-	-	29	43	4
Corynoneura		-	-	-	-	-	-	-	-
Cricotopus		1206	280	481	172	72	-	4	7
Cricotopus/Orthocladius		201	25	36	-	7	29	29	11
Diplocladius		-	-	-	-	-	158	100	14
Eukiefferiella		-	4	22	-	-	14	-	7
Hydrobaenus		-	-	-	-	-	-	-	-
Hydrosmittia		832	183	309	86	83	7	-	-

Table F.29: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributaries 1 and 12, August 2017

Taxa	Study Area	Sheardown Lake Tributary 1 (SDLT1) - Lower Reach					Sheardown Lake Tributary 12 (SDLT12)		
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3
Krenosmittia		-	-	-	-	4	29	4	-
Limnophyes		-	-	-	-	-	57	-	36
Metriocnemus		-	-	-	-	-	50	29	18
Nanocladius		-	-	57	-	-	-	-	-
Orthocladius (Euorthocladius)		86	4	-	7	4	-	-	-
Parakiefferiella		57	4	7	-	-	-	-	-
Parametriocnemus		-	-	-	-	-	-	-	-
Paraphaenocladius		-	-	-	-	-	122	47	43
Rheocricotopus		-	-	-	-	4	-	-	-
Thienemanniella		144	14	86	65	29	-	-	-
Tokunagaia		-	7	-	-	-	93	36	11
Tvetenia		-	11	-	14	-	-	-	-
indeterminate		-	-	-	-	-	129	36	**14**
S.F. Podonominae									
Trichotanypus		-	-	-	-	-	-	4	-
S.F. Tanypodinae									
Thienemannimyia complex		29	-	7	-	4	-	-	-
F. Empididae									
Clinocera		-	-	-	-	-	-	-	-
pupae		-	-	-	-	-	-	-	-
F. Muscidae		-	-	-	-	-	-	-	-
F. Simuliidae									
Gymnopais		-	-	-	-	-	-	-	-
Metacnephia		-	-	-	-	-	-	-	-
Prosimulium		-	-	7	-	-	-	-	-
Simulium baffinense		-	-	-	-	-	-	-	-
pupae		-	-	-	-	-	-	-	-
F. Tipulidae									
Ormosia		-	-	-	-	-	-	7	-
Tipula		22	11	32	25	29	54	25	4
indeterminate		-	-	-	-	4	-	-	-
Number of Organisms (No. organisms per m^2)		4,499	790	1,611	958	442	1,410	611	328
Richness (total number of taxa)[a]		13	15	16	11	15	15	16	15
Simpson's Evenness (E)		0.894	0.838	0.885	0.884	0.914	0.908	0.940	0.946
Bray-Curtis Index		0.908	0.832	0.870	0.879	0.866	0.851	0.924	0.791
Percent Composition									
% Nemata		3.8%	4.1%	0.9%	0.7%	1.6%	4.0%	2.9%	19.8%
% Oligochaeta		1.9%	6.3%	7.6%	5.9%	21.3%	31.6%	17.7%	16.5%
% Hydracarina		1.9%	3.2%	7.1%	3.0%	4.1%	0.0%	0.0%	0.0%
% Ostracods		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Ephemeroptera		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Chironomids		91.9%	85.1%	82.0%	87.7%	65.6%	60.6%	73.0%	60.4%
% Metal Sensitive Chironmids		33.9%	14.4%	18.6%	49.9%	13.8%	9.4%	18.7%	10.1%
% Simuliidae		0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%
% Tipulidae		0.5%	1.4%	2.0%	2.6%	7.5%	3.8%	5.2%	1.2%
Functional Feeding Group Composition									
% Collector - Gatherers		46.1%	50.1%	54.1%	59.6%	66.5%	92.1%	87.4%	86.0%
% Filterers		18.9%	4.8%	3.6%	15.9%	1.1%	1.6%	2.3%	6.7%
% Shredders		32.4%	41.9%	34.7%	21.5%	27.4%	6.3%	10.3%	7.3%
Habitat Preference Group Composition									
% Clingers		52.7%	48.5%	43.5%	37.8%	25.1%	2.5%	6.2%	6.1%
% Sprawlers		41.0%	39.7%	46.1%	52.9%	44.6%	53.8%	61.4%	48.2%
% Burrowers		6.2%	11.8%	10.4%	9.3%	30.3%	43.8%	31.3%	43.6%

[a] Bold entries excluded from taxa count

Table F.30: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 9, August 2017

Taxa	Study Area	Sheardown Lake Tributary 9 (SDLT9)				
	Replicate Station	B1	B2	B3	B4	B5
ROUNDWORMS						
P. Nemata		65	474	1,521	108	158
ANNELIDS						
P. Annelida						
WORMS						
Cl. Oligochaeta						
F. Enchytraeidae		93	57	273	57	-
F. Lumbriculidae						
Lumbriculus		-	-	-	-	-
ARTHROPODS						
P. Arthropoda						
MITES						
Cl. Arachnida						
O. Acarina		-	-	-	-	-
F. Sperchonidae						
Sperchon		54	57	72	151	86
HARPACTICOIDS						
O. Harpacticoida		-	-	14	-	-
SEED SHRIMPS						
Cl. Ostracoda		61	14	14	36	22
SPRINGTAILS						
Cl. Entognatha						
O. Collembola		11	14	-	-	36
INSECTS						
Cl. Insecta						
MAYFLIES						
O. Ephemeroptera						
F. Baetidae						
Acentrella feropagus		7	14	115	7	7
STONEFLIES						
O. Plecoptera						
F. Capniidae						
immature		-	-	-	-	-
CADDISFLIES						
O. Trichoptera						
F. Limnephilidae						
immature		-	-	-	-	14
TRUE FLIES						
O. Diptera						
BITING-MIDGE						
F. Ceratopogonidae						
indeterminate		7	57	-	-	-
Culicoides		-	-	-	-	-
MIDGES						
F. Chironomidae						
chironomid pupae		**22**	**129**	**172**	**287**	**136**
S.F. Chironominae						
Micropsectra		-	57	-	-	-
Paratanytarsus		-	-	-	-	-
Rheotanytarsus		-	-	-	-	-
S.F. Diamesinae						
Diamesa		-	-	72	61	-
Pseudokiefferiella		-	-	-	11	-
S.F. Orthocladiinae						
Cardiocladius		-	-	-	-	-
Chaetocladius		22	-	14	11	43
Corynoneura		29	43	201	-	-
Cricotopus		136	775	72	359	703
Cricotopus/Orthocladius		187	459	976	75	72
Diplocladius		118	-	-	61	-
Eukiefferiella		-	-	172	-	-
Hydrobaenus		-	-	-	-	-
Hydrosmittia		-	43	43	61	14

Table F.30: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 9, August 2017

Taxa	Study Area	Sheardown Lake Tributary 9 (SDLT9)				
	Replicate Station	B1	B2	B3	B4	B5
Krenosmittia		50	474	402	147	172
Limnophyes		-	43	29	14	-
Metriocnemus		36	43	57	-	-
Nanocladius		-	-	-	-	-
Orthocladius (Euorthocladius)		-	-	-	-	-
Parakiefferiella		-	-	-	-	-
Parametriocnemus		-	-	-	-	-
Paraphaenocladius		4	-	-	-	-
Rheocricotopus		-	-	-	-	-
Thienemanniella		14	29	57	25	43
Tokunagaia		47	359	861	739	402
Tvetenia		7	43	115	50	-
indeterminate		**151**	**1636**	459	136	57
S.F. Podonominae						
Trichotanypus		11	86	72	-	14
S.F. Tanypodinae						
Thienemannimyia complex		-	-	-	-	-
F. Empididae						
Clinocera		-	14	-	14	7
pupae		4	29	-	-	-
F. Muscidae		-	-	-	-	-
F. Simuliidae						
Gymnopais		-	-	-	7	-
Metacnephia		-	-	-	-	-
Prosimulium		4	14	-	7	-
Simulium baffinense		18	-	29	-	-
pupae		-	-	-	-	-
F. Tipulidae						
Ormosia		-	-	-	-	-
Tipula		197	97	111	222	50
indeterminate		-	-	-	-	-
Number of Organisms (No. organisms per m^2)		1,355	5,060	5,923	2,646	2,036
Richness (total number of taxa)[a]		23	22	22	21	16
Simpson's Evenness (E)		0.943	0.888	0.890	0.864	0.828
Bray-Curtis Index		0.798	0.873	0.845	0.795	0.839
Percent Composition						
% Nemata		4.8%	9.4%	25.7%	4.1%	7.8%
% Oligochaeta		6.9%	1.1%	4.6%	2.2%	0.0%
% Hydracarina		4.0%	1.1%	1.2%	5.7%	4.2%
% Ostracods		4.5%	0.3%	0.2%	1.4%	1.1%
% Ephemeroptera		0.5%	0.3%	1.9%	0.3%	0.3%
% Chironomids		61.5%	83.4%	63.7%	77.0%	81.3%
% Metal Sensitive Chironmids		0.0%	1.2%	1.3%	3.2%	0.0%
% Simuliidae		1.6%	0.3%	0.5%	0.5%	0.0%
% Tipulidae		14.5%	1.9%	1.9%	8.4%	2.5%
Functional Feeding Group Composition						
% Collector - Gatherers		48.9%	50.6%	75.0%	64.0%	49.1%
% Filterers		1.6%	1.4%	0.5%	0.5%	0.0%
% Shredders		44.7%	44.9%	23.2%	29.3%	46.3%
Habitat Preference Group Composition						
% Clingers		36.1%	45.2%	23.1%	27.6%	47.7%
% Sprawlers		33.1%	39.5%	43.6%	57.7%	40.3%
% Burrowers		30.0%	15.0%	33.3%	14.6%	10.2%

[a] Bold entries excluded from taxa count

Table F.31: Benthic Invertebrate Community Summary Statistics for the Sheardown Lake Tributaries, Mary River Project CREMP, August 2017

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Density (no. organisms / m^2)	Unnamed Reference Creek	1,972	1,861	832	-339	4,282	817	5,229
	Sheardown Tributary 1 (SDLT1)	1,660	1,643	735	-380	3,700	442	4,499
	Sheardown Tributary 12 (SDLT12)	783	561	324	-611	2,177	328	1,410
	Sheardown Tributary 9 (SDLT9)	3,404	1,983	887	942	5,866	1,355	5,923
Richness (Number of Taxa)	Unnamed Reference Creek	21.2	1.9	0.9	18.8	23.6	19.0	24.0
	Sheardown Tributary 1 (SDLT1)	14.0	2.0	0.9	11.5	16.5	11.0	16.0
	Sheardown Tributary 12 (SDLT12)	15.3	0.6	0.3	13.9	16.8	15.0	16.0
	Sheardown Tributary 9 (SDLT9)	20.8	2.8	1.2	17.4	24.2	16.0	23.0
Simpson's Evenness	Unnamed Reference Creek	0.935	0.017	0.008	0.913	0.956	0.909	0.951
	Sheardown Tributary 1 (SDLT1)	0.883	0.028	0.012	0.848	0.917	0.838	0.914
	Sheardown Tributary 12 (SDLT12)	0.931	0.021	0.012	0.881	0.982	0.908	0.946
	Sheardown Tributary 9 (SDLT9)	0.883	0.042	0.019	0.830	0.935	0.828	0.943
Bray-Curtis Index	Unnamed Reference Creek	0.305	0.205	0.092	0.050	0.560	0.173	0.664
	Sheardown Tributary 1 (SDLT1)	0.871	0.027	0.012	0.837	0.905	0.832	0.908
	Sheardown Tributary 12 (SDLT12)	0.855	0.067	0.039	0.689	1.021	0.791	0.924
	Sheardown Tributary 9 (SDLT9)	0.830	0.033	0.015	0.789	0.871	0.795	0.873
Nemata (% of community)	Unnamed Reference Creek	8.8%	3.5%	1.6%	4.4%	13.2%	3.1%	12.7%
	Sheardown Tributary 1 (SDLT1)	2.2%	1.6%	0.7%	0.2%	4.2%	0.7%	4.1%
	Sheardown Tributary 12 (SDLT12)	8.9%	9.5%	5.5%	-14.6%	32.4%	2.9%	19.8%
	Sheardown Tributary 9 (SDLT9)	10.4%	8.8%	4.0%	-0.6%	21.3%	4.1%	25.7%
Oligochaeta (% of community)	Unnamed Reference Creek	1.0%	1.4%	0.6%	-0.7%	2.7%	0.0%	2.9%
	Sheardown Tributary 1 (SDLT1)	8.6%	7.4%	3.3%	-0.6%	17.8%	1.9%	21.3%
	Sheardown Tributary 12 (SDLT12)	21.9%	8.4%	4.8%	1.1%	42.8%	16.5%	31.6%
	Sheardown Tributary 9 (SDLT9)	3.0%	2.8%	1.2%	-0.5%	6.4%	0.0%	6.9%
Hydracarina (% of community)	Unnamed Reference Creek	4.8%	2.3%	1.0%	2.0%	7.6%	2.2%	7.7%
	Sheardown Tributary 1 (SDLT1)	3.9%	2.0%	0.9%	1.4%	6.3%	1.9%	7.1%
	Sheardown Tributary 12 (SDLT12)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Sheardown Tributary 9 (SDLT9)	3.2%	2.0%	0.9%	0.7%	5.7%	1.1%	5.7%
Ostracoda (% of community)	Unnamed Reference Creek	3.6%	2.6%	1.2%	0.4%	6.8%	0.8%	6.2%
	Sheardown Tributary 1 (SDLT1)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Sheardown Tributary 12 (SDLT12)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Sheardown Tributary 9 (SDLT9)	1.5%	1.8%	0.8%	-0.7%	3.7%	0.2%	4.5%
Ephemeroptera (% of community)	Unnamed Reference Creek	13.8%	6.0%	2.7%	6.4%	21.3%	3.6%	19.3%
	Sheardown Tributary 1 (SDLT1)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Sheardown Tributary 12 (SDLT12)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Sheardown Tributary 9 (SDLT9)	0.7%	0.7%	0.3%	-0.2%	1.5%	0.3%	1.9%
Chironomidae (% of community)	Unnamed Reference Creek	37.9%	11.1%	5.0%	24.1%	51.7%	25.3%	55.7%
	Sheardown Tributary 1 (SDLT1)	82.5%	10.1%	4.5%	69.9%	95.0%	65.6%	91.9%
	Sheardown Tributary 12 (SDLT12)	64.7%	7.2%	4.2%	46.7%	82.6%	60.4%	73.0%
	Sheardown Tributary 9 (SDLT9)	73.4%	10.1%	4.5%	60.8%	86.0%	61.5%	83.4%
Metal-Sensitive Chironomidae (% of community)	Unnamed Reference Creek	5.7%	5.7%	2.5%	-1.3%	12.7%	1.7%	15.7%
	Sheardown Tributary 1 (SDLT1)	26.1%	15.6%	7.0%	6.8%	45.5%	13.8%	49.9%
	Sheardown Tributary 12 (SDLT12)	12.7%	5.2%	3.0%	-0.1%	25.6%	9.4%	18.7%
	Sheardown Tributary 9 (SDLT9)	1.1%	1.3%	0.6%	-0.5%	2.8%	0.0%	3.2%
Simuliidae (% of community)	Unnamed Reference Creek	28.3%	6.6%	3.0%	20.1%	36.5%	23.0%	39.3%
	Sheardown Tributary 1 (SDLT1)	0.1%	0.2%	0.1%	-0.1%	0.3%	0.0%	0.4%
	Sheardown Tributary 12 (SDLT12)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Sheardown Tributary 9 (SDLT9)	0.6%	0.6%	0.3%	-0.2%	1.3%	0.0%	1.6%
Tipulidae (% of community)	Unnamed Reference Creek	0.7%	0.4%	0.2%	0.1%	1.2%	0.3%	1.4%
	Sheardown Tributary 1 (SDLT1)	2.8%	2.7%	1.2%	-0.6%	6.2%	0.5%	7.5%
	Sheardown Tributary 12 (SDLT12)	3.4%	2.0%	1.2%	-1.6%	8.4%	1.2%	5.2%
	Sheardown Tributary 9 (SDLT9)	5.8%	5.6%	2.5%	-1.1%	12.7%	1.9%	14.5%

Table F.31: Benthic Invertebrate Community Summary Statistics for the Sheardown Lake Tributaries, Mary River Project CREMP, August 2017

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	58.8%	7.2%	3.2%	49.9%	67.6%	51.8%	69.3%
	Sheardown Tributary 1 (SDLT1)	55.3%	8.0%	3.6%	45.3%	65.2%	46.1%	66.5%
	Sheardown Tributary 12 (SDLT12)	88.5%	3.2%	1.8%	80.6%	96.4%	86.0%	92.1%
	Sheardown Tributary 9 (SDLT9)	57.5%	11.6%	5.2%	43.1%	72.0%	48.9%	75.0%
Filterer FFG (% of community)	Unnamed Reference Creek	28.6%	6.5%	2.9%	20.6%	36.7%	23.0%	39.3%
	Sheardown Tributary 1 (SDLT1)	8.9%	8.0%	3.6%	-1.0%	18.8%	1.1%	18.9%
	Sheardown Tributary 12 (SDLT12)	3.5%	2.8%	1.6%	-3.3%	10.4%	1.6%	6.7%
	Sheardown Tributary 9 (SDLT9)	0.8%	0.7%	0.3%	0.0%	1.6%	0.0%	1.6%
Shredder FFG (% of community)	Unnamed Reference Creek	6.7%	5.5%	2.4%	-0.1%	13.5%	2.7%	16.3%
	Sheardown Tributary 1 (SDLT1)	31.6%	7.7%	3.4%	22.0%	41.1%	21.5%	41.9%
	Sheardown Tributary 12 (SDLT12)	8.0%	2.1%	1.2%	2.8%	13.1%	6.3%	10.3%
	Sheardown Tributary 9 (SDLT9)	37.7%	10.7%	4.8%	24.4%	50.9%	23.2%	46.3%
Clinger HPG (% of community)	Unnamed Reference Creek	40.1%	7.8%	3.5%	30.4%	49.7%	28.8%	47.8%
	Sheardown Tributary 1 (SDLT1)	41.5%	10.7%	4.8%	28.2%	54.9%	25.1%	52.7%
	Sheardown Tributary 12 (SDLT12)	4.9%	2.1%	1.2%	-0.3%	10.2%	2.5%	6.2%
	Sheardown Tributary 9 (SDLT9)	35.9%	10.7%	4.8%	22.6%	49.2%	23.1%	47.7%
Sprawler HPG (% of community)	Unnamed Reference Creek	49.0%	9.2%	4.1%	37.6%	60.5%	37.0%	58.8%
	Sheardown Tributary 1 (SDLT1)	44.9%	5.2%	2.3%	38.4%	51.3%	39.7%	52.9%
	Sheardown Tributary 12 (SDLT12)	54.5%	6.6%	3.8%	38.0%	70.9%	48.2%	61.4%
	Sheardown Tributary 9 (SDLT9)	42.8%	9.1%	4.1%	31.5%	54.2%	33.1%	57.7%
Burrower HPG (% of community)	Unnamed Reference Creek	10.7%	4.5%	2.0%	5.2%	16.3%	4.0%	15.1%
	Sheardown Tributary 1 (SDLT1)	13.6%	9.6%	4.3%	1.7%	25.5%	6.2%	30.3%
	Sheardown Tributary 12 (SDLT12)	39.6%	7.2%	4.1%	21.8%	57.4%	31.3%	43.8%
	Sheardown Tributary 9 (SDLT9)	20.6%	10.3%	4.6%	7.8%	33.4%	10.2%	33.3%

Note: Sample size equals five for SDLT1 and SDLT9, and three for SDLT12.

Table F.32: Benthic Invertebrate Community Metric Statistical Comparisons between Individual Sheardown Lake Tributaries and Unnamed Reference Creek, Mary River Project CREMP, August 2017

Metric	Data Transform-ation	Overall 4-Area Comparison[a]		Pair-wise, post-hoc comparisons[a]					
		Significant Difference Among Areas?	P-value	Area	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Reference	Pairwise Comparison
Density (No. per m^2)	log	YES	0.0870	Reference	5	1,972	1,861	-	a,b
				SDLT1	5	1,660	1,643	-0.2	a,b
				SDLT12	3	783	561	-0.6	b
				SDLT9	5	3,404	1,983	0.8	a
Richness (No. of Taxa)	none	YES	< 0.001	Reference	5	21.2	1.9	-	a
				SDLT1	5	14.0	2.0	-3.7	b
				SDLT12	3	15.3	0.6	-3.0	b
				SDLT9	5	20.8	2.8	-0.2	a
Simpson's Evenness	none	YES	0.0010	Reference	5	0.935	0.017	-	a
				SDLT1	5	0.883	0.028	-3.0	b
				SDLT12	3	0.931	0.021	-0.2	a,b
				SDLT9	5	0.883	0.042	-3.0	b
Bray Curtis Index	rank	YES	0.0011	Reference	5	0.305	0.205	-	a
				SDLT1	5	0.871	0.027	2.8	b
				SDLT12	3	0.855	0.067	2.7	b
				SDLT9	5	0.830	0.033	2.6	b
Nemata (% of community)	fourth root	YES	0.0353	Reference	5	8.8%	3.5%	-	a
				SDLT1	5	2.2%	1.6%	-1.9	b
				SDLT12	3	8.9%	9.5%	0.0	a.b
				SDLT9	5	10.4%	8.8%	0.4	a
Oligochaeta (% of community)	fourth root	YES	0.0041	Reference	5	1.0%	1.4%	-	a
				SDLT1	5	8.6%	7.4%	5.5	b,c
				SDLT12	3	21.9%	8.4%	15.2	b
				SDLT9	5	3.0%	2.8%	1.4	a,c
Hydracarina (% of community)	fourth root	YES	< 0.001	Reference	5	4.8%	2.3%	-	a
				SDLT1	5	3.9%	2.0%	-0.4	a
				SDLT12	3	0.0%	0.0%	-2.1	b
				SDLT9	5	3.2%	2.0%	-0.7	a
Ephemeroptera (% of community)	rank	YES	< 0.001	Reference	5	13.8%	6.0%	-	a
				SDLT1	5	0.0%	0.0%	-2.3	b
				SDLT12	3	0.0%	0.0%	-2.3	b
				SDLT9	5	0.7%	0.7%	-2.2	c
Chironomidae (% of community)	none	YES	< 0.001	Reference	5	37.9%	11.1%	-	a
				SDLT1	5	82.5%	10.1%	4.0	b
				SDLT12	3	64.7%	7.2%	2.4	b
				SDLT9	5	73.4%	10.1%	3.2	b
Metal Sensitive Taxa (% of community)	fourth root	YES	< 0.001	Reference	5	5.7%	5.7%	-	a
				SDLT1	5	26.1%	15.6%	3.6	b
				SDLT12	3	12.7%	5.2%	1.2	a,b
				SDLT9	5	1.1%	1.3%	-0.8	c
Simuliidae (% of community)	fourth root	YES	0.0010	Reference	5	28.3%	6.6%	-	a
				SDLT1	5	0.1%	0.2%	-4.3	b
				SDLT12	3	0.0%	0.0%	-4.3	b
				SDLT9	5	0.6%	0.6%	-4.2	c
Tipulidae (% of community)	log	YES	0.0144	Reference	5	0.7%	0.4%	-	a
				SDLT1	5	2.8%	2.7%	4.9	a,b
				SDLT12	3	3.4%	2.0%	6.2	b
				SDLT9	5	5.8%	5.6%	11.8	b
Collector-Gatherer FFG (% of community)	log	YES	0.0022	Reference	5	58.8%	7.2%	-	a
				SDLT1	5	55.3%	8.0%	-0.5	a
				SDLT12	3	88.5%	3.2%	4.2	b
				SDLT9	5	57.5%	11.6%	-0.2	a
Filterer FFG (% of community)	square root	YES	< 0.001	Reference	5	28.6%	6.5%	-	a
				SDLT1	5	8.9%	8.0%	-3.0	b
				SDLT12	3	3.5%	2.8%	-3.9	b,c
				SDLT9	5	0.8%	0.7%	-4.3	c
Shredder FFG (% of community)	square root	YES	< 0.001	Reference	5	6.7%	5.5%	-	a
				SDLT1	5	31.6%	7.7%	4.5	b
				SDLT12	3	8.0%	2.1%	0.2	a
				SDLT9	5	37.7%	10.7%	5.7	b
Clinger HPG (% of community)	none	YES	< 0.001	Reference	5	40.1%	7.8%	-	a
				SDLT1	5	41.5%	10.7%	0.2	a
				SDLT12	3	4.9%	2.1%	-4.5	b
				SDLT9	5	35.9%	10.7%	-0.5	a
Sprawler HPG (% of community)	log	NO	0.2373	Reference	5	49.0%	9.2%	-	a
				SDLT1	5	44.9%	5.2%	-0.5	a
				SDLT12	3	54.5%	6.6%	0.6	a
				SDLT9	5	42.8%	9.1%	-0.7	a
Burrower HPG (% of community)	log	YES	0.0109	Reference	5	10.7%	4.5%	-	a
				SDLT1	5	13.6%	9.6%	0.6	a
				SDLT12	3	39.6%	7.2%	6.4	b
				SDLT9	5	20.6%	10.3%	2.2	a,b

Indicates a statisitically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of reference mean, suggesting an ecologically meaningful difference in endpoint value relative to reference conditions.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.33: Benthic Invertebrate Community Absolute Density Statistical Comparison Results between Individual Sheardown Lake Tributaries and Unnamed Reference Creek, Mary River Project CREMP, August 2017

Metric	Data Transform-ation	Overall 4-Area Comparison[a]		Pair-wise, post-hoc comparisons[a]					
		Significant Difference Among Areas?	P-value	Area	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Reference	Pairwise Comparison
Nemata (No. per m2)	log	YES	0.0270	Reference	5	187	184	-	a,b
				SDLT1	5	46	71	-0.8	b
				SDLT12	3	47	25	-0.8	a,b
				SDLT9	5	465	612	1.5	a
Oligochaeta (No. per m2)	square root	YES	0.0351	Reference	5	13	18	-	a
				SDLT1	5	82	29	3.8	a,b
				SDLT12	3	202	212	10.5	b
				SDLT9	5	96	104	4.6	a,b
Hydracarina (No. per m2)	log(X+1)	YES	< 0.001	Reference	5	99	115	-	a
				SDLT1	5	55	43	-0.4	a
				SDLT12	3	0	0	-0.9	b
				SDLT9	5	84	40	-0.1	a
Ephemeroptera (No. per m2)	rank	YES	< 0.001	Reference	5	187	58	-	a
				SDLT1	5	0	0	-3.3	b
				SDLT12	3	0	0	-3.3	b
				SDLT9	5	30	48	-2.7	c
Chironomidae (No. per m2)	log	YES	0.0627	Reference	5	878	1140	-	a,b
				SDLT1	5	1451	1544	0.5	a,b
				SDLT12	3	499	331	-0.3	a
				SDLT9	5	2504	1439	1.4	b
Metal Sensitive Taxa (No. per m2)	fourth root	YES	0.0769	Reference	5	196	349	-	a,b
				SDLT1	5	495	598	0.9	a
				SDLT12	3	93	53	-0.3	a,b
				SDLT9	5	44	41	-0.4	a
Simuliidae (No. per m2)	fourth root	YES	< 0.001	Reference	5	534	433	-	a
				SDLT1	5	1	3	-1.2	b
				SDLT12	3	0	0	-1.2	b
				SDLT9	5	16	11	-1.2	c
Tipulidae (No. per m2)	square root	YES	< 0.001	Reference	5	9	5	-	a
				SDLT1	5	25	9	3.4	a
				SDLT12	3	30	25	4.6	a
				SDLT9	5	135	72	27.7	b
Collector-Gatherer FFG (No. per m2)	log	NO	0.1889	Reference	5	1096	945	-	a
				SDLT1	5	842	724	-0.3	a
				SDLT12	3	705	530	-0.4	a
				SDLT9	5	2072	1512	1.0	a
Filterer FFG (No. per m2)	fourth root	YES	0.0073	Reference	5	542	444	-	a
				SDLT1	5	221	356	-0.7	a,b
				SDLT12	3	19	5	-1.2	b
				SDLT9	5	28	28	-1.2	b
Shredder FFG (No. per m2)	log	YES	0.0019	Reference	5	213	359	-	a,b
				SDLT1	5	535	542	0.9	b,c
				SDLT12	3	59	33	-0.4	a
				SDLT9	5	1194	667	2.7	c
Clinger HPG (No. per m2)	log	YES	< 0.001	Reference	5	861	918	-	a
				SDLT1	5	786	912	-0.1	a
				SDLT12	3	31	10	-0.9	b
				SDLT9	5	1170	705	0.3	a
Sprawler HPG (No. per m2)	log	NO	0.1581	Reference	5	890	753	-	a
				SDLT1	5	721	662	-0.2	a
				SDLT12	3	430	304	-0.6	a
				SDLT9	5	1475	864	0.8	a
Burrower HPG (No. per m2)	log	YES	0.0680	Reference	5	219	205	-	a
				SDLT1	5	153	78	-0.3	a
				SDLT12	3	317	261	0.5	a,b
				SDLT9	5	747	714	2.6	b

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of reference mean, suggesting an ecologically meaningful difference relative to reference conditions.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.34: Statistical Comparison of Benthic Metrics at Sheardown Lake Tributary 1 (SDLT1) Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2008, 2013) for the Mary River Project CREMP

Metric	Data Transformation	Overall 5-Year Comparison		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2008	Effect Size vs. Baseline Year 2013	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0268	2008	3	300	52	-	-2.0	a	Tukey's HSD
				2013	3	657	176	6.8	-	a,b	
				2015	5	722	485	8.1	0.4	a	
				2016	5	2,453	814	41.1	10.2	b	
				2017	5	1,660	1,643	25.9	5.7	a,b	
Richness (No. of Taxa)	none	NO	0.3439	2008	3	12.0	1.0	-	-1.9	a	Tukey's HSD
				2013	3	16.7	2.5	4.7	-	a	
				2015	5	15.4	4.3	3.4	-0.5	a	
				2016	5	15.2	2.5	3.2	-0.6	a	
				2017	5	14.0	2.0	2.0	-1.1	a	
Simpson's Evenness	none	YES	0.0000	2008	3	0.894	0.034	-	0.1	a	Tukey's HSD
				2013	3	0.887	0.064	-0.2	-	a	
				2015	5	0.869	0.067	-0.7	-0.3	a	
				2016	5	0.872	0.032	-0.6	-0.2	a	
				2017	5	0.406	0.067	-14.4	-7.5	b	
Oligochaeta (% of community)	modified probit	NO	0.8401	2008	3	3.0%	2.5%	-	-1.3	a	Tukey's HSD
				2013	3	7.3%	3.3%	1.7	-	a	
				2015	5	14.4%	10.8%	4.6	2.1	a	
				2016	5	14.1%	8.8%	4.5	2.0	a	
				2017	5	8.6%	7.4%	2.3	0.4	a	
Hydracarina (% of community)	modified probit	YES	0.0163	2008	3	12.1%	4.7%	-	2.6	a	Tukey's HSD
				2013	3	4.6%	2.9%	-1.6	-	b	
				2015	5	4.6%	1.6%	-1.6	0.0	b	
				2016	5	5.3%	1.3%	-1.4	0.2	b	
				2017	5	3.9%	2.0%	-1.7	-0.2	b	
Chironomidae (% of community)	modified probit	NO	0.2646	2008	3	69.2%	2.0%	-	-3.0	a	Tukey's HSD
				2013	3	81.1%	3.9%	6.0	-	a	
				2015	5	72.0%	9.0%	1.4	-2.3	a	
				2016	5	73.1%	11.9%	2.0	-2.0	b	
				2017	5	82.4%	10.1%	6.7	0.3	a	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0054	2008	3	27.5%	5.4%	-	0.5	a	Tamhane's
				2013	3	19.9%	14.3%	-1.4	-	a,b	
				2015	5	6.1%	2.9%	-3.9	-1.0	b	
				2016	5	15.6%	4.4%	-2.2	-0.3	a	
				2017	5	26.1%	15.6%	-0.3	0.4	a	
Tipulidae (% of community)	modified probit	YES	0.0419	2008	3	14.7%	2.7%	-	22.8	a	Tukey's HSD
				2013	3	3.8%	0.5%	-4.0	-	a,b	
				2015	5	2.1%	1.3%	-4.7	-3.7	b	
				2016	5	3.5%	1.9%	-4.1	-0.6	a,b	
				2017	5	2.8%	2.7%	-4.4	-2.1	b	
Collector-Gatherer FFG (% of community)	modified probit	YES	0.0127	2008	3	40.3%	2.9%	-	-2.0	a	Tukey's HSD
				2013	3	55.5%	7.5%	5.2	-	a,b	
				2015	5	64.2%	5.2%	8.2	1.2	b	
				2016	5	58.6%	10.7%	6.3	0.4	b	
				2017	5	55.3%	8.0%	5.2	0.0	a,b	
Filterer FFG (% of community)	modified probit	NO	0.6403	2008	3	5.2%	3.5%	-	-2.0	a	Tamhane's
				2013	3	8.5%	1.6%	0.9	-	a	
				2015	5	4.5%	1.4%	-0.2	-2.4	a	
				2016	5	7.6%	3.3%	0.7	-0.5	a	
				2017	5	8.9%	8.0%	1.1	0.2	a	
Shredder FFG (% of community)	modified probit	YES	0.0475	2008	3	40.6%	4.2%	-	1.6	a	Tukey's HSD
				2013	3	28.7%	7.4%	-2.8	-	a,b	
				2015	5	22.9%	4.5%	-4.2	-0.8	b	
				2016	5	27.4%	9.4%	-3.1	-0.2	a,b	
				2017	5	31.6%	7.7%	-2.1	0.4	a,b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.35: Statistical Comparison of Benthic Metrics at Sheardown Lake Tributary 12 (SDLT12) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007) for the Mary River Project CREMP

Metric	Data Transform-ation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	NO	0.9523	2007	5	1,016	669	-	a	Tukey's HSD
				2015	3	841	575	-0.3	a	
				2016	3	894	502	-0.2	a	
				2017	3	783	561	-0.3	a	
Richness (No. of Taxa)	none	YES	0.0002	2007	5	19.0	1.9	-	a	Tukey's HSD
				2015	3	12.0	1.0	-3.7	b	
				2016	3	18.3	1.2	-0.4	a	
				2017	3	15.3	0.6	-2.0	c	
Simpson's Evenness	none	YES	0.0483	2007	5	0.854	0.020	-	a	Tukey's HSD
				2015	3	0.884	0.041	1.5	a,b	
				2016	3	0.884	0.046	1.5	a,b	
				2017	3	0.931	0.021	3.9	b	
Oligochaeta (% of community)	modified probit	YES	0.0000	2007	5	0.7%	0.6%	-	a	Tukey's HSD
				2015	3	28.8%	8.8%	48.8	b	
				2016	3	31.6%	11.1%	53.6	b	
				2017	3	21.9%	8.4%	36.8	b	
Hydracarina (% of community)	modified probit	NO	0.1121	2007	5	3.0%	2.9%	-	a	Tukey's HSD
				2015	3	0.0%	0.0%	-1.0	a	
				2016	3	0.4%	0.4%	-0.9	a	
				2017	3	0.0%	0.0%	-1.0	a	
Chironomidae (% of community)	modified probit	YES	0.0098	2007	5	88.0%	10.2%	-	a	Tukey's HSD
				2015	3	65.1%	6.7%	-2.3	b	
				2016	3	54.9%	18.0%	-3.2	b	
				2017	3	64.6%	7.2%	-2.3	b	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0500	2007	5	3.2%	2.0%	-	a	Tamhane's
				2015	3	1.4%	1.5%	-0.9	a,b	
				2016	3	2.6%	0.5%	-0.3	a	
				2017	3	12.7%	5.2%	4.7	b	
Tipulidae (% of community)	modified probit	YES	0.0049	2007	5	0.3%	0.5%	-	a	Tukey's HSD
				2015	3	3.4%	1.3%	6.3	b	
				2016	3	3.8%	3.1%	7.2	b	
				2017	3	3.4%	2.0%	6.5	b	
Collector-Gatherer FFG (% of community)	modified probit	YES	0.0057	2007	5	57.8%	15.8%	-	a	Tukey's HSD
				2015	3	83.7%	11.4%	1.6	b	
				2016	3	87.0%	2.6%	1.8	b	
				2017	3	88.5%	3.2%	1.9	b	
Filterer FFG (% of community)	modified probit	YES	0.0174	2007	5	6.8%	9.2%	-	a	Tamhane's
				2015	3	0.0%	0.0%	-0.7	b	
				2016	3	2.1%	0.1%	-0.5	a	
				2017	3	3.5%	2.8%	-0.4	a	
Shredder FFG (% of community)	modified probit	YES	0.0448	2007	5	22.5%	8.9%	-	a	Tukey's HSD
				2015	3	16.3%	11.4%	-0.7	a,b	
				2016	3	9.3%	1.5%	-1.5	a,b	
				2017	3	8.0%	2.1%	-1.6	b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.36: Statistical Comparison of Benthic Metrics at Sheardown Lake Tributary 9 (SDLT9) Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007, 2013) for the Mary River Project CREMP

Metric	Data Transfor-mation	Overall 5-Year Comparison		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2013	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0660	2007	3	712	42	-	-0.8	a	Tamhane's
				2013	3	1,240	690	12.6	-	a	
				2015	5	2,147	942	34.2	1.3	a	
				2016	5	2,401	1,054	40.3	1.7	a	
				2017	5	3,404	1,983	64.2	3.1	a	
Richness (No. of Taxa)	none	NO	0.5394	2007	3	22.3	3.2	-	0.9	a	Tukey's HSD
				2013	3	19.0	3.6	-1.0	-	a	
				2015	5	19.4	4.8	-0.9	0.1	a	
				2016	5	18.2	2.6	-1.3	-0.2	a	
				2017	5	20.8	2.8	-0.5	0.5	a	
Simpson's Evenness	none	NO	0.5415	2007	3	0.865	0.049	-	-1.9	a	Tukey's HSD
				2013	3	0.899	0.018	0.7	-	a	
				2015	5	0.892	0.060	0.5	-0.4	a	
				2016	5	0.843	0.063	-0.4	-3.1	a	
				2017	5	0.883	0.042	0.4	-0.9	a	
Oligochaeta (% of community)	modified probit	NO	0.1086	2007	3	5.9%	4.1%	-	4.7	a	Tukey's HSD
				2013	3	0.7%	1.1%	-1.3	-	a	
				2015	5	0.8%	0.4%	-1.3	0.2	a	
				2016	5	1.5%	1.0%	-1.1	0.8	a	
				2017	5	3.0%	2.8%	-0.7	2.0	a	
Hydracarina (% of community)	modified probit	NO	0.3466	2007	3	3.3%	2.0%	-	-1.3	a	Tukey's HSD
				2013	3	9.0%	4.2%	2.8	-	a	
				2015	5	4.2%	4.1%	0.4	-1.1	a	
				2016	5	4.6%	3.2%	0.6	-1.0	a	
				2017	5	3.3%	2.0%	0.0	-1.4	a	
Chironomidae (% of community)	modified probit	NO	0.2687	2007	3	77.5%	5.8%	-	1.0	a	Tukey's HSD
				2013	3	73.3%	4.4%	-0.7	-	a	
				2015	5	78.7%	8.7%	0.2	1.2	a	
				2016	5	67.1%	8.8%	-1.8	-1.4	a	
				2017	5	73.4%	10.1%	-0.7	0.0	a	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0355	2007	3	2.6%	0.9%	-	2.9	a	Tamhane's
				2013	3	1.0%	0.5%	-1.8	-	a	
				2015	5	5.0%	2.5%	2.8	7.4	a	
				2016	5	0.8%	1.2%	-2.1	-0.4	a	
				2017	5	1.1%	1.3%	-1.7	0.2	a	
Tipulidae (% of community)	modified probit	NO	0.3930	2007	3	4.6%	1.9%	-	0.1	a	Tukey's HSD
				2013	3	4.4%	2.1%	-0.1	-	a	
				2015	5	3.9%	3.4%	-0.4	-0.2	a	
				2016	5	8.0%	3.3%	1.8	1.7	a	
				2017	5	5.8%	5.6%	0.7	0.7	a	
Collector-Gatherer FFG (% of community)	modified probit	NO	0.4084	2007	3	57.8%	3.1%	-	-0.4	a	Tamhane's
				2013	3	60.6%	6.9%	0.9	-	a	
				2015	5	60.7%	20.5%	0.9	0.0	a	
				2016	5	44.6%	15.7%	-4.3	-2.3	a	
				2017	5	57.5%	11.7%	-0.1	-0.4	a	
Filterer FFG (% of community)	modified probit	NO	0.5132	2007	3	1.3%	0.9%	-	-0.7	a	Tamhane's
				2013	3	1.9%	0.9%	0.6	-	a	
				2015	5	2.0%	1.8%	0.7	0.1	a	
				2016	5	0.5%	0.4%	-0.9	-1.6	a	
				2017	5	0.8%	0.7%	-0.6	-1.3	a	
Shredder FFG (% of community)	modified probit	NO	0.1403	2007	3	26.8%	3.9%	-	-0.4	a	Tukey's HSD
				2013	3	28.3%	4.4%	0.4	-	a	
				2015	5	32.0%	18.2%	1.3	0.8	a	
				2016	5	49.1%	15.0%	5.7	4.7	a	
				2017	5	37.7%	10.7%	2.8	2.1	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.37: Statistical Comparison of Physical Sediment Quality Between Sheardown Lake NW and Reference Lake 3 for Samples Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	YES	0.011	β	Reference	5	9.74	1.04	0.46	8.50	11.20
					Sheardown NW	5	8.20	0.38	0.17	7.80	8.60
	Sand-Sized Particles (% by weight)	NO	0.597	β	Reference	5	46.4	13.9	6.2	25.6	59.9
					Sheardown NW	5	53.2	21.8	9.8	34.6	90.6
	Silt-Sized Particles (% by weight)	NO	0.526	α	Reference	5	44.3	11.6	5.2	32.8	62.2
					Sheardown NW	5	38.0	17.8	8.0	8.5	55.9
	Clay-Sized Particles (% by weight)	NO	0.856	α	Reference	5	9.3	2.8	1.3	4.7	12.2
					Sheardown NW	4	10.8	1.8	0.9	9.2	13.0
	Total Organic Carbon (%)	NO	0.166	∓	Reference	5	4.9	1.8	0.8	2.7	7.2
					Sheardown NW	5	3.1	1.9	0.8	0.6	5.4
Profundal (Deep) Stations	Station Depth (m)	NO	0.775	α	Reference	5	20.56	2.17	0.97	18.50	24.20
					Sheardown NW	5	21.14	3.82	1.71	15.00	24.20
	Sand-Sized Particles (% by weight)	YES	0.057	α	Reference	5	35.7	16.5	7.4	15.6	56.0
					Sheardown NW	5	18.2	6.0	2.7	11.8	25.3
	Silt-Sized Particles (% by weight)	YES	0.045	β	Reference	5	50.2	11.8	5.3	35.3	62.4
					Sheardown NW	5	65.1	6.4	2.9	56.7	74.4
	Clay-Sized Particles (% by weight)	NO	0.455	α	Reference	5	14.1	5.2	2.3	8.8	22.0
					Sheardown NW	5	16.7	5.2	2.3	10.9	21.4
	Total Organic Carbon (%)	YES	0.006	β	Reference	5	3.6	1.1	0.5	1.8	4.4
					Sheardown NW	5	1.6	0.4	0.2	1.2	2.2

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted; ∓ data square root transformed, t-test conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table F.38: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake NW, August 2017

Taxa	Study Area	Sheardown Lake NW - Littoral Stations 2017					Sheardown Lake NW - Profundal Stations 2017				
	Replicate Station	DLO-1-9	DLO-1-4	DLO-1-3	DLO-1-11	DLO-1-10	DLO-1-5	DLO-1-14	DLO-1-15	DLO-1-2	DLO-1-12
ROUNDWORMS											
P. Nemata		103	172	-	-	17	-	-	-	-	69
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae											
Lumbriculus		-	34	-	-	-	-	-	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina											
immature		-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae											
Acalyptonotus		-	-	-	86	121	17	60	26	-	60
F. Hygrobatidae											
Hygrobates		-	-	34	466	34	34	9	17	-	26
F. Lebertiidae											
Lebertia		-	-	-	155	17	26	-	-	-	9
HARPACTICOIDS											
O. Harpacticoida		-	-	414	-	-	-	-	-	-	-
SEED SHRIMPS											
Cl. Ostracoda		517	1,862	2,207	603	328	78	147	-	26	95
FAIRY SHRIMP											
O. Notostraca											
Lepidurus arcticus		-	-	-	-	17	-	-	-	-	-
INSECTS											
Cl. Insecta											
CADDISFLIES											
O. Trichoptera											
F. Apataniidae											
Apatania		-	-	-	17	-	-	-	-	-	-
TRUE FLIES											
O. Diptera											
MIDGES											
F. Chironomidae											
chironomid pupae		**34**	**-**	**69**	**17**	**-**	**17**	17	**-**	**-**	-
S.F. Chironominae											
Chironomus		414	241	69	-	-	207	845	-	-	-
Micropsectra		276	172	552	241	190	9	-	9	-	17
Paratanytarsus		138	345	1,655	103	86	-	17	-	-	-
Sergentia		69	759	379	34	17	-	-	-	-	-
Stictochironomus		2,138	966	2,172	1,621	1,448	43	43	-	-	-
Tanytarsus		345	172	552	52	103	26	69	-	-	-
S.F. Diamesinae		-	-	-	-	-	-	-	-	-	-
Protanypus		-	-	-	-	17	9	9	17	17	9
Pseudodiamesa		-	-	-	-	-	-	103	-	-	9
S.F. Orthocladiinae											
Abiskomyia		34	34	103	69	34	52	112	-	-	-
Chaetocladius		-	-	-	-	-	-	-	-	-	-
Corynoneura		-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius		-	34	-	-	-	-	-	-	-	-
Heterotrissocladius		-	-	172	190	172	181	-	310	397	534
Mesocricotopus		-	-	-	-	-	-	-	-	-	-
Paracladius		-	-	-	-	121	-	-	-	-	-
Parakiefferiella		-	-	-	-	-	-	-	-	-	-
Psectrocladius		34	-	-	-	52	-	-	-	-	-

Table F.38: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake NW, August 2017

Taxa	Study Area	Sheardown Lake NW - Littoral Stations 2017					Sheardown Lake NW - Profundal Stations 2017				
	Replicate Station	DLO-1-9	DLO-1-4	DLO-1-3	DLO-1-11	DLO-1-10	DLO-1-5	DLO-1-14	DLO-1-15	DLO-1-2	DLO-1-12
Zalutschia		-	-	-	86	17	9	-	-	-	9
Genus "Greenland"		-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Arctopelopia		276	207	966	190	17	-	-	-	9	-
Procladius		-	34	-	172	414	43	26	86	164	181
F. Tipulidae											
Tipula		-	-	-	-	-	-	-	-	-	-
Density (No. organisms per m^2)		4,378	5,032	9,344	4,102	3,222	751	1,457	465	613	1,018
Richness (total number of taxa)[a]		11	13	12	15	19	13	11	6	5	11
Simpson's Evenness (E)		0.790	0.857	0.911	0.851	0.802	0.899	0.690	0.618	0.633	0.743
Bray-Curtis Index		0.760	0.786	0.859	0.707	0.695	0.722	0.946	0.645	0.763	0.817
Percent Composition											
% Nemata		2.4%	3.4%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	6.8%
% Hydracarina		0.0%	0.0%	0.4%	17.2%	5.3%	10.3%	4.7%	9.2%	0.0%	9.3%
% Ostracods		11.8%	37.0%	23.6%	14.7%	10.2%	10.4%	10.1%	0.0%	4.2%	9.3%
% Chironomids		85.8%	58.9%	71.6%	67.6%	83.4%	79.4%	85.2%	90.8%	95.8%	74.6%
% Metal Sensitive Chironmids		17.5%	13.7%	29.8%	9.7%	12.3%	6.1%	13.7%	5.6%	2.8%	3.4%
% Tipulidae		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Functional Feeding Group Composition											
% Collector - Gatherers		76.1%	80.8%	59.4%	61.6%	69.0%	77.6%	87.5%	70.3%	71.8%	70.3%
% Filterers		17.5%	0.14	0.30	0.10	0.12	0.05	0.06	0.02	0.00	0.02
% Shredders		0.0%	0.7%	0.0%	2.1%	0.5%	1.3%	0.0%	0.0%	0.0%	0.9%
Habitat Preference Group Composition											
% Clingers		15.9%	22.6%	16.4%	25.7%	15.0%	15.2%	9.5%	11.2%	0.0%	11.0%
% Sprawlers		22.9%	49.3%	59.4%	34.6%	39.0%	49.4%	28.0%	85.2%	97.2%	81.3%
% Burrowers		61.2%	28.1%	24.2%	39.8%	46.0%	35.4%	62.5%	3.7%	2.8%	7.7%

[a] Bold entries excluded from taxa coun

Table F.39: Statistical Comparison of Benthic Metrics at Sheardown Lake NW Littoral (Shallow) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007, 2008, 2013) for the Mary River Project CREMP

Metric	Data Transformation	Overall 6-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]								
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2008	Effect Size vs. Baseline Year 2013	Pairwise Comparison	Statistical Test
Density (No. per m^2)	log	NO	0.5559	2007	4	5,974	3,000	-	-0.3	-1.5	a	Tukey's HSD
				2008	4	7,536	5,273	0.5	-	-0.9	a	
				2013	3	9,940	2,634	1.3	0.5	-	a	
				2015	5	5,665	3,230	-0.1	-0.4	-1.6	a	
				2016	5	5,503	4,184	-0.2	-0.4	-1.7	a	
				2017	5	5,216	2,398	-0.3	-0.4	-1.8	a	
Richness (No. of Taxa)	log	NO	0.1822	2007	4	12.3	1.5	-	-1.3	-1.7	a	Tukey's HSD
				2008	4	14.5	1.7	1.4	-	-1.0	a,b	
				2013	3	17.7	3.2	3.5	1.9	-	b	
				2015	5	13.8	1.9	1.0	-0.4	-1.2	a,b	
				2016	5	14.6	2.4	1.5	0.1	-1.0	a,b	
				2017	5	14.0	3.2	1.1	-0.3	-1.1	a,b	
Simpson's Evenness	none	YES	0.0419	2007	4	0.768	0.055	-	-0.7	-2.0	a,b	Tukey's HSD
				2008	4	0.840	0.098	1.3	-	-0.5	a,b	
				2013	3	0.863	0.047	1.7	0.2	-	a,b	
				2015	5	0.759	0.096	-0.2	-0.8	-2.2	a	
				2016	5	0.893	0.024	2.3	0.5	0.6	b	
				2017	5	0.842	0.048	1.3	0.0	-0.5	a,b	
Nemata (% of community)	modified probit	NO	0.9172	2007	4	1.5%	1.6%	-	0.4	1.1	a	Tukey's HSD
				2008	4	1.1%	1.0%	-0.3	-	0.6	a	
				2013	3	0.6%	0.8%	-0.6	-0.5	-	a	
				2015	5	0.9%	1.1%	-0.4	-0.2	0.3	a	
				2016	5	1.1%	0.7%	-0.2	0.1	0.6	a	
				2017	5	1.3%	1.5%	-0.2	0.2	0.8	a	
Ostracoda (% of community)	modified probit	NO	0.1703	2007	4	11.9%	12.8%	-	0.1	-1.4	a	Tamhane's
				2008	4	10.8%	8.7%	-0.1	-	-1.5	a	
				2013	3	23.4%	8.1%	0.9	1.4	-	a	
				2015	5	7.8%	3.7%	-0.3	-0.3	-1.9	a	
				2016	5	9.2%	6.1%	-0.2	-0.2	-1.7	a	
				2017	5	19.5%	11.1%	0.6	1.0	-0.5	a	
Chironomidae (% of community)	modified probit	YES	0.0186	2007	4	83.0%	8.3%	-	0.3	1.3	a,b	Tukey's HSD
				2008	4	81.2%	6.7%	-0.2	-	1.1	a,b	
				2013	3	70.5%	9.6%	-1.5	-1.6	-	a	
				2015	5	89.8%	3.2%	0.8	1.3	2.0	b	
				2016	5	85.0%	6.6%	0.2	0.6	1.5	a,b	
				2017	5	73.5%	11.2%	-1.1	-1.2	0.3	a	
Metal Sensitive Taxa (% of community)	modified probit	NO	0.8454	2007	4	16.9%	16.8%	-	-0.2	-0.9	a	Tamhane's
				2008	4	20.7%	17.2%	0.2	-	-0.1	a	
				2013	3	21.0%	4.6%	0.2	0.0	-	a	
				2015	5	19.1%	7.2%	0.1	-0.1	-0.4	a	
				2016	5	24.6%	15.2%	0.5	0.2	0.8	a	
				2017	5	16.6%	7.9%	0.0	-0.2	-0.9	a	
Collector-Gatherer FFG (% of community)	modified probit	NO	0.3349	2007	4	71.6%	13.5%	-	0.7	0.7	a	Tukey's HSD
				2008	4	61.1%	15.0%	-0.8	-	-0.5	a	
				2013	3	65.3%	9.0%	-0.5	0.3	-	a	
				2015	5	68.9%	8.0%	-0.2	0.5	0.4	a	
				2016	5	56.8%	7.7%	-1.1	-0.3	-1.0	a	
				2017	5	69.4%	9.2%	-0.2	0.6	0.5	a	
Filterer FFG (% of community)	modified probit	NO	0.9164	2007	4	16.7%	17.1%	-	-0.2	-0.9	a	Tamhane's
				2008	4	19.9%	17.1%	0.2	-	-0.2	a	
				2013	3	21.0%	4.7%	0.3	0.1	-	a	
				2015	5	18.6%	6.8%	0.1	-0.1	-0.5	a	
				2016	5	23.0%	17.3%	0.4	0.2	0.4	a	
				2017	5	16.5%	8.0%	0.0	-0.2	-1.0	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.40: Statistical Comparison of Benthic Metrics at Sheardown Lake NW Profundal (Deep) Stations Among Years of Mine Operation (2015, 2017) and Baseline (2007,2013) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2013	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0000	2007	4	1,461	308	-	-4.3	a	Tukey's HSD
				2013	3	2,744	302	4.2	-	b	
				2015	5	1,425	210	-0.1	-4.4	a	
				2017	5	861	391	-1.9	-6.2	c	
Richness (No. of Taxa)	none	NO	0.6912	2007	4	7.5	0.4	-	-0.9	a	Tamhane's
				2013	3	9.8	2.5	5.4	-	a	
				2015	5	8.4	3.0	2.1	-0.6	a	
				2017	5	9.2	3.5	4.0	-0.3	a	
Simpson's Evenness	none	YES	0.0265	2007	4	0.426	0.165	-	-0.6	a	Tukey's HSD
				2013	3	0.521	0.167	0.6	-	a,b	
				2015	5	0.355	0.212	-0.4	-1.0	a	
				2017	5	0.717	0.113	1.8	1.2	b	
Nemata (% of community)	none	NO	0.2085	2007	4	0.6%	0.5%	-	-1.2	a	Tukey's HSD
				2013	3	3.6%	2.6%	5.8	-	a	
				2015	5	0.5%	0.3%	-0.2	-1.2	a	
				2017	5	1.4%	3.0%	1.4	-0.9	a	
Ostracoda (% of community)	none	NO	0.2094	2007	4	0.3%	0.4%	-	-0.7	a	Tamhane's
				2013	3	6.2%	8.7%	16.4	-	a	
				2015	5	2.8%	3.7%	7.0	-0.4	a	
				2017	5	6.8%	4.6%	18.2	0.1	a	
Chironomidae (% of community)	none	NO	0.1171	2007	4	94.6%	1.9%	-	1.1	a	Tukey's HSD
				2013	3	84.9%	8.8%	-5.0	-	a	
				2015	5	93.2%	6.0%	-0.7	0.9	a	
				2017	5	85.1%	8.5%	-4.9	0.0	a	
Metal Sensitive Taxa (% of community)	none	YES	0.0510	2007	4	0.5%	0.6%	-	-0.5	a	Tukey's HSD
				2013	3	1.4%	1.7%	1.4	-	a,b	
				2015	5	2.8%	2.8%	3.7	0.9	a,b	
				2017	5	6.3%	4.4%	9.2	2.9	b	
Collector-Gatherer FFG (% of community)	none	YES	0.0253	2007	4	83.6%	8.4%	-	-0.6	a	Tukey's HSD
				2013	3	86.4%	4.8%	0.3	-	a	
				2015	5	90.5%	5.3%	0.8	0.9	a	
				2017	5	75.5%	7.3%	-1.0	-2.3	a	
Filterer FFG (% of community)	none	NO	0.2780	2007	4	0.1%	0.1%	-	-0.8	a,b	Tamhane's
				2013	3	1.3%	1.6%	11.6	-	a,b	
				2015	5	1.9%	2.6%	16.7	0.3	a	
				2017	5	2.9%	2.5%	26.2	1.0	b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.41: Statistical Comparison of Physical Sediment Quality Between Sheardown Lake SE and Reference Lake 3 for Samples Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	NO	0.423	β	Reference	5	9.74	1.04	0.46	8.50	11.20
					Sheardown SE	5	9.10	1.58	0.71	7.50	11.50
	Sand-Sized Particles (% by weight)	YES	<0.001	β	Reference	5	46.4	13.9	6.2	25.6	59.9
					Sheardown SE	5	8.9	2.4	1.1	5.8	12.5
	Silt-Sized Particles (% by weight)	YES	0.002	β	Reference	5	44.3	11.6	5.2	32.8	62.2
					Sheardown SE	5	76.4	9.8	4.4	62.4	89.9
	Clay-Sized Particles (% by weight)	NO	0.280	∓	Reference	5	9.3	2.8	1.3	4.7	12.2
					Sheardown SE	5	14.7	9.0	4.0	4.3	28.6
	Total Organic Carbon (%)	YES	<0.001	β	Reference	5	4.9	1.8	0.8	2.7	7.2
					Sheardown SE	5	1.2	0.2	0.1	1.0	1.5
Profundal (Deep) Stations	Station Depth (m)	YES	<0.001	β	Reference	5	20.56	2.17	0.97	18.50	24.20
					Sheardown SE	5	12.44	1.17	0.52	10.50	13.50
	Sand-Sized Particles (% by weight)	YES	0.013	α	Reference	5	35.7	16.5	7.4	15.6	56.0
					Sheardown SE	5	10.9	5.4	2.4	4.1	17.0
	Silt-Sized Particles (% by weight)	YES	0.007	∓	Reference	5	50.2	11.8	5.3	35.3	62.4
					Sheardown SE	5	73.4	6.3	2.8	67.1	81.7
	Clay-Sized Particles (% by weight)	NO	0.381	β	Reference	5	14.1	5.2	2.3	8.8	22.0
					Sheardown SE	5	15.7	1.7	0.8	14.2	18.6
	Total Organic Carbon (%)	YES	0.001	α	Reference	5	3.6	1.1	0.5	1.8	4.4
					Sheardown SE	5	1.1	0.1	0.0	1.0	1.1

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted; ∓ data square root transformed, t-test conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table F.42: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake SE, August 2017

Taxa	Study Area	Sheardown Lake SE - Littoral Stations 2017					Sheardown Lake SE - Profundal Stations 2017				
	Replicate Station	DLO-2-11	DLO-2-10	DLO-2-4	DLO-2-9	DLO-2-1	DLO-2-12	DLO-2-8	DLO-2-13	DLO-2-2	DLO-2-3
ROUNDWORMS											
P. Nemata		34	-	69	9	-	-	-	-	-	-
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae											
Lumbriculus		-	-	-	-	-	-	-	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina											
immature		-	-	-	-	-	-	-	-	-	-
F. Acalyptonotidae											
Acalyptonotus		34	69	138	60	17	17	26	52	52	26
F. Hygrobatidae											
Hygrobates		138	34	86	43	-	-	9	-	34	9
F. Lebertiidae											
Lebertia		34	34	17	-	17	9	9	-	17	34
HARPACTICOIDS											
O. Harpacticoida		-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS											
Cl. Ostracoda		17	121	17	9	26	17	9	17	-	129
FAIRY SHRIMP											
O. Notostraca											
Lepidurus arcticus		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
CADDISFLIES											
O. Trichoptera											
F. Apataniidae											
Apatania		-	-	-	-	-	-	-	-	-	-
TRUE FLIES											
O. Diptera											
MIDGES											
F. Chironomidae											
chironomid pupae		-	-	-	9	9	-	-	-	-	17
S.F. Chironominae											
Chironomus		-	-	-	-	1,431	-	-	-	-	17
Micropsectra		457	483	328	233	-	267	129	34	276	862
Paratanytarsus		-	34	-	-	-	-	-	-	-	-
Sergentia		-	34	-	-	-	-	-	-	-	-
Stictochironomus		1,974	2,741	1,500	1,569	328	698	1,414	862	2,086	1,621
Tanytarsus		353	207	414	190	138	181	26	34	207	147
S.F. Diamesinae		-	-	-	-	-	-	-	-	-	-
Protanypus		-	-	-	-	-	-	9	-	-	-
Pseudodiamesa		-	-	-	-	-	-	-	-	-	-
S.F. Orthocladiinae											
Abiskomyia		-	-	-	34	17	26	43	-	17	34
Chaetocladius		-	-	-	-	-	-	-	-	-	-
Corynoneura		-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius		-	-	-	-	-	-	-	-	-	-
Heterotrissocladius		-	-	-	-	-	-	-	17	-	17
Mesocricotopus		-	-	-	-	-	-	-	-	-	-
Paracladius		-	-	-	-	-	-	-	-	-	-
Parakiefferiella		-	-	-	-	-	-	-	-	-	-
Psectrocladius		-	-	-	-	-	-	-	-	-	-

Table F.42: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake SE, August 2017

Taxa	Study Area	Sheardown Lake SE - Littoral Stations 2017					Sheardown Lake SE - Profundal Stations 2017				
	Replicate Station	DLO-2-11	DLO-2-10	DLO-2-4	DLO-2-9	DLO-2-1	DLO-2-12	DLO-2-8	DLO-2-13	DLO-2-2	DLO-2-3
Zalutschia		-	-	-	-	-	-	-	-	-	-
Genus "Greenland"		-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Arctopelopia		-	-	-	-	-	-	-	-	-	-
Procladius		2,198	1,914	2,000	2,190	276	2,784	603	1,276	1,293	707
F. Tipulidae											
Tipula		-	-	-	-	-	-	-	-	-	-
Density (No. organisms per m^2)		5,239	5,671	4,569	4,346	2,259	3,999	2,277	2,292	3,982	3,620
Richness (total number of taxa)[a]		9	10	9	9	8	8	10	7	8	11
Simpson's Evenness (E)		0.753	0.715	0.771	0.685	0.634	0.547	0.600	0.639	0.700	0.768
Bray-Curtis Index		0.924	0.908	0.915	0.914	0.918	0.983	0.964	0.972	0.983	0.973
Percent Composition											
% Nemata		0.6%	0.0%	1.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Hydracarina		3.9%	2.4%	5.3%	2.4%	1.5%	0.7%	1.9%	2.3%	2.6%	1.9%
% Ostracods		0.3%	2.1%	0.4%	0.2%	1.2%	0.4%	0.4%	0.7%	0.0%	3.6%
% Chironomids		95.1%	95.5%	92.8%	97.2%	97.3%	98.9%	97.7%	97.0%	97.4%	94.5%
% Metal Sensitive Chironmids		15.5%	12.8%	16.2%	9.8%	6.2%	11.2%	7.2%	3.0%	12.1%	28.0%
% Tipulidae		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Functional Feeding Group Composition											
% Collector - Gatherers		38.7%	51.1%	34.7%	37.4%	80.1%	18.5%	64.8%	39.1%	52.8%	50.4%
% Filterers		15.5%	0.13	0.16	0.10	0.06	0.11	0.07	0.03	0.12	0.28
% Shredders		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Habitat Preference Group Composition											
% Clingers		19.4%	15.2%	21.5%	12.1%	7.7%	11.9%	8.7%	5.2%	14.7%	29.9%
% Sprawlers		42.3%	36.5%	44.1%	51.5%	14.2%	70.7%	28.8%	57.2%	32.9%	24.6%
% Burrowers		38.3%	48.3%	34.3%	36.4%	78.2%	17.5%	62.5%	37.6%	52.4%	45.5%

[a] Bold entries excluded from taxa coun

Table F.43: Statistical Comparison of Benthic Metrics at Sheardown Lake SE Littoral (Shallow) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2013) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0013	2013	5	10,649	4,062	-	a	Tamhane's
				2015	5	4,829	1,898	-1.4	a,b	
				2016	5	3,700	1,485	-1.7	b	
				2017	5	4,417	1,317	-1.5	a,b	
Richness (No. of Taxa)	none	YES	0.0434	2013	5	14.2	4.0	-	a	Tukey's HSD
				2015	5	10.6	2.5	-0.9	a,b	
				2016	5	11.4	2.3	-0.7	a,b	
				2017	5	9.0	0.7	-1.3	b	
Simpson's Evenness	none	NO	0.6327	2013	5	0.785	0.096	-	a	Tukey's HSD
				2015	5	0.759	0.123	-0.3	a	
				2016	5	0.772	0.089	-0.1	a	
				2017	5	0.712	0.055	-0.8	a	
Nemata (% of community)	modified probit	NO	0.9486	2013	5	0.2%	0.2%	-	a	Tukey's HSD
				2015	5	1.5%	2.9%	7.0	a	
				2016	5	1.1%	1.3%	4.4	a	
				2017	5	0.5%	0.6%	1.4	a	
Ostracoda (% of community)	modified probit	NO	0.9082	2013	5	5.9%	8.8%	-	a	Tamhane's
				2015	5	5.5%	10.0%	0.0	a	
				2016	5	1.7%	2.5%	-0.5	a	
				2017	5	0.8%	0.8%	-0.6	b	
Chironomidae (% of community)	modified probit	NO	0.1173	2013	5	89.9%	7.5%	-	a	Tukey's HSD
				2015	5	88.9%	9.4%	-0.1	a	
				2016	5	95.4%	3.9%	0.7	a	
				2017	5	95.6%	1.8%	0.8	b	
Metal Sensitive Taxa (% of community)	modified probit	NO	0.3976	2013	5	15.1%	9.8%	-	a	Tukey's HSD
				2015	5	12.7%	10.4%	-0.2	b	
				2016	5	6.8%	4.2%	-0.8	b	
				2017	5	12.1%	4.2%	-0.3	a	
Collector-Gatherer FFG (% of community)	modified probit	NO	0.3443	2013	5	44.6%	8.2%	-	a	Tukey's HSD
				2015	5	59.1%	10.6%	1.8	a	
				2016	5	56.5%	12.8%	1.5	a	
				2017	5	48.4%	18.8%	0.5	a	
Filterer FFG (% of community)	modified probit	NO	0.3395	2013	5	15.1%	9.8%	-	a	Tukey's HSD
				2015	5	12.5%	10.4%	-0.3	a	
				2016	5	6.7%	4.4%	-0.9	a	
				2017	5	12.1%	4.2%	-0.3	b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.44: Statistical Comparison of Benthic Metrics at Sheardown Lake SE Profundal (Deep) Stations Among Years of Mine Operation (2015, 2017) and Baseline (2007,2013) for the Mary River Project CREMP

Metric	Data Transfor-mation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2013	Pairwise Comparison	Statistical Test
Density (No. per m^2)	log	YES	0.0001	2007	3	4,998	348	-	-1.8	a,c	Tamhane's
				2013	4	6,602	874	4.6	-	a	
				2015	5	3,185	281	-5.2	-3.9	b	
				2017	5	3,234	880	-5.1	-3.9	b,c	
Richness (No. of Taxa)	log	NO	0.6225	2007	3	9.0	2.8	-	-0.7	a	Tukey's HSD
				2013	4	10.5	2.1	0.5	-	a	
				2015	5	8.8	1.8	-0.1	-0.8	a	
				2017	5	8.8	1.6	-0.1	-0.8	a	
Simpson's Evenness	log	NO	0.3865	2007	3	0.607	0.093	-	-2.4	a	Tukey's HSD
				2013	4	0.703	0.039	1.0	-	a	
				2015	5	0.588	0.130	-0.2	-2.9	a	
				2017	5	0.651	0.086	0.5	-1.3	a	
Nemata (% of community)	modified probit	NO	0.3304	2007	3	0.0%	0.1%	-	-0.9	a	Tamhane's
				2013	4	0.1%	0.1%	1.6	-	a	
				2015	5	0.6%	1.1%	11.4	5.4	a	
				2017	5	0.0%	0.0%	-0.6	-1.2	a	
Ostracoda (% of community)	modified probit	NO	0.5460	2007	3	1.1%	1.5%	-	5.1	a	Tukey's HSD
				2013	4	0.2%	0.2%	-0.7	-	a	
				2015	5	0.5%	0.4%	-0.4	1.8	a	
				2017	5	1.0%	1.4%	-0.1	4.5	a	
Chironomidae (% of community)	modified probit	NO	0.6852	2007	3	97.0%	2.9%	-	-5.6	a	Tukey's HSD
				2013	4	98.6%	0.3%	0.6	-	a	
				2015	5	97.0%	2.9%	0.0	-5.5	a	
				2017	5	97.1%	1.6%	0.0	-5.3	a	
Metal Sensitive Taxa (% of community)	modified probit	NO	0.3087	2007	3	13.5%	11.4%	-	-1.2	a	Tukey's HSD
				2013	4	16.8%	2.8%	0.3	-	a	
				2015	5	8.0%	4.7%	-0.5	-3.2	a	
				2017	5	12.3%	9.5%	-0.1	-1.6	a	
Collector-Gatherer FFG (% of community)	modified probit	NO	0.1801	2007	3	74.1%	15.7%	-	1.2	a	Tukey's HSD
				2013	4	64.9%	7.5%	-0.6	-	a	
				2015	5	60.2%	23.0%	-0.9	-0.6	a	
				2017	5	45.1%	17.4%	-1.8	-2.6	a	
Filterer FFG (% of community)	modified probit	NO	0.2931	2007	3	13.4%	11.5%	-	-1.2	a	Tukey's HSD
				2013	4	16.8%	2.8%	0.3	-	a	
				2015	5	7.8%	4.7%	-0.5	-3.2	a	
				2017	5	12.2%	9.6%	-0.1	-1.6	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.45: Coordinates of Mary River Tributary-F Benthic Invertebrate Community Sampling Stations Used for the Mary River Project EEM, August 2017

Study Area	Station	Date Sampled	UTM Zone 17, NAD 83	
			Easting	Northing
Mary River Tributary-F Reference	MRTF-REF1	25-Aug-17	565271	7916323
	MRTF-REF2	25-Aug-17	565220	7916261
	MRTF-REF3	25-Aug-17	565163	7916211
	MRTF-REF4	25-Aug-17	565124	7916167
	MRTF-REF5	25-Aug-17	565074	7916129
Mary River Tributary-F Effluent-Exposed	MRTF-EXP1	25-Aug-17	564950	7916062
	MRTF-EXP2	25-Aug-17	564933	7916037
	MRTF-EXP3	25-Aug-17	564918	7915998
	MRTF-EXP4	25-Aug-17	564915	7915909
	MRTF-EXP5	25-Aug-17	564911	7915804

Table F.46: Replicate Habitat Measurements Collected at Mary River Tributary-F Benthic Invertebrate Community Stations Used for the Mary River Project EEM, August 2017

Study Area	Station	Water Depth (cm)			Water Velocity (m/s)			Substrate Size[a] (cm)			Embeddedness		
		Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3
Mary River Tributary-F Reference	MRTF-REF1	6	7	6	0.27	0.25	0.26	6.6	6.4	6.8	0%	38%	13%
	MRTF-REF2	4	4	4	0.28	0.14	0.18	6.6	6.1	6.8	25%	13%	38%
	MRTF-REF3	3	3	3	0.19	0.14	0.15	6.7	6.1	4.9	13%	0%	13%
	MRTF-REF4	4	5	6	0.12	0.19	0.15	6.7	4.1	8.0	0%	25%	25%
	MRTF-REF5	4	4	4	0.13	0.11	0.29	6.2	5.5	5.0	25%	25%	38%
Mary River Tributary-F Effluent-Exposed	MRTF-EXP1	4	4	4	0.11	0.18	0.26	5.6	6.1	4.7	13%	25%	13%
	MRTF-EXP2	6	6	6	0.17	0.23	0.22	5.2	5.7	6.5	0%	25%	50%
	MRTF-EXP3	6	7	7	0.29	0.17	0.13	7.0	6.9	7.0	13%	13%	13%
	MRTF-EXP4	7	7	6	0.30	0.14	0.19	7.8	6.4	6.8	13%	38%	0%
	MRTF-EXP5	8	9	6	0.29	0.23	0.17	6.7	5.9	7.2	13%	25%	25%

[a] Substrate measurements taken on the intermediate axis of each individual particle observed within the Surber sampler area as viewed from the surface prior to sampling. Sample size ranged from 6 - 8 measurements per replicate grab, with a mean of 6.2 for the entire 2017 MRTF creek sampling program.

Table F.47: Replicate Station Habitat Feature Summary and Statistical Comparison Results between Mary River Tributary-F Effluent-Exposed and Reference Study Areas Used for the Mary River Project EEM, August 2017

Channel Feature	Two-Area Comparison			Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
	Significant Difference between Areas?	p-value	Statistical Test					Lower Bound	Upper Bound		
Water Depth (cm)	YES	0.0706	α	Reference	4.5	1.3	0.6	2.9	6.0	3.0	6.3
				Effluent-Exposed	6.2	1.4	0.6	4.5	7.9	4.0	7.7
Water Velocity (cm/s)	NO	0.4811	α	Reference	19.0	4.3	1.9	13.7	24.3	15.3	26.0
				Effluent-Exposed	20.5	1.7	0.8	18.4	22.7	18.3	23.0
Substrate Size (cm)	NO	0.6103	α	Reference	6.2	0.4	0.2	5.6	6.7	5.6	6.6
				Effluent-Exposed	6.4	0.7	0.3	5.5	7.2	5.5	7.0
Substrate Embeddedness (%)	NO	0.8480	α	Reference	19.2	8.1	3.6	9.1	29.3	8.3	29.2
				Effluent-Exposed	18.3	4.8	2.1	12.4	24.2	12.5	25.0

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.1.

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance.

Table F.48: Benthic Invertebrate Community Data (Densities Expressed in Number of Organisms per Square Metre) for Mary River Tributary-F Study Areas, August 2017

Taxa	Reference Area					Effluent-Exposed Area				
	1	2	3	4	5	1	2	3	4	5
ROUNDWORMS										
P. Nemata	7	-	-	-	-	-	-	4	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	4	-	-	4	-	-	-	-	7	4
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
F. Sperchonidae										
Sperchon	-	7	-	7	4	7	-	4	18	-
INSECTS										
Cl. Insecta										
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
immature	-	-	-	4	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	18	4	-	14	14	-	4	4	4	-
S.F. Diamesinae										
Diamesa	75	29	22	86	36	22	50	100	133	97
Pseudokiefferiella	57	-	11	68	36	14	4	-	7	11
S.F. Orthocladiinae										
Chaetocladius	14	-	-	14	-	7	-	4	-	-
Corynoneura	-	-	7	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	4	-	7	-	-	7	7	32	-
Diplocladius	11	-	4	4	-	7	4	4	7	-
Eukiefferiella	208	104	47	280	100	39	168	247	222	43
Krenosmittia	14	75	7	39	29	32	39	39	14	4
Limnophyes	18	7	-	4	-	4	-	-	-	-
Metriocnemus	-	-	-	7	-	-	-	-	-	-
Parakiefferiella	-	11	-	-	-	-	-	-	-	-
Paraphaenocladius	4	-	-	-	-	-	-	-	-	-
Tokunagaia	11	7	4	-	25	4	4	14	7	-
Tvetenia	-	-	-	-	-	-	4	-	-	-
Vivacricotopus	-	-	-	4	-	-	-	-	-	-
indeterminate	-	-	-	4	-	4	-	-	-	-
F. Empididae										
Clinocera	-	-	-	-	-	4	-	-	7	-
pupae	4	-	-	-	-	-	-	-	-	-
F. Simuliidae										
Gymnopais	161	219	82	480	75	297	462	552	706	685
Prosimulium/Helodon	-	-	-	7	-	-	-	-	-	-
F. Tipulidae										
Tipula	7	7	4	25	11	7	4	36	11	11
Density (No. organisms per m^2)	613	474	188	1,058	330	448	750	1,015	1,175	855
Richness[a]	6	4	3	6	4	5	3	5	6	4
Simpson's Evenness (E)[a]	0.297	0.529	0.689	0.359	0.430	0.379	0.637	0.428	0.338	0.370
Bray-Curtis Index[a]	0.204	0.069	0.378	0.439	0.121	0.291	0.302	0.423	0.481	0.491

[a] Metrics calculated using Family Level (FL) taxonomy.

Table F.49: Supporting Benthic Invertebrate Community Metrics for Mary River Tributary-F Effluent-Exposed and Reference Study Area Replicate Stations Used for the Mary River Project EEM, August 2017

Supporting Metric	Reference Area					Effluent-Exposed Area				
	1	2	3	4	5	1	2	3	4	5
Family Level Taxonomy										
Simpson's Diversity (FL) [a]	0.439	0.528	0.516	0.536	0.418	0.472	0.477	0.533	0.507	0.324
Shannon-Wiener Diversity (FL)[a]	1.108	1.191	1.121	1.251	1.061	1.162	1.001	1.239	1.216	0.818
Lowest Practical Level Taxonomy										
Richness (LPL) [b]	14	10	9	16	8	12	10	11	12	7
Simpson's Evenness (LPL)[b]	0.319	0.339	0.406	0.211	0.626	0.182	0.228	0.246	0.202	0.217
Bray-Curtis Index (LPL) [b]	0.249	0.200	0.385	0.460	0.160	0.312	0.387	0.493	0.557	0.580
Simpson's Diversity (LPL) [b]	0.776	0.705	0.726	0.704	0.800	0.542	0.561	0.631	0.588	0.342
Shannon-Wiener Diversity (LPL)[b]	2.655	2.213	2.332	2.322	2.581	1.918	1.667	1.919	1.849	1.063
Dominant Taxa Groups										
% Chironomidae	70.1%	50.8%	54.3%	50.2%	72.7%	29.7%	37.9%	41.3%	36.3%	18.1%
% Metal Sensitive Chironomidae	24.8%	22.2%	21.3%	18.8%	32.4%	15.6%	12.5%	13.8%	13.2%	13.1%
% Simuliidae	26.3%	46.2%	43.6%	46.0%	22.7%	66.3%	61.6%	54.4%	60.1%	80.1%
% Tipulidae	1.1%	1.5%	2.1%	2.4%	3.3%	1.6%	0.5%	3.5%	0.9%	1.3%
Functional Feeding Groups										
% Collector Gatherers	71.9%	50.0%	54.3%	50.3%	72.7%	29.7%	36.9%	41.0%	34.1%	18.6%
% Filterers	26.3%	46.2%	43.6%	46.0%	22.7%	66.3%	61.6%	54.4%	60.1%	80.1%
% Shredders	1.1%	2.3%	2.1%	3.0%	3.3%	1.6%	1.5%	4.2%	3.7%	1.3%
Habitat Preference Groups										
% Clingers	26.9%	48.5%	43.6%	47.7%	23.9%	68.8%	62.5%	55.5%	64.9%	80.1%
% Sprawlers	70.1%	50.0%	54.3%	48.9%	72.7%	29.7%	36.9%	40.6%	33.5%	18.1%
% Burrowers	2.9%	1.5%	2.1%	3.4%	3.3%	1.6%	0.5%	3.9%	1.5%	1.8%
Dominant Taxa Groups										
Density Chironomidae	430	241	102	531	240	133	284	419	426	155
Density Metal Sensitive Chironomidae	152	105	40	199	107	70	94	140	155	112
Density Simuliidae	161	219	82	487	75	297	462	552	706	685
Density Tipulidae	7	7	4	25	11	7	4	36	11	11
Functional Feeding Groups										
Density Collector Gatherers	441	237	102	532	240	133	277	416	401	159
Density Filterers	161	219	82	487	75	297	462	552	706	685
Density Shredders	7	11	4	32	11	7	11	43	43	11
Habitat Preference Groups										
Density Clingers	165	230	82	505	79	308	469	563	763	685
Density Sprawlers	430	237	102	517	240	133	277	412	394	155
Density Burrowers	18	7	4	36	11	7	4	40	18	15

[a] Metrics calculated using Family Level (FL) taxonomy.

[b] Metrics calculated using Lowest Practical Level (LPL) taxonomy.

Table F.50: Summary of Habitat Features at Mary River Study Areas Evaluated for the 2017 Mary River Project CREMP Benthic Invertebrate Community Assessment

Habitat Characteristic		Mary River Upstream		Mary River Downstream		
		GO-09	GO-03	EO-01	EO-20	CO-05
Mean Width (m)	Wetted	30.3	37.5	20.3	12.3	73
Mean Depth (m)	Average	0.20	0.25	0.34	0.27	0.22
Mean Velocity (m/s)	Average	not measured	0.28	not measured	not measured	0.16
Stream Morphology	% Pool	0	0	0	0	0
	% Rapid	0	0	30	10	0
	% Riffle	100	95	63	90	20
	% Run	0	5	7	0	80
Substrate (% areal coverage)		45% boulder 35% cobble 5% pebble 5% gravel 10% sand	35% boulder 50% cobble 10% pebble 5% gravel	48% boulder 48% cobble 2% pebble 2% gravel	5% boulder 88% cobble 7% pebble trace sand	10% boulder 10% cobble 5% pebble 10% gravel 65% sand
Mean Substrate Size (mm)		191	177	201	119	38
Aquatic Vegetation (% areal coverage)	Bryophyte Coverage	15%	trace	trace	none observed	none observed
	Periphyton Coverage	<5%	trace	trace	trace	trace
	Periphyton Description	Rocks slightly slippery, yellow-green (0.5-1.0 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)	Rocks not slippery, no obvious colour (<0.5 mm thick)
Functional Instream Cover (% areal coverage)		8% boulder	15% boulder	22% deep pool/ boulder mix	no significant cover	25% deep pool

Table F.51: Replicate Grab Data for Benthic Invertebrate Community Samples Collected at the Mary River, Mary River Project CREMP,

Study Area	Station	Water Depth (cm)			Water Velocity (m/s)			Substrate Size[a] (cm)			Embeddedness			In-Stream Vegetation			Algae Presence		
		Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3	Replicate Grab 1	Replicate Grab 2	Replicate Grab 3
Mary River Upstream Reference (GO-09)	GO-09 B1	10	10	18	-	-	-	74.9	52.8	64.8	75%	50%	50%	none	none	none	scarce	scarce	scarce
	GO-09 B2	10	20	20	-	-	-	65.6	65.3	69.8	50%	50%	50%	none	none	none	none	none	scarce
	GO-09 B3	20	18	15	-	-	-	66.5	56.4	55.0	50%	-	-	scarce	none	none	none	scarce	scarce
	GO-09 B4	18	19	18	-	-	-	50.0	45.6	46.8	25%	25%	25%	none	none	none	none	none	none
	GO-09 B5	16	15	15	-	-	0.45	37.4	54.1	69.1	50%	50%	50%	none	none	scarce	none	none	common
Mary River Upstream (GO-03)	GO-03 B1	12	12	14	0.27	0.45	0.45	72.0	85.2	80.7	25%	25%	0%	scarce	scarce	none	common	scarce	common
	GO-03 B2	12	11	14	0.22	0.31	0.24	-	58.3	69.8	25%	25%	0%	none	none	none	scarce	scarce	scarce
	GO-03 B3	14	10	12	0.34	0.26	0.27	85.5	84.1	76.1	0%	25%	25%	none	none	none	scarce	scarce	scarce
	GO-03 B4	16	12	12	0.26	0.31	0.44	60.1	57.6	71.5	0%	25%	0%	none	none	none	none	scarce	scarce
	GO-03 B5	14	6	18	0.25	0.31	0.26	65.4	75.4	92.6	25%	0%	0%	none	none	none	none	none	none
Mary River Upper Mine-Exposed (EO-01)	EO-01 B1	20	19	25	-	-	-	64.3	69.4	53.8	0%	25%	25%	none	none	none	none	scarce	none
	EO-01 B2	15	22	20	-	-	-	56.4	79.0	59.8	0%	50%	25%	none	none	none	scarce	none	none
	EO-01 B3	20	12	10	-	-	-	71.3	64.7	71.4	25%	25%	25%	none	scarce	none	none	none	none
	EO-01 B4	15	18	23	-	-	-	62.4	60.3	92.6	25%	-	50%	none	none	none	none	scarce	none
	EO-01 B5	20	14	17	-	-	-	86.9	56.9	77.6	-	50%	25%	scarce	none	none	none	scarce	scarce
Mary River Middle Mine-Exposed (EO-20)	EO-20 B1	22	22	15	-	-	-	97.7	63.8	79.3	75%	50%	50%	none	none	none	scarce	scarce	scarce
	EO-20 B2	14	15	19	-	-	-	81.0	48.8	63.6	50%	0%	25%	common	scarce	none	common	scarce	scarce
	EO-20 B3	18	19	16	-	-	-	-	62.5	66.5	75%	50%	50%	none	none	none	none	none	none
	EO-20 B4	20	16	21	-	-	-	74.2	57.6	55.8	75%	25%	50%	none	none	none	none	none	none
	EO-20 B5	17	15	18	-	-	-	86.4	87.8	58.6	0%	0%	50%	none	none	none	none	none	none
Mary River Lower Mine-Exposed (CO-05)	CO-05 B1	18	15	14	0.33	0.43	0.34	50.3	53.5	55.1	75%	75%	75%	none	none	none	scarce	scarce	scarce
	CO-05 B2	10	8	10	0.45	0.38	0.44	64.8	77.3	62.5	75%	50%	75%	scarce	common	scarce	none	none	none
	CO-05 B3	12	8	14	0.36	0.38	0.34	64.0	52.1	71.6	50%	75%	75%	scarce	common	scarce	none	none	none
	CO-05 B4	8	9	5	0.40	0.30	0.56	80.8	76.3	89.3	75%	75%	75%	scarce	scarce	scarce	none	none	none
	CO-05 B5	10	9	8	0.54	0.46	0.40	95.3	96.4	79.0	75%	50%	75%	common	none	common	scarce	scarce	scarce

[a] Substrate measurements taken from the intermediate axis of each individual particle observed within the Surber sampler area as viewed from the surface prior to sampling. Sample size ranged from 5 - 8 measurements per replicate grab, with a mean of 7.3 for Mary River sampling stations in 2017.

Table F.52: Replicate Station Habitat Feature Summary Statistics for Mary River Benthic Stations, Mary River Project CREMP, August 2017

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Depth (cm)	GO-09 Reference Area	16.1	2.2	1.0	13.3	18.9	12.7	18.3
	GO-03 Upstream Area	12.6	0.5	0.2	12.0	13.2	12.0	13.3
	EO-01 Upper Mine-Exposed Area	18.0	2.7	1.2	14.6	21.4	14.0	21.3
	EO-20 Middle Mine-Exposed Area	17.8	1.5	0.7	15.9	19.7	16.0	19.7
	CO-05 Lower Mine-Exposed Area	10.5	3.2	1.4	6.6	14.5	7.3	15.7
Water Velocity (cm/s)	GO-09 Reference Area	-	-	-	-	-	-	-
	GO-03 Upstream Area	30.9	5.4	2.4	24.2	37.6	25.7	39.0
	EO-01 Upper Mine-Exposed Area	-	-	-	-	-	-	-
	EO-20 Middle Mine-Exposed Area	-	-	-	-	-	-	-
	CO-05 Lower Mine-Exposed Area	40.7	4.4	2.0	35.2	46.2	36.0	46.7
Substrate Size (mm diameter)	GO-09 Reference Area	58.3	7.9	3.5	48.5	68.0	47.5	66.9
	GO-03 Upstream Area	73.2	9.0	4.0	62.1	84.3	63.1	81.9
	EO-01 Upper Mine-Exposed Area	68.4	4.7	2.1	62.6	74.2	62.5	73.8
	EO-20 Middle Mine-Exposed Area	69.9	8.4	3.7	59.5	80.2	62.5	80.2
	CO-05 Lower Mine-Exposed Area	71.2	15.0	6.7	52.6	89.8	53.0	90.2
Substrate Embeddedness (%)	GO-09 Reference Area	47	13	6	31	62	25	58
	GO-03 Upstream Area	13	5	2	8	19	8	17
	EO-01 Upper Mine-Exposed Area	28	9	4	17	40	17	38
	EO-20 Middle Mine-Exposed Area	42	19	9	17	66	17	58
	CO-05 Lower Mine-Exposed Area	70	5	2	64	76	66	75

Note: Five stations were sampled at each study area.

Table F.53: Benthic Station Habitat Feature Statistical Comparisons Among Mary River Reference and Mine-Exposed Study Areas, Mary River Project CREMP, August 2017

Metric	Overall 5-group Comparison			Pair-wise, post-hoc comparisons[a]				
	Significant Difference Among Areas?	P-value	Statistical Test[b]	(I) Area	(J) Area	Significant Difference Between Areas?	P-value	Statistical Test
Water Depth (cm)	YES	0.0001	α	GO-09	GO-03	NO	0.1342	Tukey's HSD
				GO-09	EO-01	NO	0.6870	
				GO-09	EO-20	NO	0.7668	
				GO-09	CO-05	YES	0.0065	
				GO-03	EO-01	YES	0.0089	
				GO-03	EO-20	YES	0.0121	
				GO-03	CO-05	NO	0.6026	
				EO-01	EO-20	NO	0.9999	
				EO-01	CO-05	YES	0.0003	
				EO-20	CO-05	YES	0.0005	
Substrate Size (mm diameter)	NO	0.1582	α	GO-09	GO-03	NO	0.2110	Tamhane's
				GO-09	EO-01	NO	0.3655	
				GO-09	EO-20	NO	0.4250	
				GO-09	CO-05	NO	0.7715	
				GO-03	EO-01	NO	0.9818	
				GO-03	EO-20	NO	0.9997	
				GO-03	CO-05	NO	1.0000	
				EO-01	EO-20	NO	1.0000	
				EO-01	CO-05	NO	1.0000	
				EO-20	CO-05	NO	1.0000	
Substrate Embeddedness (%)	YES	0.0008	ζ	GO-09	GO-03	YES	0.0079	Mann-Whitney U-test
				GO-09	EO-01	YES	0.0556	
				GO-09	EO-20	NO	1.0000	
				GO-09	CO-05	YES	0.0079	
				GO-03	EO-01	YES	0.0159	
				GO-03	EO-20	YES	0.0159	
				GO-03	CO-05	YES	0.0079	
				EO-01	EO-20	NO	0.3095	
				EO-01	CO-05	YES	0.0079	
				EO-20	CO-05	YES	0.0079	

Note: Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

[b] Data analysis included: α - data untransformed, single factor ANOVA test conducted; ζ - data untransformed, Kruskal-Wallis H-test conducted; η - data log transformed, single factor ANOVA test conducted; β - data logit transformed, single factor ANOVA test conducted.

Table F.54: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary River GO-09 and GO-03 Study Areas, August 2017

Taxa	Study Area	GO-09 Reference Area					GO-03 Upstream of Mine				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS											
P. Nemata		-	4	-	-	4	11	4	11	-	-
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		-	-	-	-	-	-	-	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina											
F. Sperchonidae											
Sperchon		-	-	-	-	-	22	7	11	-	-
SEED SHRIMPS											
Cl. Ostracoda		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
MAYFLIES											
O. Ephemeroptera											
F. Baetidae											
Acentrella feropagus		-	-	-	-	-	29	11	18	-	-
STONEFLIES											
O. Plecoptera											
F. Capniidae											
immature		-	-	-	-	-	-	-	-	4	-
TRUE FLIES											
O. Diptera											
MIDGES											
F. Chironomidae											
chironomid pupae		**72**	**47**	**57**	**65**	**72**	**36**	**57**	**65**	**39**	**7**
S.F. Chironominae											
Stictochironomus		-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae											
Diamesa		136	36	154	108	276	115	47	104	72	14
Pseudokiefferiella		11	7	22	18	237	43	32	39	4	18
S.F. Orthocladiinae											
Chaetocladius		-	-	4	-	-	-	-	-	-	-
Cardiocladius		4	-	-	-	14	11	7	29	-	-
Corynoneura		-	4	-	-	-	-	-	-	-	-
Cricotopus		-	4	-	-	-	7	-	4	-	-
Cricotopus/Orthocladius		7	4	11	7	32	14	4	11	-	-
Diplocladius		-	-	-	-	-	-	7	-	4	4
Eukiefferiella		7	11	7	4	39	11	-	-	-	-
Hydrobaenus		-	-	-	-	-	-	11	-	-	-
Hydrosmittia		-	-	-	-	-	-	-	4	4	-
Krenosmittia		7	4	4	-	-	11	7	22	7	7
Limnophyes		-	-	-	-	-	-	-	-	-	-
Orthocladius (Euorthocladius)		18	4	7	-	-	18	11	4	-	-
Parakiefferiella		-	-	-	-	-	-	-	-	-	-
Parametriocnemus		-	-	-	-	-	-	-	-	-	-

Table F.54: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary River GO-09 and GO-03 Study Areas, August 2017

Taxa	Study Area	GO-09 Reference Area					GO-03 Upstream of Mine				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
Paraphaenocladius		-	-	-	-	-	-	-	-	-	-
Thienemanniella		-	-	-	-	7	-	-	-	-	-
Tokunagaia		7	4	7	11	47	32	14	25	4	7
Tvetenia		-	-	-	-	7	-	-	4	4	7
indeterminate		-	-	-	-	-	-	-	-	-	-
S.F. Podonominae											
Trichotanypus		-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Thienemannimyia complex		-	-	-	-	-	-	-	-	-	-
F. Empididae											
Hemerodromia		-	-	-	-	-	-	-	-	-	-
F. Simuliidae											
Gymnopais		32	39	32	32	47	25	7	29	4	14
Metacnephia		11	-	7	-	18	25	7	4	4	-
Prosimulium		18	7	11	-	151	61	22	29	4	-
pupae		-	-	-	-	-	-	-	-	-	-
F. Tipulidae											
Tipula		4	4	11	-	7	18	11	7	-	4
Number of Organisms (No. organisms per m^2)		334	179	334	245	958	489	266	420	154	82
Richness (total number of taxa)[a]		12	13	12	6	13	16	16	17	11	8
Simpson's Evenness (E)		0.729	0.892	0.694	0.678	0.854	0.938	0.939	0.909	0.621	0.960
Bray-Curtis Index		0.082	0.400	0.050	0.133	0.536	0.387	0.488	0.351	0.437	0.653
Percent Composition											
% Nemata		0.0%	2.2%	0.0%	0.0%	0.4%	2.2%	1.5%	2.6%	0.0%	0.0%
% Oligochaeta		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Hydracarina		0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	2.6%	2.6%	0.0%	0.0%
% Ostracods		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Ephemeroptera		0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	4.1%	4.3%	0.0%	0.0%
% Chironomids		80.5%	69.8%	81.7%	86.9%	76.3%	60.9%	74.1%	74.0%	89.6%	78.0%
% Metal Sensitive Chironmids		59.9%	38.5%	66.8%	73.9%	59.3%	36.8%	41.7%	43.1%	68.8%	43.9%
% Simuliidae		18.3%	25.7%	15.0%	13.1%	22.5%	22.7%	13.5%	14.8%	7.8%	17.1%
% Tipulidae		1.2%	2.2%	3.3%	0.0%	0.7%	3.7%	4.1%	1.7%	0.0%	4.9%
Functional Feeding Group Composition											
% Collector - Gatherers		75.7%	65.4%	77.5%	82.9%	71.3%	61.8%	74.1%	67.6%	89.6%	78.0%
% Filterers		18.3%	25.7%	15.0%	13.1%	22.5%	22.7%	13.5%	14.8%	7.8%	17.1%
% Shredders		4.2%	8.9%	7.5%	4.1%	4.5%	8.6%	6.0%	6.2%	2.6%	4.9%
Habitat Preference Group Composition											
% Clingers		21.3%	32.4%	19.2%	17.1%	26.3%	32.1%	18.0%	21.9%	7.8%	17.1%
% Sprawlers		75.7%	63.1%	77.5%	82.9%	70.9%	59.5%	72.6%	65.0%	92.2%	78.0%
% Burrowers		3.0%	4.5%	3.3%	0.0%	2.8%	8.4%	9.4%	13.1%	0.0%	4.9%

[a] Bold entries excluded from taxa count

Table F.55: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary River EO-01 and EO-20 Study Areas, August 2017

Taxa	Study Area	EO-01 Mine-Exposed Area					EO-20 Mine-Exposed Area				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS											
P. Nemata		-	-	4	-	-	-	50	-	-	-
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		-	-	-	-	-	4	18	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina											
F. Sperchonidae											
Sperchon		-	4	-	4	11	7	54	4	-	4
SEED SHRIMPS											
Cl. Ostracoda		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
MAYFLIES											
O. Ephemeroptera											
F. Baetidae											
Acentrella feropagus		-	-	14	4	18	11	14	7	-	-
STONEFLIES											
O. Plecoptera											
F. Capniidae											
immature		-	-	-	-	-	-	-	-	-	-
TRUE FLIES											
O. Diptera											
MIDGES											
F. Chironomidae											
chironomid pupae		**-**	**18**	**18**	**11**	**29**	**18**	**43**	**7**	**4**	**7**
S.F. Chironominae											
Stictochironomus		-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae											
Diamesa		4	7	22	22	54	22	179	7	-	18
Pseudokiefferiella		-	4	-	14	36	11	804	4	4	-
S.F. Orthocladiinae											
Chaetocladius		-	-	-	4	-	-	-	4	-	-
Cardiocladius		-	-	4	-	-	-	54	4	-	-
Corynoneura		-	-	-	-	-	-	-	-	-	-
Cricotopus		-	-	-	-	18	-	126	-	-	-
Cricotopus/Orthocladius		-	-	-	-	11	4	-	-	4	-
Diplocladius		-	-	-	4	-	-	-	-	-	-
Eukiefferiella		-	-	7	11	39	7	18	-	-	4
Hydrobaenus		-	4	-	4	-	4	-	-	-	-
Hydrosmittia		-	-	-	4	-	-	7	-	-	-
Krenosmittia		-	32	7	18	4	4	-	11	14	7

Table F.55: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary River EO-01 and EO-20 Study Areas, August 2017

Taxa	Study Area	EO-01 Mine-Exposed Area					EO-20 Mine-Exposed Area				
	Replicate Station	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
Limnophyes		-	4	-	-	-	-	-	-	-	-
Orthocladius (Euorthocladius)		-	4	4	-	25	7	11	4	4	-
Parakiefferiella		-	-	-	-	-	-	-	-	-	-
Parametriocnemus		-	-	-	-	4	-	-	-	-	-
Paraphaenocladius		-	-	-	-	-	-	-	-	-	-
Thienemanniella		4	-	-	-	4	14	-	-	4	-
Tokunagaia		-	-	7	4	18	7	7	4	4	-
Tvetenia		-	7	4	4	7	4	18	-	-	-
indeterminate		-	-	4	-	-	-	-	-	-	-
S.F. Podonominae											
Trichotanypus		-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Thienemannimyia complex		-	-	-	-	-	-	-	-	4	-
F. Empididae											
Hemerodromia		-	-	-	-	-	-	4	-	-	-
F. Simuliidae											
Gymnopais		4	11	7	4	7	14	65	11	-	4
Metacnephia		-	-	-	-	4	4	43	4	-	4
Prosimulium		-	-	-	11	7	11	25	7	7	-
pupae		-	-	-	-	-	-	7	-	-	-
F. Tipulidae											
Tipula		-	-	-	-	4	7	22	-	-	4
Number of Organisms (No. organisms per m^2)		12	95	102	123	300	160	1,569	78	49	52
Richness (total number of taxa)[a]		3	9	10	14	17	17	18	12	8	7
Simpson's Evenness (E)		1.000	0.855	0.945	0.955	0.947	0.977	0.731	0.983	0.932	0.884
Bray-Curtis Index		0.949	0.825	0.675	0.653	0.510	0.543	0.694	0.738	0.836	0.753
Percent Composition											
% Nemata		0.0%	0.0%	3.9%	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	0.0%
% Oligochaeta		0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	1.1%	0.0%	0.0%	0.0%
% Hydracarina		0.0%	4.2%	0.0%	3.3%	3.7%	4.4%	3.4%	5.1%	0.0%	7.7%
% Ostracods		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Ephemeroptera		0.0%	0.0%	13.7%	3.3%	6.0%	6.9%	0.9%	9.0%	0.0%	0.0%
% Chironomids		66.7%	84.2%	75.5%	81.3%	83.0%	63.8%	80.8%	57.7%	85.7%	69.2%
% Metal Sensitive Chironmids		33.3%	14.7%	29.4%	33.3%	34.0%	25.0%	64.8%	16.7%	8.2%	42.3%
% Simuliidae		33.3%	11.6%	6.9%	12.2%	6.0%	18.1%	8.9%	28.2%	14.3%	15.4%
% Tipulidae		0.0%	0.0%	0.0%	0.0%	1.3%	4.4%	1.4%	0.0%	0.0%	7.7%
Functional Feeding Group Composition											
% Collector - Gatherers		66.7%	84.2%	88.2%	84.6%	78.0%	70.0%	74.1%	60.3%	67.3%	69.2%
% Filterers		33.3%	11.6%	6.9%	12.2%	6.0%	18.1%	8.9%	28.2%	14.3%	15.4%
% Shredders		0.0%	0.0%	0.0%	0.0%	12.3%	7.5%	9.7%	0.0%	10.2%	7.7%
Habitat Preference Group Composition											
% Clingers		33.3%	15.8%	6.9%	15.4%	20.7%	25.6%	20.9%	33.3%	24.5%	23.1%
% Sprawlers		66.7%	84.2%	84.3%	84.6%	78.0%	67.5%	69.8%	60.3%	75.5%	69.2%
% Burrowers		0.0%	0.0%	8.8%	0.0%	1.3%	6.9%	9.3%	6.4%	0.0%	7.7%

[a] Bold entries excluded from taxa count

Table F.56: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary River Study Area CO-05, August 2017

Taxa	Study Area	CO-05 Downstream Mine-Exposed Area				
	Replicate Station	B1	B2	B3	B4	B5
ROUNDWORMS						
P. Nemata		4	22	79	14	22
ANNELIDS						
P. Annelida						
WORMS						
Cl. Oligochaeta						
F. Enchytraeidae		-	7	14	-	22
ARTHROPODS						
P. Arthropoda						
MITES						
Cl. Arachnida						
O. Acarina						
F. Sperchonidae						
Sperchon		43	47	22	4	36
SEED SHRIMPS						
Cl. Ostracoda		4	-	11	-	-
INSECTS						
Cl. Insecta						
MAYFLIES						
O. Ephemeroptera						
F. Baetidae						
Acentrella feropagus		72	57	147	47	72
STONEFLIES						
O. Plecoptera						
F. Capniidae						
immature		-	-	-	-	-
TRUE FLIES						
O. Diptera						
MIDGES						
F. Chironomidae						
chironomid pupae		**43**	**72**	**43**	**25**	**32**
S.F. Chironominae						
Stictochironomus		-	4	-	-	11
S.F. Diamesinae						
Diamesa		-	14	22	14	-
Pseudokiefferiella		14	341	653	334	1,396
S.F. Orthocladiinae						
Chaetocladius		-	4	-	-	-
Cardiocladius		32	93	22	43	14
Corynoneura		-	-	-	-	-
Cricotopus		4	18	83	22	11
Cricotopus/Orthocladius		4	29	83	22	65
Diplocladius		-	-	-	-	11
Eukiefferiella		-	7	22	-	-
Hydrobaenus		11	4	25	-	4
Hydrosmittia		4	4	54	7	7
Krenosmittia		7	4	-	7	7

Table F.56: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary River Study Area CO-05, August 2017

Taxa	Study Area	CO-05 Downstream Mine-Exposed Area				
	Replicate Station	B1	B2	B3	B4	B5
Limnophyes		-	-	4	7	4
Orthocladius (Euorthocladius)		18	4	-	7	14
Parakiefferiella		-	-	11	-	4
Parametriocnemus		-	7	-	-	-
Paraphaenocladius		-	7	4	-	7
Thienemanniella		7	18	22	7	22
Tokunagaia		7	7	-	14	-
Tvetenia		22	18	50	36	36
indeterminate		-	4	11	-	-
S.F. Podonominae						
Trichotanypus		4	-	-	-	-
S.F. Tanypodinae						
Thienemannimyia complex		-	11	-	-	7
F. Empididae						
Hemerodromia		-	-	-	-	-
F. Simuliidae						
Gymnopais		11	25	18	11	32
Metacnephia		14	118	39	72	54
Prosimulium		22	283	147	140	147
pupae		-	-	-	-	-
F. Tipulidae						
Tipula		14	7	11	-	7
Number of Organisms (No. organisms per m^2)		361	1,236	1,597	833	2,044
Richness (total number of taxa)[a]		20	26	22	18	24
Simpson's Evenness (E)		0.954	0.862	0.826	0.822	0.527
Bray-Curtis Index		0.765	0.840	0.886	0.824	0.914
Percent Composition						
% Nemata		1.1%	1.8%	4.9%	1.7%	1.1%
% Oligochaeta		0.0%	0.6%	0.9%	0.0%	1.1%
% Hydracarina		11.9%	3.8%	1.4%	0.5%	1.8%
% Ostracods		1.1%	0.0%	0.7%	0.0%	0.0%
% Ephemeroptera		19.9%	4.6%	9.2%	5.6%	3.5%
% Chironomids		49.0%	54.2%	69.4%	65.4%	80.8%
% Metal Sensitive Chironmids		5.3%	32.2%	44.0%	43.8%	69.7%
% Simuliidae		13.0%	34.5%	12.8%	26.8%	11.4%
% Tipulidae		3.9%	0.6%	0.7%	0.0%	0.3%
Functional Feeding Group Composition						
% Collector - Gatherers		56.5%	47.1%	72.4%	61.8%	81.7%
% Filterers		13.0%	34.9%	12.8%	26.8%	11.9%
% Shredders		6.9%	4.9%	12.0%	5.5%	4.2%
Habitat Preference Group Composition						
% Clingers		28.0%	42.6%	25.4%	32.8%	17.0%
% Sprawlers		55.4%	45.7%	66.6%	60.1%	79.8%
% Burrowers		16.6%	12.1%	8.0%	7.1%	3.7%

[a] Bold entries excluded from taxa count

Table F.57: Benthic Invertebrate Community Summary Statistics for Mary River, Mary River Project CREMP, August 2017

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Density (no. organisms / m^2)	GO-09 Reference Area	410	313	140	21	799	179	958
	GO-03 Upstream Area	282	172	77	68	496	82	489
	EO-01 Upper Mine-Exposed Area	126	106	47	-5	258	12	300
	EO-20 Middle Mine-Exposed Area	382	665	298	-444	1,208	49	1,569
	CO-05 Lower Mine-Exposed Area	1,214	654	292	403	2,026	361	2,044
Richness (Number of Taxa)	GO-09 Reference Area	11.2	2.9	1.3	7.5	14.9	6.0	13.0
	GO-03 Upstream Area	13.6	3.9	1.7	8.7	18.5	8.0	17.0
	EO-01 Upper Mine-Exposed Area	10.6	5.3	2.4	4.0	17.2	3.0	17.0
	EO-20 Middle Mine-Exposed Area	12.4	5.0	2.2	6.2	18.6	7.0	18.0
	CO-05 Lower Mine-Exposed Area	22.0	3.2	1.4	18.1	25.9	18.0	26.0
Simpson's Evenness	GO-09 Reference Area	0.770	0.097	0.044	0.649	0.891	0.678	0.892
	GO-03 Upstream Area	0.873	0.142	0.064	0.697	1.050	0.621	0.960
	EO-01 Upper Mine-Exposed Area	0.940	0.053	0.023	0.875	1.006	0.855	1.000
	EO-20 Middle Mine-Exposed Area	0.902	0.103	0.046	0.774	1.030	0.731	0.983
	CO-05 Lower Mine-Exposed Area	0.798	0.161	0.072	0.599	0.998	0.527	0.954
Bray-Curtis Index	GO-09 Reference Area	0.240	0.215	0.096	-0.027	0.507	0.050	0.536
	GO-03 Upstream Area	0.463	0.118	0.053	0.317	0.610	0.351	0.653
	EO-01 Upper Mine-Exposed Area	0.722	0.169	0.076	0.513	0.932	0.510	0.949
	EO-20 Middle Mine-Exposed Area	0.713	0.108	0.048	0.579	0.847	0.543	0.836
	CO-05 Lower Mine-Exposed Area	0.846	0.058	0.026	0.775	0.918	0.765	0.914
Ephemeroptera (% of community)	GO-09 Reference Area	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	GO-03 Upstream Area	2.9%	2.7%	1.2%	-0.5%	6.2%	0.0%	5.9%
	EO-01 Upper Mine-Exposed Area	4.6%	5.7%	2.5%	-2.4%	11.6%	0.0%	13.7%
	EO-20 Middle Mine-Exposed Area	3.4%	4.3%	1.9%	-1.9%	8.7%	0.0%	9.0%
	CO-05 Lower Mine-Exposed Area	8.6%	6.7%	3.0%	0.3%	16.9%	3.5%	19.9%
Chironomidae (% of community)	GO-09 Reference Area	79.0%	6.4%	2.9%	71.1%	87.0%	69.8%	86.9%
	GO-03 Upstream Area	75.3%	10.3%	4.6%	62.6%	88.1%	60.9%	89.6%
	EO-01 Upper Mine-Exposed Area	78.1%	7.2%	3.2%	69.2%	87.1%	66.7%	84.2%
	EO-20 Middle Mine-Exposed Area	71.4%	11.7%	5.2%	57.0%	85.9%	57.7%	85.7%
	CO-05 Lower Mine-Exposed Area	63.8%	12.6%	5.6%	48.1%	79.4%	49.0%	80.8%
Metal-Sensitive Chironomidae (% of community)	GO-09 Reference Area	59.7%	13.2%	5.9%	43.2%	76.1%	38.5%	73.9%
	GO-03 Upstream Area	46.9%	12.6%	5.6%	31.3%	62.5%	36.8%	68.8%
	EO-01 Upper Mine-Exposed Area	28.9%	8.2%	3.7%	18.8%	39.1%	14.7%	34.0%
	EO-20 Middle Mine-Exposed Area	31.4%	22.5%	10.1%	3.4%	59.4%	8.2%	64.8%
	CO-05 Lower Mine-Exposed Area	39.0%	23.3%	10.4%	10.1%	67.9%	5.3%	69.7%
Simuliidae (% of community)	GO-09 Reference Area	18.9%	5.2%	2.3%	12.5%	25.4%	13.1%	25.7%
	GO-03 Upstream Area	15.2%	5.4%	2.4%	8.4%	21.9%	7.8%	22.7%
	EO-01 Upper Mine-Exposed Area	14.0%	11.1%	5.0%	0.2%	27.8%	6.0%	33.3%
	EO-20 Middle Mine-Exposed Area	17.0%	7.1%	3.2%	8.2%	25.8%	8.9%	28.2%
	CO-05 Lower Mine-Exposed Area	19.7%	10.4%	4.6%	6.8%	32.6%	11.4%	34.5%
Collector-Gatherer FFG (% of community)	GO-09 Reference Area	74.6%	6.6%	2.9%	66.4%	82.8%	65.4%	82.9%
	GO-03 Upstream Area	74.2%	10.6%	4.7%	61.1%	87.4%	61.8%	89.6%
	EO-01 Upper Mine-Exposed Area	80.3%	8.5%	3.8%	69.8%	90.8%	66.7%	88.2%
	EO-20 Middle Mine-Exposed Area	68.2%	5.1%	2.3%	61.9%	74.5%	60.3%	74.1%
	CO-05 Lower Mine-Exposed Area	63.9%	13.5%	6.0%	47.1%	80.7%	47.1%	81.7%
Filterer FFG (% of community)	GO-09 Reference Area	18.9%	5.2%	2.3%	12.5%	25.4%	13.1%	25.7%
	GO-03 Upstream Area	15.2%	5.4%	2.4%	8.4%	21.9%	7.8%	22.7%
	EO-01 Upper Mine-Exposed Area	14.0%	11.1%	5.0%	0.2%	27.8%	6.0%	33.3%
	EO-20 Middle Mine-Exposed Area	17.0%	7.1%	3.2%	8.2%	25.8%	8.9%	28.2%
	CO-05 Lower Mine-Exposed Area	19.9%	10.4%	4.7%	6.9%	32.8%	11.9%	34.9%
Shredder FFG (% of community)	GO-09 Reference Area	5.8%	2.2%	1.0%	3.1%	8.6%	4.1%	8.9%
	GO-03 Upstream Area	5.7%	2.2%	1.0%	3.0%	8.4%	2.6%	8.6%
	EO-01 Upper Mine-Exposed Area	2.5%	5.5%	2.5%	-4.4%	9.3%	0.0%	12.3%
	EO-20 Middle Mine-Exposed Area	7.0%	4.1%	1.8%	1.9%	12.1%	0.0%	10.2%
	CO-05 Lower Mine-Exposed Area	6.7%	3.1%	1.4%	2.8%	10.6%	4.2%	12.0%
Clinger HPG (% of community)	GO-09 Reference Area	23.3%	6.1%	2.7%	15.6%	30.9%	17.1%	32.4%
	GO-03 Upstream Area	19.4%	8.8%	3.9%	8.5%	30.3%	7.8%	32.1%
	EO-01 Upper Mine-Exposed Area	18.4%	9.7%	4.3%	6.4%	30.4%	6.9%	33.3%
	EO-20 Middle Mine-Exposed Area	25.5%	4.7%	2.1%	19.6%	31.3%	20.9%	33.3%
	CO-05 Lower Mine-Exposed Area	29.2%	9.5%	4.2%	17.4%	40.9%	17.0%	42.6%
Sprawler HPG (% of community)	GO-09 Reference Area	74.0%	7.5%	3.3%	64.8%	83.3%	63.1%	82.9%
	GO-03 Upstream Area	73.5%	12.6%	5.7%	57.8%	89.2%	59.5%	92.2%
	EO-01 Upper Mine-Exposed Area	79.6%	7.7%	3.4%	70.0%	89.1%	66.7%	84.6%
	EO-20 Middle Mine-Exposed Area	68.5%	5.5%	2.4%	61.7%	75.2%	60.3%	75.5%
	CO-05 Lower Mine-Exposed Area	61.5%	12.7%	5.7%	45.7%	77.3%	45.7%	79.8%
Burrower HPG (% of community)	GO-09 Reference Area	2.7%	1.7%	0.7%	0.7%	4.8%	0.0%	4.5%
	GO-03 Upstream Area	7.2%	5.0%	2.2%	1.0%	13.3%	0.0%	13.1%
	EO-01 Upper Mine-Exposed Area	2.0%	3.8%	1.7%	-2.7%	6.8%	0.0%	8.8%
	EO-20 Middle Mine-Exposed Area	6.1%	3.6%	1.6%	1.6%	10.5%	0.0%	9.3%
	CO-05 Lower Mine-Exposed Area	9.5%	5.0%	2.2%	3.3%	15.7%	3.7%	16.6%

Table F.58: Benthic Invertebrate Community Metric Statistical Comparison Results among Mary River Reference (GO-09), Upstream (GO-03) and Mine-Exposed (EO-01, EO-20, CO-05) Study Areas, Mary River Project CREMP, August 2017

Metric	Data Transform-ation	Overall 5-Area Comparison		Pair-wise, post-hoc comparisons[a]				
		Significant Difference Among Areas?	P-value	Area	Mean	Standard Deviation	Effect Size vs. GO-09 Reference	Pairwise Comparison
Density (No. per m^2)	log	YES	0.0077	GO-09 Ref	410	313	-	a,b
				GO-03	282	172	-0.4	a,b
				EO-01	126	106	-0.9	a
				EO-20	382	665	-0.1	a
				CO-05	1,214	654	2.6	b
Richness (No. of Taxa)	none	YES	0.0022	GO-09 Ref	11.2	2.9	-	a
				GO-03	13.6	3.9	0.8	a
				EO-01	10.6	5.3	-0.2	a
				EO-20	12.4	5.0	0.4	a
				CO-05	22.0	3.2	3.7	b
Simpson's Evenness	log	NO	0.2131	GO-09 Ref	0.770	0.097	-	a
				GO-03	0.873	0.142	1.1	a
				EO-01	0.940	0.053	1.8	a
				EO-20	0.902	0.103	1.4	a
				CO-05	0.798	0.161	0.3	a
Bray-Curtis Index	none	YES	< 0.001	GO-09 Ref	0.240	0.215	-	a
				GO-03	0.463	0.118	1.0	a
				EO-01	0.722	0.169	2.2	b
				EO-20	0.713	0.108	2.2	b
				CO-05	0.846	0.058	2.8	b
Ephemeroptera (% of community)	square root	YES	0.0272	GO-09 Ref	0.0	0.0	-	a
				GO-03	2.9	2.7	nc	a,b
				EO-01	4.6	5.7	nc	a,b
				EO-20	3.4	4.3	nc	a,b
				CO-05	8.6	6.7	nc	b
Chironomidae (% of community)	log	NO	0.1168	GO-09 Ref	79.0	6.4	-	a
				GO-03	75.3	10.3	-0.6	a
				EO-01	78.1	7.2	-0.1	a
				EO-20	71.4	11.7	-1.2	a
				CO-05	63.8	12.6	-2.4	a
Metal Sensitive Chironomidae (% of community)	none	YES	0.0608	GO-09 Ref	59.7	13.2	-	a
				GO-03	46.9	12.6	-1.0	a,b
				EO-01	28.9	8.2	-2.3	b
				EO-20	31.4	22.5	-2.1	a,b
				CO-05	39.0	23.3	-1.6	a,b
Simuliidae (% of community)	log	NO	0.5293	GO-09 Ref	18.9	5.2	-	a
				GO-03	15.2	5.4	-0.7	a
				EO-01	14.0	11.1	-0.9	a
				EO-20	17.0	7.1	-0.4	a
				CO-05	19.7	10.4	0.1	a
Tipulidae (% of community)	log (X+1)	NO	0.2086	GO-09 Ref	1.5	1.3	-	a
				GO-03	2.9	2.0	1.1	a
				EO-01	0.3	0.6	-0.9	a
				EO-20	2.7	3.3	0.9	a
				CO-05	1.1	1.6	-0.3	a
Collector-Gatherer FFG (% of community)	square root	YES	0.0925	GO-09 Ref	74.6	6.6	-	a,b
				GO-03	74.2	10.6	-0.1	a,b
				EO-01	80.3	8.5	0.9	a
				EO-20	68.2	5.1	-1.0	a,b
				CO-05	63.9	13.5	-1.6	b
Filterer FFG (% of community)	log	NO	0.5154	GO-09 Ref	18.9	5.2	-	a
				GO-03	15.2	5.4	-0.7	a
				EO-01	14.0	11.1	-0.9	a
				EO-20	17.0	7.1	-0.4	a
				CO-05	19.9	10.4	0.2	a
Shredder FFG (% of community)	none	NO	0.3312	GO-09 Ref	5.8	2.2	-	a
				GO-03	5.7	2.2	-0.1	a
				EO-01	2.5	5.5	-1.5	a
				EO-20	7.0	4.1	0.5	a
				CO-05	6.7	3.1	0.4	a
Clinger HPG (% of community)	square root	NO	0.2122	GO-09 Ref	23.3	6.1	-	a
				GO-03	19.4	8.8	-0.6	a
				EO-01	18.4	9.7	-0.8	a
				EO-20	25.5	4.7	0.4	a
				CO-05	29.2	9.5	1.0	a
Sprawler HPG (% of community)	log	YES	0.0692	GO-09 Ref	74.0	7.5	-	a,b
				GO-03	73.5	12.6	-0.1	a,b
				EO-01	79.6	7.7	0.7	a
				EO-20	68.5	5.5	-0.7	a,b
				CO-05	61.5	12.7	-1.7	b
Burrower HPG (% of community)	none	YES	0.0411	GO-09 Ref	2.7	1.7	-	a
				GO-03	7.2	5.0	2.7	a,b
				EO-01	2.0	3.8	-0.4	a
				EO-20	6.1	3.6	2.0	a,b
				CO-05	9.5	5.0	4.1	b

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoin

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.59: Statistical Comparison of Benthic Metrics at Mary River Reference Area Stations (GO-09) Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2006, 2007) for the Mary River Project CREMP

Metric	Data Transformation	Overall 5-Year Comparison		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2006	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	log	NO	0.2340	2006	3	403	149	-	-4.0	a	Tukey's HSD
				2007	3	739	84	2.3	-	a	
				2015	5	472	255	0.5	-3.2	a	
				2016	5	662	320	1.7	-0.9	a	
				2017	5	410	313	0.0	-3.9	a	
Richness (No. of Taxa)	log	YES	0.0342	2006	3	7.3	2.9	-	-10.4	a	Tukey's HSD
				2007	3	13.3	0.6	2.1	-	b	
				2015	5	11.4	3.2	1.4	-3.3	a,b	
				2016	5	14.0	1.6	2.3	1.2	b	
				2017	5	11.2	2.9	1.3	-3.7	a,b	
Simpson's Evenness	none	YES	0.0000	2006	3	0.324	0.095	-	-8.5	a	Tamhane's
				2007	3	0.655	0.039	3.5	-	a,c	
				2015	5	0.878	0.049	5.8	5.7	b	
				2016	5	0.907	0.023	6.1	6.5	b	
				2017	5	0.770	0.097	4.7	3.0	b,c	
Nemata (% of community)	modified probit	NO	0.5292	2006	3	0.6%	0.5%	-	1.4	a	Tukey's HSD
				2007	3	0.4%	0.1%	-0.3	-	a	
				2015	5	0.3%	0.4%	-0.6	-1.2	a	
				2016	5	1.7%	1.2%	2.0	10.6	a	
				2017	5	0.5%	1.0%	-0.1	0.8	a	
Oligochaeta (% of community)	modified probit	YES	0.0648	2006	3	0.0%	0.0%	-	-0.6	a	Tamhane's
				2007	3	0.1%	0.2%	nc	-	a	
				2015	5	0.8%	1.0%	nc	3.7	a	
				2016	5	0.0%	0.0%	nc	-0.6	a	
				2017	5	0.0%	0.0%	nc	-0.6	a	
Hydracarina (% of community)	modified probit	YES	0.0000	2006	3	0.5%	0.9%	-	0.2	a,b	Tamhane's
				2007	3	0.4%	0.4%	-0.1	-	a,b	
				2015	5	4.1%	3.0%	4.2	9.4	a	
				2016	5	4.8%	2.1%	5.0	11.1	a	
				2017	5	0.0%	0.0%	-0.6	-1.1	b	
Chironomidae (% of community)	modified probit	YES	0.0000	2006	3	98.7%	0.8%	-	0.9	a	Tukey's HSD
				2007	3	97.4%	1.4%	-1.5	-	a	
				2015	5	88.1%	2.8%	-13.0	-6.7	b	
				2016	5	84.2%	4.6%	-17.9	-9.5	b	
				2017	5	79.1%	6.4%	-24.3	-13.2	b	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0002	2006	3	62.1%	3.7%	-	1.8	a	Tukey's HSD
				2007	3	31.2%	17.4%	-8.4	-	a,b	
				2015	5	12.8%	14.0%	-13.4	-1.1	b	
				2016	5	23.4%	12.3%	-10.6	-0.5	b	
				2017	5	59.7%	13.2%	-0.7	1.6	a	
Tipulidae (% of community)	modified probit	NO	0.1209	2006	3	0.2%	0.4%	-	-0.7	a	Tukey's HSD
				2007	3	1.5%	1.8%	3.1	-	a	
				2015	5	4.6%	2.9%	10.5	1.7	a	
				2016	5	1.9%	1.6%	4.1	0.2	a	
				2017	5	1.5%	1.3%	3.1	0.0	a	
Collector-Gatherer FFG (% of community)	modified probit	YES	0.0000	2006	3	98.7%	1.2%	-	3.6	a	Tukey's HSD
				2007	3	94.6%	1.1%	-3.4	-	a	
				2015	5	78.0%	12.1%	-17.4	-14.7	b	
				2016	5	75.4%	9.1%	-19.6	-17.1	b	
				2017	5	74.6%	6.6%	-20.3	-17.8	b	
Filterer FFG (% of community)	modified probit	NO	0.1210	2006	3	0.1%	0.2%	-	-0.3	a	Tamhane's
				2007	3	0.2%	0.1%	0.2	-	a	
				2015	5	1.9%	1.9%	8.6	11.7	a	
				2016	5	7.3%	4.3%	35.1	48.6	a	
				2017	5	18.9%	5.2%	91.4	127.3	a	
Shredder FFG (% of community)	modified probit	YES	0.0001	2006	3	0.2%	0.4%	-	-10.8	a	Tukey's HSD
				2007	3	4.2%	0.4%	9.6	-	b	
				2015	5	16.0%	11.2%	38.3	32.4	b	
				2016	5	12.0%	3.7%	28.7	21.5	b	
				2017	5	5.8%	2.2%	13.6	4.5	b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.60: Statistical Comparison of Benthic Metrics at Mary River Upstream Study Area (GO-03) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	NO	0.2293	2007	3	136	29	-	a	Tamhane's
				2015	5	169	122	1.1	a	
				2016	5	287	92	5.1	a	
				2017	5	282	172	5.0	a	
Richness (No. of Taxa)	log	YES	0.0105	2007	3	6.3	1.2	-	a	Tukey's HSD
				2015	5	9.4	3.5	2.7	a,b	
				2016	5	14.4	1.8	7.0	b	
				2017	5	13.6	3.9	6.3	b	
Simpson's Evenness	none	YES	0.0004	2007	3	0.591	0.003	-	a	Tukey's HSD
				2015	5	0.921	0.045	126.1	b	
				2016	5	0.899	0.041	117.5	b	
				2017	5	0.873	0.142	107.8	b	
Nemata (% of community)	modified probit	YES	0.0008	2007	3	0.0%	0.0%	-	a	Tukey's HSD
				2015	5	0.0%	0.0%	nc	a	
				2016	5	2.6%	0.7%	nc	b	
				2017	5	1.3%	1.2%	nc	a,b	
Hydracarina (% of community)	modified probit	YES	0.0011	2007	3	0.6%	1.1%	-	a,b	Tamhane's
				2015	5	7.0%	2.5%	5.7	a,b	
				2016	5	9.8%	4.6%	8.2	a	
				2017	5	1.9%	1.9%	1.2	b	
Chironomidae (% of community)	modified probit	YES	0.0000	2007	3	97.2%	0.9%	-	a	Tukey's HSD
				2015	5	72.2%	8.8%	-27.2	b	
				2016	5	77.6%	7.3%	-21.4	b	
				2017	5	75.3%	10.3%	-23.8	b	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0005	2007	3	5.4%	1.1%	-	a	Tukey's HSD
				2015	5	8.2%	5.0%	2.4	a	
				2016	5	8.8%	5.9%	3.0	a	
				2017	5	46.9%	12.6%	36.1	b	
Tipulidae (% of community)	modified probit	YES	0.0092	2007	3	2.2%	1.9%	-	a	Tukey's HSD
				2015	5	19.0%	6.2%	8.6	b	
				2016	5	8.5%	7.0%	3.2	a,b	
				2017	5	2.9%	2.0%	0.4	a	
Collector-Gatherer FFG (% of community)	modified probit	YES	0.0000	2007	3	94.4%	1.9%	-	a	Tamhane's
				2015	5	60.7%	9.5%	-17.7	b	
				2016	5	64.0%	6.1%	-16.0	b	
				2017	5	74.2%	10.6%	-10.6	b	
Filterer FFG (% of community)	modified probit	YES	0.0001	2007	3	0.0%	0.0%	-	a	Tamhane's
				2015	5	1.0%	1.6%	nc	a	
				2016	5	0.6%	0.9%	nc	a	
				2017	5	15.2%	5.4%	nc	b	
Shredder FFG (% of community)	modified probit	YES	0.0000	2007	3	5.0%	0.9%	-	a	Tukey's HSD
				2015	5	29.8%	8.7%	28.9	b	
				2016	5	20.7%	5.5%	18.3	b	
				2017	5	5.7%	2.2%	0.8	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.61: Statistical Comparison of Benthic Metrics at Mary River Upper Mine-Exposed Area (EO-01) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0133	2007	3	797	648	-	a	Tamhane's
				2015	5	116	97	-1.1	a	
				2016	5	230	109	-0.9	a	
				2017	5	126	106	-1.0	a	
Richness (No. of Taxa)	none	NO	0.1418	2007	3	16.3	8.1	-	a	Tukey's HSD
				2015	5	7.8	2.7	-1.0	a	
				2016	5	13.2	4.1	-0.4	a	
				2017	5	10.6	5.3	-0.7	a	
Simpson's Evenness	none	YES	0.0016	2007	3	0.698	0.059	-	a	Tukey's HSD
				2015	5	0.873	0.095	3.0	b	
				2016	5	0.865	0.037	2.8	b	
				2017	5	0.940	0.053	4.1	b	
Nemata (% of community)	modified probit	NO	0.7456	2007	3	2.8%	3.2%	-	a	Tukey's HSD
				2015	5	1.3%	2.8%	-0.5	a	
				2016	5	2.0%	1.4%	-0.3	a	
				2017	5	0.8%	1.8%	-0.6	a	
Hydracarina (% of community)	modified probit	YES	0.0982	2007	3	1.9%	3.3%	-	a	Tukey's HSD
				2015	5	2.1%	3.0%	0.1	a,b	
				2016	5	7.2%	4.6%	1.6	b	
				2017	5	2.2%	2.1%	0.1	a,b	
Chironomidae (% of community)	modified probit	NO	0.1649	2007	3	89.1%	4.1%	-	a	Tukey's HSD
				2015	5	82.6%	6.0%	-1.6	b	
				2016	5	82.8%	7.2%	-1.5	b	
				2017	5	78.1%	7.2%	-2.7	b	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0862	2007	3	36.4%	32.0%	-	a,b	Tamhane's
				2015	5	6.5%	5.7%	-0.9	a	
				2016	5	5.7%	4.7%	-1.0	a,b	
				2017	5	29.0%	8.2%	-0.2	b	
Tipulidae (% of community)	modified probit	YES	0.0417	2007	3	3.4%	4.6%	-	a,b	Tukey's HSD
				2015	5	7.9%	5.5%	1.0	a	
				2016	5	3.2%	2.2%	0.0	a,b	
				2017	5	0.3%	0.6%	-0.7	b	
Collector-Gatherer FFG (% of community)	modified probit	YES	0.0229	2007	3	43.6%	26.6%	-	a	Tukey's HSD
				2015	5	71.4%	16.9%	1.0	b	
				2016	5	77.6%	6.8%	1.3	b	
				2017	5	80.3%	8.5%	1.4	b	
Filterer FFG (% of community)	modified probit	YES	0.0025	2007	3	35.8%	31.5%	-	a,b	Tamhane's
				2015	5	0.0%	0.0%	-1.1	a	
				2016	5	0.9%	0.8%	-1.1	a	
				2017	5	14.0%	11.2%	-0.7	b	
Shredder FFG (% of community)	modified probit	YES	0.0248	2007	3	8.2%	8.0%	-	a,b	Tukey's HSD
				2015	5	20.1%	18.3%	1.5	a	
				2016	5	8.2%	6.9%	0.0	a,b	
				2017	5	2.5%	5.5%	-0.7	b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.62: Statistical Comparison of Benthic Metrics at Mary River Middle Mine-Exposed Area (EO-20) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2011) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2011	Pairwise Comparison	Statistical Test
Density (No. per m^2)	log	YES	0.0957	2011	3	854	348	-	a	Tukey's HSD
				2015	5	278	146	-1.7	a,b	
				2016	5	283	118	-1.6	a,b	
				2017	5	382	665	-1.4	b	
Richness (No. of Taxa)	log	NO	0.7012	2011	3	14.0	2.6	-	a	Tukey's HSD
				2015	5	11.6	2.2	-0.9	a	
				2016	5	13.6	3.1	-0.2	a	
				2017	5	12.4	5.0	-0.6	a	
Simpson's Evenness	none	YES	0.0047	2011	3	0.483	0.247	-	a	Tukey's HSD
				2015	5	0.726	0.140	1.0	a,b	
				2016	5	0.835	0.038	1.4	b	
				2017	5	0.902	0.103	1.7	b	
Nemata (% of community)	modified probit	NO	0.1835	2011	3	0.7%	0.6%	-	a	Tukey's HSD
				2015	5	0.2%	0.4%	-0.9	a	
				2016	5	1.4%	0.9%	1.1	a	
				2017	5	0.6%	1.4%	-0.1	a	
Hydracarina (% of community)	modified probit	YES	0.0073	2011	3	0.9%	0.7%	-	a	Tukey's HSD
				2015	5	3.8%	1.4%	4.1	b	
				2016	5	6.4%	3.0%	8.0	b	
				2017	5	4.1%	2.8%	4.6	b	
Chironomidae (% of community)	modified probit	YES	0.0029	2011	3	94.9%	4.6%	-	a	Tukey's HSD
				2015	5	87.4%	5.1%	-1.6	b	
				2016	5	86.2%	6.3%	-1.9	b	
				2017	5	71.4%	11.7%	-5.1	b	
Metal Sensitive Taxa (% of community)	modified probit	YES	0.0025	2011	3	3.1%	5.4%	-	a,b	Tamhane's
				2015	5	3.6%	2.0%	0.1	a	
				2016	5	4.3%	2.9%	0.2	a	
				2017	5	31.4%	22.5%	5.2	b	
Tipulidae (% of community)	modified probit	NO	0.5951	2011	3	1.9%	1.7%	-	a	Tukey's HSD
				2015	5	4.6%	2.4%	1.6	a	
				2016	5	4.3%	4.8%	1.4	a	
				2017	5	2.7%	3.3%	0.5	a	
Collector-Gatherer FFG (% of community)	none	YES	0.0000	2011	3	22.1%	15.9%	-	a	Tukey's HSD
				2015	5	77.1%	6.5%	3.5	b	
				2016	5	70.5%	7.5%	3.0	b	
				2017	5	68.2%	5.1%	2.9	b	
Filterer FFG (% of community)	modified probit	YES	0.0011	2011	3	3.1%	5.4%	-	a,b	Tamhane's
				2015	5	0.6%	1.0%	-0.5	a	
				2016	5	0.4%	0.8%	-0.5	a	
				2017	5	17.0%	7.1%	2.5	b	
Shredder FFG (% of community)	modified probit	NO	0.2972	2011	3	6.5%	7.4%	-	a	Tukey's HSD
				2015	5	13.0%	3.9%	0.9	a	
				2016	5	8.4%	5.3%	0.3	a	
				2017	5	7.0%	4.1%	0.1	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.63: Statistical Comparison of Benthic Metrics at Mary River Lower Mine-Exposed Area (CO-05) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007, 2011) for the Mary River Project CREMP

Metric	Data Transformation	Overall 5-Year Comparison		Pair-wise, post-hoc comparisons[a]							
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Effect Size vs. Baseline Year 2011	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	YES	0.0144	2007	3	311	230	-	-0.4	a,b	Tukey's HSD
				2011	3	491	455	0.8	-	a,b	
				2015	5	234	168	-0.3	-0.6	a	
				2016	5	1,161	584	3.7	1.5	b	
				2017	5	1,214	654	3.9	1.6	b	
Richness (No. of Taxa)	none	YES	0.0008	2007	3	10.7	3.8	-	-2.1	a	Tukey's HSD
				2011	3	19.0	4.0	2.2	-	b,c	
				2015	5	13.2	2.7	0.7	-1.5	a,b	
				2016	5	19.6	3.3	2.4	0.2	c	
				2017	5	22.0	3.2	3.0	0.8	c	
Simpson's Evenness	none	YES	0.0136	2007	3	0.668	0.022	-	-2.7	a	Tukey's HSD
				2011	3	0.879	0.079	9.8	-	b	
				2015	5	0.923	0.038	11.8	0.6	b	
				2016	5	0.848	0.015	8.4	-0.4	b	
				2017	5	0.798	0.161	6.0	-1.0	a,b	
Nemata (% of community)	modified probit	YES	0.0313	2007	3	0.2%	0.4%	-	-1.9	a	Tukey's HSD
				2011	3	3.5%	1.7%	7.8	-	b	
				2015	5	3.2%	2.2%	7.1	-0.2	b	
				2016	5	1.5%	0.9%	3.1	-1.2	a,b	
				2017	5	2.1%	1.6%	4.5	-0.8	b	
Oligochaeta (% of community)	modified probit	YES	0.0002	2007	3	0.1%	0.2%	-	-3.6	a	Tamhane's
				2011	3	2.6%	0.7%	12.0	-	a	
				2015	5	10.1%	1.9%	48.0	10.7	b	
				2016	5	1.0%	1.1%	4.4	-2.3	a	
				2017	5	0.5%	0.5%	1.8	-3.0	a	
Hydracarina (% of community)	modified probit	YES	0.0526	2007	3	0.5%	0.4%	-	-0.4	a,b	Tukey's HSD
				2011	3	0.7%	0.5%	0.5	-	a	
				2015	5	2.3%	3.1%	4.4	3.3	a,b	
				2016	5	6.5%	2.5%	14.4	11.7	b	
				2017	5	3.9%	4.7%	8.2	6.4	a,b	
Chironomidae (% of community)	modified probit	YES	0.0000	2007	3	99.0%	0.8%	-	1.9	a	Tukey's HSD
				2011	3	90.0%	4.7%	-10.9	-	b	
				2015	5	78.1%	9.9%	-25.2	-2.5	c,d	
				2016	5	88.0%	3.2%	-13.4	-0.4	b,d	
				2017	5	63.8%	12.6%	-42.5	-5.6	c	
Metal Sensitive Taxa (% of community)	modified probit	NO	0.2558	2007	3	37.2%	16.0%	-	2.1	a	Tukey's HSD
				2011	3	14.5%	10.5%	-1.4	-	a	
				2015	5	17.1%	11.0%	-1.3	0.2	a	
				2016	5	29.2%	13.6%	-0.5	1.4	a	
				2017	5	39.0%	23.3%	0.1	2.3	a	
Tipulidae (% of community)	modified probit	NO	0.2684	2007	3	0.0%	0.0%	-	-0.9	a	Tukey's HSD
				2011	3	2.1%	2.4%	nc	-	a	
				2015	5	5.1%	8.1%	nc	1.3	a	
				2016	5	1.9%	0.9%	nc	-0.1	a	
				2017	5	1.1%	1.6%	nc	-0.4	a	
Collector-Gatherer FFG (% of community)	modified probit	YES	0.0074	2007	3	35.0%	15.3%	-	-2.0	a	Tukey's HSD
				2011	3	66.3%	16.0%	2.0	-	a,b	
				2015	5	80.6%	12.7%	3.0	0.9	b	
				2016	5	59.9%	10.4%	1.6	-0.4	a	
				2017	5	63.9%	13.5%	1.9	-0.2	a,b	
Filterer FFG (% of community)	modified probit	YES	0.0009	2007	3	21.0%	28.3%	-	0.6	a	Tukey's HSD
				2011	3	14.3%	10.4%	-0.2	-	a	
				2015	5	0.8%	1.4%	-0.7	-1.3	b	
				2016	5	0.9%	0.7%	-0.7	-1.3	b	
				2017	5	19.9%	10.4%	0.0	0.5	a	
Shredder FFG (% of community)	modified probit	YES	0.0126	2007	3	40.2%	20.9%	-	5.7	a	Tukey's HSD
				2011	3	7.0%	5.8%	-1.6	-	b	
				2015	5	16.0%	10.1%	-1.2	1.6	a,b	
				2016	5	9.8%	5.4%	-1.5	0.5	b	
				2017	5	6.7%	3.1%	-1.6	-0.1	b	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.64: Statistical Comparison of Physical Sediment Quality Between Mary Lake and Reference Lake 3 for Samples Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2017

Lake Zone	Habitat Variable	Statistical Test Results			Summary Statistics						
		Significant Difference Between Areas?	P-value	Statistical Analysis[a]	Study Lake	Sample Size (n)	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Littoral (Shallow) Stations	Station Depth (m)	NO	0.752	α	Reference	5	9.74	1.04	0.46	8.50	11.20
					Mary Lake	4	9.38	2.22	1.11	6.60	12.00
	Sand-Sized Particles (% by weight)	NO	0.107	β	Reference	5	46.4	13.9	6.2	25.6	59.9
					Mary Lake	4	28.5	33.2	16.6	7.9	78.0
	Silt-Sized Particles (% by weight)	NO	0.530	α	Reference	5	44.3	11.6	5.2	32.8	62.2
					Mary Lake	4	52.1	23.1	11.6	19.4	73.8
	Clay-Sized Particles (% by weight)	NO	0.191	α , η	Reference	5	9.3	2.8	1.3	4.7	12.2
					Mary Lake	4	19.5	15.7	7.9	2.7	33.0
	Total Organic Carbon (%)	YES	0.004	α , η	Reference	5	4.9	1.8	0.8	2.7	7.2
					Mary Lake	4	0.9	0.4	0.2	0.5	1.4
Profundal (Deep) Stations	Station Depth (m)	NO	0.748	β	Reference	5	20.56	2.17	0.97	18.50	24.20
					Mary Lake	6	21.58	4.50	1.84	15.00	29.00
	Sand-Sized Particles (% by weight)	NO	0.387	β	Reference	5	35.7	16.5	7.4	15.6	56.0
					Mary Lake	6	30.9	31.1	12.7	6.1	86.7
	Silt-Sized Particles (% by weight)	NO	0.709	α	Reference	5	50.2	11.8	5.3	35.3	62.4
					Mary Lake	6	46.1	21.7	8.8	10.0	71.3
	Clay-Sized Particles (% by weight)	NO	0.436	∓	Reference	5	14.1	5.2	2.3	8.8	22.0
					Mary Lake	6	23.0	16.9	6.9	3.3	44.6
	Total Organic Carbon (%)	YES	<0.001	∓	Reference	5	3.6	1.1	0.5	1.8	4.4
					Mary Lake	6	0.8	0.2	0.1	0.5	1.0

[a] Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data log-transformed, Mann-Whitney U-test conducted; ζ - single factor ANOVA test validated using Mann-Whitney U-test; η - single factor ANOVA test validated using t-test assuming unequal variance; δ - data untransformed, t-test assuming unequal variance conducted; ∓ data square root transformed, t-test conducted.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Table F.65: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary Lake, August 2017

Taxa	Study Area	Mary Lake - Littoral Stations 2017				Mary Lake - Profundal Stations 2017					
	Replicate Station	BLO-1	BLO-11	BLO-7	BLO-6	BLO-3	BLO-15	BLO-14	BLO-13	BLO-4	BLO-5
ROUNDWORMS											
P. Nemata		-	34	-	43	9	9	-	9	9	34
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae		-	34	-	-	-	-	-	-	-	-
F. Lumbriculidae											
Lumbriculus		-	34	-	-	-	-	-	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina											
immature		-	-	-	-	**26**	-	-	-	-	34
F. Acalyptonotidae											
Acalyptonotus		103	-	17	34	9	17	9	9	17	-
F. Hygrobatidae											
Hygrobates		-	-	-	9	-	-	-	-	-	-
F. Lebertiidae											
Lebertia		34	-	9	9	17	9	-	9	17	-
HARPACTICOIDS											
O. Harpacticoida		-	-	-	-	-	-	-	-	-	-
SEED SHRIMPS											
Cl. Ostracoda		86	34	-	17	-	-	-	52	17	-
FAIRY SHRIMP											
O. Notostraca											
Lepidurus arcticus		-	-	-	-	-	-	-	-	-	-
INSECTS											
Cl. Insecta											
CADDISFLIES											
O. Trichoptera											
F. Apataniidae											
Apatania		-	-	-	-	-	-	-	-	-	-
TRUE FLIES											
O. Diptera											
MIDGES											
F. Chironomidae											
chironomid pupae		**-**	**-**	**-**	**-**	**-**	-	-	**9**	**-**	-
S.F. Chironominae											
Chironomus		-	34	-	-	-	-	-	-	-	414
Micropsectra		724	931	-	-	9	9	-	9	26	34
Paratanytarsus		-	-	-	-	-	-	-	-	-	-
Sergentia		-	276	-	-	-	-	-	-	-	310
Stictochironomus		603	1,345	26	-	-	-	-	-	-	552
Tanytarsus		103	-	-	-	-	-	-	-	-	69
S.F. Diamesinae		-	-	-	-	-	-	-	-	-	-
Protanypus		-	-	9	-	-	-	17	-	-	-
Pseudodiamesa		-	-	26	52	-	-	9	-	-	-
S.F. Orthocladiinae											
Abiskomyia		86	69	-	-	34	-	-	-	-	-
Chaetocladius		-	-	-	-	-	-	-	-	-	34

Table F.65: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary Lake, August 2017

Taxa	Study Area	Mary Lake - Littoral Stations 2017				Mary Lake - Profundal Stations 2017					
	Replicate Station	BLO-1	BLO-11	BLO-7	BLO-6	BLO-3	BLO-15	BLO-14	BLO-13	BLO-4	BLO-5
Corynoneura		-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius		-	-	-	-	-	-	-	-	-	-
Heterotrissocladius		34	34	43	103	26	414	190	241	353	34
Mesocricotopus		-	-	-	-	-	-	-	-	9	-
Paracladius		-	-	-	34	-	-	-	-	-	-
Parakiefferiella		-	-	-	-	-	-	-	-	-	-
Psectrocladius		-	-	-	-	-	-	-	-	-	-
Zalutschia		17	-	-	-	-	-	-	-	-	-
Genus "Greenland"		-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae											
Arctopelopia		-	-	-	-	9	-	-	-	-	-
Procladius		2,121	34	86	34	17	52	17	-	9	-
F. Tipulidae											
Tipula		-	34	-	-	-	-	-	-	-	-
Density (No. organisms per m^2)		3,911	2,893	216	335	156	510	242	338	457	1,515
Richness (total number of taxa)[a]		10	12	7	9	8	6	5	6	8	9
Simpson's Evenness (E)		0.717	0.730	0.890	0.934	0.962	0.394	0.464	0.512	0.451	0.839
Bray-Curtis Index		0.838	0.853	0.852	0.768	0.567	0.699	0.471	0.621	0.671	0.958
Percent Composition											
% Nemata		0.0%	1.2%	0.0%	12.8%	5.8%	1.8%	0.0%	2.7%	2.0%	2.2%
% Hydracarina		3.5%	0.0%	12.0%	15.5%	33.3%	5.1%	3.7%	5.3%	7.4%	2.2%
% Ostracods		2.2%	1.2%	0.0%	5.1%	0.0%	0.0%	0.0%	15.4%	3.7%	0.0%
% Chironomids		94.3%	94.1%	88.0%	66.6%	60.9%	93.1%	96.3%	76.6%	86.9%	95.5%
% Metal Sensitive Chironmids		21.1%	32.2%	16.2%	15.5%	5.8%	1.8%	10.7%	2.7%	5.7%	6.8%
% Tipulidae		0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Functional Feeding Group Composition											
% Collector - Gatherers		20.7%	65.5%	48.1%	74.3%	44.2%	82.9%	89.3%	92.0%	84.9%	91.0%
% Filterers		21.1%	0.32	0.00	0.00	0.06	0.02	0.00	0.03	0.06	0.07
% Shredders		0.4%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Habitat Preference Group Composition											
% Clingers		24.6%	41.7%	12.0%	15.5%	39.1%	6.9%	3.7%	8.0%	13.1%	29.5%
% Sprawlers		59.9%	5.9%	71.8%	71.6%	55.1%	91.4%	89.3%	89.3%	84.9%	4.5%
% Burrowers		15.4%	52.4%	16.2%	12.8%	5.8%	1.8%	7.0%	2.7%	2.0%	66.0%

[a] Bold entries excluded from taxa coun

Table F.66: Statistical Comparison of Benthic Metrics at Mary Lake Littoral (Shallow) Stations Among Years of Mine Operation (2015, 2016, 2017) and Baseline (2007) for the Mary River Project CREMP

Metric	Data Transformation	Overall 4-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	none	NO	0.9028	2007	3	2,667	1,454	-	a	Tukey's HSD
				2015	4	2,453	2,186	-0.1	a	
				2016	6	1,947	1,591	-0.5	a	
				2017	4	1,839	1,853	-0.6	a	
Richness (No. of Taxa)	log	NO	0.6596	2007	3	8.0	2.0	-	a	Tukey's HSD
				2015	4	9.0	1.8	0.5	a	
				2016	6	8.7	0.5	0.3	a	
				2017	4	9.5	2.1	0.8	a	
Simpson's Evenness	none	NO	0.2738	2007	3	0.718	0.041	-	a	Tamhane's
				2015	4	0.761	0.058	1.1	a	
				2016	6	0.574	0.299	-3.5	a	
				2017	4	0.818	0.110	2.4	a	
Nemata (% of community)	modified probit	NO	0.6950	2007	3	7.3%	11.2%	-	a	Tukey's HSD
				2015	4	5.6%	6.3%	-0.1	a	
				2016	6	3.6%	7.5%	-0.3	a	
				2017	4	3.5%	6.2%	-0.3	a	
Ostracoda (% of community)	modified probit	NO	0.4702	2007	3	0.2%	0.4%	-	a	Tukey's HSD
				2015	4	1.9%	2.2%	4.3	a	
				2016	6	2.3%	2.2%	5.5	a	
				2017	4	2.1%	2.2%	5.0	a	
Chironomidae (% of community)	modified probit	NO	0.7784	2007	3	90.8%	11.8%	-	a	Tukey's HSD
				2015	4	91.1%	7.7%	0.0	a	
				2016	6	90.6%	12.2%	0.0	a	
				2017	4	85.7%	13.1%	-0.4	a	
Metal Sensitive Taxa (% of community)	modified probit	NO	0.7548	2007	3	22.4%	13.8%	-	a	Tukey's HSD
				2015	4	15.8%	14.6%	-0.5	a	
				2016	6	19.2%	13.3%	-0.2	a	
				2017	4	21.3%	7.7%	-0.1	a	
Collector-Gatherer FFG (% of community)	modified probit	NO	0.5006	2007	3	66.0%	26.7%	-	a	Tukey's HSD
				2015	4	72.8%	23.1%	0.3	a	
				2016	6	73.5%	24.7%	0.3	a	
				2017	4	52.2%	23.6%	-0.5	a	
Filterer FFG (% of community)	modified probit	NO	0.7065	2007	3	22.0%	14.5%	-	a	Tukey's HSD
				2015	4	14.4%	16.2%	-0.5	a	
				2016	6	12.4%	13.2%	-0.7	a	
				2017	4	13.3%	16.0%	-0.6	a	

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

Table F.67: Statistical Comparison of Benthic Metrics at Mary Lake Profundal (Deep) Stations Among Years of Mine Operation (2015, 2017) and Baseline (2007) for the Mary River Project CREMP

Metric	Data Transformation	Overall 3-Year Comparison[a]		Pair-wise, post-hoc comparisons[a]						
		Significant Difference Among Years?	P-value	Year	Sample Size (n)	Mean	Standard Deviation	Effect Size vs. Baseline Year 2007	Pairwise Comparison	Statistical Test
Density (No. per m^2)	log	YES	0.0361	2007	4	3,512	3,257	-	a	Tukey's HSD
				2015	6	775	748	-0.8	b	
				2017	6	536	497	-0.9	b	
Richness (No. of Taxa)	log	NO	0.9103	2007	4	8.0	6.2	-	a	Tukey's HSD
				2015	6	7.7	4.1	0.0	a	
				2017	6	7.0	1.5	-0.2	a	
Simpson's Evenness	log	NO	0.2061	2007	4	0.453	0.268	-	a	Tamhane's
				2015	6	0.696	0.142	0.9	a	
				2017	6	0.604	0.236	0.6	a	
Nemata (% of community)	modified probit	NO	0.4109	2007	4	1.3%	1.8%	-	a	Tamhane's
				2015	6	2.0%	2.6%	0.4	a	
				2017	6	2.4%	1.9%	0.6	a	
Ostracoda (% of community)	modified probit	NO	0.4085	2007	4	1.6%	2.2%	-	a	Tukey's HSD
				2015	6	11.1%	10.9%	4.4	a	
				2017	6	3.2%	6.2%	0.7	a	
Chironomidae (% of community)	modified probit	YES	0.0516	2007	4	96.4%	4.7%	-	a	Tukey's HSD
				2015	6	83.8%	12.2%	-2.7	b	
				2017	6	84.9%	13.8%	-2.5	b	
Metal Sensitive Taxa (% of community)	modified probit	NO	0.7473	2007	4	33.7%	27.9%	-	a	Tamhane's
				2015	6	9.5%	8.2%	-0.9	a	
				2017	6	5.6%	3.2%	-1.0	a	
Collector-Gatherer FFG (% of community)	modified probit	NO	0.9753	2007	4	64.4%	27.7%	-	a	Tamhane's
				2015	6	82.7%	5.9%	0.7	a	
				2017	6	80.7%	18.2%	0.6	a	
Filterer FFG (% of community)	modified probit	NO	0.5026	2007	4	33.1%	27.8%	-	a	Tukey's HSD
				2015	6	9.4%	7.9%	-0.9	a	
				2017	6	3.8%	2.7%	-1.1	a	

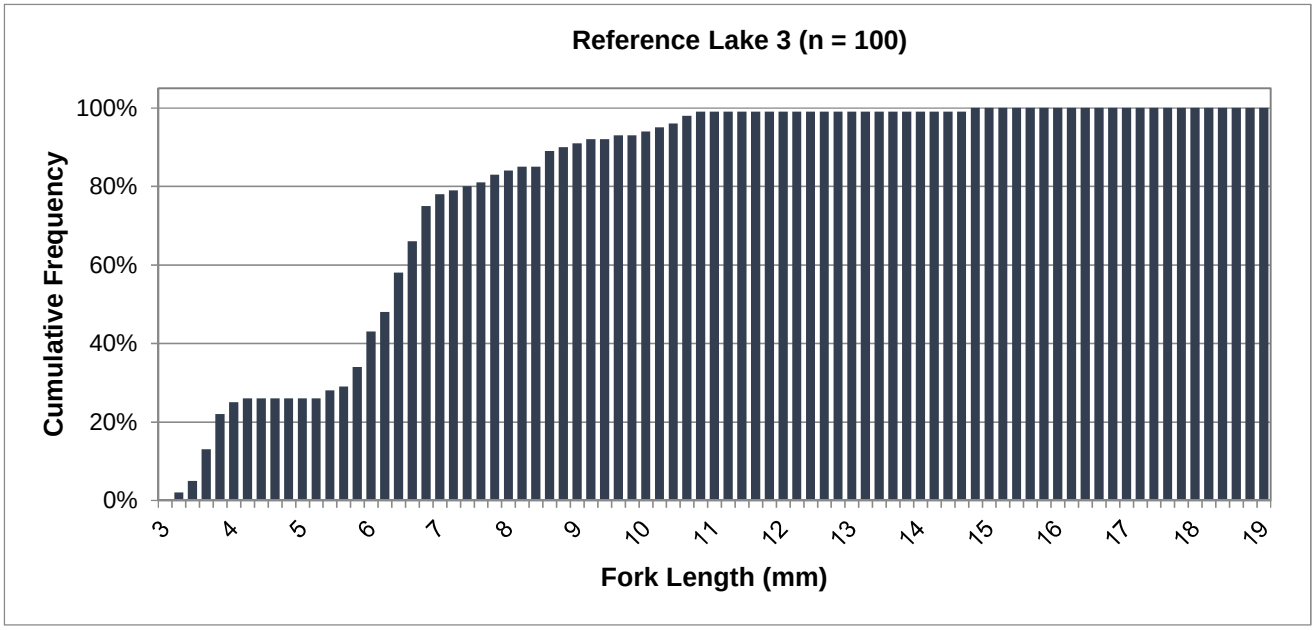
Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

[a] Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons

APPENDIX G

FISH POPULATION SURVEY DATA



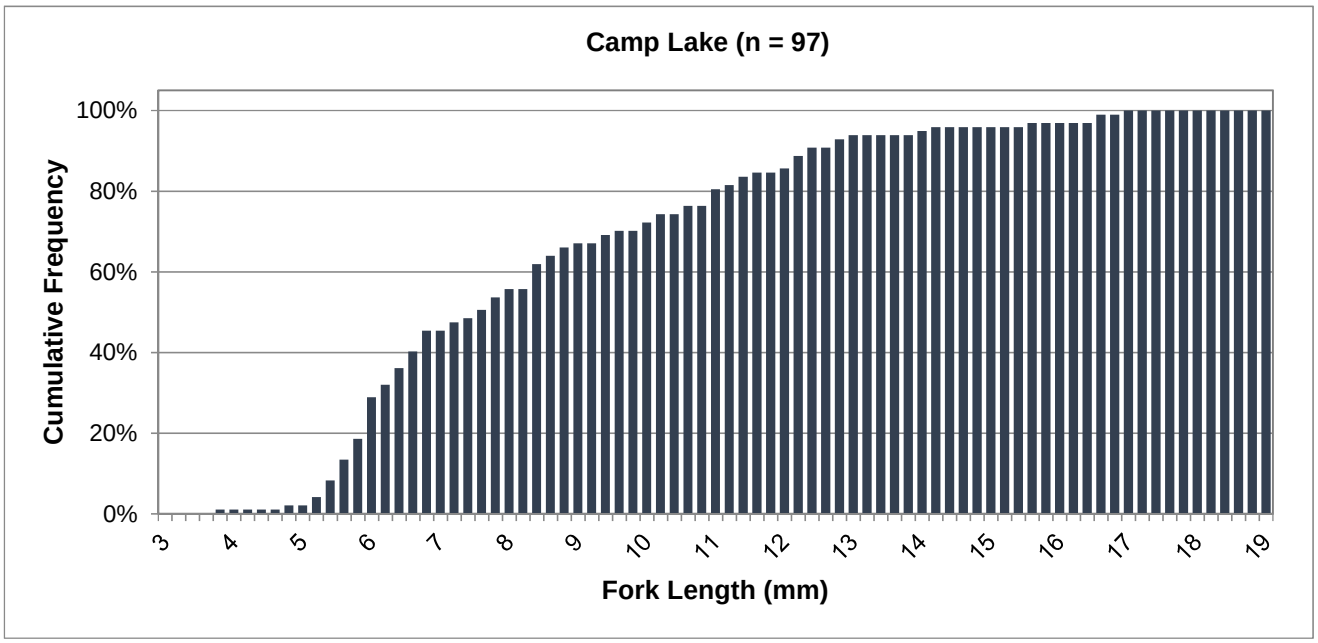
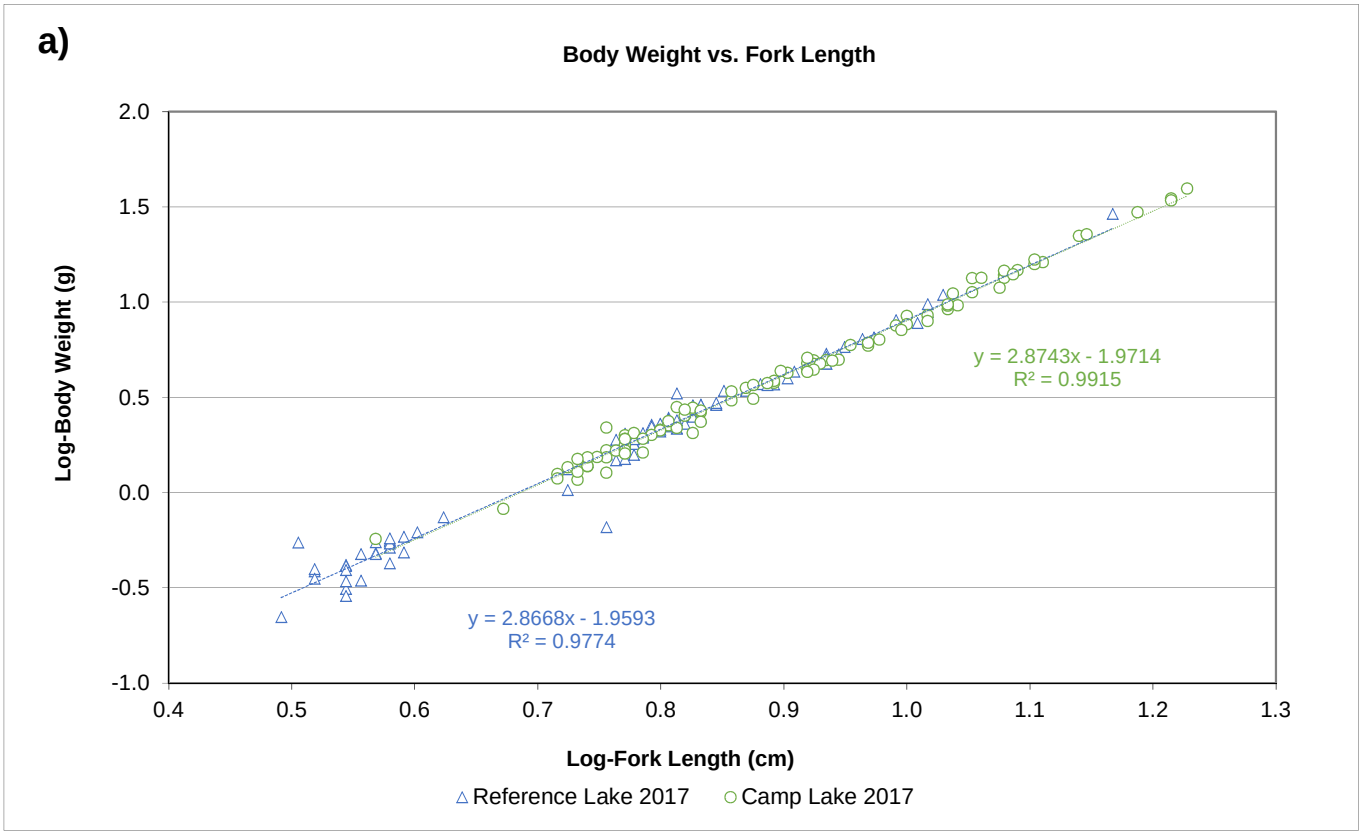


Figure G.1: Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2017



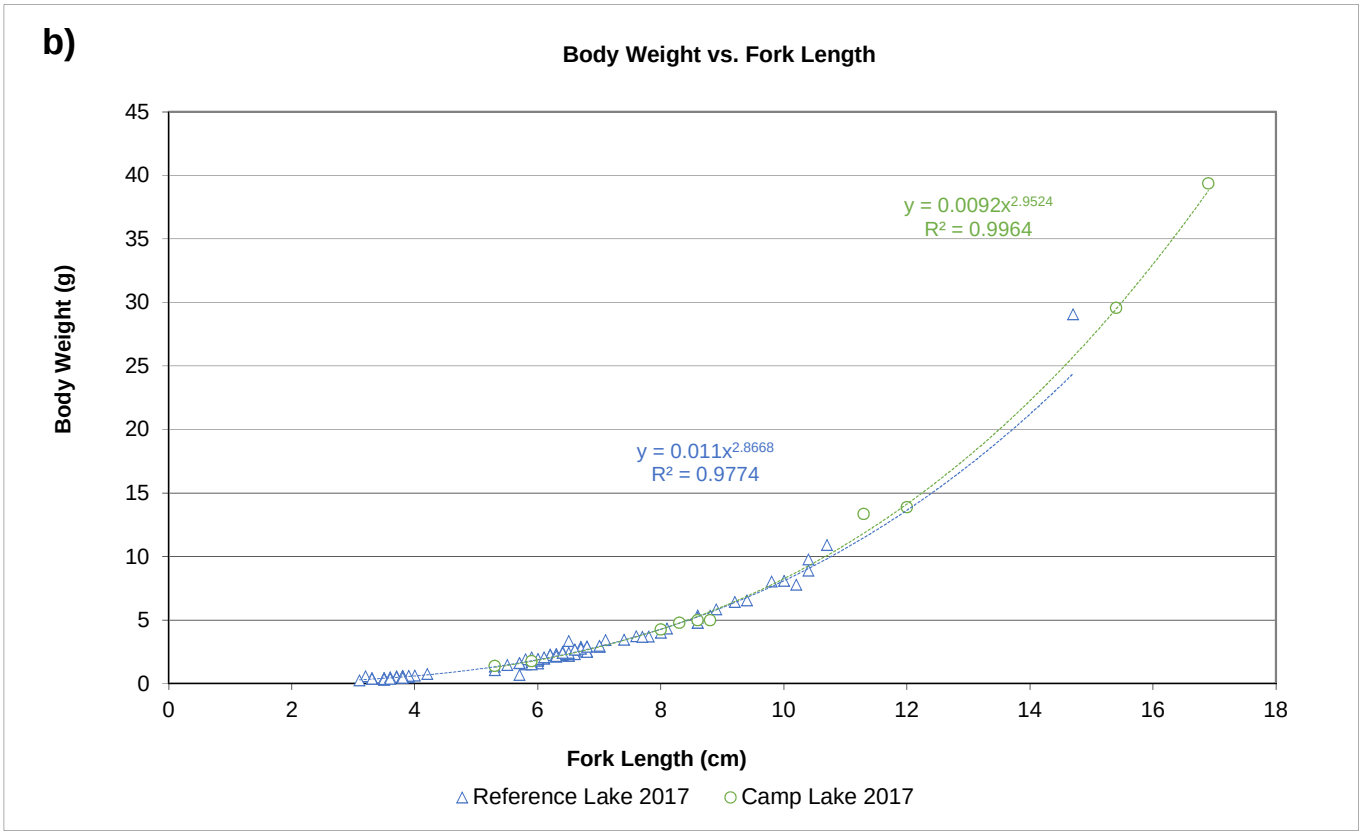
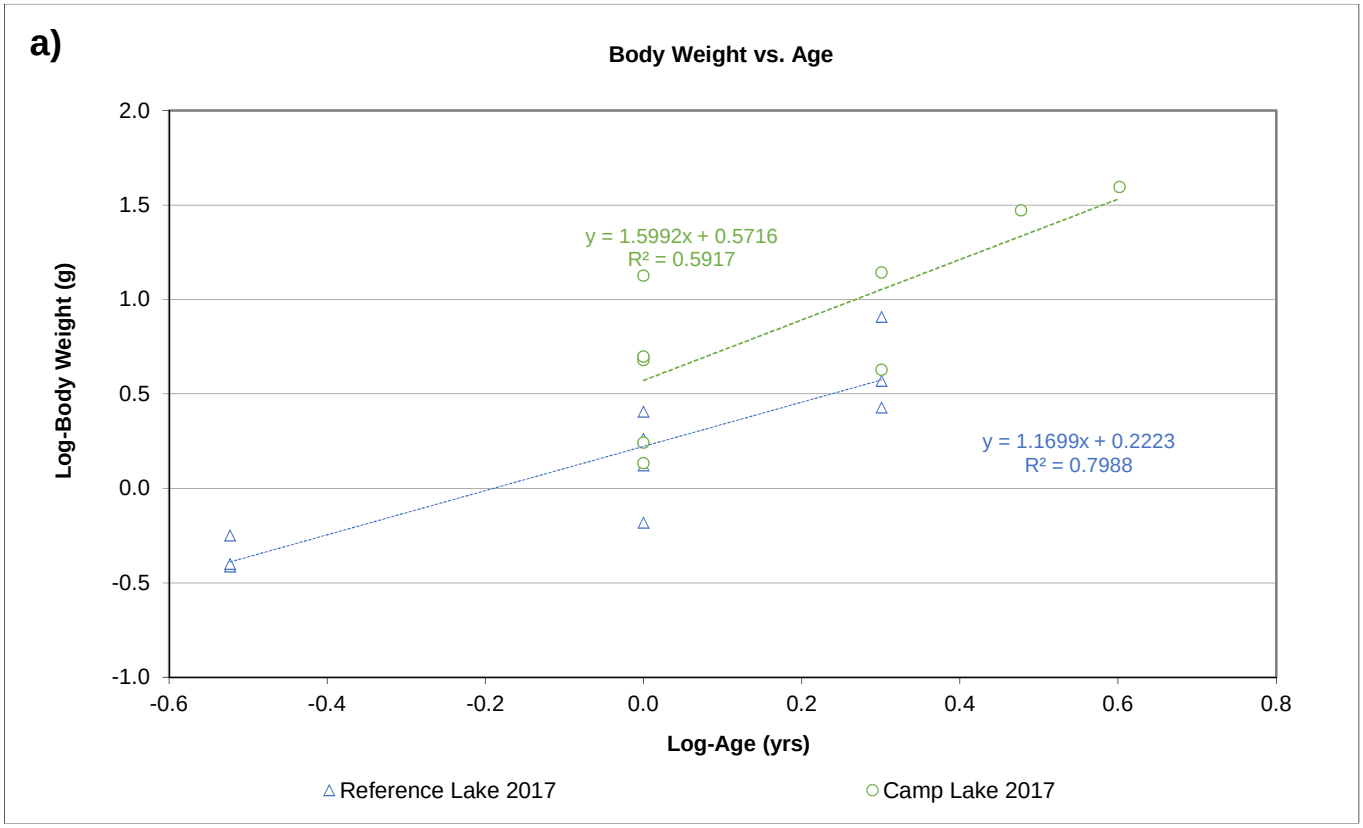


Figure G.2: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at the Nearshore Area of Camp Lake and Reference Lake 3 in August 2017 using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP, 2017



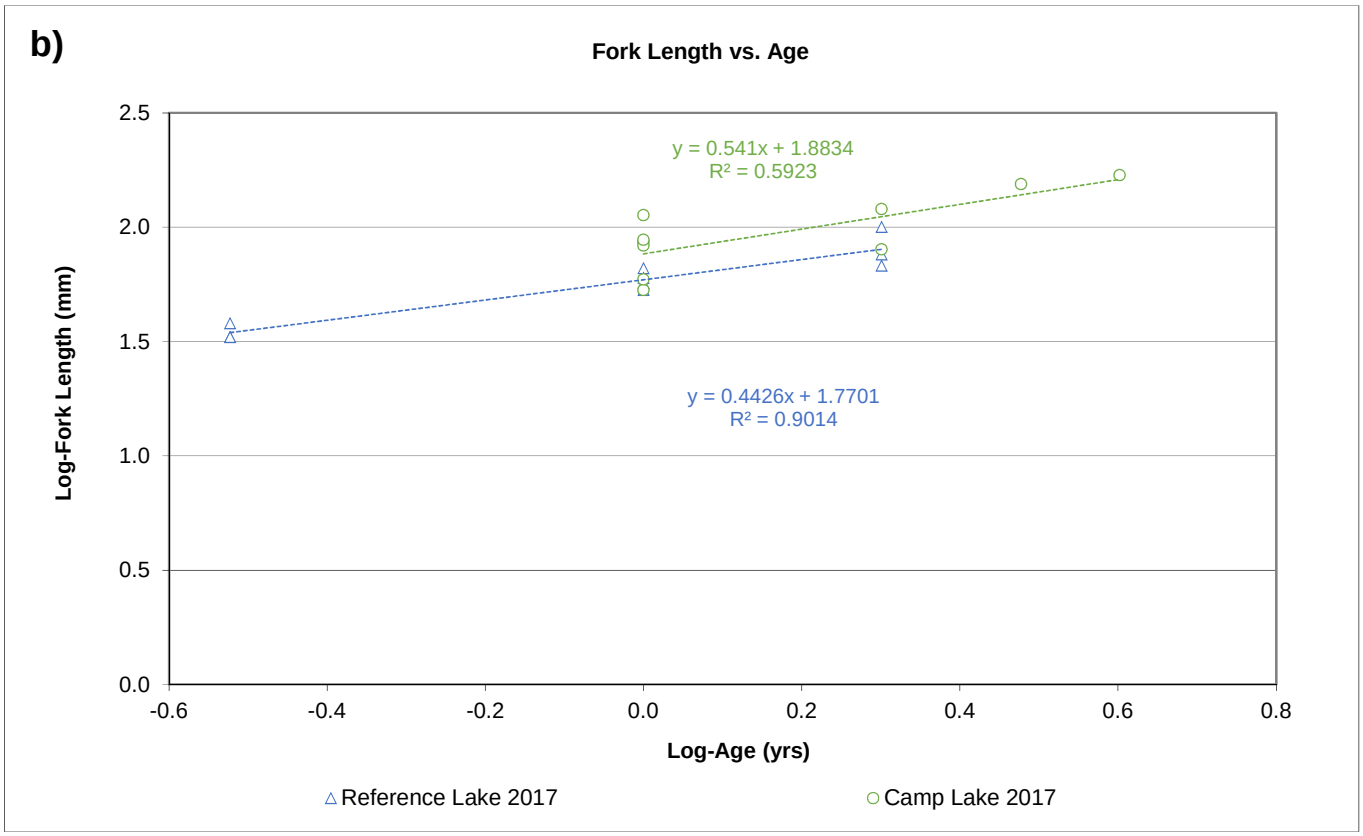
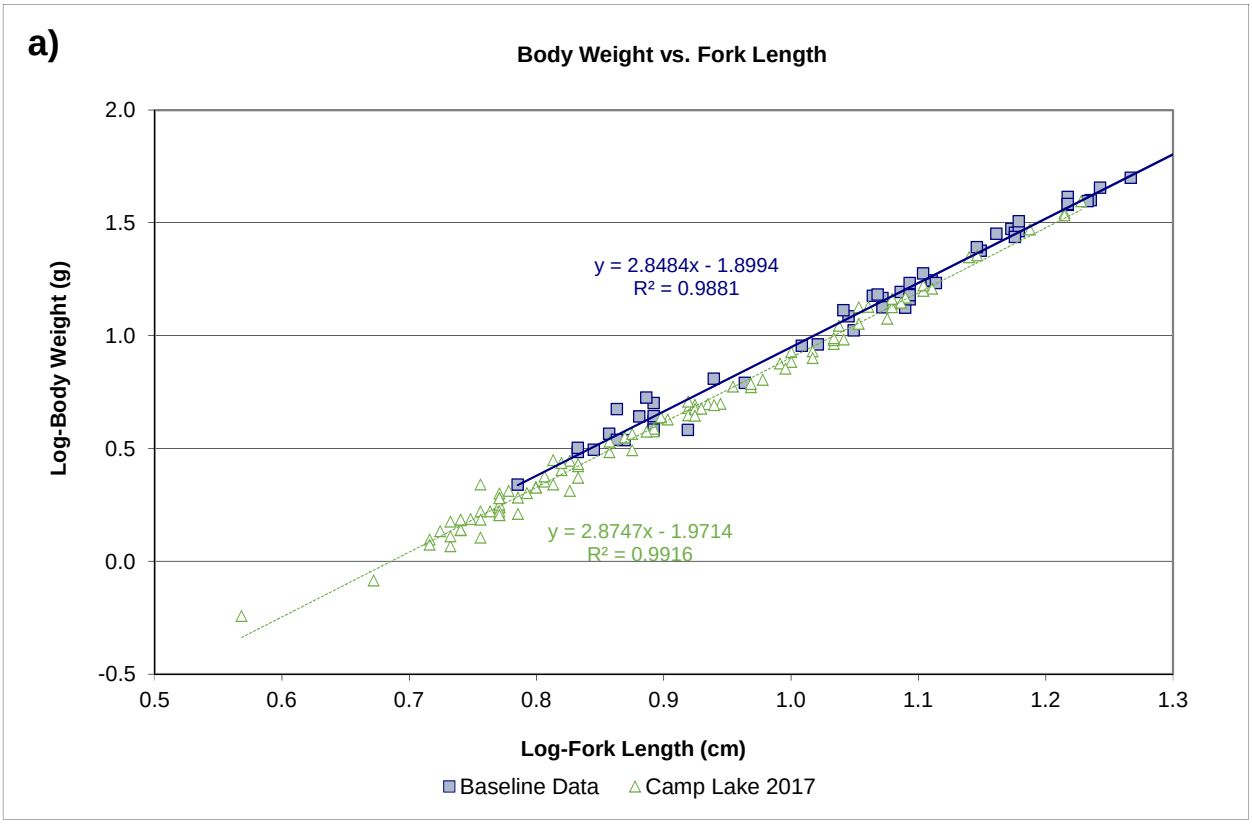


Figure G.3: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected at the Nearshore Area of Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2017



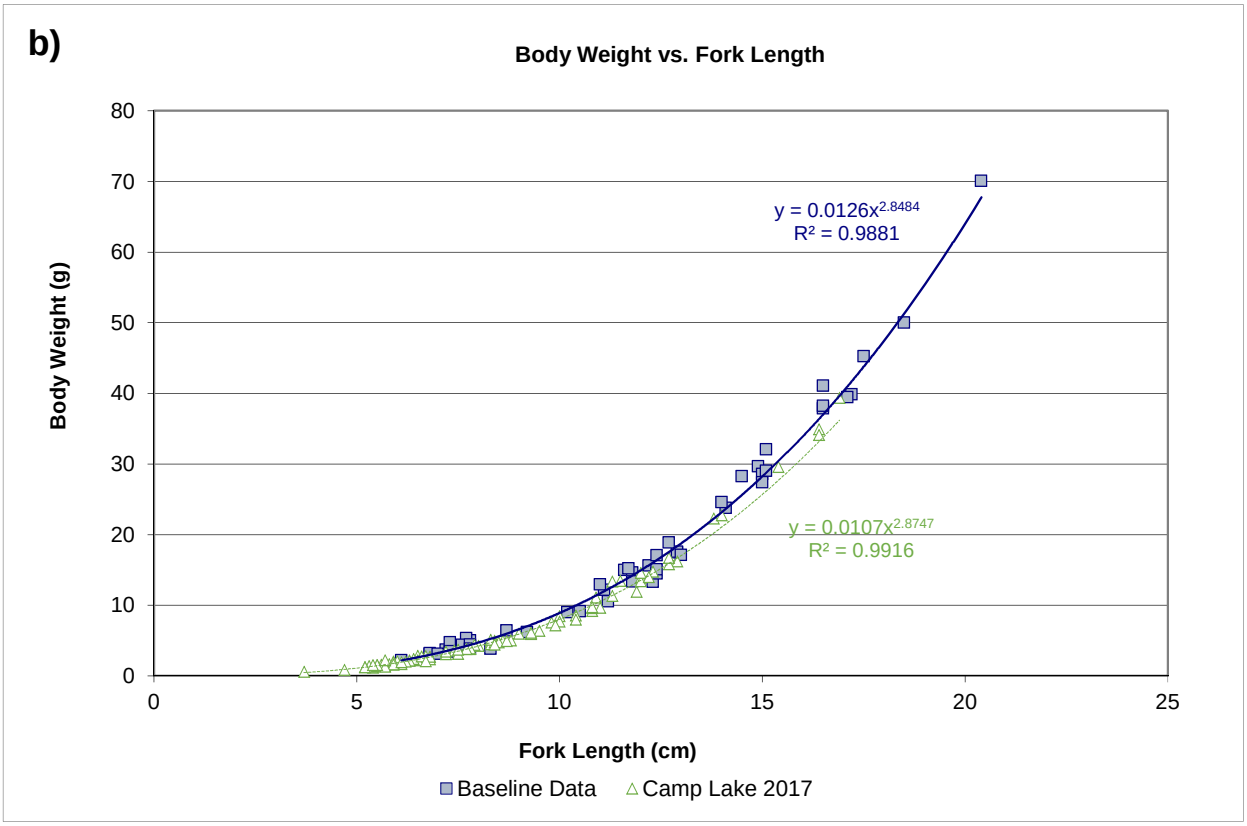
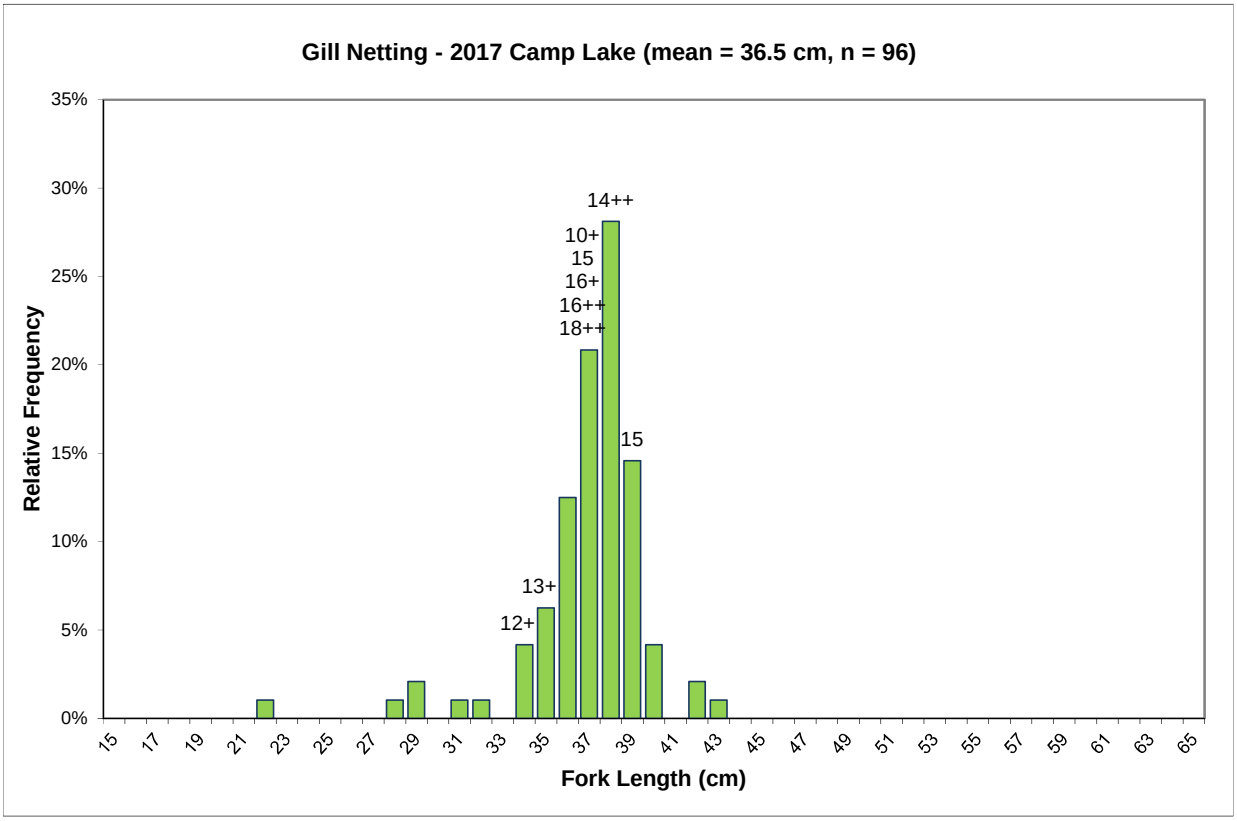


Figure G.4: Comparison of Condition (Weight-at-fork length Relationship) for Arctic Charr Collected in Fall (August-September) at Camp Lake Nearshore Areas in 2017 and during the Mine Baseline Period (2013) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP



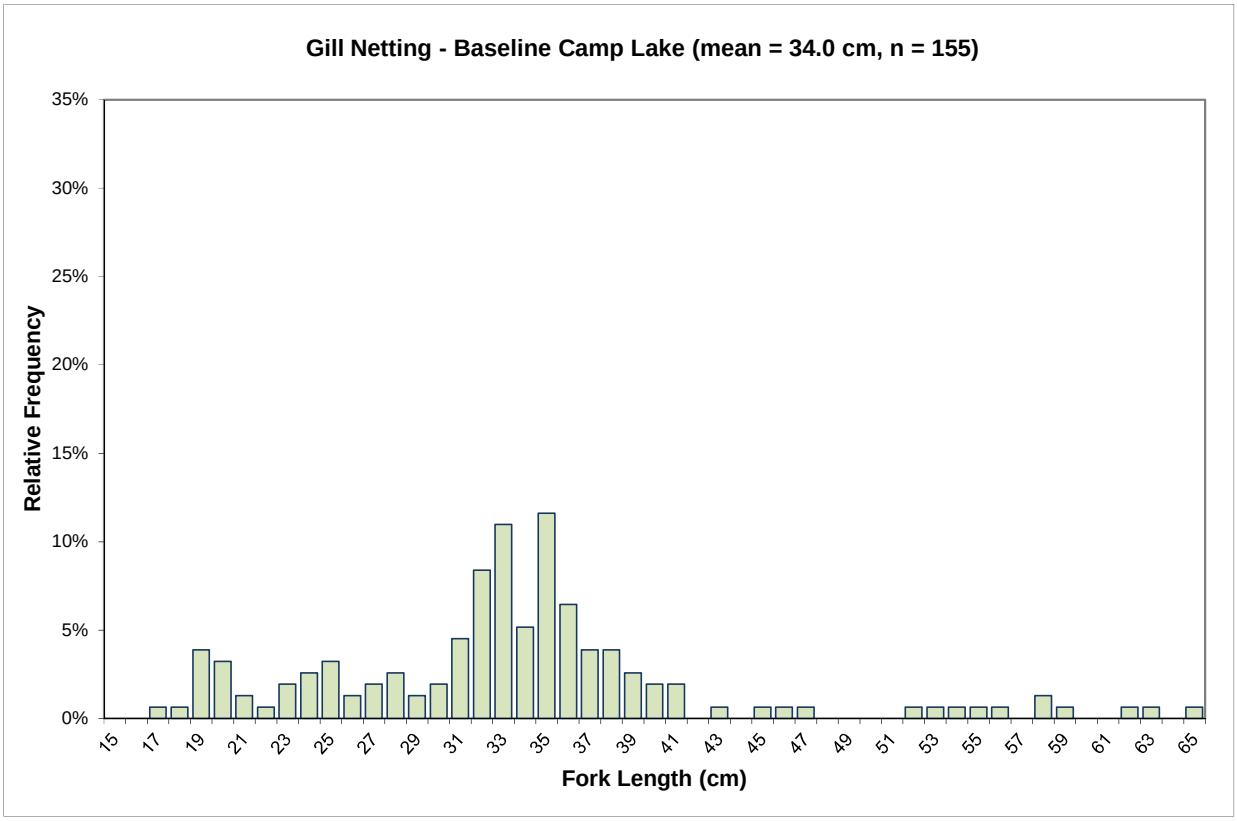
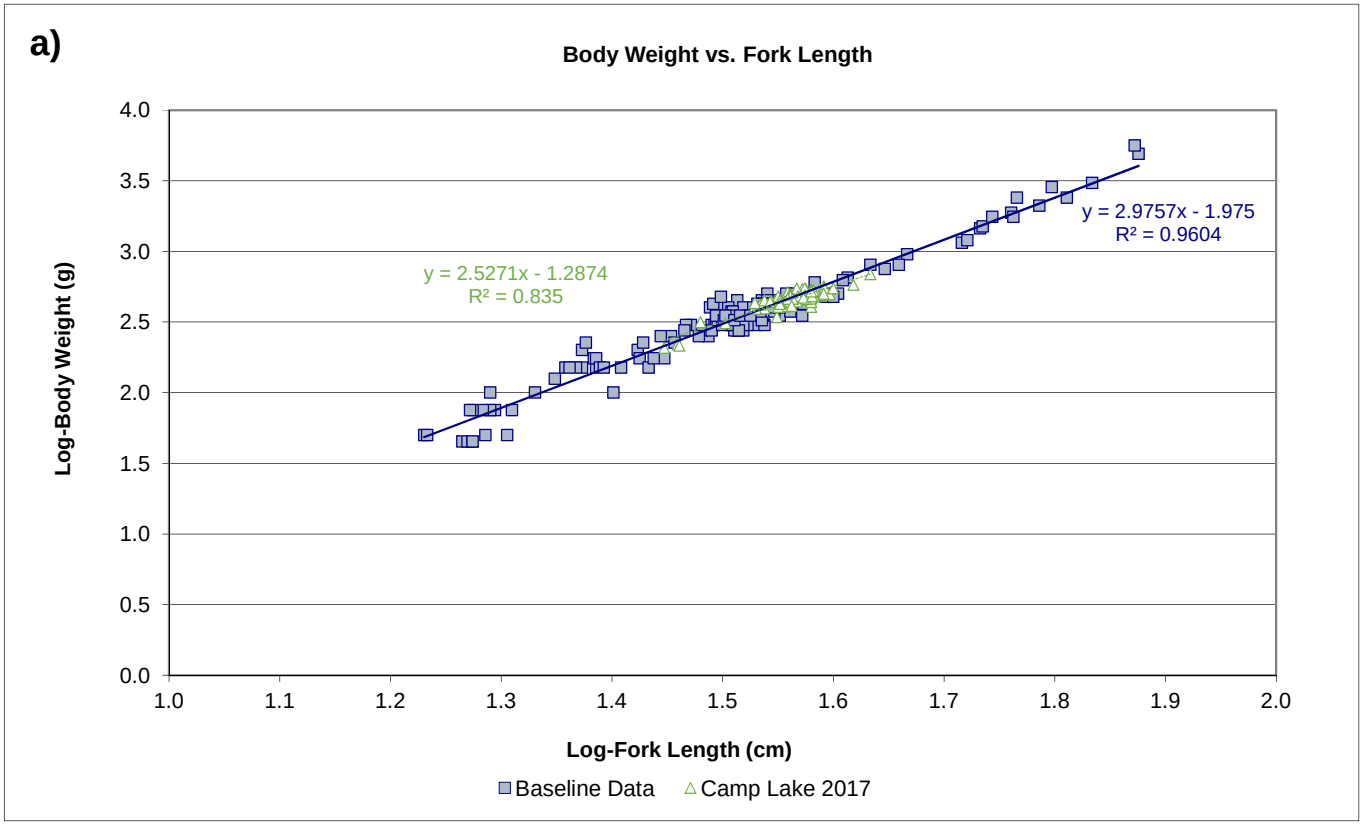


Figure G.5: Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Camp Lake (JLO) in 2017 and Baseline Studies Conducted in Fall, Mary River Project CREMP

Note: Fish ages are shown above the bars, where available.



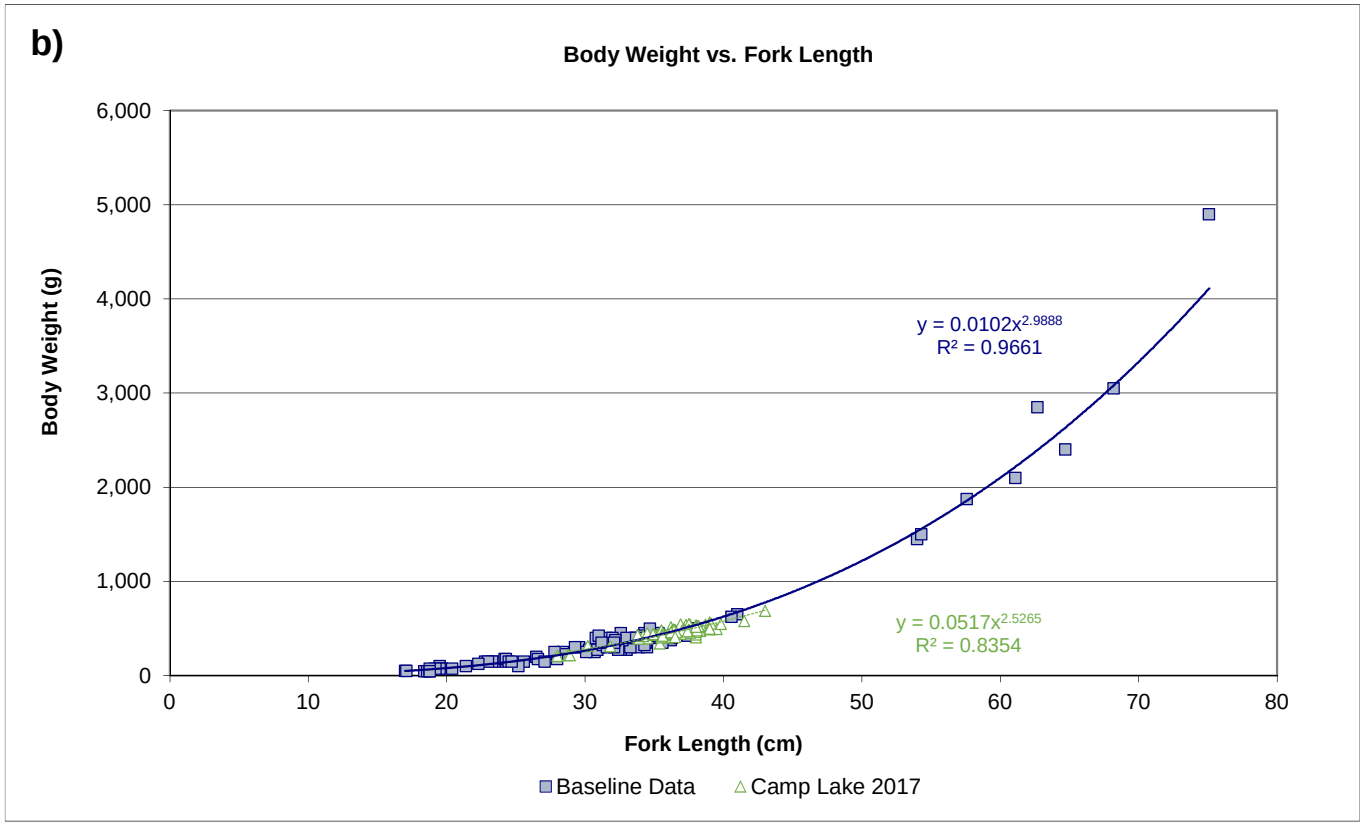
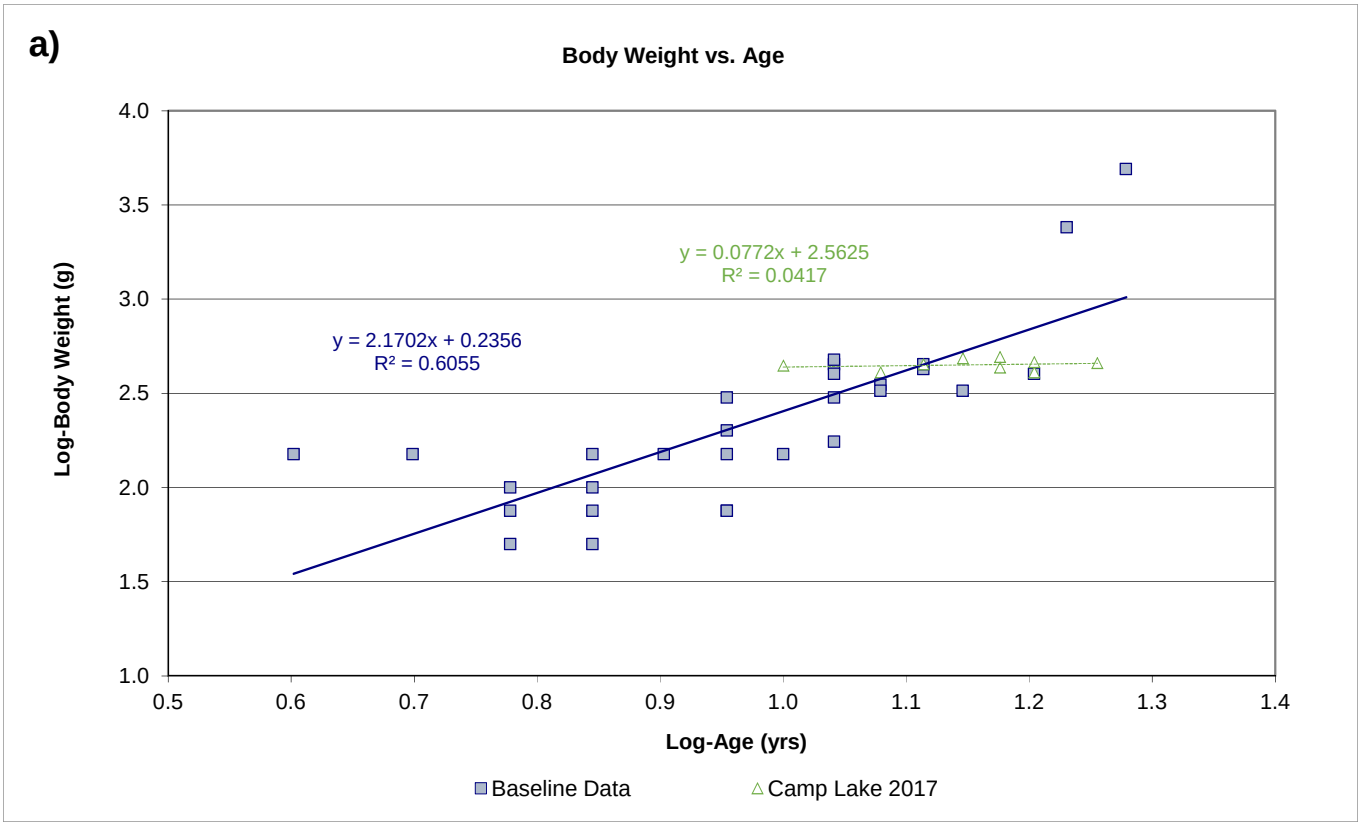


Figure G.6: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Camp Lake Littoral/Profundal Areas in 2017 and during the Mine Baseline Period (2006, 2007, 2008, 2013) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP



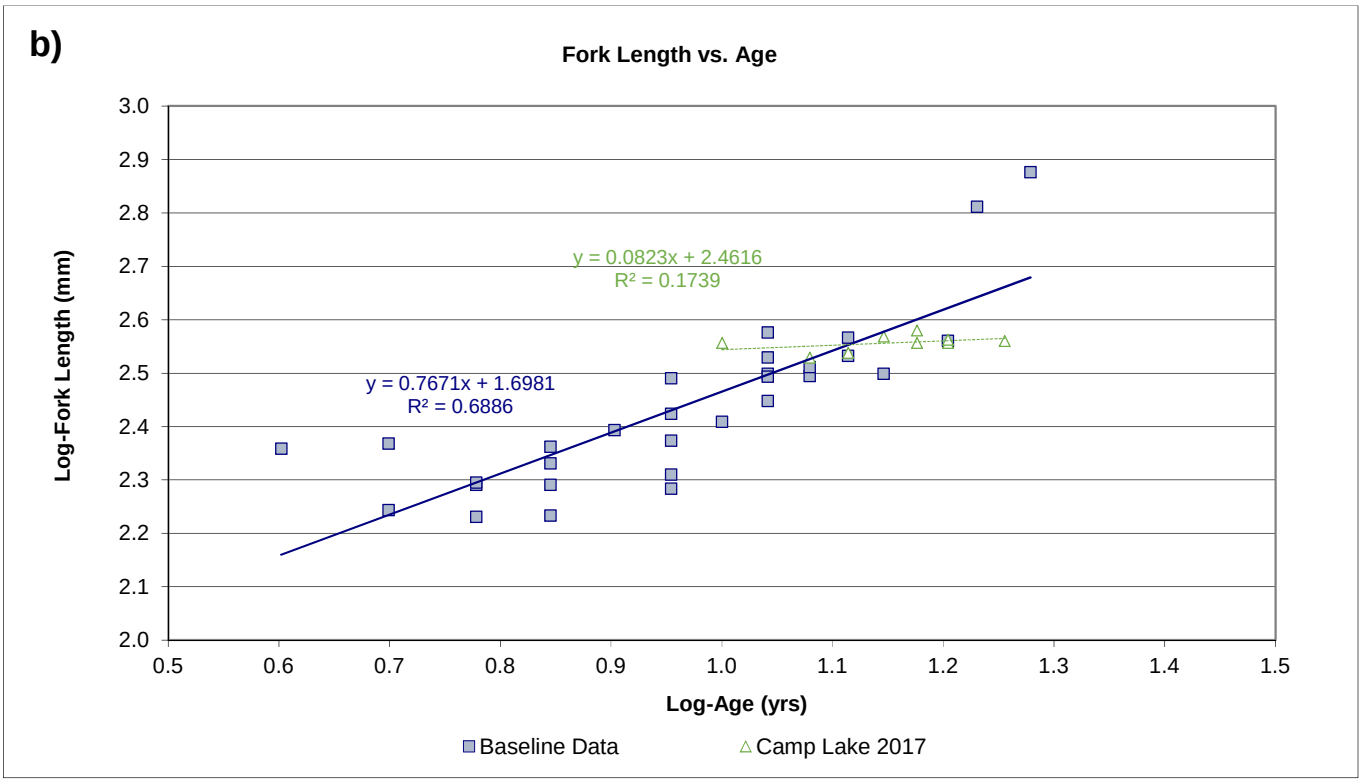
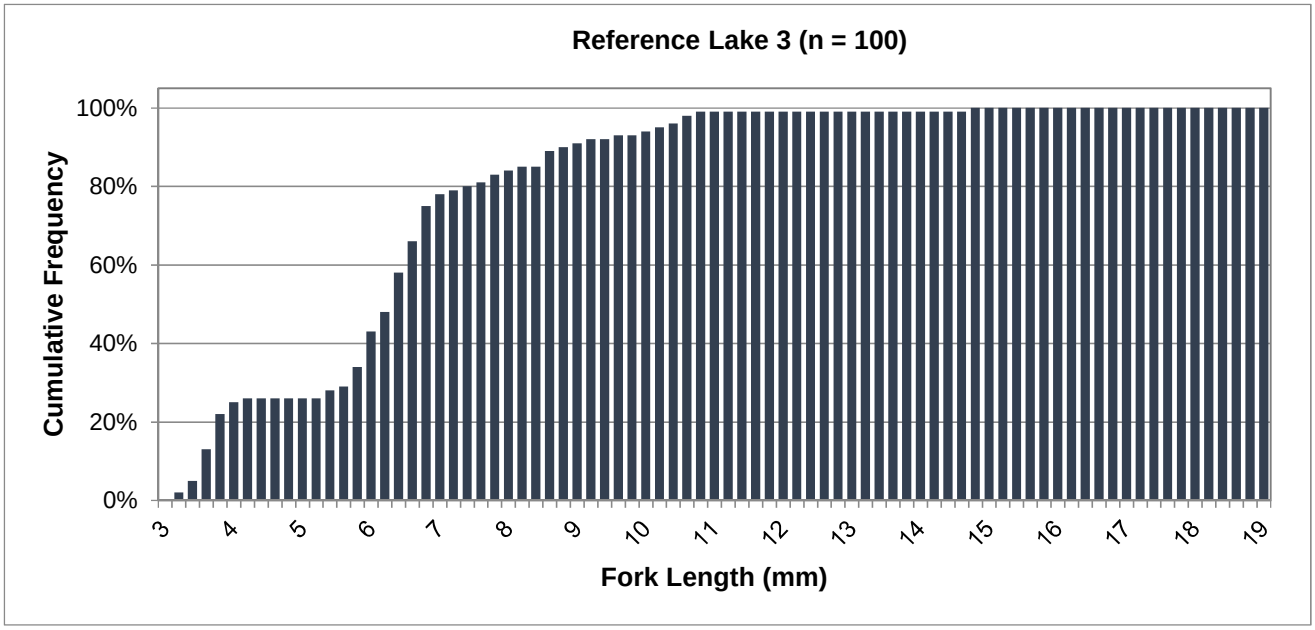


Figure G.7: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected in Fall (August-September) at Camp Lake Littoral and Profundal Areas in 2017 and during the Baseline Period (2006, 2007, 2013), Mary River Project CREMP



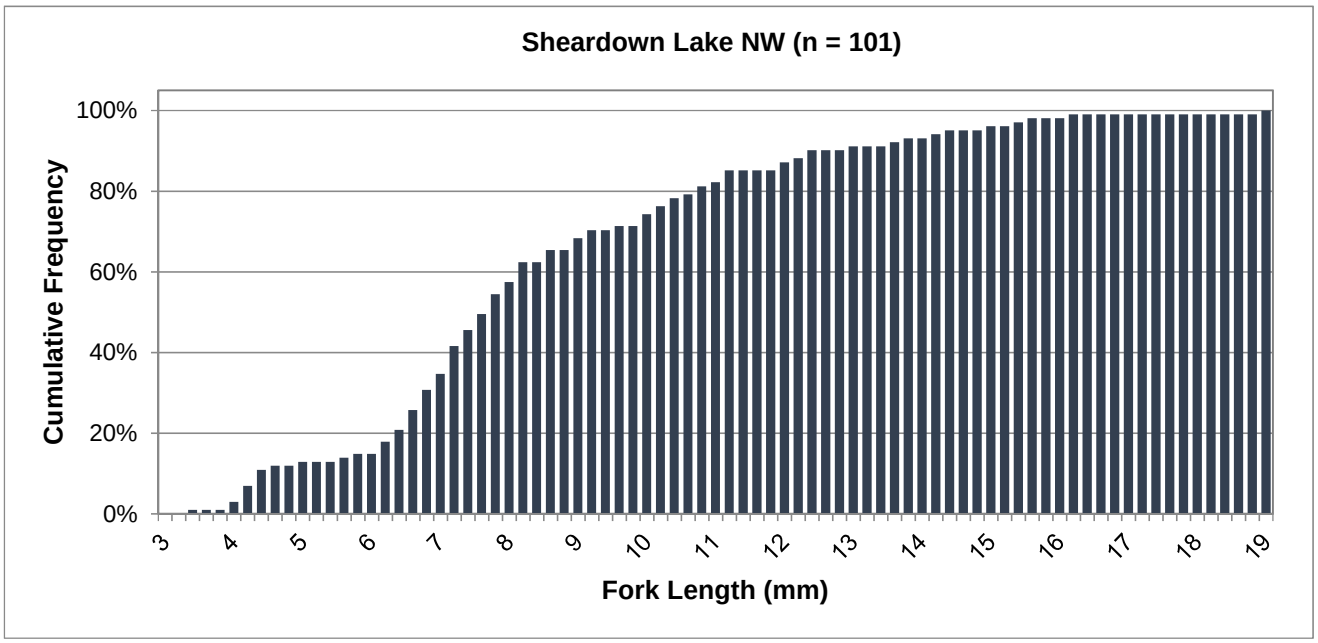
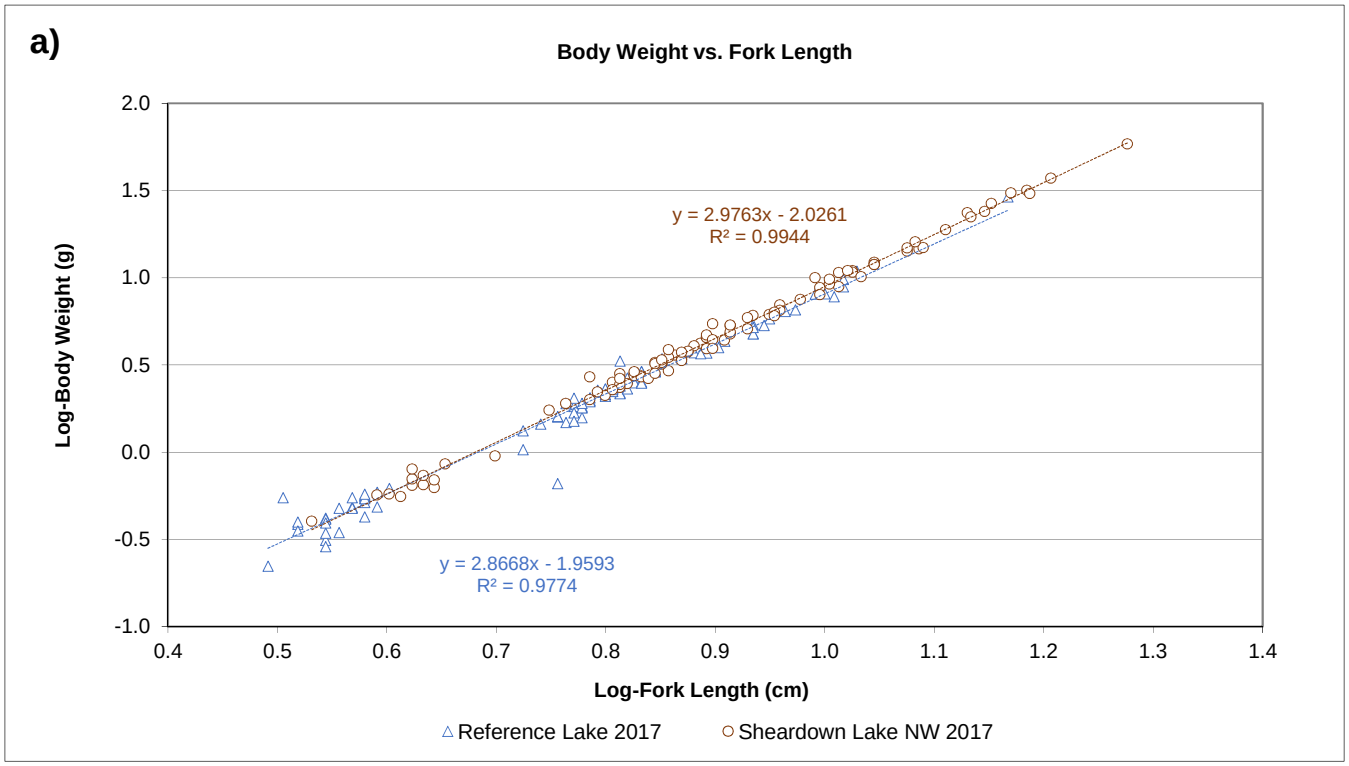


Figure G.8: Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2017



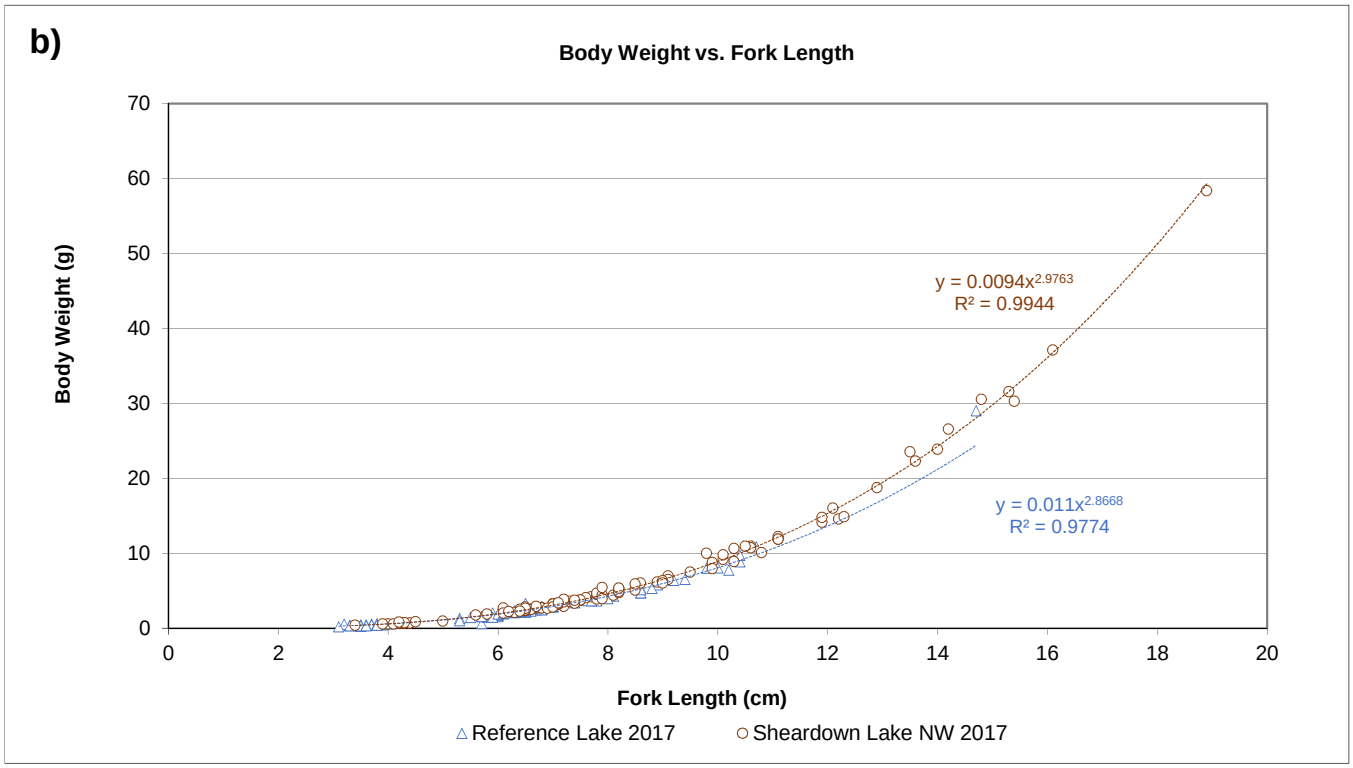


Figure G.9: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at the Nearshore Area of Sheardown Lake NW and Reference Lake 3 in August 2017 using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP, 2017

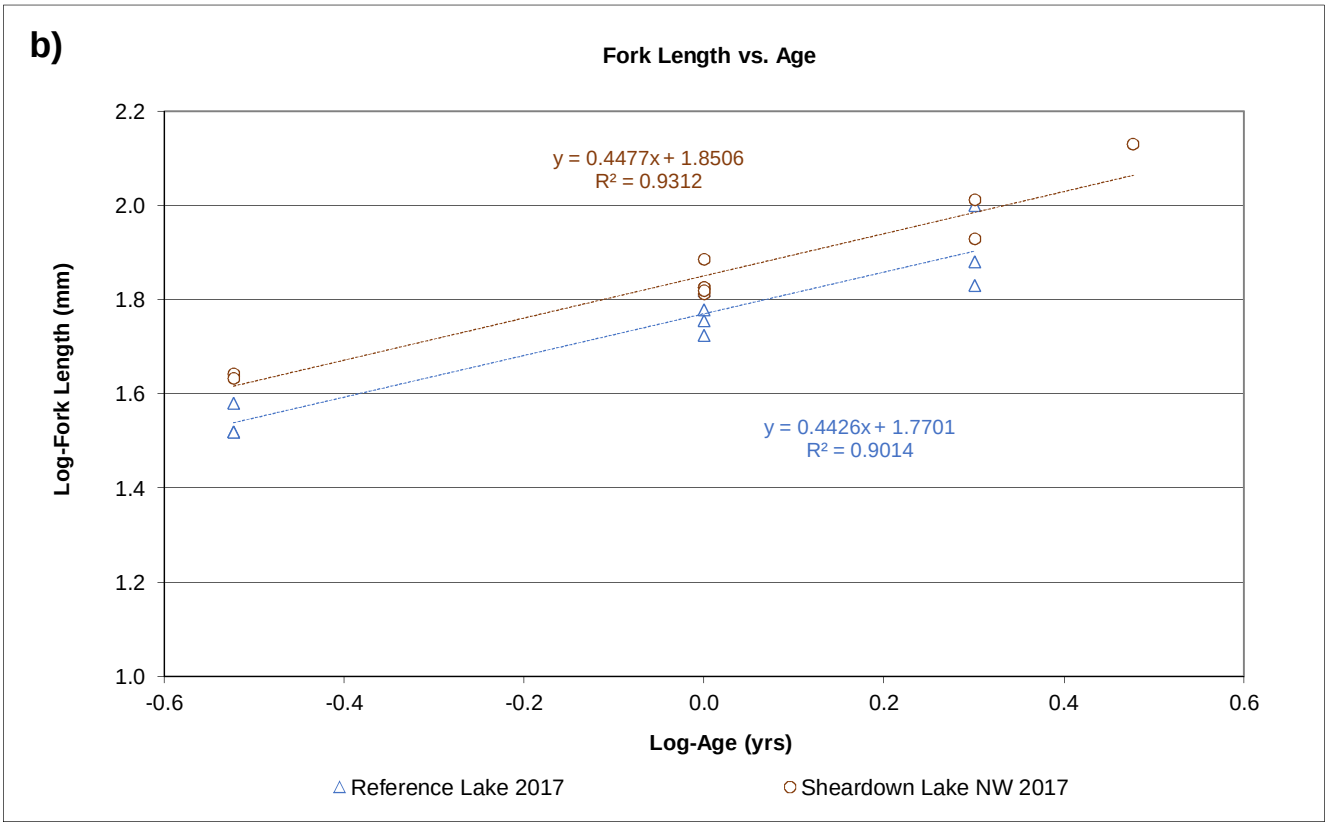
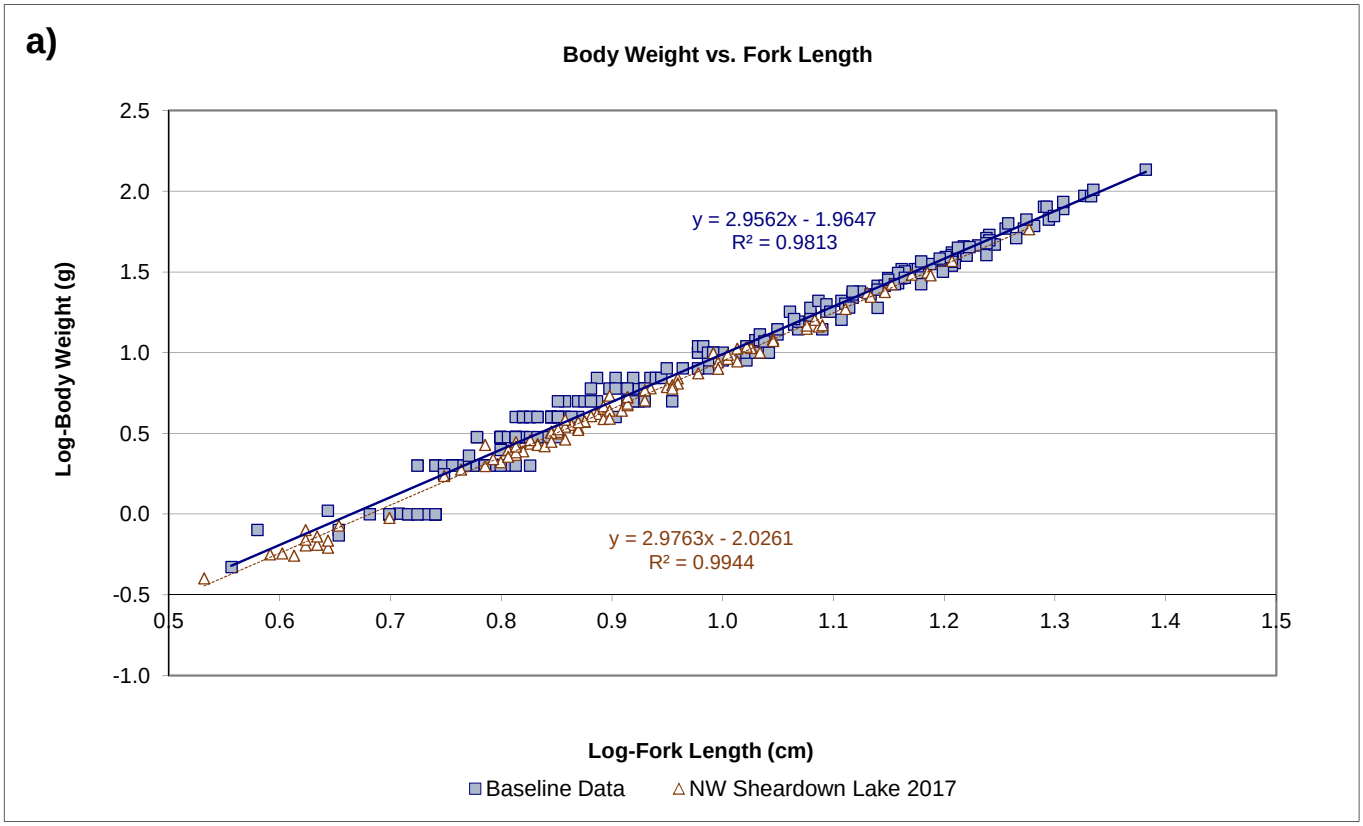


Figure G.10: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected at the Nearshore Area of Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2017



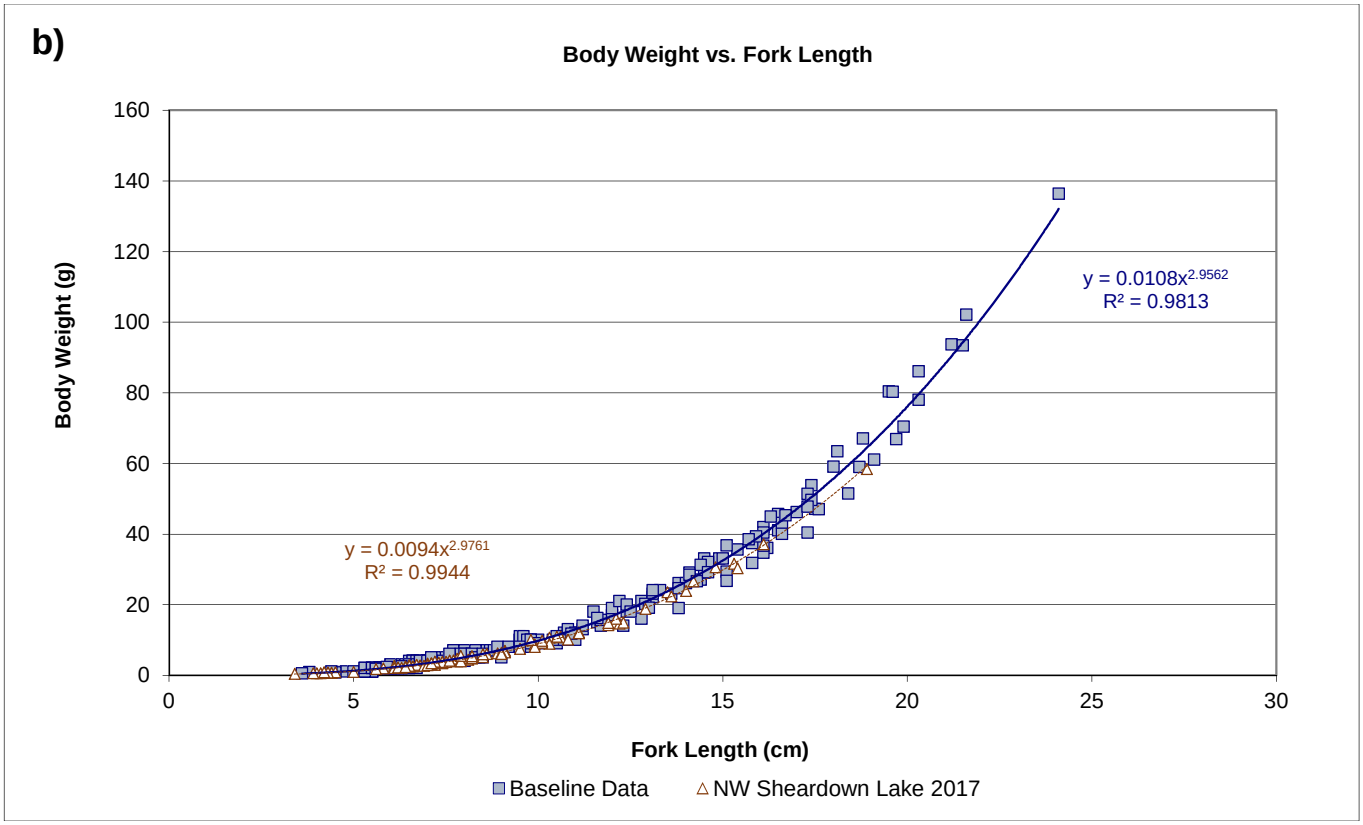


Figure G.11: Comparison of Condition (Weight-at-fork length Relationship) for Arctic Charr Collected in Fall (August-September) at Sheardown Lake NW Nearshore Areas in 2017 and During the Mine Baseline Period (2007, 2008, 2013) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP

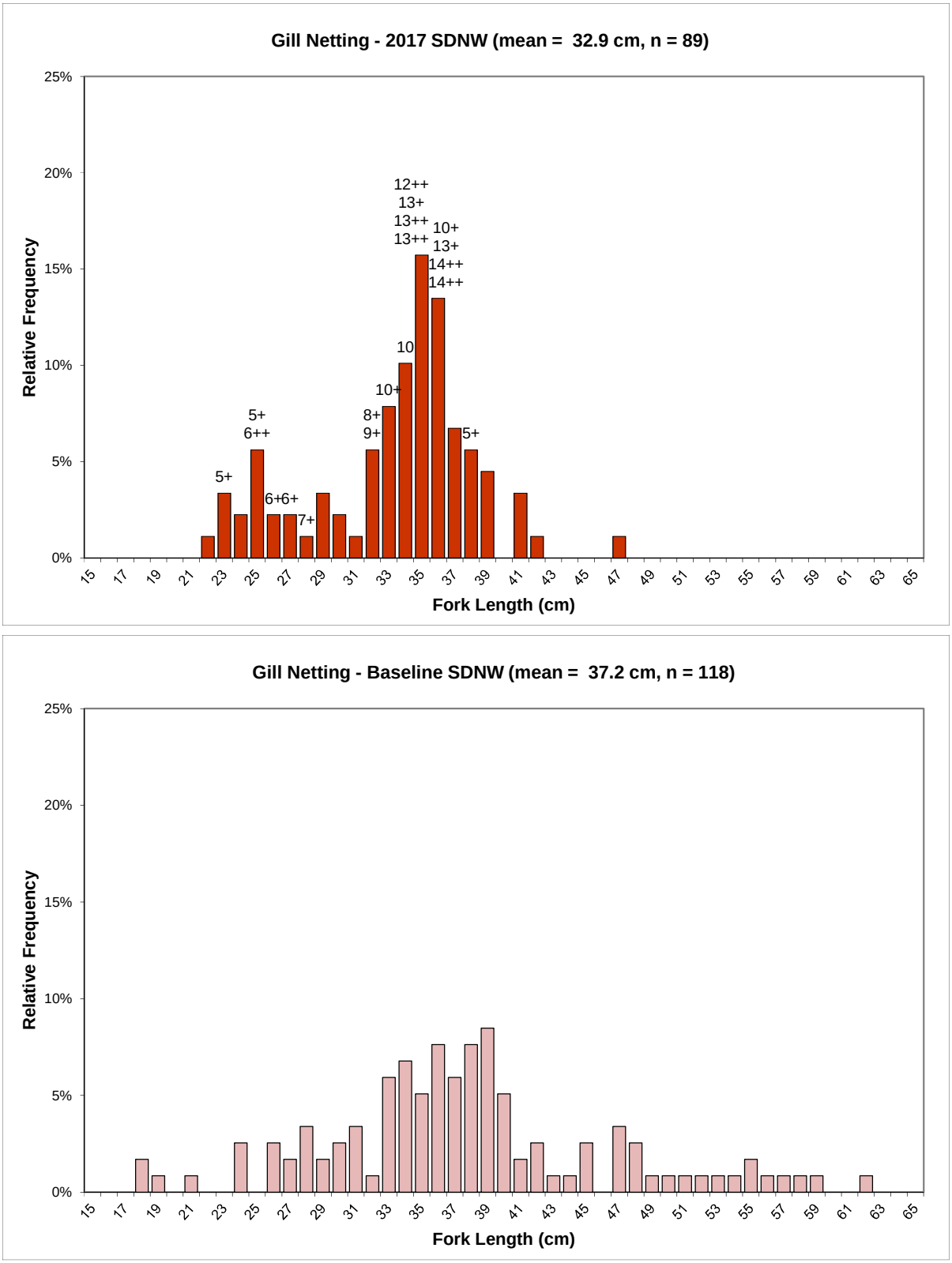


Figure G.12: Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Sheardown Lake NW (DLO-01) in 2017 and Baseline Studies Conducted in Fall, Mary River Project CREMP

Note: Fish ages are shown above the bars, where available.

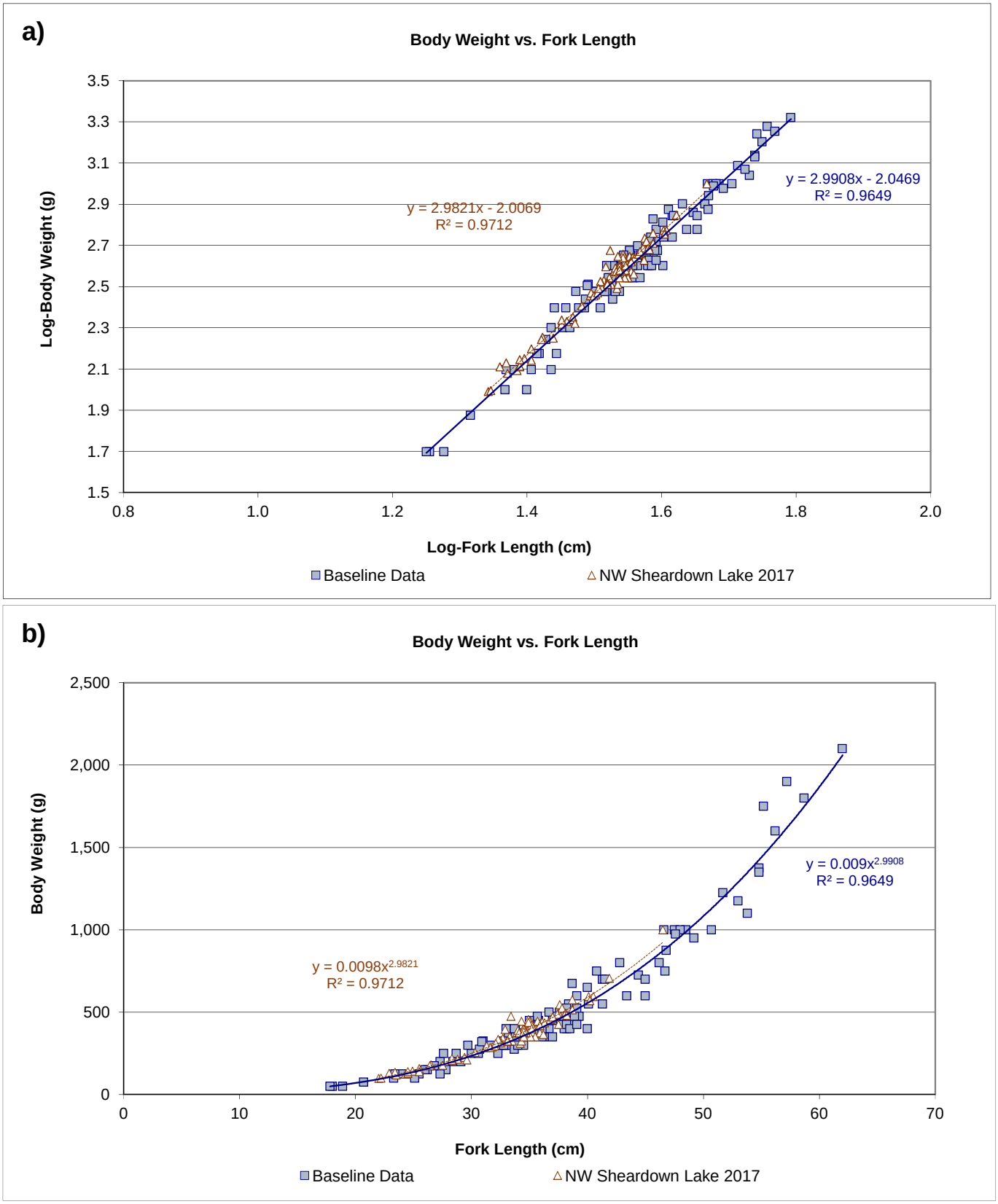
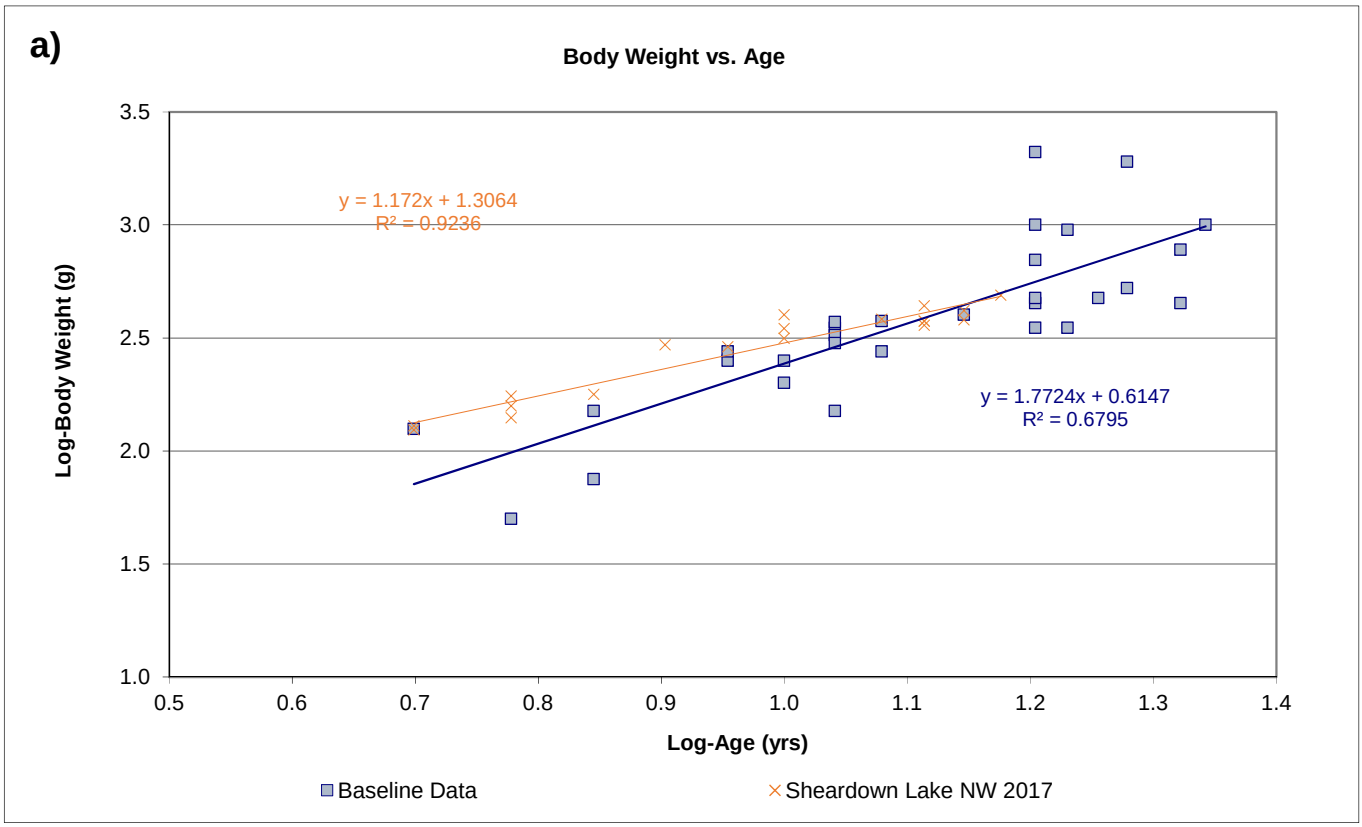


Figure G.13: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Sheardown Lake NW Nearshore Areas in 2017 and during the Mine Baseline Period (2006, 2007, 2008, 2013) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP



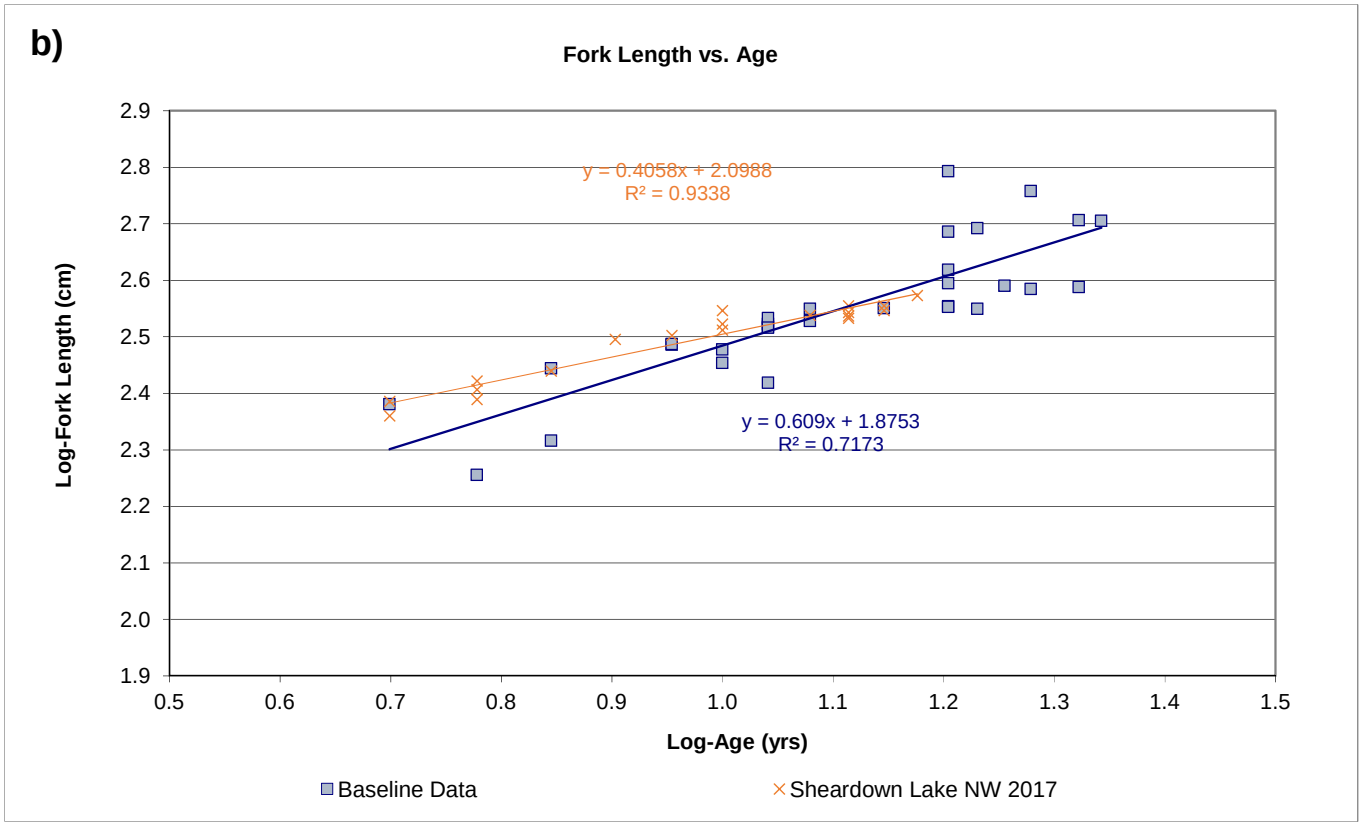
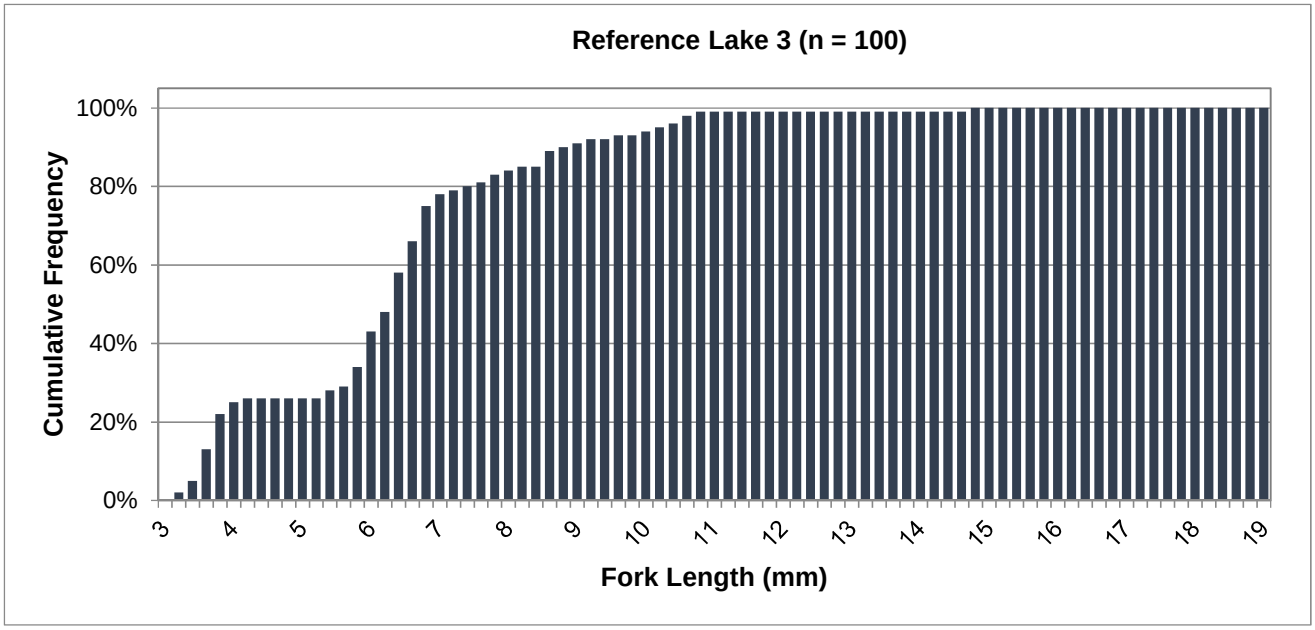


Figure G.14: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected in Fall (August-September) at Sheardown Lake NW Littoral/Profundal Areas in 2017 and During the Baseline Period (2006, 2007, 2013), Mary River Project CREMP



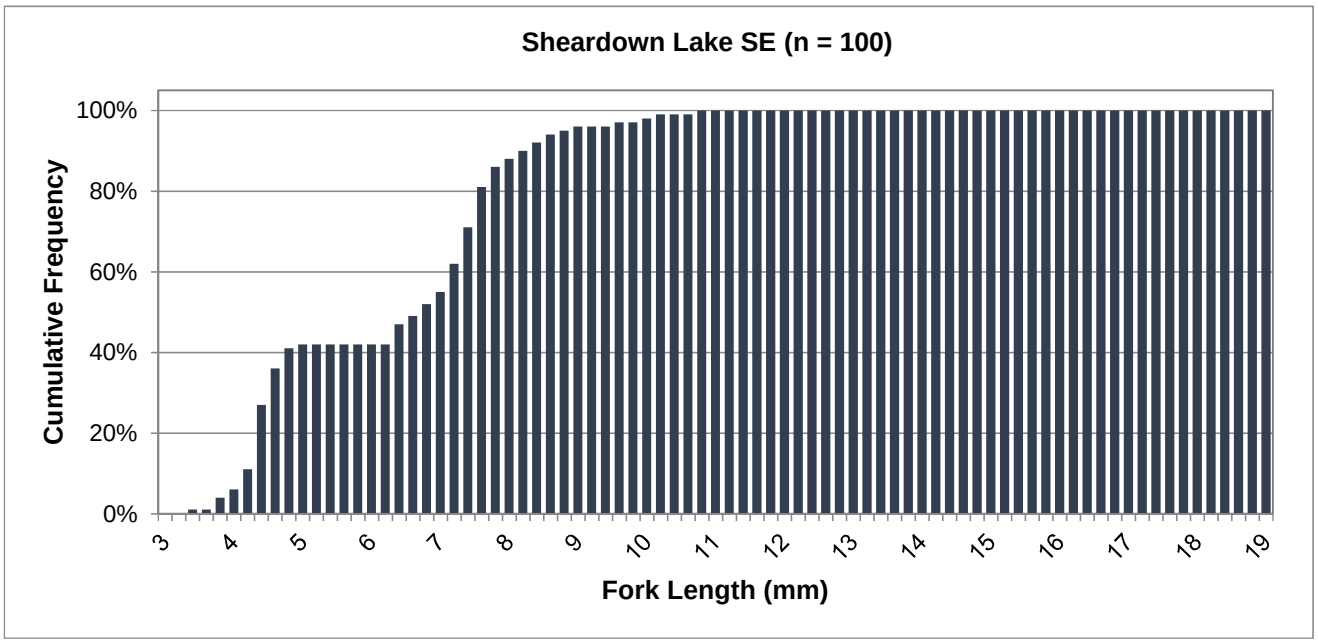


Figure G.15: Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2017

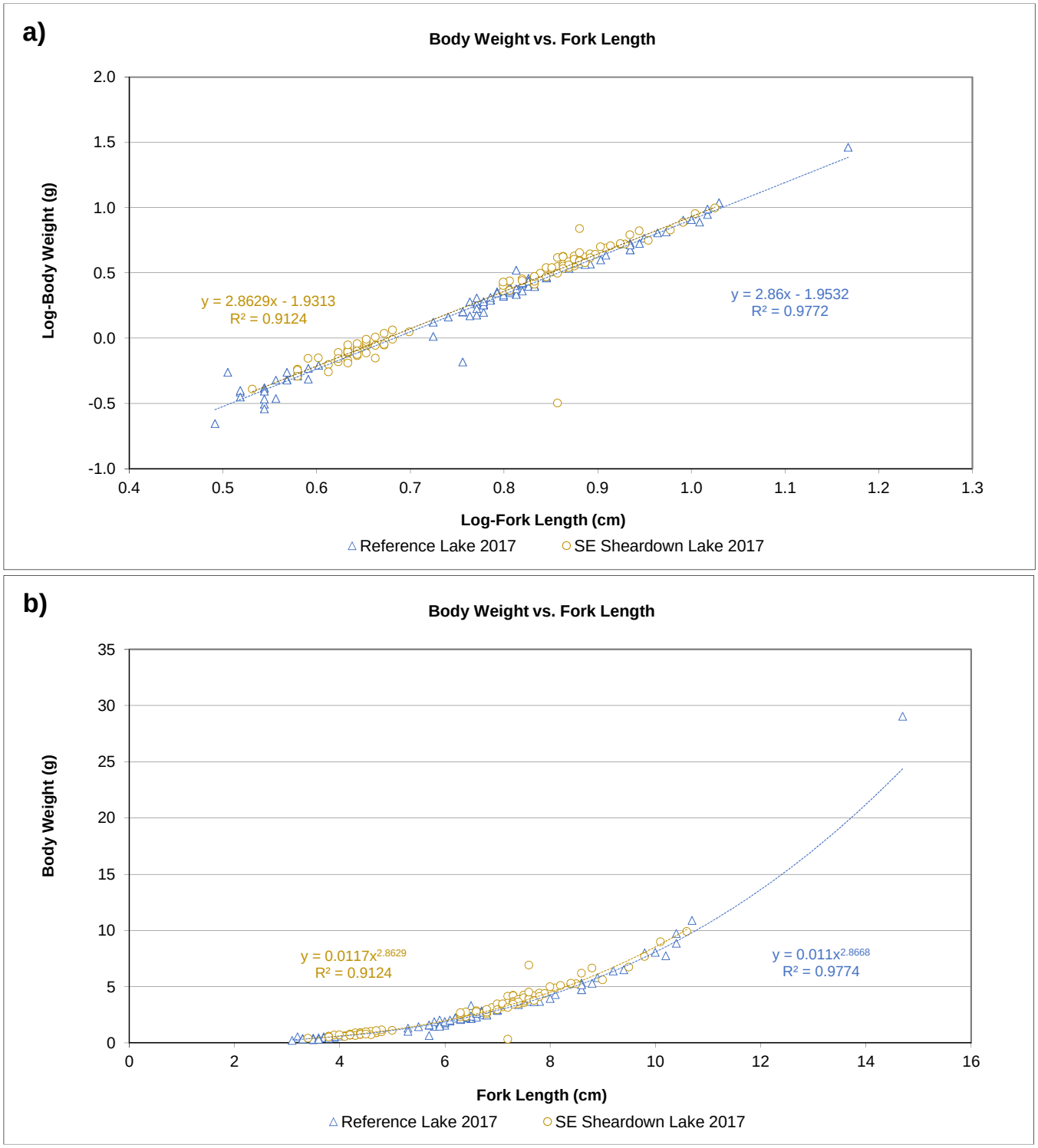


Figure G.16: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected at the Nearshore Area of Sheardown Lake SE and Reference Lake 3 in August 2017 using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP, 2017

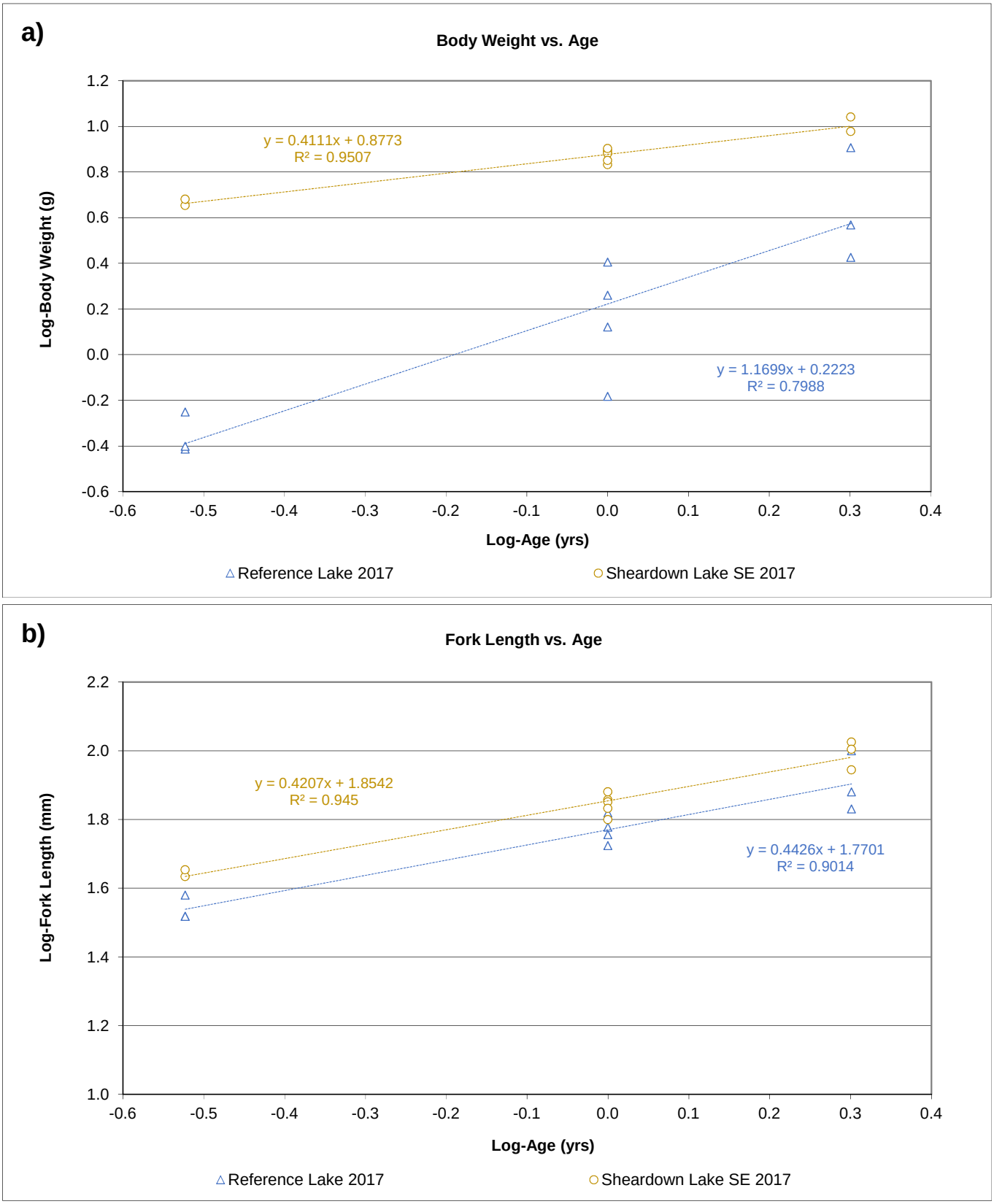


Figure G.17: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected at the Nearshore Area of Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2017

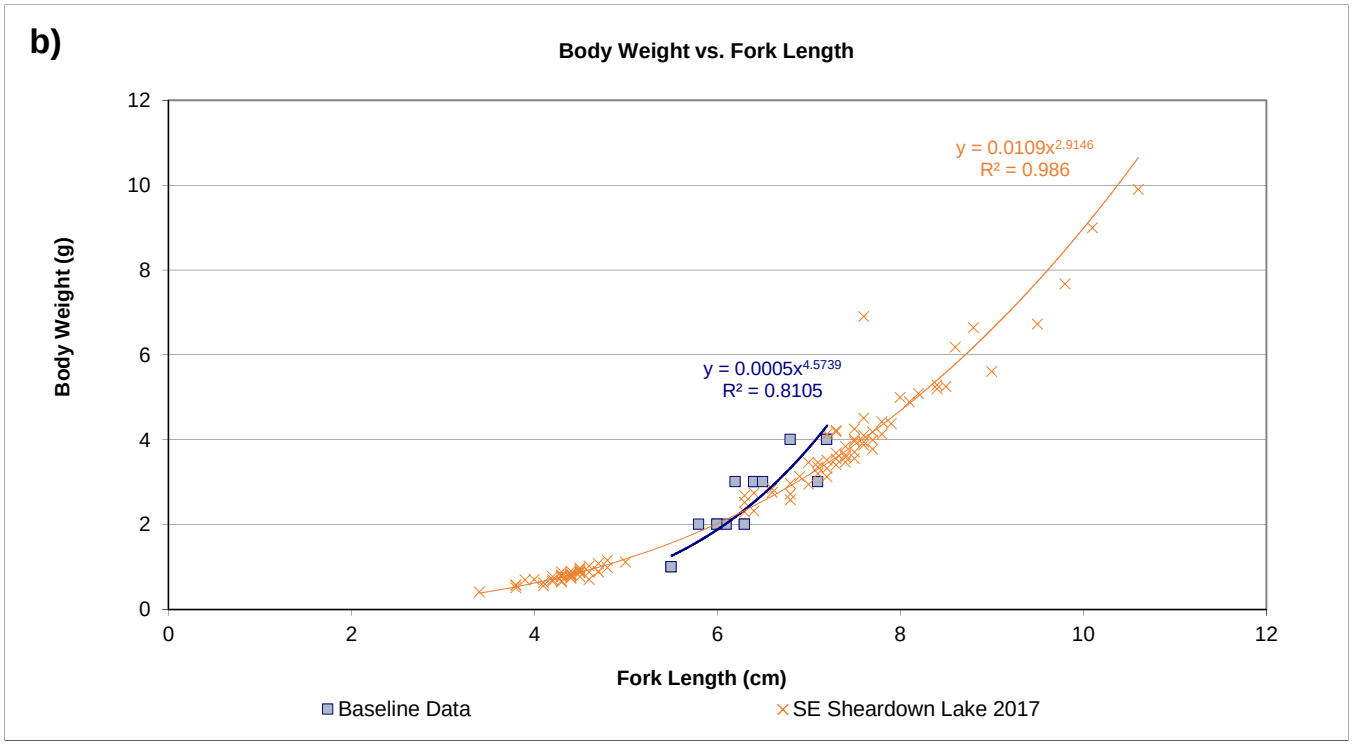
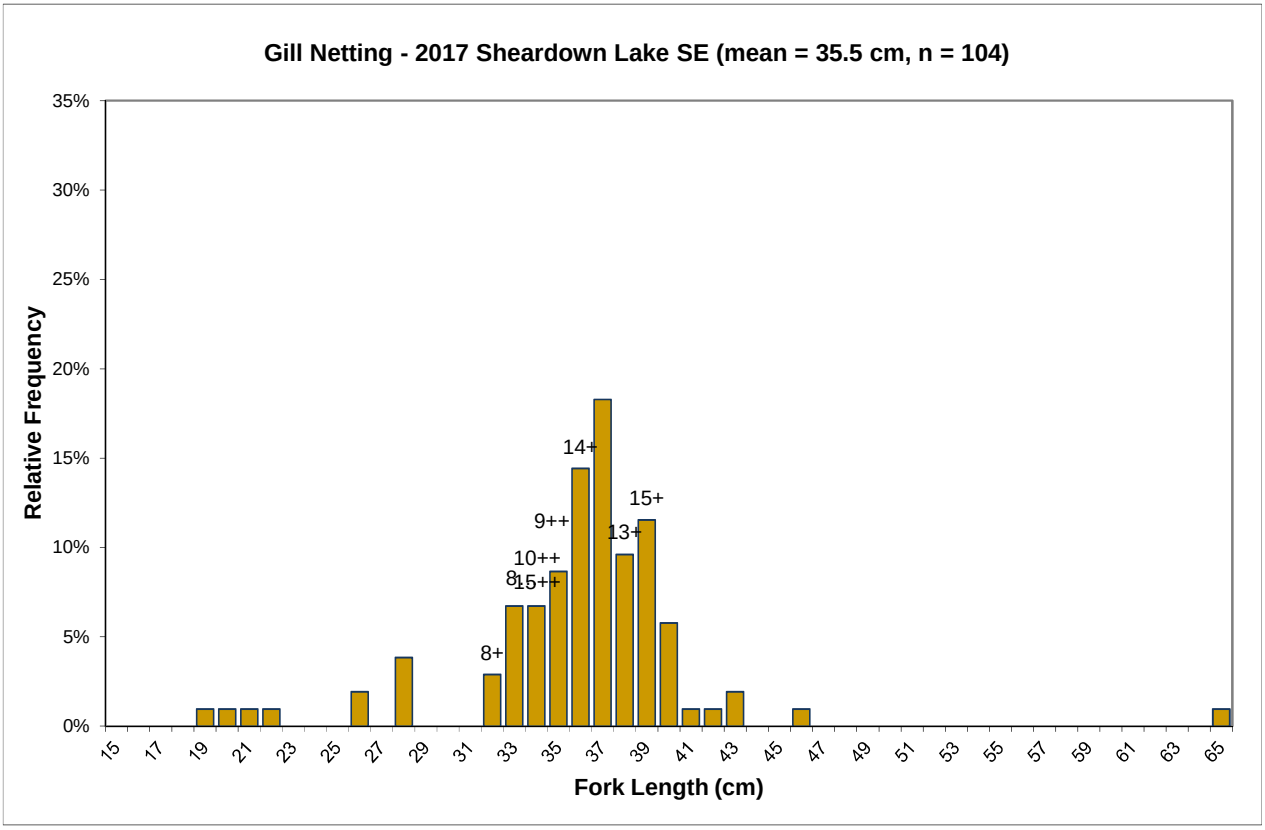


Figure G.18: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Sheardown Lake SE Nearshore Areas in 2017 and During the Mine Baseline Period (2007) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP



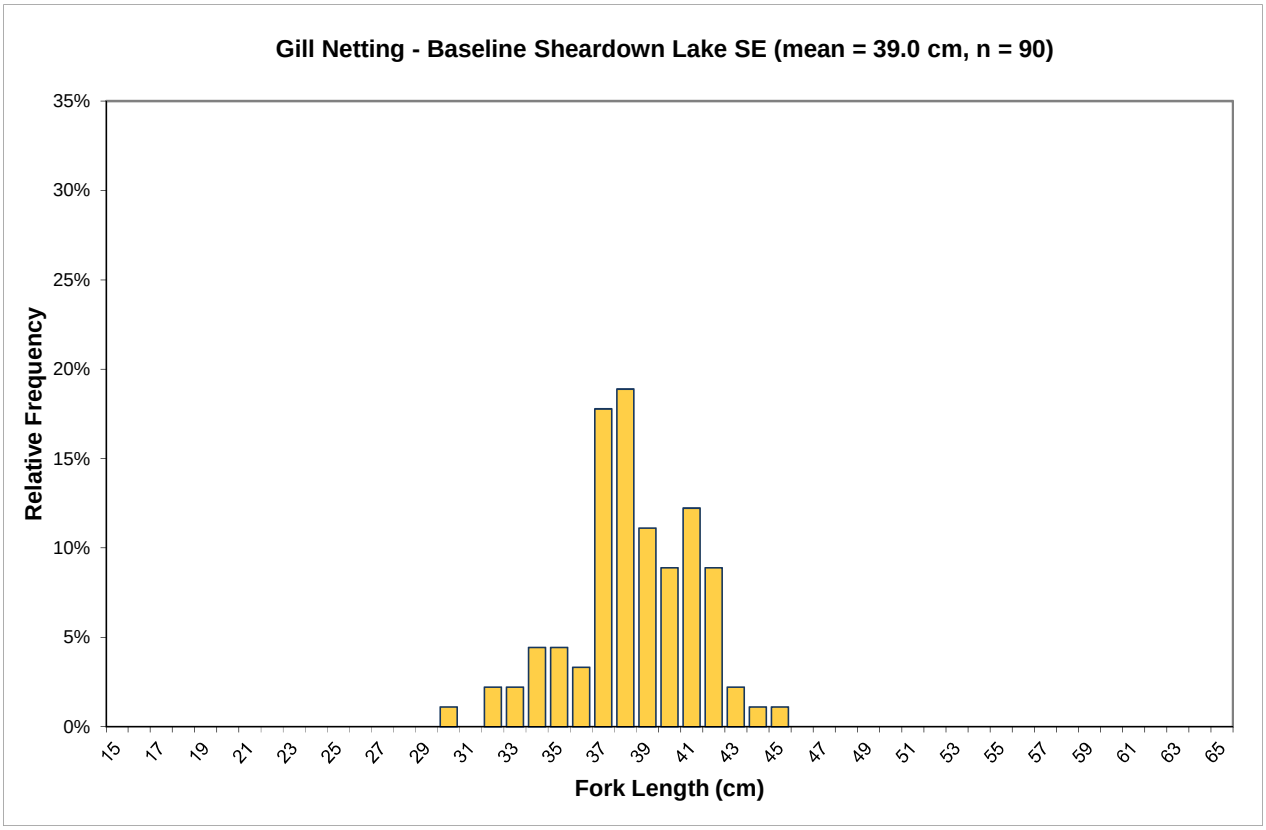
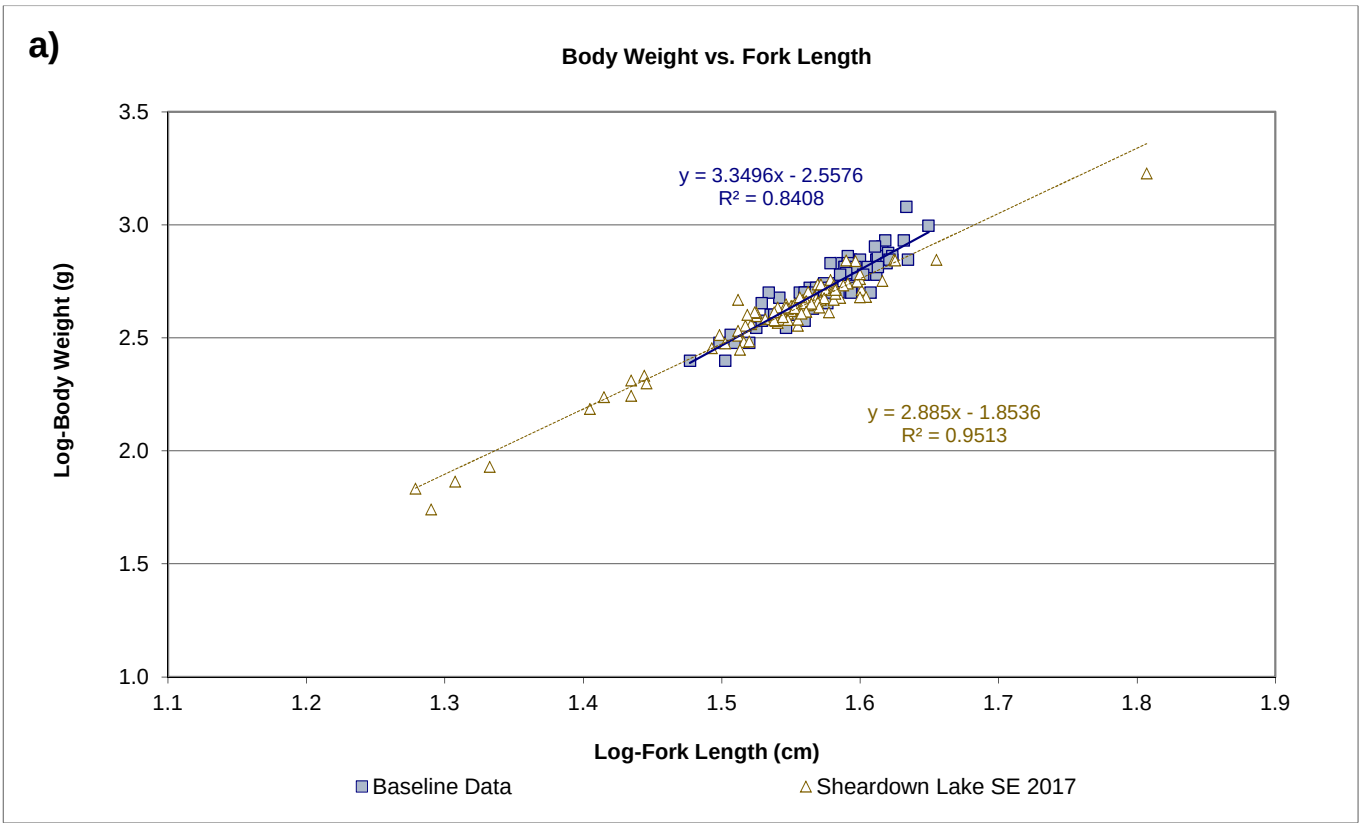


Figure G.19: Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Sheardown Lake SE (DLO-02) in 2017 and Baseline Studies Conducted in Fall, Mary River Project CREMP

Note: Fish ages are shown above the bars, where available.



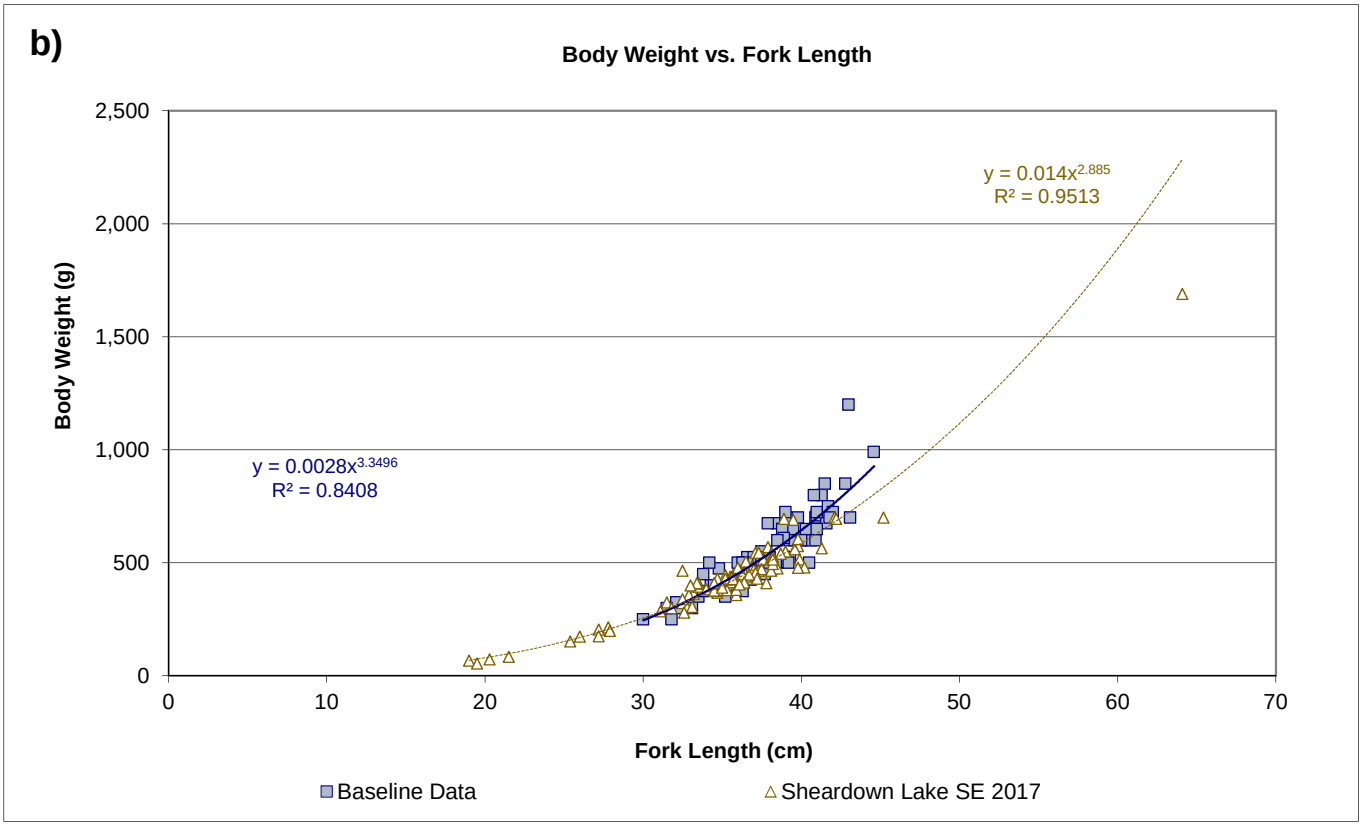


Figure G.20: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr collected in Fall (August-September) at Sheardown Lake SE Nearshore Areas in 2017 and During the Mine Baseline Period (2007, 2008) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP

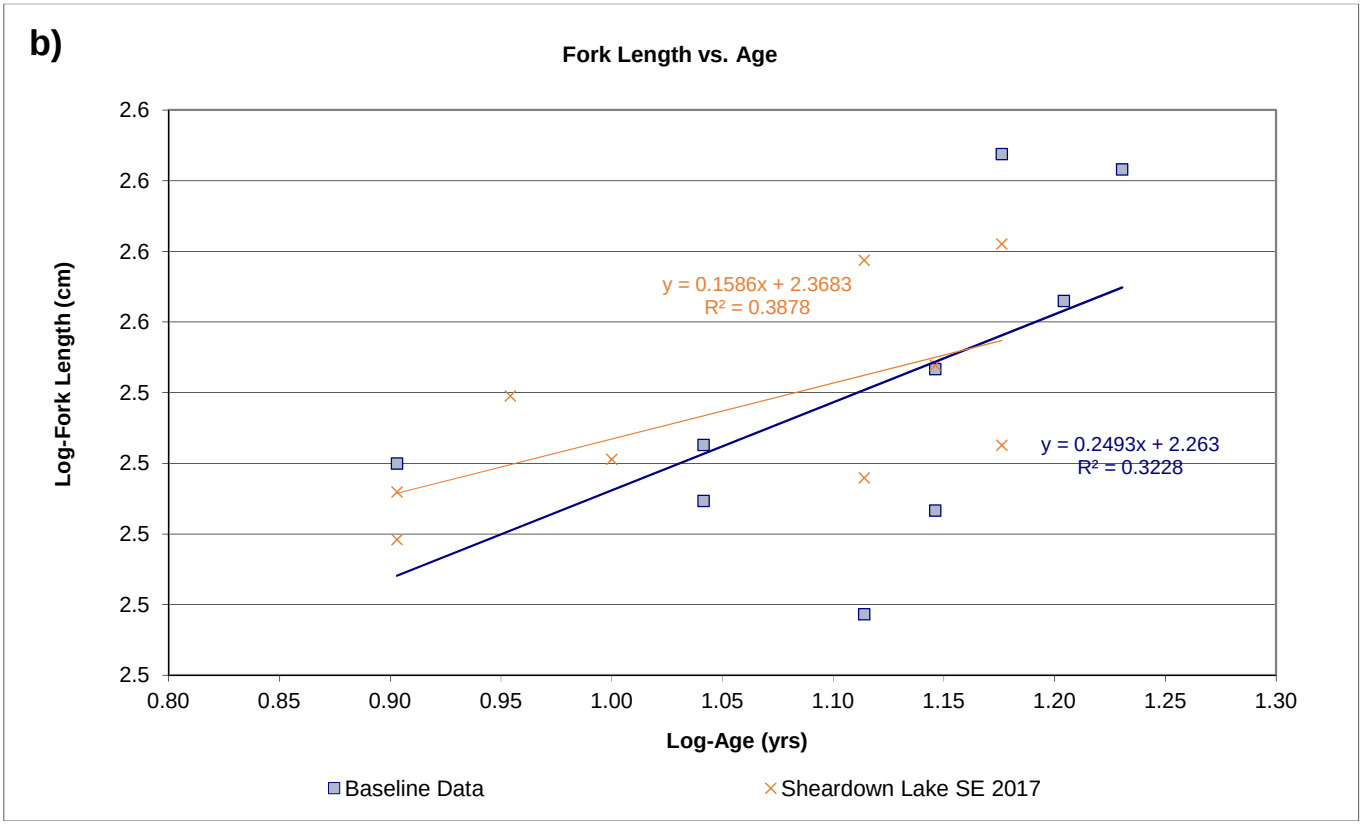


Figure G.21: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected in Fall (August-September) at Sheardown Lake SE Littoral/Profundal Areas in 2017 and During the Baseline Period (2007), Mary River Project CREMP

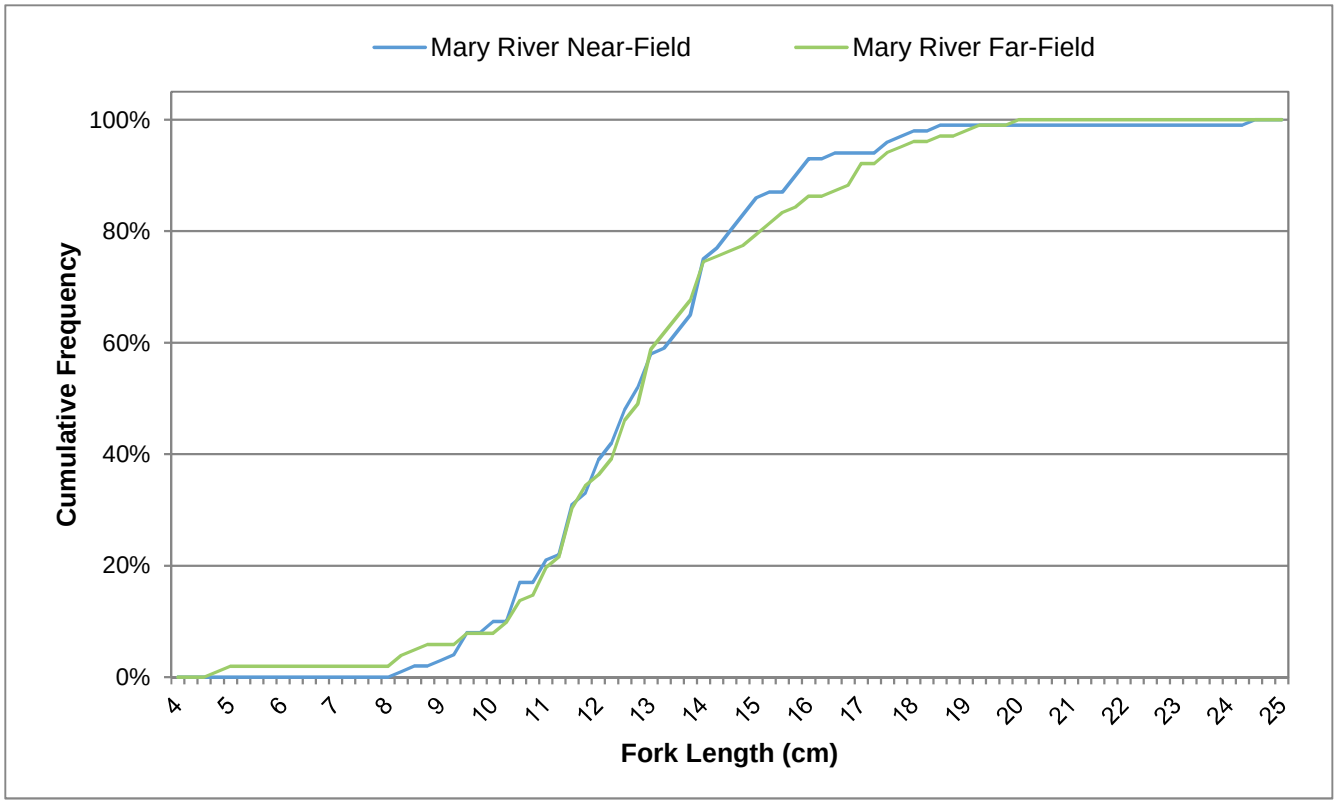
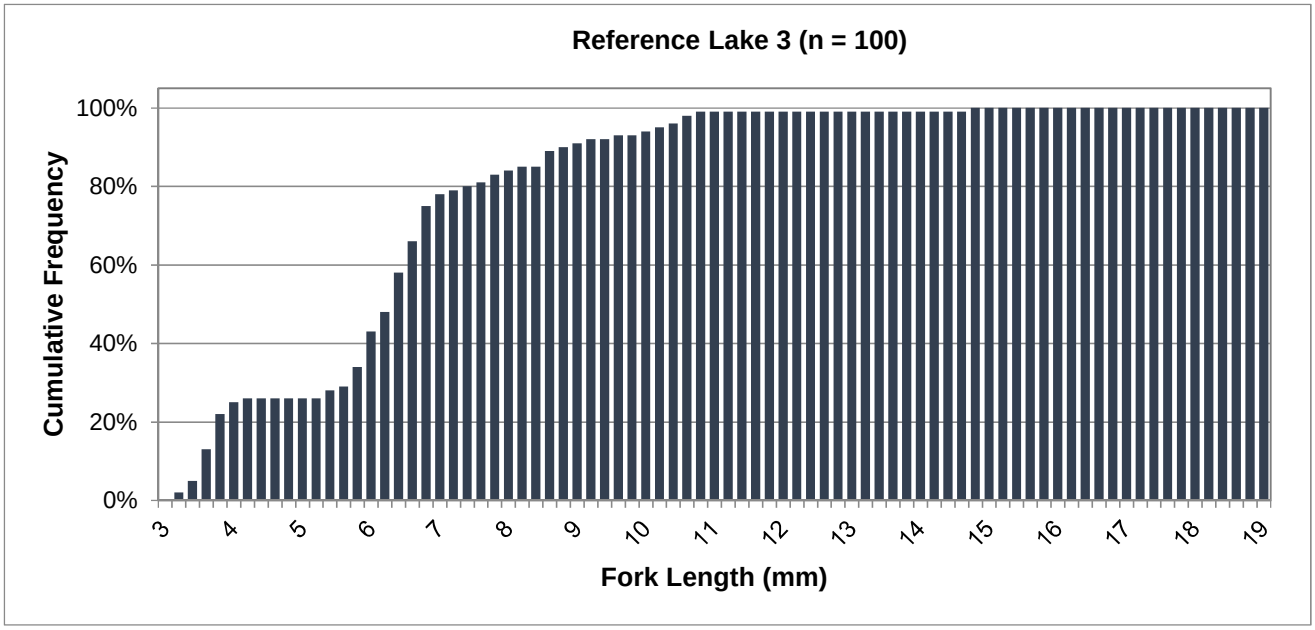


Figure G.22: Cumulative Length-frequency Distributions for Arctic Charr Captured at Mary River Near- and Far-Field Study Areas as Part of the Mary River Project EEM Study, August 2017

Figure G.23: Comparison of Condition (Weight-at-Fork Length Relationship) for Arctic Charr Non-Young-of-the-Year (Non-YOY) Collected at Mary River Near- and Far-Field Areas as Part of the Mary River Project EEM Study, August 2017



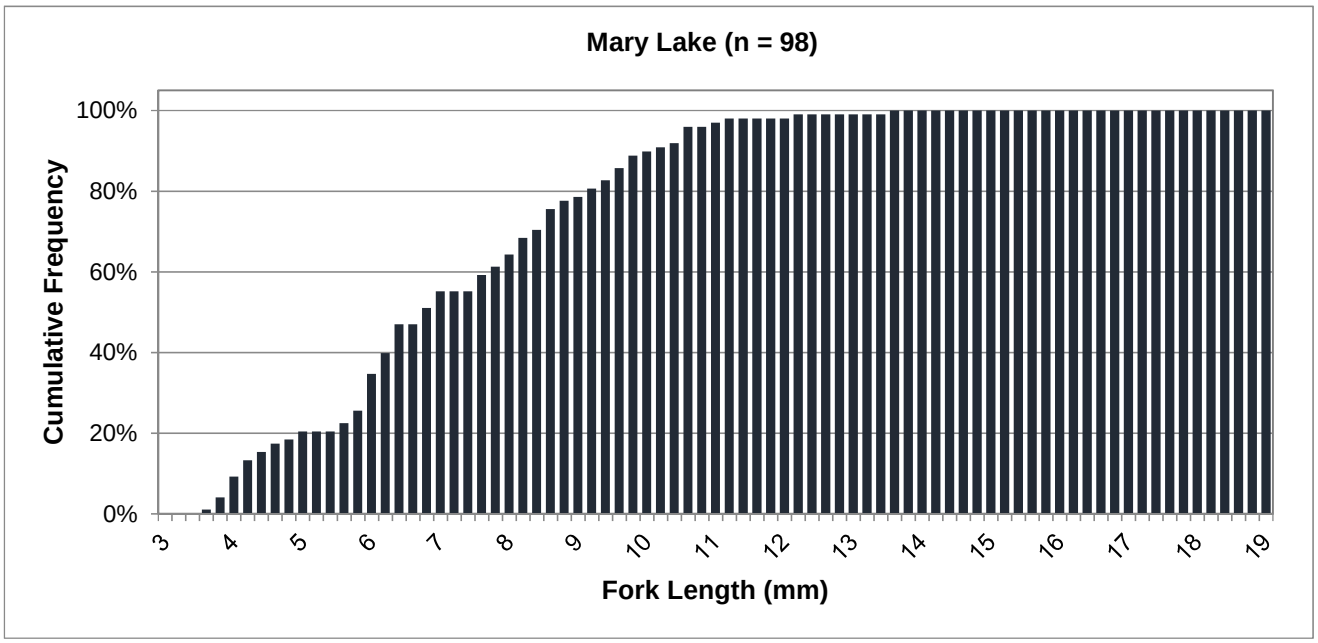
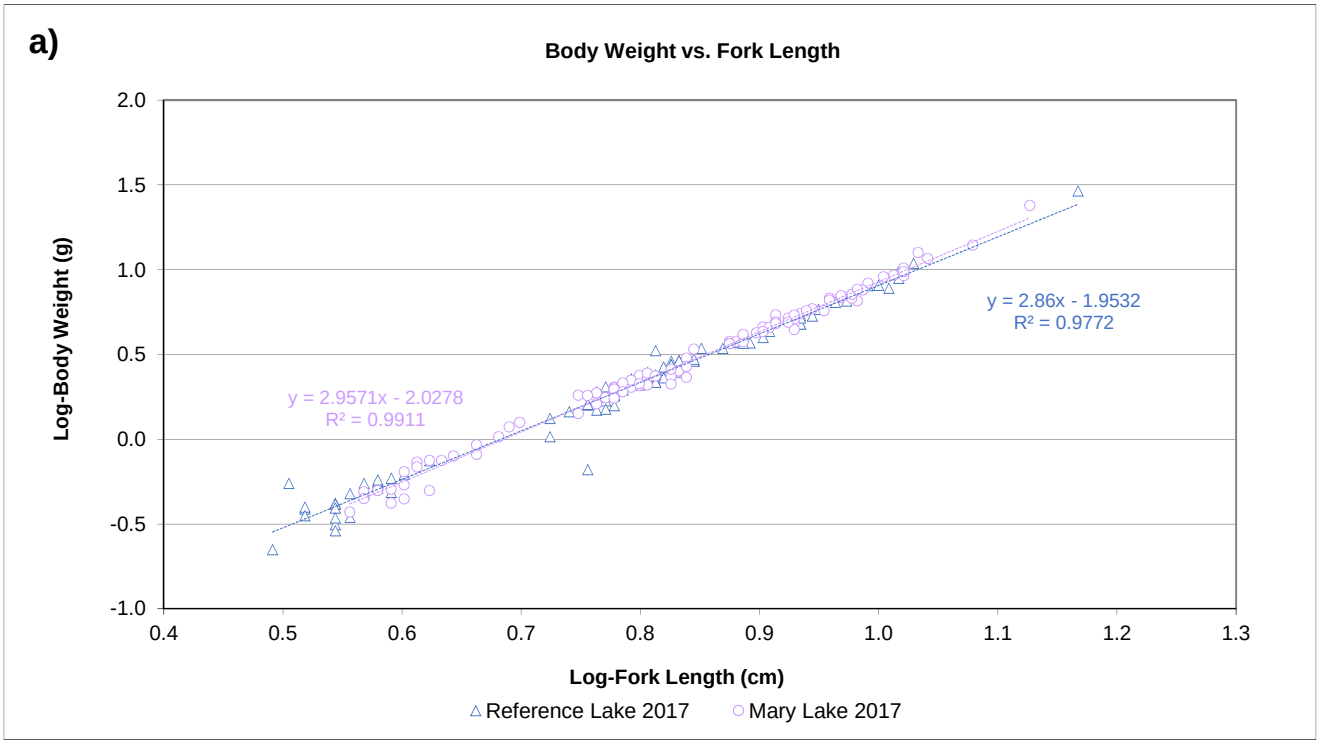


Figure G.24: Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2017



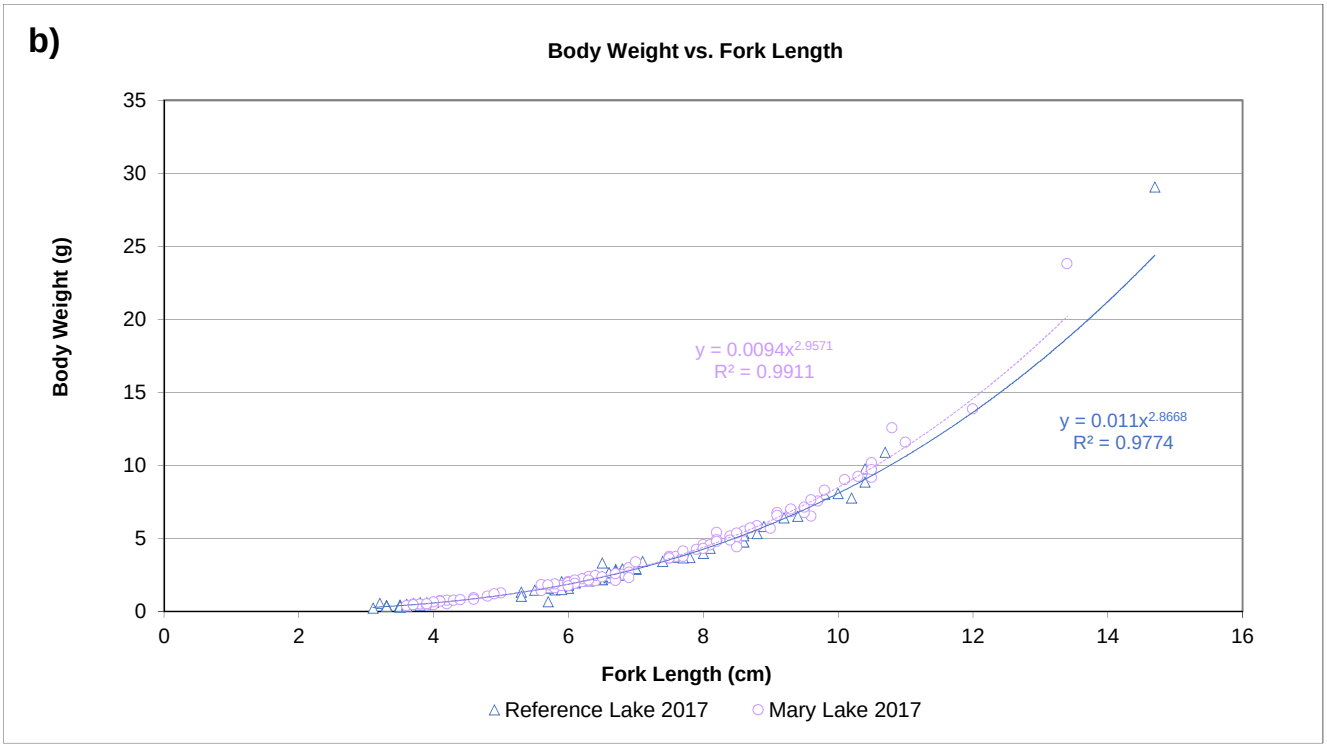
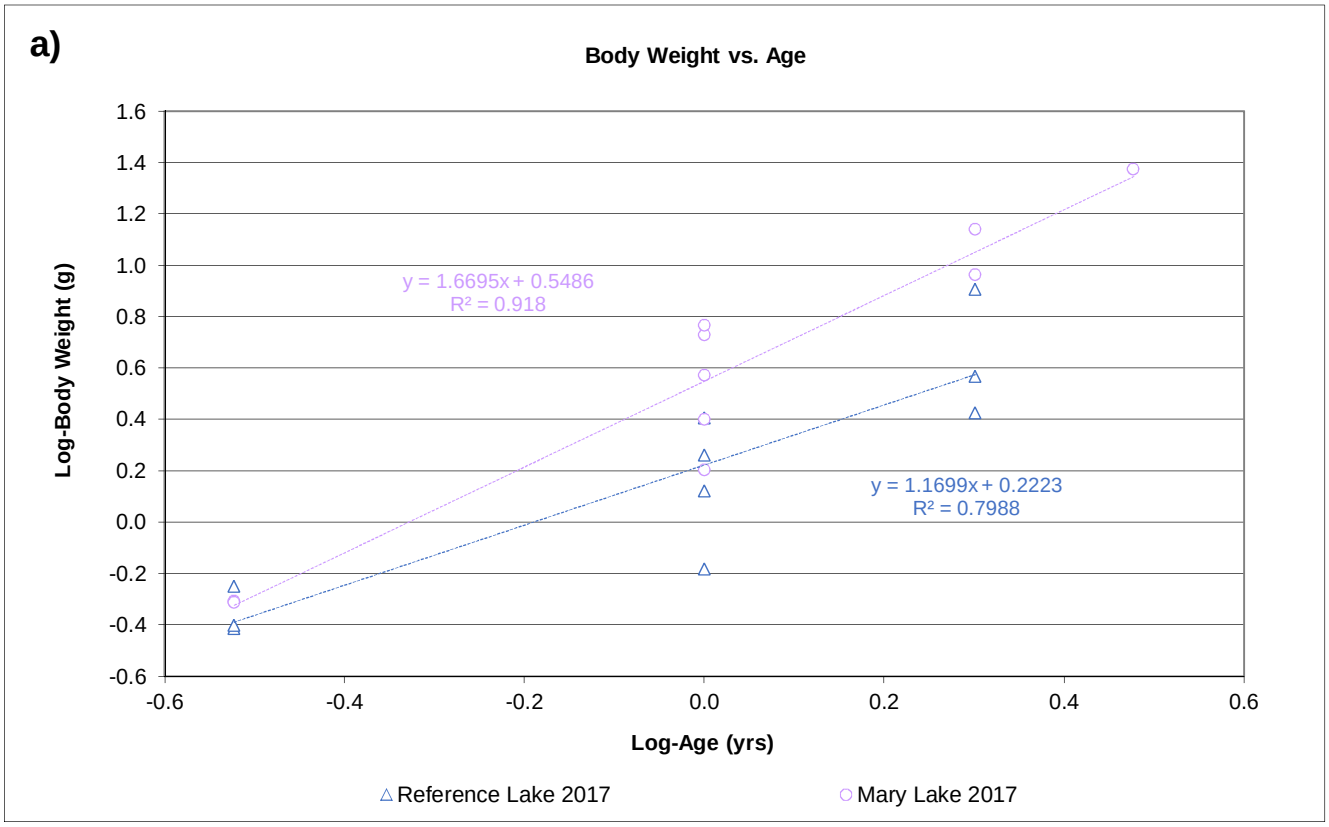


Figure G.25: Comparison of Condition (Weight-at-fork-Length Relationship) for Arctic Charr Collected at the Nearshore Area of Mary Lake and Reference Lake 3 in August 2017 using Log-Transformed (a) and Untransformed (b) Data, Mary River Project CREMP, 2017



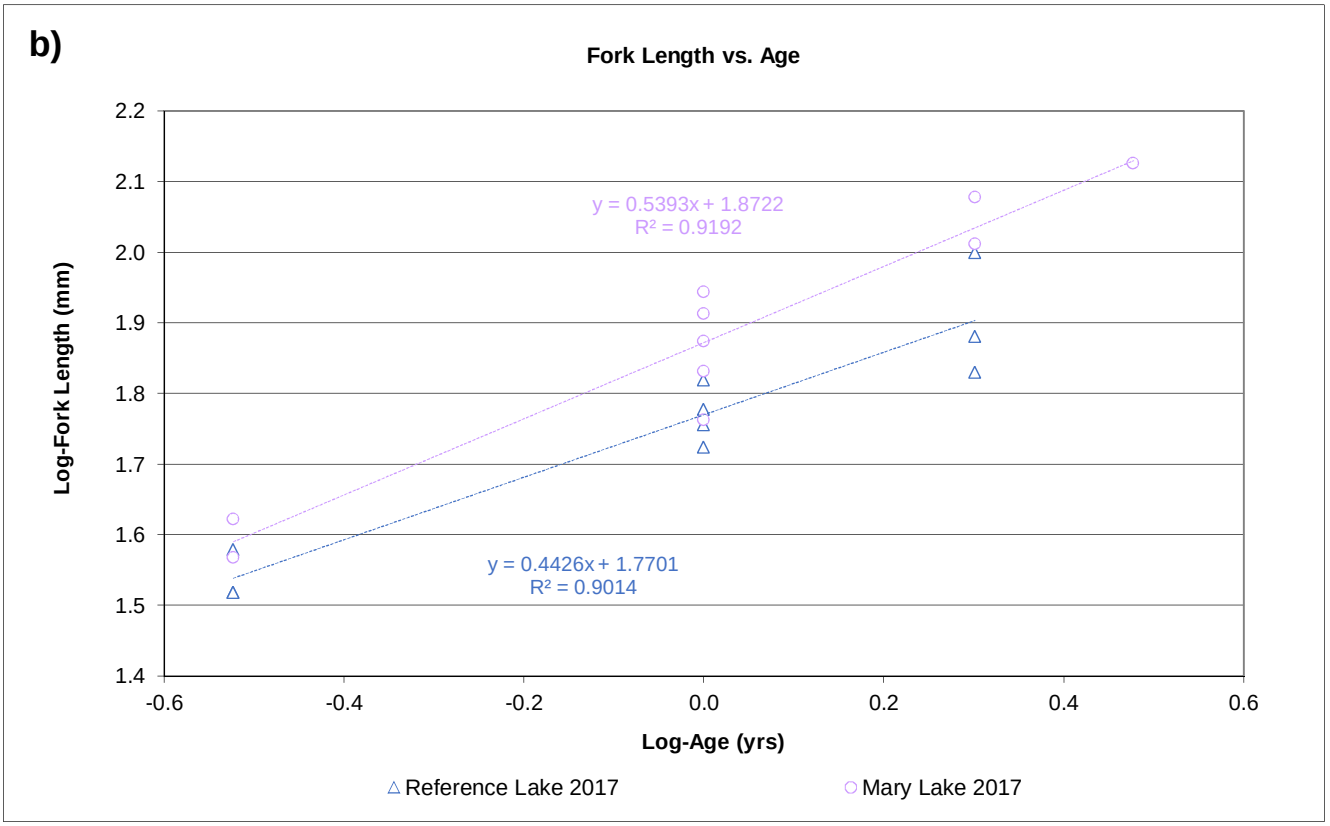
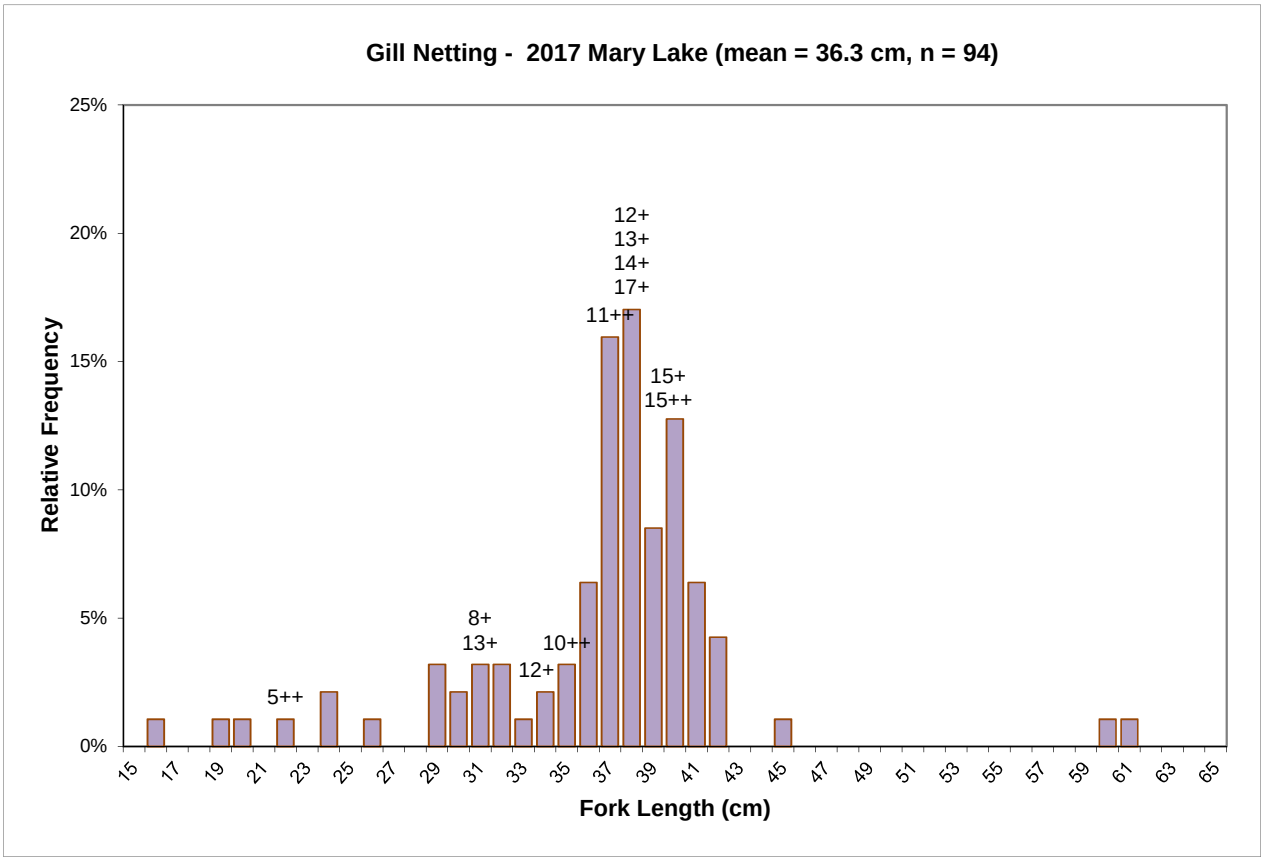


Figure G.26: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected at the Nearshore Areas of Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2017



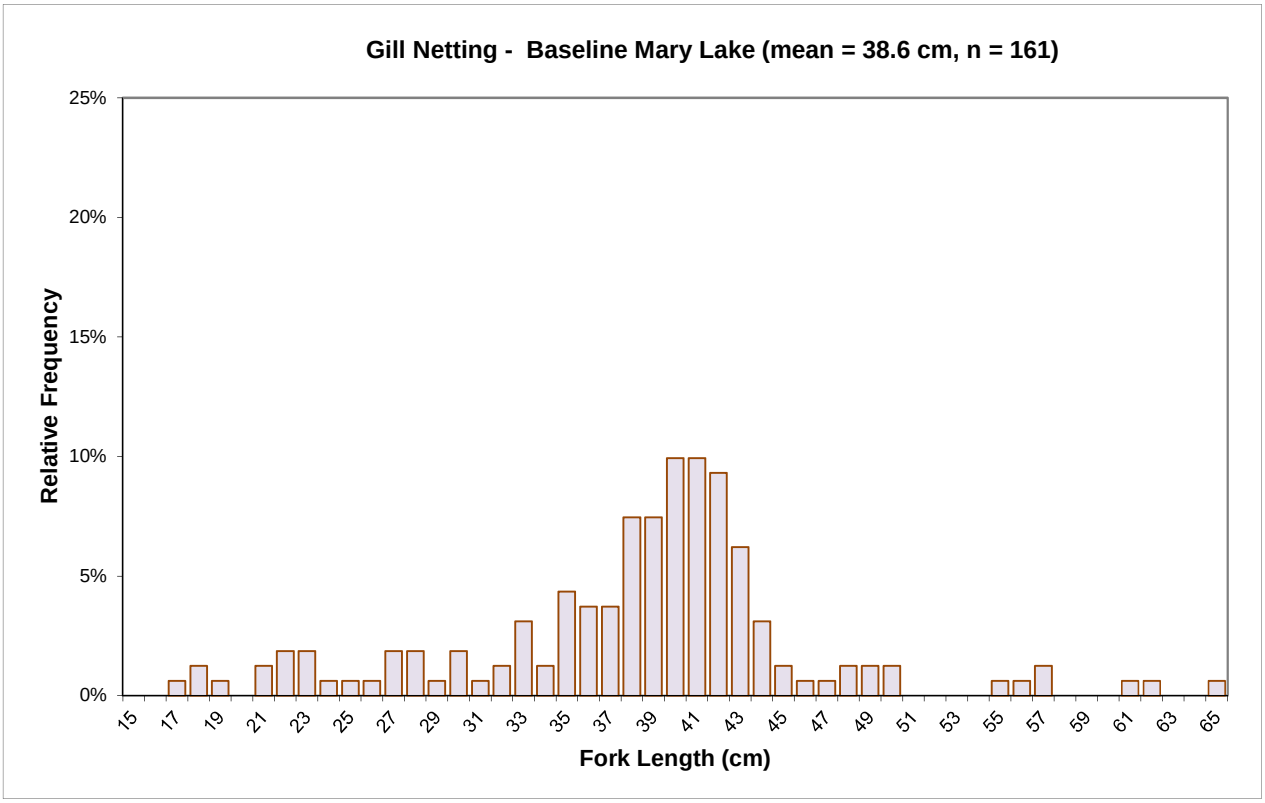


Figure G.27: Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Mary Lake (BLO) in 2017 and Baseline Studies Conducted in Fall, Mary River Project

Note: Fish ages are shown above the bars, where available.

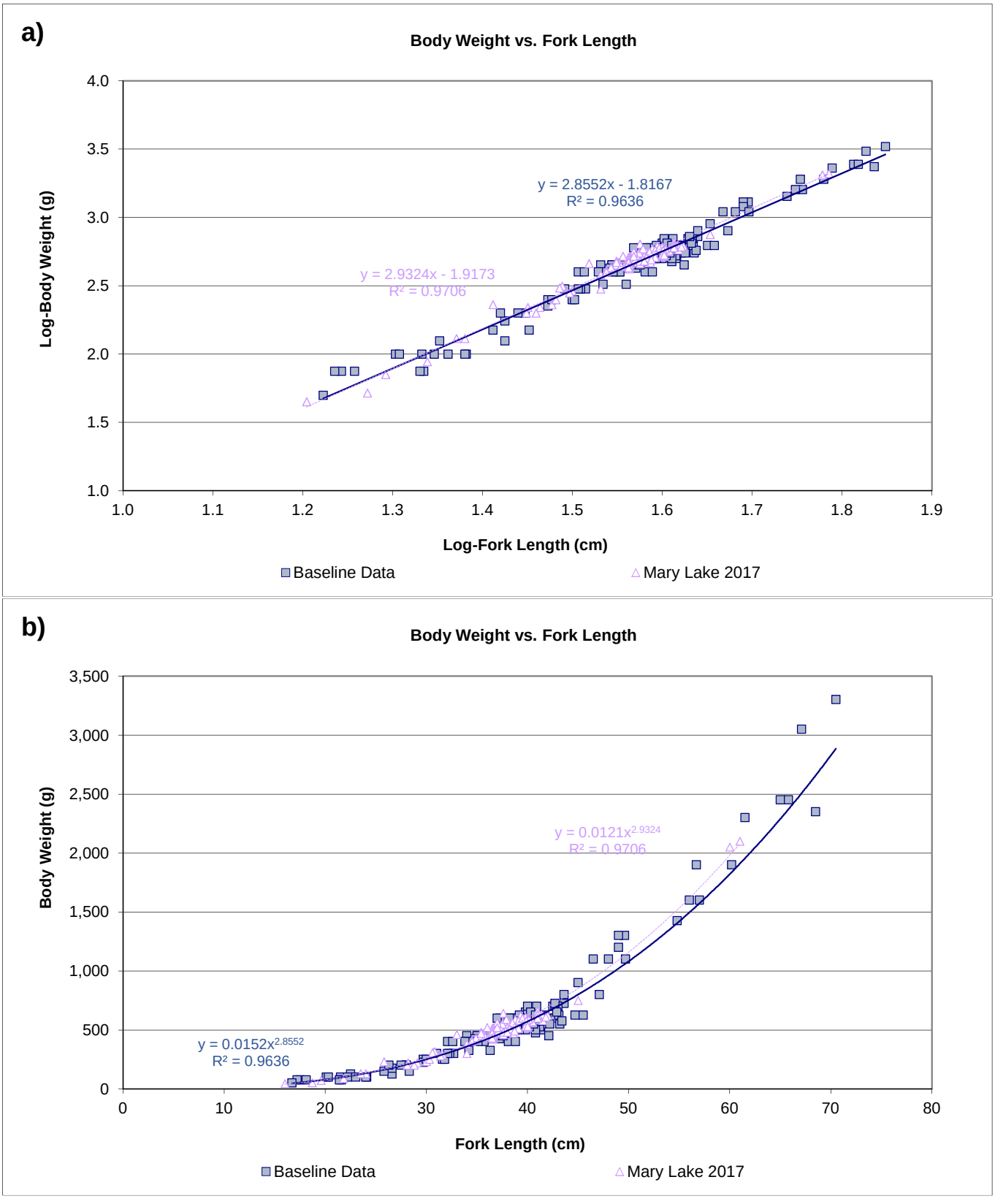


Figure G.28: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Mary Lake Nearshore Areas in 2017 and During the Mine Baseline Period (2006, 2007) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP

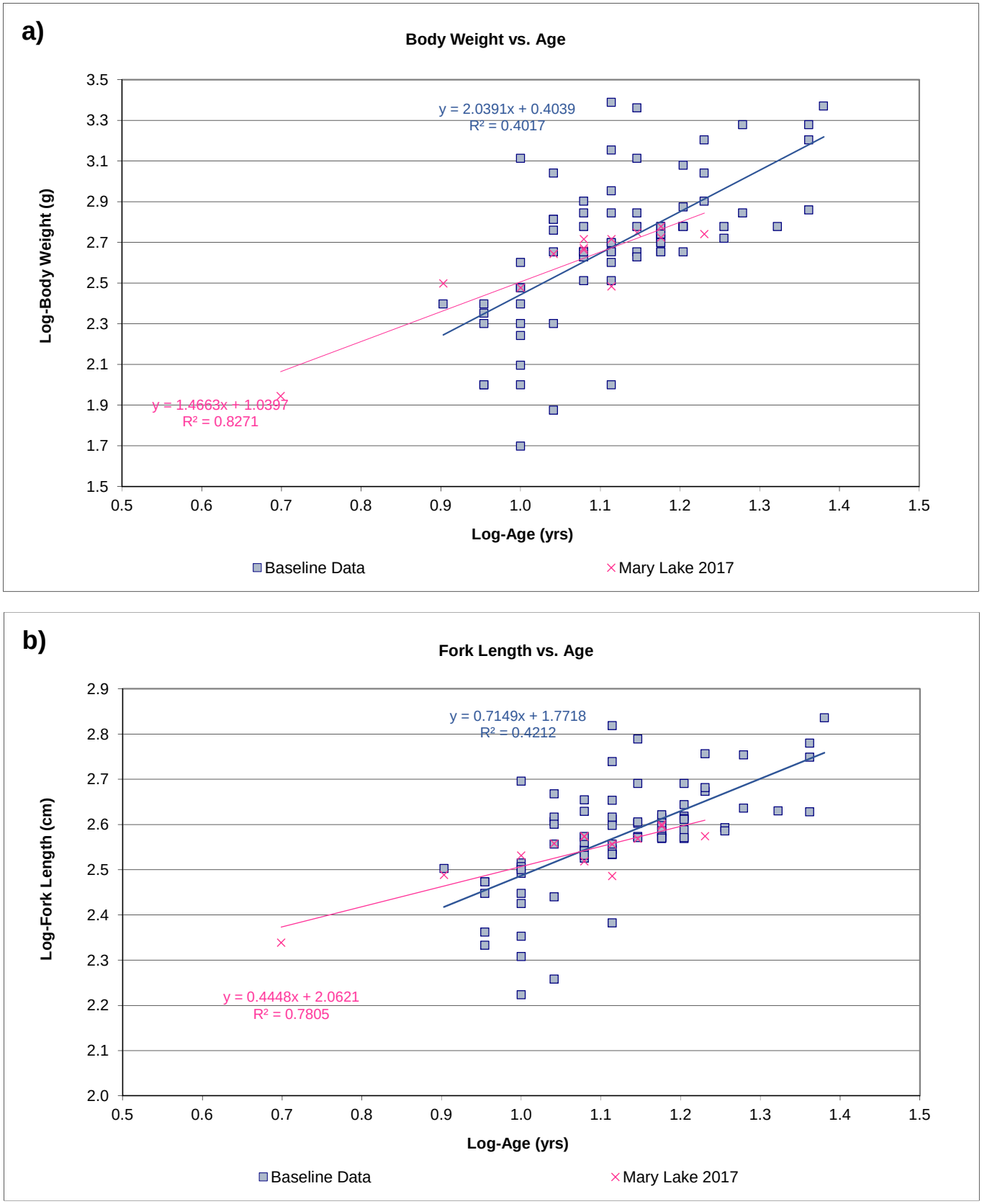


Figure G.29: Weight-at-age (a) and Length-at-age (b) Growth Relationships for Arctic Charr Collected in Fall (August-September) at Mary Lake Littoral and Profundal Areas in 2017 and During the Baseline Period (2006, 2007), Mary River Project CREMP

1) Mary River Tributary-F Benthic Reference Area.

2) Mary River Tributary-F Benthic Effluent-Exposed Area.

3) Mary River Tributary-F step-drop cascade barrier.

4) Mary River downstream of Mary River Tributary-F confluence.

Photo Plate G.1: Photographs of Mary River Tributary-F and Mary River at Gorge Area, August 2017

1) Mary River Fish Population Near-Field Study Area

2) Mary River Fish Population Near-Field Study Area Substrate

3) Mary River Fish Population Far-Field Study Area

4) Mary River Fish Population Far-Field Study Area Substrate

Photo Plate G.2: Photographs of Mary River Fish Population Survey Near- and Far-Field Study Areas, August 2017

Table G.1: Electrofishing Catch Records, Mary River Project CREMP, August 2017

Waterbody	Sample Station Identifier	Location (NAD83, UTM Zone 17W)				Fishing Date	Electrofisher Settings			Effort (seconds)	Fish Species				Total (all species)	
		Start		Finish							Arctic Charr		Nine-spine Stickleback			
		Easting	Northing	Easting	Northing		Output Voltage (volts)	Cycle Freq. (Hz)	Duty Cycle (%)		No. Captured	CPUE	No. Captured	CPUE	Total Catch	CPUE
Reference Lake 3	REF317-EF-1	575164	7853094	574878	7853051	21-Aug-17	450	30	10	5,833	100	1.03	11	0.11	111	1.14
Camp Lake	CL17-EF-1	557805	7914668	557804	7914619	16-Aug-17	400	30	10	1,672	97	3.48	4	0.14	101	3.62
Sheardown Lake NW	SDNW17-EF-1	560280	7913482	560212	7913481	19-Aug-17	450	30	10	1,239	101	4.89	0	0.00	101	4.89
Sheardown Lake SE	SDSE17-EF-1	560725	7912351	560853	7912244	19-Aug-17	450	30	10	1,349	100	4.45	15	0.67	115	5.11
Mary Lake	ML17-EF-1	555419	7905153	555501	7905001	18-Aug-17	450	30	10	4,152	98	1.42	20	0.29	118	1.71

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per electrofishing minute.

Table G.2: Gill Netting Catch Records for Reference Lake 3, Mary River Project CREMP, August 2017

Gill Net Set ID	Location (NAD83, UTM Zone 17W)		Length (m)	Set Date	Lift Date	Set Time	Lift Time	Fishing Hours	Effort (m*hrs/100 m)	Arctic Charr Catch Per Mesh Size			Total Catch	CPUE
	Easting	Northing								1½"	2"	3"		
REF317-GN-1	575881	7852703	91.4	29-Aug-17	29-Aug-17	10:00	12:25	2.42	2.21	0	0	0	0	0
				29-Aug-17	29-Aug-17	12:30	14:45	2.25	2.06	0	0	0	0	0
				29-Aug-17	29-Aug-17	14:45	16:30	1.75	1.60	0	0	0	0	0
REF317-GN-2	575750	7852542	91.4	29-Aug-17	29-Aug-17	10:23	12:35	2.20	2.01	0	0	0	0	0
				29-Aug-17	29-Aug-17	12:40	14:55	2.25	2.06	0	0	0	0	0
				29-Aug-17	29-Aug-17	14:55	16:35	1.67	1.52	0	0	0	0	0
REF317-GN-3	574253	7852451	91.4	29-Aug-17	29-Aug-17	10:45	13:00	2.25	2.06	0	0	0	0	0
				29-Aug-17	29-Aug-17	13:05	15:10	2.08	1.90	0	0	0	0	0
				29-Aug-17	29-Aug-17	15:10	16:50	1.67	1.52	0	0	0	0	0
REF317-GN-4	573945	7852906	91.4	29-Aug-17	29-Aug-17	11:00	13:10	2.17	1.98	0	0	0	0	0
				29-Aug-17	29-Aug-17	13:10	15:25	2.25	2.06	0	0	0	0	0
				29-Aug-17	29-Aug-17	15:25	17:00	1.58	1.45	0	0	0	0	0
REF317-GN-5	574499	7853078	91.4	29-Aug-17	29-Aug-17	11:15	13:15	2.00	1.83	0	0	0	0	0
				29-Aug-17	29-Aug-17	13:15	15:40	2.42	2.21	0	1	0	1	0.45
				29-Aug-17	29-Aug-17	15:40	17:00	1.33	1.22	0	0	0	0	0
REF317-GN-6	574510	7853512	91.4	29-Aug-17	29-Aug-17	11:25	13:25	2.00	1.83	0	0	0	0	0
				29-Aug-17	29-Aug-17	13:25	15:46	2.35	2.15	0	0	0	0	0
				29-Aug-17	29-Aug-17	15:46	17:15	1.48	1.36	0	0	0	0	0
REF317-GN-7	574014	7853834	91.4	29-Aug-17	29-Aug-17	11:40	13:40	2.00	1.83	0	0	0	0	0
				29-Aug-17	29-Aug-17	13:40	16:00	2.33	2.13	0	0	0	0	0
				29-Aug-17	29-Aug-17	16:00	17:25	1.42	1.30	0	0	0	0	0
REF317-GN-8	573715	7853285	91.4	29-Aug-17	29-Aug-17	11:50	13:50	2.00	1.83	0	0	0	0	0
				29-Aug-17	29-Aug-17	13:50	16:10	2.33	2.13	0	0	0	0	0
				29-Aug-17	29-Aug-17	16:10	17:30	1.33	1.22	0	0	0	0	0
								Total	**43.46**	**0**	**1**	**0**	**1**	**0.02**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Table G.3: Summary of Arctic Charr Gill Net Catches by Mesh Size, Mary River Project CREMP, August 2017

Waterbody	Effort (m*hrs/100 m)	Arctic Charr Catch Per Mesh Size			Total Catch	CPUE	Mortalities
		1½"	2"	3"			
Reference Lake 3	43.46	0	1	0	1	0.02	0
Camp Lake	66.37	0	42	35	96	1.40	10
Sheardown Lake NW	33.92	17	52	22	91	2.81	18
Sheardown Lake SE	17.62	19	42	44	105	5.96	10
Mary Lake	28.12	21	32	40	93	3.41	13
Total	**189.49**	**57**	**169**	**141**	**386**	**2.72**	**51**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Table G.4: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
REF317-ACJ-1	6.6	7.0	2.548	1	0.886
REF317-ACJ-2	7.6	8.1	3.706	2+	0.844
REF317-ACJ-3	3.3	3.5	0.386	0++	1.074
REF317-ACJ-4	10.0	10.1	8.073	2++	0.807
REF317-ACJ-5	6.0	6.4	1.823	1+	0.844
REF317-ACJ-6	3.8	4.0	0.562	0++	1.024
REF317-ACJ-7	5.3	5.6	1.323	1+	0.889
REF317-ACJ-8	3.3	3.5	0.397	0++	1.105
REF317-ACJ-9	6.8	7.1	2.672	2+	0.861
REF317-ACJ-10	5.7	6.1	0.658	1+	0.355
REF317-ACJ-11	14.7	15.8	29.049	-	0.914
REF317-ACJ-12	6.0	6.3	1.575	-	0.729
REF317-ACJ-13	7.1	7.7	3.416	-	0.954
REF317-ACJ-14	6.5	6.9	2.178	-	0.793
REF317-ACJ-15	5.8	6.2	1.479	-	0.758
REF317-ACJ-16	6.4	6.9	2.247	-	0.857
REF317-ACJ-17	9.8	10.5	8.024	-	0.853
REF317-ACJ-18	8.6	9.3	5.347	-	0.841
REF317-ACJ-19	6.8	7.1	2.896	-	0.921
REF317-ACJ-20	3.5	3.7	0.312	-	0.728
REF317-ACJ-21	6.0	6.5	1.796	-	0.831
REF317-ACJ-22	6.7	7.1	2.496	-	0.830
REF317-ACJ-23	5.9	6.3	1.823	-	0.888
REF317-ACJ-24	5.3	5.6	1.032	-	0.693
REF317-ACJ-25	3.2	3.5	0.547	-	1.669
REF317-ACJ-26	3.5	3.7	0.417	-	0.973
REF317-ACJ-27	3.7	3.9	0.482	-	0.952
REF317-ACJ-28	4.0	4.2	0.619	-	0.967
REF317-ACJ-29	3.9	4.1	0.485	-	0.818
REF317-ACJ-30	3.5	3.7	0.412	-	0.961
REF317-ACJ-31	6.2	6.6	2.265	-	0.950
REF317-ACJ-32	7.8	8.2	3.693	-	0.778
REF317-ACJ-33	6.0	6.3	1.797	-	0.832
REF317-ACJ-34	6.5	6.8	2.164	-	0.788
REF317-ACJ-35	6.3	6.7	2.089	-	0.835
REF317-ACJ-36	6.8	7.1	2.512	-	0.799
REF317-ACJ-37	6.6	7.0	2.298	-	0.799
REF317-ACJ-38	5.9	6.3	1.678	-	0.817
REF317-ACJ-39	5.9	6.3	2.036	-	0.991
REF317-ACJ-40	6.7	7.1	2.878	-	0.957
REF317-ACJ-41	3.3	3.5	0.353	-	0.982
REF317-ACJ-42	3.5	3.7	0.392	-	0.914
REF317-ACJ-43	3.8	4.0	0.514	-	0.937
REF317-ACJ-44	8.6	9.2	4.758	-	0.748
REF317-ACJ-45	8.6	8.9	4.754	-	0.747
REF317-ACJ-46	6.1	6.5	1.975	-	0.870
REF317-ACJ-47	5.5	5.8	1.448	-	0.870
REF317-ACJ-48	6.7	7.1	2.754	-	0.916
REF317-ACJ-49	6.6	7.1	2.637	-	0.917
REF317-ACJ-50	3.7	3.9	0.548	-	1.082
REF317-ACJ-51	6.1	6.5	1.947	-	0.858
REF317-ACJ-52	6.8	7.3	2.478	-	0.788
REF317-ACJ-53	7.0	7.4	2.904	-	0.847
REF317-ACJ-54	6.4	6.7	2.331	-	0.889
REF317-ACJ-55	3.5	3.7	0.287	-	0.669
REF317-ACJ-56	6.5	6.9	3.319	-	1.209
REF317-ACJ-57	7.0	7.5	2.882	-	0.840
REF317-ACJ-58	6.4	6.8	2.467	-	0.941

Table G.4: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
REF317-ACJ-59		6.3	6.6	2.291	-	0.916
REF317-ACJ-60		5.7	6.0	1.585	-	0.856
REF317-ACJ-61		6.4	6.7	2.227	-	0.850
REF317-ACJ-62		10.2	10.9	7.756	-	0.731
REF317-ACJ-63		8.1	8.7	4.312	-	0.811
REF317-ACJ-64		6.2	6.5	2.217	-	0.930
REF317-ACJ-65		6.3	6.6	2.297	-	0.919
REF317-ACJ-66		8.6	9.3	5.179	-	0.814
REF317-ACJ-67		3.7	3.9	0.476	-	0.940
REF317-ACJ-68		6.7	7.1	2.731	-	0.908
REF317-ACJ-69		6.5	6.9	2.391	-	0.871
REF317-ACJ-70		8.9	9.5	5.812	-	0.824
REF317-ACJ-71		5.8	6.1	1.893	-	0.970
REF317-ACJ-72		5.9	6.2	1.502	-	0.731
REF317-ACJ-73		8.8	9.4	5.318	-	0.780
REF317-ACJ-74		6.0	6.5	1.906	-	0.882
REF317-ACJ-75		3.8	4.0	0.552	-	1.006
REF317-ACJ-76		10.7	11.4	10.896	-	0.889
REF317-ACJ-77		10.4	10.9	8.862	-	0.788
REF317-ACJ-78		10.4	11.3	9.746	-	0.866
REF317-ACJ-79		7.7	8.2	3.667	-	0.803
REF317-ACJ-80		6.8	7.2	2.885	-	0.918
REF317-ACJ-81		7.4	7.8	3.423	-	0.845
REF317-ACJ-82		6.1	6.5	2.048	-	0.902
REF317-ACJ-83		6.6	7.1	2.658	-	0.925
REF317-ACJ-84		6.4	6.7	2.285	-	0.872
REF317-ACJ-85		3.8	4.0	0.541	-	0.986
REF317-ACJ-86		8.0	8.5	3.972	-	0.776
REF317-ACJ-87		9.2	9.8	6.408	-	0.823
REF317-ACJ-88		5.7	6.0	1.598	-	0.863
REF317-ACJ-89		3.5	3.7	0.342	-	0.798
REF317-ACJ-90		9.4	10.1	6.519	-	0.785
REF317-ACJ-91		3.9	4.1	0.587	-	0.990
REF317-ACJ-92		3.6	3.8	0.476	-	1.020
REF317-ACJ-93		6.3	6.6	2.142	-	0.857
REF317-ACJ-94		7.0	7.4	2.947	-	0.859
REF317-ACJ-95		4.2	4.4	0.743	-	1.003
REF317-ACJ-96		3.8	4.0	0.574	-	1.046
REF317-ACJ-97		6.4	6.8	2.407	-	0.918
REF317-ACJ-98		3.1	3.3	0.222	-	0.745
REF317-ACJ-99		3.8	4.0	0.425	-	0.775
REF317-ACJ-100		3.6	3.8	0.345	-	0.739
Overall Catch Summary	Sample Size (N)	100	100	100	10	100
	Average	6.2	6.6	2.781	1.0	0.877
	Median	6.3	6.6	2.198	1.0	0.862
	Standard Deviation	2.1	2.2	3.430	0.82	0.134
	Standard Error	0.2	0.2	0.343	0.26	0.013
	Minimum	3.1	3.3	0.222	0	0.355
	Maximum	14.7	15.8	29.049	2	1.669
Young-of-the-Year Catch Summary	proportion of YOY	**26%**				
	Sample Size (N)	26	26	26	3	26
	Average	3.6	3.8	0.461	0	0.958
	Median	3.7	3.9	0.476	0	0.970
	Standard Deviation	0.3	0.3	0.118	0	0.189
	Standard Error	0.1	0.0	0.023	0	0.037
	Minimum	3.1	3.3	0.222	0	0.669
	Maximum	4.2	4.4	0.743	0	1.669

Table G.5: Arctic Charr Measurements from Fish Captured at Camp Lake by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
CL17-ACJ-1	11.3	12.4	13.345	1++	0.925
CL17-ACJ-2	5.3	5.7	1.357	1+	0.911
CL17-ACJ-3	12.0	12.9	13.862	2++	0.802
CL17-ACJ-4	16.9	18.5	39.359	4++	0.815
CL17-ACJ-5	15.4	16.7	29.552	3++	0.809
CL17-ACJ-6	8.0	8.6	4.242	2+	0.829
CL17-ACJ-7	8.6	9.3	4.960	1++	0.780
CL17-ACJ-8	8.3	8.8	4.774	1++	0.835
CL17-ACJ-9	8.8	9.4	4.977	1+	0.730
CL17-ACJ-10	5.9	6.2	1.740	1	0.847
CL17-ACJ-11	5.5	5.9	1.370	-	0.823
CL17-ACJ-12	10.9	11.9	11.060	-	0.854
CL17-ACJ-13	5.9	6.4	1.727	-	0.841
CL17-ACJ-14	6.3	6.6	2.132	-	0.853
CL17-ACJ-15	5.9	6.2	1.610	-	0.784
CL17-ACJ-16	6.4	6.7	2.252	-	0.859
CL17-ACJ-17	12.9	13.8	16.177	-	0.754
CL17-ACJ-18	9.0	9.6	5.946	-	0.816
CL17-ACJ-19	6.1	6.4	1.622	-	0.715
CL17-ACJ-20	4.7	4.9	0.821	-	0.791
CL17-ACJ-21	7.9	8.4	4.351	-	0.882
CL17-ACJ-22	7.2	7.6	3.042	-	0.815
CL17-ACJ-23	5.5	5.9	1.517	-	0.912
CL17-ACJ-24	10.0	10.7	8.451	-	0.845
CL17-ACJ-25	12.3	13.2	14.724	-	0.791
CL17-ACJ-26	16.4	17.6	34.887	-	0.791
CL17-ACJ-27	6.5	7.0	2.806	-	1.022
CL17-ACJ-28	7.8	8.2	3.762	-	0.793
CL17-ACJ-29	6.6	7.1	2.533	-	0.881
CL17-ACJ-30	8.4	9.1	4.937	-	0.833
CL17-ACJ-31	6.7	7.3	2.785	-	0.926
CL17-ACJ-32	8.3	8.9	4.435	-	0.776
CL17-ACJ-33	6.5	6.9	2.187	-	0.796
CL17-ACJ-34	5.4	5.7	1.165	-	0.740
CL17-ACJ-35	6.4	6.7	2.372	-	0.905
CL17-ACJ-36	6.6	7.2	2.726	-	0.948
CL17-ACJ-37	9.3	9.9	5.907	-	0.734
CL17-ACJ-38	13.8	14.9	22.236	-	0.846
CL17-ACJ-39	16.4	17.8	34.102	-	0.773
CL17-ACJ-40	11.3	12.2	11.275	-	0.781
CL17-ACJ-41	10.4	11.3	8.513	-	0.757
CL17-ACJ-42	7.8	8.4	3.857	-	0.813
CL17-ACJ-43	5.7	6.2	1.662	-	0.897
CL17-ACJ-44	6.8	7.3	2.635	-	0.838
CL17-ACJ-45	5.7	6.1	1.527	-	0.825
CL17-ACJ-46	5.9	6.4	1.995	-	0.971
CL17-ACJ-47	5.9	6.4	1.781	-	0.867
CL17-ACJ-48	5.2	5.5	1.249	-	0.888
CL17-ACJ-49	5.4	5.6	1.287	-	0.817
CL17-ACJ-50	11.5	12.5	13.410	-	0.882
CL17-ACJ-51	14.0	15.1	22.704	-	0.827
CL17-ACJ-52	10.8	11.7	9.180	-	0.729
CL17-ACJ-53	12.7	13.5	15.790	-	0.771
CL17-ACJ-54	12.0	13.1	13.382	-	0.774
CL17-ACJ-55	9.5	10.1	6.360	-	0.742
CL17-ACJ-56	8.4	8.9	4.726	-	0.797

Table G.5: Arctic Charr Measurements from Fish Captured at Camp Lake by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
CL17-ACJ-57		5.8	6.1	1.661	-	0.851
CL17-ACJ-58		7.4	7.9	3.534	-	0.872
CL17-ACJ-59		7.7	8.1	3.754	-	0.822
CL17-ACJ-60		7.2	7.6	3.392	-	0.909
CL17-ACJ-61		6.8	7.2	2.345	-	0.746
CL17-ACJ-62		5.9	6.3	1.664	-	0.810
CL17-ACJ-63		7.5	7.9	3.105	-	0.736
CL17-ACJ-64		5.9	6.3	1.915	-	0.932
CL17-ACJ-65		3.7	3.9	0.571	-	1.127
CL17-ACJ-66		6.0	6.6	2.051	-	0.950
CL17-ACJ-67		11.0	11.8	9.595	-	0.721
CL17-ACJ-68		12.7	13.7	16.695	-	0.815
CL17-ACJ-69		10.0	10.7	7.655	-	0.766
CL17-ACJ-70		9.3	9.9	6.104	-	0.759
CL17-ACJ-71		8.3	8.9	5.093	-	0.891
CL17-ACJ-72		11.9	13.0	11.890	-	0.706
CL17-ACJ-73		8.5	9.1	4.745	-	0.773
CL17-ACJ-74		6.8	7.2	2.695	-	0.857
CL17-ACJ-75		7.5	7.8	3.667	-	0.869
CL17-ACJ-76		6.7	6.9	2.051	-	0.682
CL17-ACJ-77		5.5	5.8	1.375	-	0.826
CL17-ACJ-78		6.3	6.6	2.120	-	0.848
CL17-ACJ-79		9.8	10.5	7.527	-	0.800
CL17-ACJ-80		5.6	6.0	1.538	-	0.876
CL17-ACJ-81		10.4	11.2	7.938	-	0.706
CL17-ACJ-82		5.9	6.3	1.903	-	0.927
CL17-ACJ-83		5.9	6.3	1.601	-	0.780
CL17-ACJ-84		5.7	6.0	1.272	-	0.687
CL17-ACJ-85		5.5	5.8	1.529	-	0.919
CL17-ACJ-86		12.0	12.9	14.565	-	0.843
CL17-ACJ-87		9.9	10.7	7.132	-	0.735
CL17-ACJ-88		10.8	11.6	9.551	-	0.758
CL17-ACJ-89		8.7	9.4	4.925	-	0.748
CL17-ACJ-90		8.4	8.9	4.415	-	0.745
CL17-ACJ-91		5.2	5.4	1.185	-	0.843
CL17-ACJ-92		6.2	6.6	2.001	-	0.840
CL17-ACJ-93		5.4	5.7	1.500	-	0.953
CL17-ACJ-94		5.7	6.1	2.191	-	1.183
CL17-ACJ-95		12.2	13.1	13.987	-	0.770
CL17-ACJ-96		6.1	6.4	1.914	-	0.843
CL17-ACJ-97		10.8	11.6	9.722	-	0.772
Overall Catch Summary	Sample Size (N)	97	97	97	10	97
	Average	8.3	8.9	6.569	1.7	0.828
	Median	7.5	7.9	3.667	1	0.822
	Standard Deviation	2.9	3.2	7.616	1.1	0.083
	Standard Error	0.3	0.3	0.773	0.3	0.008
	Minimum	3.7	3.9	0.571	1	0.682
	Maximum	16.9	18.5	39.359	4	1.183
Young-of-the-Year Catch Summary	proportion of YOY			**2%**		
	Sample Size (N)	2	2	2	-	2
	Average	4.2	4.4	0.696	-	0.959
	Median	4.2	4.4	0.696	-	0.959
	Standard Deviation	0.7	0.7	0.177	-	0.238
	Standard Error	0.5	0.5	0.125	-	0.168
	Minimum	3.7	3.9	0.571	-	0.791
	Maximum	4.7	4.9	0.821	-	1.127

Table G.6: Results of Nearshore Arctic Charr Young-of-the-Year (YOY) and Non-YOY Health Endpoint Statistical Comparisons between Camp Lake (JLO) and Reference Lake 3 (REF), Mary River Project CREMP, August 2017

Group	Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
			Response	Covariate	REF	JLO		Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]	Statistic	REF	JLO		
								Interaction P-value	Covariate P-value						
All Fish	Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	100	97	K-S	-	-	-	-	-	-	<0.001	34
YOY	Body Size	Fork Length	log[Fork Length (cm)]	-	26	2	-	-	-	-	Geometric Mean	3.6	3.6	-	0
		Body Weight	log[Body Weight (g)]	-	26	2	-	-	-	-	Geometric Mean	0.446	0.684	-	53
	Energy Storage	Condition	log[Body Weight (g)]	log[Fork Length (cm)]	26	2	-	-	-	-	-	-	-	-	-
Non-YOY	Survival	Length Frequency Distribution	Fork Length (cm)	-	74	95	K-S	-	-	-	-	-	-	0.004	27
	Body Size	Fork Length	Fork Length (cm)	-	74	95	M-W	-	-	-	Median	6.6	7.7	0.031	17
		Body Weight	Body Weight (g)	-	74	95	M-W	-	-	-	Median	2.49	3.75	0.014	51
	Energy Storage	Condition	log[Body Weight (g)]	log[Fork Length (cm)]	74	95	ANCOVA	0.652	<0.001	7.54	Adjusted Mean	3.63	3.55	0.101	-2.2

P-value < 0.1

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for log_{10}-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

Table G.7: Results of Nearshore Arctic Charr Non-Young-of-the-Year (Non-YOY) Health Endpoint Statistical Comparisons between Samples Collected in 2017 and the Baseline Period at Individual Mine-Exposed Lakes, Mary River Project CREMP, 2017

Lake	Group	Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
				Response	Covariate	Baseline	2017		Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]	Statistic	Baseline	2017		
									Interaction P-value	Covariate P-value						
Camp (JLO)	Non-YOY	Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	51	95	K-S	-	-	-	-	-	-	<0.001	-43
		Body Size	Fork Length	Fork Length (cm)	-	51	95	M-W	-	-	-	Median	11.8	7.7	<0.001	-35
			Body Weight	Body Weight (g)	-	51	95	M-W	-	-	-	Median	14.6	3.75	<0.001	-74
		Energy Storage	Condition	log[Body Weight (g)]	log[Fork Length (cm)]	51	95	ANCOVA	0.445	<0.001	9.00	Adjusted Mean	6.56	5.91	<0.001	-9.9
Sheardown NW (DLO-01)	Non-YOY	Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	247	89	K-S	-	-	-	-	-	-	0.021	19
		Body Size	Fork Length	Fork Length (cm)	-	247	89	M-W	-	-	-	Median	8.2	7.9	0.947	-3.7
			Body Weight	Body Weight (g)	-	247	89	M-W	-	-	-	Median	6.00	4.52	0.188	-25
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	247	89	ANCOVA	0.974	<0.001	9.00	Adjusted Mean	7.18	6.54	<0.001	-9.0
Sheardown SE (DLO-02)	Non-YOY	Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	16	59	K-S	-	-	-	-	-	-	<0.001	65
		Body Size	Fork Length	log[Fork Length (cm)]	-	16	59	t-test	-	-	-	Geometric Mean	6.32	7.49	<0.001	19
			Body Weight	Body Weight (g)	-	16	59	M-W	-	-	-	Median	2.50	3.84	<0.001	54
		Energy Storage	Condition[e]	log[Body Weight (g)]	log[Fork Length (cm)]	16	59	ANCOVA	<0.001	<0.001	5.5	Predicted Mean	1.27	1.66	-	31
											7.2		4.34	3.49		-20
						16	58	ANCOVA	<0.001	<0.001	5.5	Predicted Mean	1.27	1.65	-	30
											7.2		4.34	3.46		-20

Indicates p-value < 0.1

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for log_{10}-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(2017 mean - baseline mean) / baseline area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(2017 predicted mean - baseline predicted mean) / baseline predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between groups. A negative difference implies that 2017 has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that 2017 has fewer fish less than the length where the maximum difference in CFRDs was observed.

[e] Sample SDSE17-ACJ-36 was detected as a statistical outlier (Studentized residual = 4.94) from the 2017 data set. The analysis is presented with both the inclusion and exclusion of this individual.

Table G.8: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Camp Lake Using 2017 Data Relative to Reference Lake 3 (2017) Data or Camp Lake Baseline (2006 - 2013) Data with α=β=0.1, Mary River Project CREMP, 2017

Comparison	Group	Indicator	Endpoint	Variables		Test	S[a]	COV (%)[b]	Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1									
				Response	Covariate				log(Response)	5%	10%	20%	25%	30%	33%	40%	50%	100%
										-5%	-9%	-17%	-20%	-23%	-25%	-29%	-33%	-50%
									Response	±5%	±10%	±20%	±25%	±30%	±33%	±40%	±50%	±100%
Nearshore Arctic Charr (Electrofishing Data) versus Reference Lake 3, 2017 Data	Non-YOY	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	33.94	Response	916	231	60	39	27	22	17	11	4
			Body Weight	Body Weight (g)	-	M-W	-	172.4	Response	23,568	5,893	1,475	945	657	532	370	238	61
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.03661	-	log(Response)	53	16	6	5	4	4	4	3	3
Nearshore Arctic Charr (Electrofishing Data) 2017 versus Baseline	Non-YOY	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	28.39	Response	641	161	42	27	20	17	12	9	4
			Body Weight	Body Weight (g)	-	M-W	-	87.66	Response	6,094	1,525	382	246	171	139	97	63	17
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.03943	-	log(Response)	62	18	7	5	5	4	4	4	3
Littoral/Profundal Arctic Charr (Gill Netting Data) 2017 versus Baseline	All fish	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	25.01	Response	498	125	33	21	16	13	10	7	4
			Body Weight	Body Weight (g)	-	M-W	-	111.3	Response	9,825	2,458	616	395	275	223	156	100	26
		Growth	Weight-at-age	log[Adjusted Body Weight (g)]	log[Age (years)]	ANCOVA	0.26375	-	log(Response)	2,656	698	192	129	94	79	58	41	15
			Length-at-age	log[Fork Length (cm)]	log[Age (years)]	ANCOVA	0.08081	-	log(Response)	251	67	20	14	11	9	8	6	4
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.06395	-	log(Response)	158	43	13	10	8	7	6	5	4

[a] Pooled standard deviation of the regression residuals

[b] Coefficient of variation (pooled standard deviation/reference mean)×100%

Table G.9: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
REF316-AC-01	2	36.5	40.0	435	-	0.895

Table G.10: Gill Netting Catch Records for Camp Lake, Mary River Project CREMP, August 2017

Gill Net Set ID	Location (NAD83, UTM Zone 17W)		Length (m)	Set Date	Lift Date	Set Time	Lift Time	Hours	Effort (m*hrs/100 m)	Arctic Charr Catch Per Mesh Size			Total Catch	CPUE
	Easting	Northing								1½"	2"	3"		
CL17-GN-1	557640	7914728	91.4	19-Aug-17	19-Aug-17	11:50	14:00	2.17	1.98	1	2	2	5	2.52
				19-Aug-17	19-Aug-17	14:10	15:20	1.17	1.07	0	2	0	2	1.87
				20-Aug-17	20-Aug-17	8:50	10:30	1.67	1.52	0	5	1	6	3.94
				20-Aug-17	20-Aug-17	10:55	12:50	1.92	1.75	2	2	1	5	2.85
				20-Aug-17	20-Aug-17	13:05	15:10	2.08	1.90	0	3	2	5	2.62
				20-Aug-17	20-Aug-17	15:30	16:40	1.17	1.07	1	0	0	1	0.94
				22-Aug-17	22-Aug-17	7:55	9:25	1.50	1.37	0	2	2	4	2.92
				22-Aug-17	22-Aug-17	9:36	10:25	0.82	0.75	2	0	1	3	4.02
				22-Aug-17	22-Aug-17	10:35	12:00	1.42	1.30	0	1	0	1	0.8
				22-Aug-17	22-Aug-17	12:10	13:05	0.92	0.84	0	0	1	1	1.19
CL17-GN-2	557498	7914807	91.4	19-Aug-17	19-Aug-17	11:55	14:15	2.33	2.13	1	1	1	3	1.41
				19-Aug-17	19-Aug-17	14:30	15:30	1.00	0.91	0	1	1	2	2.19
				20-Aug-17	20-Aug-17	8:55	11:00	2.08	1.90	1	2	1	4	2.10
				20-Aug-17	20-Aug-17	11:10	13:10	2.00	1.83	0	1	1	2	1.09
				20-Aug-17	20-Aug-17	13:15	15:35	2.33	2.13	0	0	3	3	1.41
				20-Aug-17	20-Aug-17	15:40	16:50	1.17	1.07	1	1	0	2	1.87
				22-Aug-17	22-Aug-17	8:00	9:36	1.60	1.46	0	0	1	1	0.68
				22-Aug-17	22-Aug-17	9:45	10:35	0.83	0.76	0	1	0	1	1.31
				22-Aug-17	22-Aug-17	10:46	12:10	1.40	1.28	0	1	0	1	0.8
				22-Aug-17	22-Aug-17	12:18	13:10	0.87	0.79	0	0	0	0	0.00
CL17-GN-3	557495	7914816	91.4	19-Aug-17	19-Aug-17	12:00	14:30	2.50	2.29	0	0	2	2	0.87
				20-Aug-17	20-Aug-17	9:00	11:10	2.17	1.98	0	0	0	0	0.00
				20-Aug-17	20-Aug-17	11:15	13:20	2.08	1.90	0	0	0	0	0.00
				22-Aug-17	22-Aug-17	8:05	9:40	1.58	1.45	0	1	1	2	1.38
				22-Aug-17	22-Aug-17	9:55	10:55	1.00	0.91	0	0	0	0	0.00
				22-Aug-17	22-Aug-17	10:55	12:20	1.42	1.30	1	0	1	2	1.54
				22-Aug-17	22-Aug-17	12:25	13:20	0.92	0.84	0	0	0	0	0.00
CL17-GN-4	557245	7914869	91.4	19-Aug-17	19-Aug-17	12:10	14:55	2.75	2.51	1	5	2	8	3.18
				20-Aug-17	20-Aug-17	9:05	11:20	2.25	2.06	1	1	2	4	1.94
				20-Aug-17	20-Aug-17	11:35	13:25	1.83	1.68	1	1	0	2	1.19
				20-Aug-17	20-Aug-17	13:35	15:40	2.08	1.91	0	3	0	3	1.57
				22-Aug-17	22-Aug-17	8:10	9:56	1.77	1.62	0	0	0	0	0.00
				22-Aug-17	22-Aug-17	10:05	11:00	0.92	0.84	0	0	0	0	0.00
CL17-GN-5	557135	7915023	91.4	19-Aug-17	19-Aug-17	12:15	15:05	2.83	2.59	0	0	2	2	0.77
				22-Aug-17	22-Aug-17	10:20	12:55	2.58	2.36	1	3	1	5	2.12
				22-Aug-17	22-Aug-17	12:45	13:35	0.83	0.76	0	0	0	0	0.00
CL17-GN-6	557191	7914974	91.4	20-Aug-17	20-Aug-17	9:10	11:40	2.50	2.29	2	0	0	2	0.87
				20-Aug-17	20-Aug-17	11:45	13:40	1.92	1.75	0	2	4	6	3.42
				20-Aug-17	20-Aug-17	13:55	15:43	1.80	1.65	0	1	0	1	0.61
				22-Aug-17	22-Aug-17	11:05	12:50	1.75	1.60	2	0	0	2	1.25
CL17-GN-7	557789	7914572	91.4	20-Aug-17	20-Aug-17	13:20	16:05	2.75	2.51	0	0	2	2	0.8
				22-Aug-17	22-Aug-17	8:15	10:10	1.92	1.75	1	0	0	1	0.57
								Total	**66.4**	**0**	**42**	**35**	**96**	**1.40**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Table G.11: Arctic Charr Measurements from Fish Captured at Camp Lake by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
CL17-AC-01	3	37.6	41.0	500	-	0.941
CL17-AC-02	3	34.5	37.0	395	-	0.962
CL17-AC-03	2	38.0	40.9	493	15	0.898
CL17-AC-04	2	37.6	41.5	515	-	0.969
CL17-AC-05	1½	38.2	41.2	495	-	0.888
CL17-AC-06	3	36.5	39.7	485	-	0.997
CL17-AC-07	2	33.8	36.8	408	12+	1.057
CL17-AC-08	1½	38.1	41.5	510	-	0.922
CL17-AC-09	3	43.0	47.2	690	-	0.868
CL17-AC-10	3	37.5	40.5	508	-	0.963
CL17-AC-11	3	35.2	37.3	435	-	0.997
CL17-AC-12	3	34.5	37.8	435	-	1.059
CL17-AC-13	2	36.4	39.8	445	-	0.923
CL17-AC-14	2	38.0	41.9	405	-	0.738
CL17-AC-15	2	36.6	40.0	475	-	0.969
CL17-AC-16	2	37.5	40.9	455	-	0.863
CL17-AC-17	2	35.9	38.5	406	-	0.877
CL17-AC-18	1½	38.0	41.2	438	-	0.798
CL17-AC-19	3	35.8	38.7	433	-	0.944
CL17-AC-20	3	37.4	40.6	515	-	0.984
CL17-AC-21	2	31.8	34.4	310	-	0.964
CL17-AC-22	2	41.5	45.4	580	-	0.811
CL17-AC-23	3	38.3	41.5	475	-	0.845
CL17-AC-24	2	35.3	38.6	445	-	1.012
CL17-AC-25	3	37.5	40.7	540	-	1.024
CL17-AC-26	2	38.0	41.5	535	-	0.975
CL17-AC-27	2	37.3	40.7	540	-	1.041
CL17-AC-28	2	36.0	39.2	408	16++	0.874
CL17-AC-29	2	38.0	41.1	463	-	0.844
CL17-AC-30	2	33.9	36.8	393	-	1.009
CL17-AC-31	3	37.1	40.2	465	-	0.911
CL17-AC-32	2	28.8	31.0	220	-	0.921
CL17-AC-33	2	37.0	40.1	480	-	0.948
CL17-AC-34	3	36.3	39.2	458	-	0.958
CL17-AC-35	2	36.0	39.1	433	15	0.928
CL17-AC-36	1½	37.6	41.0	498	-	0.937
CL17-AC-37	1½	38.2	40.7	518	-	0.929
CL17-AC-38	1½	36.2	39.3	435	-	0.917
CL17-AC-39	1½	38.1	41.5	515	-	0.931
CL17-AC-40	3	39.1	42.7	502	-	0.840
CL17-AC-41	2	38.1	41.2	528	-	0.955
CL17-AC-42	2	37.6	41.0	458	-	0.862
CL17-AC-43	1½	37.4	30.4	495	-	0.946
CL17-AC-44	1½	38.7	42.4	543	-	0.937
CL17-AC-45	3	36.2	39.2	514	-	1.084
CL17-AC-46	2	36.0	38.6	443	10+	0.950
CL17-AC-47	2	37.0	39.9	485	14++	0.957
CL17-AC-48	1½	35.4	38.0	343	-	0.773
CL17-AC-49	3	36.3	39.4	483	-	1.010
CL17-AC-50	3	38.2	41.6	525	-	0.942
CL17-AC-51	3	39.0	42.3	565	-	0.952
CL17-AC-52	3	39.5	42.6	495	-	0.803
CL17-AC-53	2	36.3	39.2	458	18++	0.958
CL17-AC-54	2	39.1	42.5	552	-	0.923
CL17-AC-55	3	37.6	40.2	538	-	1.012
CL17-AC-56	3	34.2	37.1	420	-	1.050

Table G.11: Arctic Charr Measurements from Fish Captured at Camp Lake by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
CL17-AC-57	2	28.9	31.2	215	-	0.891
CL17-AC-58	2	28.0	30.2	208	-	0.948
CL17-AC-59	2	35.0	38.0	445	-	1.038
CL17-AC-60	3	36.9	40.4	443	-	0.882
CL17-AC-61	3	36.9	40.2	545	-	1.085
CL17-AC-62	3	39.8	42.5	548	-	0.869
CL17-AC-63	2	36.5	40.2	462	16+	0.950
CL17-AC-64	2	37.5	40.8	548	-	1.039
CL17-AC-65	2	35.5	38.2	405	-	0.905
CL17-AC-66	2	34.5	37.7	450	13+	1.096
CL17-AC-67	3	39.0	42.5	490	-	0.826
CL17-AC-68	3	37.5	41.1	489	-	0.927
CL17-AC-69	1½	37.2	40.0	485	-	0.942
CL17-AC-70	2	38.2	41.7	525	-	0.942
CL17-AC-71	3	36.4	39.8	490	-	1.016
CL17-AC-72	3	37.0	40.2	480	-	0.948
CL17-AC-73	2	30.2	32.7	315	-	1.144
CL17-AC-74	2	36.4	39.5	480	-	0.995
CL17-AC-75	3	39.0	42.5	500	-	0.843
CL17-AC-76	3	37.9	41.6	500	-	0.918
CL17-AC-77	2	37.5	40.5	480	-	0.910
CL17-AC-78	1½	37.4	41.0	470	-	0.898
CL17-AC-79	3	35.5	39.0	480	-	1.073
CL17-AC-80	1½	35.6	38.9	450	-	0.997
CL17-AC-81	1½	33.8	37.0	430	-	1.114
CL17-AC-82	2	36.6	39.4	460	-	0.938
CL17-AC-83	2	35.6	39.0	425	-	0.942
CL17-AC-84	2	36.2	39.3	460	-	0.970
CL17-AC-85	3	38.1	40.9	480	-	0.868
CL17-AC-86	1½	38.0	42.2	520	-	0.948
CL17-AC-87	3	36.5	39.5	410	-	0.843
CL17-AC-88	2	34.9	38.0	440	-	1.035
CL17-AC-89	2	38.1	41.4	560	-	1.013
CL17-AC-90	2	37.8	41.5	500	-	0.926
CL17-AC-91	1½	21.8	23.2	80	-	0.772
CL17-AC-92	1½	41.6	43.0	640	-	0.889
CL17-AC-93	1½	37.5	41.1	500	-	0.948
CL17-AC-94	3	37.0	40.1	490	-	0.967
CL17-AC-95	1½	37.6	40.3	510	-	0.959
CL17-AC-96	3	33.6	36.7	403	-	1.062
Overall Catch Summary	Sample Size (N)	96	96	96	9	96
	Average	36.5	39.6	466	14.3	0.944
	Median	37.1	40.2	480	15	0.945
	Standard Deviation	2.8	3.2	84	2.4	0.078
	Standard Error	0.3	0.3	9	0.8	0.008
	Minimum	21.8	23.2	80	10	0.738
	Maximum	43.0	47.2	690	18	1.144

Table G.12: Additional Meristics Collected From Adult Arctic Charr Incidental Mortalities at Camp Lake, Mary River Project CREMP, August 2017

Specimen ID		Age (years)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Adjusted Body Weight (g)	Fulton's Condition Factor (K)	Sex	Liver Weight (g)	Liver Somatic Index (LSI)	Gonad Weight (g)	Gonad Somatic Index (GSI)	Gill Net Mesh Size (inches)	Abnormalities[a]
CL17-AC-03		15	38.0	40.9	493	488	0.90	i	5.346	1.10	-	-	2	iw (VA)
CL17-AC-46		10+	36.0	38.6	443	439	0.95	i	3.593	0.82	-	-	2	iw (C)
CL17-AC-47		14++	37.0	39.9	485	480	0.96	i	4.860	1.01	-	-	2	iw (A)
CL17-AC-07		12+	33.8	36.8	408	402	1.06	F	3.904	0.97	2.451	0.610	2	iw (VA)
CL17-AC-17		-	35.9	38.5	406	397	0.88	F	5.471	1.38	3.442	0.867	2	iw (VA), tw (S)
CL17-AC-28		16++	36.0	39.2	408	399	0.87	F	6.898	1.73	1.639	0.410	2	iw (C)
CL17-AC-35		15	36.0	39.1	433	425	0.93	F	4.632	1.09	3.476	0.818	2	iw (C)
CL17-AC-53		18++	36.3	39.2	458	449	0.96	F	5.699	1.27	2.873	0.639	2	iw (A)
CL17-AC-63		16+	36.5	40.2	462	455	0.95	F	3.702	0.81	3.791	0.834	2	iw (VA)
CL17-AC-66		13+	34.5	37.7	450	441	1.10	F	5.711	1.29	3.124	0.708	2	iw (S)
Adult Non-Spawner Statistics	Average	13	37.0	39.8	473.7	469.1	0.9	-	4.6	1.0	-	-	-	-
	Standard deviation	2.6	1.0	1.2	26.9	26.0	0.0	-	0.9	0.1	-	-	-	-
	Minimum	10	36.0	38.6	443.0	439.4	0.9	-	3.6	0.8	-	-	-	-
	Maximum	15	38.0	40.9	493.0	487.7	1.0	-	5.3	1.1	-	-	-	-
	Sample Size (N)	3	3	3	3	3	3	3	3	3	-	-	-	-
Females Statistics	Average	15	35.6	38.7	432	424	0.96	-	5.145	1.22	2.97	0.70	-	-
	Standard deviation	2.2	1.0	1.1	25	25	0.08	-	1.132	0.30	0.73	0.16	-	-
	Minimum	12	33.8	36.8	406	397	0.87	-	3.702	0.81	1.64	0.41	-	-
	Maximum	18	36.5	40.2	462	455	1.10	-	6.898	1.73	3.79	0.87	-	-
	Sample Size (N)	6	7	7	7	7	7	7	7	7	7	7	-	-

[a] - Abnormalities include internal worms (iw) and tapeworms (tw) in body cavity; letter in parentheses indicates Scarce (1-5), Common (6-15), Abundant (16-50) and Very Abundant (>50) observation.
Sex - Female (F), Indeterminate (i)

Table G.13: Results of Adult (Littoral/Profundal) Arctic Charr Health Endpoint Statistical Comparisons for Camp Lake (JLO) between 2017 and the Mine Baseline (2006 - 2013) Period, Mary River Project CREMP, 2017

Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
							Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]					
		Response	Covariate	Baseline	2017		Interaction P-value	Covariate P-value		Statistic	Baseline	2017		
Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	155	96	K-S	-	-	-	-	-	-	<0.001	53
Body Size	Fork Length	Fork Length (cm)	-	155	96	M-W	-	-	-	Median	33	37	<0.001	12
	Body Weight	Body Weight (g)	-	155	96	M-W	-	-	-	Median	350	480	<0.001	37
Growth	Length-at-age	log[Fork Length (cm)]	log[Age]	30	9	ANCOVA	0.073	<0.001	10.12	Adjusted Mean	293	282	0.624	-3.9
	Weight-at-age	log[Body Weight (g)]	log[Age]	29	9	ANCOVA	0.095	<0.001	10.31	Adjusted Mean	268	235	0.613	-13
Energy Storage	Condition	log[Body Weight (g)]	log[Fork Length (cm)]	155	96	ANCOVA	0.498	<0.001	33.97	Adjusted Mean	381	370	0.123	-3.0

Indicates P-value < 0.1 (i.e., significant difference between data sets)

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for $\log_{10}$-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(2017 mean - baseline mean) / baseline area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(2017 predicted mean - baseline predicted mean) / baseline predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between groups. A negative difference implies that 2017 has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that 2017 has fewer fish less than the length where the maximum difference in CFRDs was observed.

Table G.14: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW17-ACJ-01	13.5	14.6	23.509	3+	0.956
SDNW17-ACJ-02	7.7	8.3	4.194	1+	0.919
SDNW17-ACJ-03	10.3	11.1	10.651	2+	0.975
SDNW17-ACJ-04	8.5	9.0	5.075	2++	0.826
SDNW17-ACJ-05	6.5	6.8	2.809	1+	1.023
SDNW17-ACJ-06	6.7	7.1	2.823	1+	0.939
SDNW17-ACJ-07	6.7	7.1	2.739	1+	0.911
SDNW17-ACJ-08	6.6	7.0	2.459	1+	0.855
SDNW17-ACJ-09	4.4	4.6	0.623	0++	0.731
SDNW17-ACJ-10	4.3	4.5	0.649	0++	0.816
SDNW17-ACJ-11	6.8	7.2	2.723	-	0.866
SDNW17-ACJ-12	7.8	8.3	3.901	-	0.822
SDNW17-ACJ-13	8.1	8.6	4.382	-	0.825
SDNW17-ACJ-14	7.8	8.3	4.521	-	0.953
SDNW17-ACJ-15	4.2	4.4	0.643	-	0.868
SDNW17-ACJ-16	5.0	5.2	0.949	-	0.759
SDNW17-ACJ-17	6.1	6.5	2.689	-	1.185
SDNW17-ACJ-18	4.2	4.4	0.698	-	0.942
SDNW17-ACJ-19	9.1	9.8	6.950	-	0.922
SDNW17-ACJ-20	4.0	4.2	0.574	-	0.897
SDNW17-ACJ-21	10.3	11.0	8.868	-	0.812
SDNW17-ACJ-22	14.0	15.0	23.875	-	0.870
SDNW17-ACJ-23	4.1	4.3	0.555	-	0.805
SDNW17-ACJ-24	8.2	8.6	4.730	-	0.858
SDNW17-ACJ-25	7.5	8.0	3.741	-	0.887
SDNW17-ACJ-26	7.1	7.5	3.200	-	0.894
SDNW17-ACJ-27	8.9	9.4	6.143	-	0.871
SDNW17-ACJ-28	7.0	7.4	3.258	-	0.950
SDNW17-ACJ-29	7.8	8.2	4.518	-	0.952
SDNW17-ACJ-30	3.4	3.6	0.401	-	1.020
SDNW17-ACJ-31	7.8	8.3	4.671	-	0.984
SDNW17-ACJ-32	9.5	10.2	7.489	-	0.873
SDNW17-ACJ-33	8.2	8.7	5.289	-	0.959
SDNW17-ACJ-34	14.2	15.4	26.562	-	0.928
SDNW17-ACJ-35	7.9	8.5	4.385	-	0.889
SDNW17-ACJ-36	9.9	10.5	8.746	-	0.901
SDNW17-ACJ-37	3.9	4.1	0.565	-	0.952
SDNW17-ACJ-38	7.2	3.6	2.914	-	0.781
SDNW17-ACJ-39	7.1	7.6	3.179	-	0.888
SDNW17-ACJ-40	4.4	4.6	0.689	-	0.809
SDNW17-ACJ-41	6.5	7.0	2.338	-	0.851
SDNW17-ACJ-42	15.3	16.5	31.568	-	0.881
SDNW17-ACJ-43	4.5	4.7	0.851	-	0.934
SDNW17-ACJ-44	6.4	6.8	2.502	-	0.954
SDNW17-ACJ-45	6.8	7.1	2.695	-	0.857
SDNW17-ACJ-46	12.2	13.1	14.570	-	0.802
SDNW17-ACJ-47	9.1	9.9	6.479	-	0.860
SDNW17-ACJ-48	11.9	12.9	14.127	-	0.838
SDNW17-ACJ-49	10.6	11.4	10.923	-	0.917
SDNW17-ACJ-50	14.8	16.0	30.549	-	0.942
SDNW17-ACJ-51	10.6	11.3	10.729	-	0.901
SDNW17-ACJ-52	12.3	13.2	14.849	-	0.798
SDNW17-ACJ-53	12.9	13.9	18.744	-	0.873
SDNW17-ACJ-54	7.1	7.7	3.248	-	0.907
SDNW17-ACJ-55	7.0	7.5	3.198	-	0.932
SDNW17-ACJ-56	7.3	7.7	3.591	-	0.923
SDNW17-ACJ-57	6.7	7.1	2.884	-	0.959
SDNW17-ACJ-58	6.5	6.9	2.429	-	0.884
SDNW17-ACJ-59	7.6	8.2	4.058	-	0.924

Table G.14: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW17-ACJ-60		10.1	11.0	9.168	-	0.890
SDNW17-ACJ-61		4.3	4.5	0.731	-	0.919
SDNW17-ACJ-62		6.3	6.6	2.108	-	0.843
SDNW17-ACJ-63		11.1	12.0	12.195	-	0.892
SDNW17-ACJ-64		11.1	12.0	11.857	-	0.867
SDNW17-ACJ-65		12.1	13.2	16.003	-	0.903
SDNW17-ACJ-66		10.1	11.0	9.760	-	0.947
SDNW17-ACJ-67		8.6	9.4	6.042	-	0.950
SDNW17-ACJ-68		6.9	7.3	2.638	-	0.803
SDNW17-ACJ-69		6.1	6.3	1.989	-	0.876
SDNW17-ACJ-70		7.4	7.8	3.429	-	0.846
SDNW17-ACJ-71		4.2	4.5	0.798	-	1.077
SDNW17-ACJ-72		18.9	20.5	58.382	-	0.865
SDNW17-ACJ-73		15.4	16.5	30.268	-	0.829
SDNW17-ACJ-74		13.6	14.8	22.287	-	0.886
SDNW17-ACJ-75		10.8	11.5	10.083	-	0.800
SDNW17-ACJ-76		7.2	7.8	3.484	-	0.933
SDNW17-ACJ-77		9.9	10.5	7.963	-	0.821
SDNW17-ACJ-78		7.0	7.5	2.823	-	0.823
SDNW17-ACJ-79		7.9	8.4	3.912	-	0.793
SDNW17-ACJ-80		11.9	12.8	14.759	-	0.876
SDNW17-ACJ-81		16.1	17.6	37.098	-	0.889
SDNW17-ACJ-82		7.5	8.0	3.778	-	0.896
SDNW17-ACJ-83		8.5	9.1	5.886	-	0.958
SDNW17-ACJ-84		5.8	6.1	1.891	-	0.969
SDNW17-ACJ-85		9.0	9.5	6.324	-	0.867
SDNW17-ACJ-86		7.4	7.8	3.342	-	0.825
SDNW17-ACJ-87		6.5	7.0	2.632	-	0.958
SDNW17-ACJ-88		5.6	5.9	1.732	-	0.986
SDNW17-ACJ-89		10.5	11.1	10.919	-	0.943
SDNW17-ACJ-90		7.4	7.9	3.728	-	0.920
SDNW17-ACJ-91		6.2	6.6	2.206	-	0.926
SDNW17-ACJ-92		8.2	8.7	4.858	-	0.881
SDNW17-ACJ-93		7.9	8.5	5.432	-	1.102
SDNW17-ACJ-94		6.4	6.8	2.275	-	0.868
SDNW17-ACJ-95		9.8	10.6	9.986	-	1.061
SDNW17-ACJ-96		11.1	12.0	11.858	-	0.867
SDNW17-ACJ-97		9.0	9.7	6.023	-	0.826
SDNW17-ACJ-98		8.2	8.7	5.343	-	0.969
SDNW17-ACJ-99		7.2	7.6	3.858	-	1.034
SDNW17-ACJ-100		7.1	7.5	3.360		0.939
SDNW17-ACJ-101		7.6	8.1	4.124	-	0.939
Overall Catch Summary	Sample Size (N)	101	101	101	10	101
	Average	8.4	8.9	7.475	1.2	0.900
	Median	7.7	8.2	4.058	1	0.892
	Standard Deviation	3.0	3.3	9.080	0.9	0.073
	Standard Error	0.3	0.3	0.903	0.3	0.007
	Minimum	3.4	3.6	0.401	0	0.731
	Maximum	18.9	20.5	58.382	3	1.185
Young-of-the-Year Catch Summary	proportion of YOY			**13%**		
	Sample Size (N)	13	13	13	2	13
	Average	4.2	4.4	0.671	0	0.887
	Median	4.2	4.5	0.649	0	0.897
	Standard Deviation	0.4	0.4	0.142	0	0.101
	Standard Error	0.1	0.1	0.039	0	0.028
	Minimum	3.4	3.6	0.401	0	0.731
	Maximum	5.0	5.2	0.949	0	1.077

Table G.15: Results of Nearshore Arctic Charr Young-of-the-Year (YOY) and Non-YOY Health Endpoint Statistical Comparisons between Sheardown Lake NW (DLO-01) and Reference Lake 3 (REF), Mary River Project CREMP, August 2017

Group	Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
			Response	Covariate	REF	DLO-01		Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]	Statistic	REF	DLO-01		
								Interaction P-value	Covariate P-value						
All Fish	Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	100	101	K-S	-	-	-	-	-	-	<0.001	44
YOY	Body Size	Fork Length	log[Fork Length (cm)]	-	26	12	t-test	-	-	-	Geometric Mean	3.6	4.2	<0.001	15
		Body Weight	log[Body Weight (g)]	-	26	12	t-test	-	-	-	Geometric Mean	447	631	<0.001	41
	Energy Storage	Condition [e]	log[Body Weight (g)]	log[Fork Length (cm)]	26	12	ANCOVA	0.537	<0.001	3.79	Adjusted Mean	500	498	0.95	-0.48
			log[Body Weight (g)]	log[Fork Length (cm)]	25	12	ANCOVA	0.097	<0.001	3.79	Adjusted Mean	504	487	0.591	-3.4
Non-YOY	Survival	Length Frequency Distribution	Fork Length (cm)	-	74	89	K-S	-	-	-	-	-	-	<0.001	45
	Body Size	Fork Length	Fork Length (cm)	-	74	89	M-W	-	-	-	Median	6.6	7.9	<0.001	20
		Body Weight	Body Weight (g)	-	74	89	M-W	-	-	-	Median	2	5	0.211	82.4
	Energy Storage	Condition [f]	log[Body Weight (g)]	log[Fork Length (cm)]	74	89	ANCOVA	0.434	<0.001	7.82	Adjusted Mean	4.1	4.3	<0.001	6.5
			log[Body Weight (g)]	log[Fork Length (cm)]	73	89	ANCOVA	0.507	<0.001	7.83	Adjusted Mean	4.1	4.3	<0.001	6.9

Indicates P-value < 0.1 (i.e., significant difference between data sets)

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for $\log_{10}$-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted values of the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction (i.e., different slopes) occurs.

[c] The magnitude of difference calculated as: [(exposed area mean - reference area mean) /reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted value - reference area predicted value) / reference area predicted value] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

[e] Sample REF317-ACJ-25 was detected as a statistical outlier (studentized residual = 4.21) from the 2017 Reference Lake 3 data set. The analysis is presented with both the inclusion and exclusion of this individual.

[f] Sample REF317-ACJ-56 was detected as a statistical outlier (studentized residual = 4.65) from the 2017 Reference Lake 3 data set. The analysis is presented with both the inclusion and exclusion of this individual.

Table G.16: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Sheardown Lake NW Using 2017 Data Relative to Reference Lake 3 (2017) Data or Sheardown Lake NW Baseline (2006 - 2013) Data with α=β=0.1, Mary River Project CREMP, 2017

Comparison	Group	Indicator	Endpoint	Variables		Test	S[a]	COV (%)[b]	Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1									
				Response	Covariate				log(Response)	5%	10%	20%	25%	30%	33%	40%	50%	100%
										-5%	-9%	-17%	-20%	-23%	-25%	-29%	-33%	-50%
									Response	±5%	±10%	±20%	±25%	±30%	±33%	±40%	±50%	±100%
Nearshore Arctic Charr (Electrofishing Data) versus Reference Lake 3, 2017 Data	YOY	Body Size	Fork Length	log[Fork Length (cm)]	-	t-test	0.03082	-	log(Response)	37	11	4	3	3	3	3	2	2
			Body Weight	log[Adjusted Body Weight (g)]	-	t-test	0.10931	-	log(Response)	457	121	34	23	17	14	11	8	4
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.07046	-	log(Response)	192	52	16	11	9	8	6	5	4
				log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.05797	-	log(Response)	130	36	11	8	7	6	5	4	3
	Non-YOY	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	33.06	Response	869	218	56	36	26	21	16	11	4
			Body Weight	Body Weight (g)	-	M-W	-	202.6	Response	32,558	8,141	2,036	1,304	907	734	511	327	84
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.03439	-	log(Response)	47	14	6	5	4	4	4	3	3
				log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.03236	-	log(Response)	42	13	5	4	4	4	4	3	3
Nearshore Arctic Charr (Electrofishing Data) 2017 versus Baseline	Non-YOY	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	40.70	Response	1,315	330	84	55	39	32	22	16	5
			Body Weight	Body Weight (g)	-	M-W	-	117.6	Response	10,976	2,746	688	440	307	249	173	112	29
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.06710	-	log(Response)	174	47	15	10	8	7	6	5	4
Littoral/Profundal Arctic Charr (Gill Netting Data) 2017 versus Baseline	All fish	Body Size	Fork Length	Fork Length (mm)	-	M-W	-	19.57	Response	306	78	21	14	11	9	6	5	3
			Body Weight	Body Weight (g)	-	M-W	-	59.30	Response	2,791	700	176	114	79	64	46	29	9
		Growth	Weight-at-age	log[Adjusted Body Weight (g)]	log[Age (years)]	ANCOVA	0.17325	-	log(Response)	1,147	302	84	57	42	35	26	19	8
			Weight-at-age	log[Adjusted Body Weight (g)]	log[Age (years)]	ANCOVA	0.14984	-	log(Response)	859	227	64	43	32	27	20	15	7
			Length-at-age	log[Fork Length (mm)]	log[Age (years)]	ANCOVA	0.05285	-	log(Response)	109	30	10	7	6	5	5	4	3
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (mm)]	ANCOVA	0.05032	-	log(Response)	99	28	9	7	6	5	5	4	3

[a] Pooled standard deviation of the regression residuals

[b] Coefficient of variation (pooled standard deviation/reference mean)×100%

Table G.17: Gill Netting Catch Records for Sheardown Lake NW, Mary River Project CREMP, August 2017

Gill Net Set ID	Location (NAD83, UTM Zone 17W)		Length (m)	Set Date	Lift Date	Set Time	Lift Time	Fishing Hours	Effort (m*hrs/100 m)	Arctic Charr Catch Per Mesh Size			Total Catch	CPUE
	Easting	Northing								1½"	2"	3"		
SDNW17-GN-1	560441	7913260	91.4	17-Aug-17	17-Aug-17	9:00	10:30	1.50	1.37	0	7	3	10	7.29
				17-Aug-17	17-Aug-17	11:15	13:20	2.08	1.90	1	4	1	6	3.15
				17-Aug-17	17-Aug-17	13:40	15:10	1.50	1.37	1	4	1	6	4.37
				18-Aug-17	18-Aug-17	8:35	10:20	1.75	1.60	1	8	2	11	6.87
				18-Aug-17	18-Aug-17	10:45	11:50	1.08	0.99	0	3	0	3	3.03
SDNW17-GN-2	560522	7913165	91.4	17-Aug-17	17-Aug-17	9:10	11:15	2.08	1.90	0	2	2	4	2.10
				17-Aug-17	17-Aug-17	11:50	13:30	1.67	1.52	0	0	0	0	0
				18-Aug-17	18-Aug-17	8:30	10:00	1.50	1.37	0	2	1	3	2.19
				18-Aug-17	18-Aug-17	10:15	12:00	1.75	1.60	0	1	1	2	1.25
SDNW17-GN-3	560062	7913418	91.4	17-Aug-17	17-Aug-17	9:30	11:50	2.33	2.13	1	1	1	3	1.41
				17-Aug-17	17-Aug-17	12:10	13:49	1.65	1.51	0	0	0	0	0
				18-Aug-17	18-Aug-17	8:40	10:50	2.17	1.98	2	2	1	5	2.52
SDNW17-GN-4	560007	7913447	91.4	17-Aug-17	17-Aug-17	9:45	12:10	2.42	2.21	1	2	1	4	1.81
				17-Aug-17	17-Aug-17	12:35	14:00	1.42	1.30	1	2	1	4	3.09
SDNW17-GN-5	559918	7913511	91.4	17-Aug-17	17-Aug-17	10:00	12:35	2.58	2.36	0	3	2	5	2.12
				17-Aug-17	17-Aug-17	12:50	14:30	1.67	1.52	0	3	2	5	3.28
SDNW17-GN-6	559738	7913545	91.4	17-Aug-17	17-Aug-17	14:00	15:30	1.50	1.37	2	0	0	2	1.46
SDNW17-GN-7	559987	7913162	91.4	17-Aug-17	17-Aug-17	14:25	15:42	1.28	1.17	2	3	1	6	5.11
				18-Aug-17	18-Aug-17	8:45	11:00	2.25	2.06	3	1	1	5	2.43
SDNW17-GN-8	559975	7913189	91.4	17-Aug-17	17-Aug-17	8:50	11:45	2.92	2.67	2	4	1	7	2.62
								Total	**33.92**	**17**	**52**	**22**	**91**	**2.81**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Table G.18: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW17-AC-01	3	36.0	38.8	435	-	0.932
SDNW17-AC-02	3	32.3	35.0	318	-	0.944
SDNW17-AC-03	3	37.5	40.2	495	-	0.939
SDNW17-AC-04	2	35.3	38.4	389	-	0.884
SDNW17-AC-05	2	46.5	50.0	1,000	-	0.995
SDNW17-AC-06	2	30.3	33.2	255	-	0.917
SDNW17-AC-07	2	34.8	37.9	385	-	0.914
SDNW17-AC-08	2	35.9	38.9	375	13+	0.810
SDNW17-AC-09	2	24.9	26.8	142	-	0.920
SDNW17-AC-10	2	26.5	28.7	180	-	0.967
SDNW17-AC-11	3	35.1	37.9	445	-	1.029
SDNW17-AC-12	3	41.9	45.4	705	-	0.958
SDNW17-AC-13	2	31.2	33.6	185	-	0.609
SDNW17-AC-14	2	25.5	27.7	158	6+	0.953
SDNW17-AC-15 *	3	38.7	41.7	315	-	0.543
SDNW17-AC-16	2	27.5	30.0	178	7+	0.856
SDNW17-AC-17	1½	34.5	37.5	405	-	0.986
SDNW17-AC-18	1½	22.0	23.9	98	-	0.920
SDNW17-AC-19	2	33.9	37.3	375	-	0.963
SDNW17-AC-20	2	37.4	40.5	488	5+	0.933
SDNW17-AC-21	3	33.5	36.0	325	-	0.864
SDNW17-AC-22	3	38.1	42.0	495	-	0.895
SDNW17-AC-23	3	35.7	38.3	445	-	0.978
SDNW17-AC-24	2	34.5	37.2	383	12++	0.933
SDNW17-AC-25	3	34.5	37.3	395	-	0.962
SDNW17-AC-26	2	32.7	35.7	340	-	0.972
SDNW17-AC-27	2	35.2	37.9	380	14++	0.871
SDNW17-AC-28	2	34.4	37.1	359	13++	0.882
SDNW17-AC-29	2	31.8	34.2	289	9+	0.899
SDNW17-AC-30	1½	36.9	39.6	460	-	0.916
SDNW17-AC-31	3	37.6	41.1	545	-	1.025
SDNW17-AC-32	2	28.8	31.0	215	-	0.900
SDNW17-AC-33	2	29.4	31.5	225	-	0.885
SDNW17-AC-34	1½	24.3	26.4	124	5+	0.864
SDNW17-AC-35	3	40.5	43.5	595	-	0.896
SDNW17-AC-36	3	37.8	41.0	525	-	0.972
SDNW17-AC-37	2	34.0	36.7	390	-	0.992
SDNW17-AC-38	2	34.9	37.9	455	-	1.070
SDNW17-AC-39	2	31.3	33.8	295	8+	0.962
SDNW17-AC-40	3	31.6	34.4	285	-	0.903
SDNW17-AC-41	2	24.5	36.4	129	-	0.877
SDNW17-AC-42	2	28.3	30.7	208	-	0.918
SDNW17-AC-43	2	33.3	36.0	348	10	0.942
SDNW17-AC-44	2	24.5	26.6	130	-	0.884
SDNW17-AC-45	1½	22.2	24.0	99	-	0.905
SDNW17-AC-46	1½	36.1	39.3	440	-	0.935
SDNW17-AC-47	3	33.3	36.0	350	-	0.948
SDNW17-AC-48	2	32.5	35.3	325	-	0.947
SDNW17-AC-49	2	35.2	38.4	420	-	0.963
SDNW17-AC-50	1½	35.5	38.3	350	-	0.782
SDNW17-AC-51	2	25.5	27.7	139	-	0.838
SDNW17-AC-52	1½	32.5	35.3	315	10+	0.918
SDNW17-AC-53	3	35.9	39.7	420	-	0.908

Table G.18: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW17-AC-54	2	23.5	25.4	120	-	0.925
SDNW17-AC-55	2	34.1	36.3	375	13+	0.946
SDNW17-AC-56	3	38.2	41.3	480	-	0.861
SDNW17-AC-57	3	36.3	39.8	435	-	0.909
SDNW17-AC-58	2	32.3	35.0	335	-	0.994
SDNW17-AC-59	2	34.2	37.2	310	-	0.775
SDNW17-AC-60	2	35.1	38.1	350	-	0.809
SDNW17-AC-61	2	32.0	34.8	295	-	0.900
SDNW17-AC-62	2	33.1	36.1	325	-	0.896
SDNW17-AC-63	2	34.7	37.7	375	-	0.898
SDNW17-AC-64	2	34.3	37.1	325	-	0.805
SDNW17-AC-65	1½	32.9	36.8	395	-	1.109
SDNW17-AC-66	2	40.1	43.4	595	-	0.923
SDNW17-AC-67	2	29.6	31.9	210	-	0.810
SDNW17-AC-68 *	1½	22.5	25.2	300	-	2.634
SDNW17-AC-69	1½	33.4	36.2	475	-	1.275
SDNW17-AC-70	1½	34.9	38.0	438	13++	1.030
SDNW17-AC-71	2	32.1	34.9	310	-	0.937
SDNW17-AC-72	2	23.4	25.4	135	-	1.054
SDNW17-AC-73	3	38.7	41.6	575	-	0.992
SDNW17-AC-74	3	36.8	39.9	455	-	0.913
SDNW17-AC-75	2	22.9	25.9	129	5+	1.074
SDNW17-AC-76	1½	34.5	37.3	380	-	0.925
SDNW17-AC-77	1½	24.5	26.7	140	6++	0.952
SDNW17-AC-78	1½	34.3	37.1	445	-	1.103
SDNW17-AC-79	3	37.0	40.1	470	-	0.928
SDNW17-AC-80	2	36.2	39.3	365	-	0.769
SDNW17-AC-81	2	35.9	38.0	418	14++	0.903
SDNW17-AC-82	2	28.3	30.9	218	-	0.962
SDNW17-AC-83	1½	34.5	37.2	350	-	0.852
SDNW17-AC-84	1½	26.4	28.8	175	6+	0.951
SDNW17-AC-85	3	33.1	35.6	330	-	0.910
SDNW17-AC-86	2	35.2	38.1	400	10+	0.917
SDNW17-AC-87	2	37.5	40.1	425	-	0.806
SDNW17-AC-88	2	40.2	43.6	570	-	0.877
SDNW17-AC-89	2	33.1	35.9	325	-	0.896
Overall Catch Summary	Sample Size (N)	89	89	89	19	89
	Average	32.9	35.8	351	9.4	0.939
	Median	34.2	37.1	350	10	0.920
	tandard Deviation	4.9	5.2	147	3.4	0.204
	Standard Error	0.5	0.6	15.6	0.8	0.022
	Minimum	22.0	23.9	98	5	0.543
	Maximum	46.5	50.0	1,000	14	2.634

* Initial screening indicated sample was an outlier, and therefore the sample was removed from all subsequent statistical analysis data sets.

Table G.19: Additional Meristics Collected from Adult Arctic Charr Incidental Mortalities at Sheardown Lake NW, Mary River Project CREMP, August 2017

Specimen ID		Age (years)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Adjusted Body Weight (g)	Fulton's Condition Factor (K)	Sex	Liver Weight (g)	Liver Somatic Index (LSI)	Gonad Weight (g)	Gonad Somatic Index (GSI)	Gill Net Mesh Size (inches)	Abnormalities[a]
SDNW17-AC-08		13+	35.9	38.9	375	372	0.81	i	3.462	0.93	-	-	2	iw (C)
SDNW17-AC-14		6+	25.5	27.7	158	156	0.95	i	1.603	1.02	-	-	2	iw (S)
SDNW17-AC-20		5+	37.4	40.5	488	487	0.93	i	1.193	0.25	-	-	2	-
SDNW17-AC-27		14++	35.2	37.9	380	376	0.87	i	4.401	1.17	-	-	2	iw (A)
SDNW17-AC-28		13++	34.4	37.1	359	355	0.88	i	3.847	1.08	-	-	2	iw (A)
SDNW17-AC-39		8+	31.3	33.8	295	292	0.96	i	2.599	0.89	-	-	2	iw (C)
SDNW17-AC-43		10	33.3	36.0	348	344	0.94	i	4.301	1.25	-	-	2	iw (S)
SDNW17-AC-52		10+	32.5	35.3	315	312	0.92	i	3.178	1.02	-	-	1½	iw (S)
SDNW17-AC-55		13+	34.1	36.3	375	370	0.95	i	4.958	1.34	-	-	2	iw (A)
SDNW17-AC-70		13++	34.9	38.0	438	433	1.03	i	4.851	1.12	-	-	1½	-
SDNW17-AC-75		5+	22.9	25.9	129	126	1.07	i	2.592	2.05	-	-	2	iw (S)
SDNW17-AC-77		6++	24.5	36.7	140	139	0.95	i	1.012	0.73	-	-	1½	iw (S)
SDNW17-AC-84		6+	26.4	28.8	175	173	0.95	i	1.950	1.13	-	-	1½	iw (S)
SDNW17-AC-86		10+	35.2	38.1	400	397	0.92	i	2.591	0.65	-	-	2	iw (S)
SDNW17-AC-16		7+	27.5	30.0	178	177	0.86	F	0.583	0.33	0.583	0.330	2	iw (S)
SDNW17-AC-24		12++	34.5	37.2	383	348	0.93	F	7.525	2.17	27.937	8.039	2	iw (VA)
SDNW17-AC-29		9+	31.8	34.2	289	283	0.90	F	4.816	1.70	1.584	0.561	2	iw (A)
SDNW17-AC-34		5+	24.3	26.4	124	122	0.86	F	1.474	1.21	0.434	0.355	1½	iw (C)
SDNW17-AC-37		-	34.0	36.7	390	383	0.99	F	4.024	1.05	2.635	0.687	2	-
SDNW17-AC-81		14++	35.9	38.0	418	365	0.90	F	8.181	2.24	45.136	12.377	2	iw (C)
Adult Non-Spawner Statistics	Average	9.4	31.7	35.1	313	309	0.94	-	3.038	1.05	#DIV/0!	#DIV/0!	-	-
	Standard deviation	3.4	4.8	4.5	117	116	0.06	-	1.319	0.40	#DIV/0!	#DIV/0!	-	-
	Minimum	5	22.9	25.9	129	126	0.81	-	1.012	0.25	0.000	0.000	-	-
	Maximum	14	37.4	40.5	488	487	1.07	-	4.958	2.05	0.000	0.000	-	-
	Sample Size (N)	14	14	14	14	14	14	14	14	14	0.000	0.000	-	-
Females Statistics	Average	9.4	31.3	33.8	297	280	0.91	-	4.434	1.45	13.05	3.72	-	-
	Standard deviation	3.6	4.5	4.6	122	108	0.05	-	3.082	0.73	19.00	5.21	-	-
	Minimum	5	24.3	26.4	124	122	0.86	-	0.583	0.33	0.43	0.33	-	-
	Maximum	14	35.9	38	418	383	0.99	-	8.181	2.24	45.14	12.38	-	-
	Sample Size (N)	5	6	6	6	6	6	6	6	6	6	6	-	-

[a] Abnormalities include internal worms (iw) in body cavity; letter in parentheses indicates Scarce (1-5), Common (6-15), Abundant (16-50) and Very Abundant (>50) observation.

Note: Sex - Female (F), Indeterminate (i).

Table G.20: Results of Adult (Littoral/Profundal) Arctic Charr Health Endpoint Statistical Comparisons for Sheardown Lake NW (DLO-01) between 2017 and the Mine Baseline (2006 - 2013) Period, Mary River Project CREMP, 2017

Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
							Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]					
		Response	Covariate	Baseline	2017		Interaction P-value	Covariate P-value		Statistic	Baseline	2017		
Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	118	88	K-S	-	-	-	-	-	-	<0.001	-34
Body Size	Fork Length	log[Fork Length (cm)]	-	118	88	M-W	-	-	-	Median	36.5	34.3	<0.001	-6.2
	Body Weight	log[Body Weight (g)]	-	118	88	M-W	-	-	-	Median	400	362	0.003	-9.5
Growth	Weight-at-age	log[Body Weight (g)]	log[Age (years)]	30	19	ANCOVA	0.056	<0.001	11.3	Adjusted Mean	308	371	0.150	20
				29[e]	19	ANCOVA	0.053	<0.001	11.2	Adjusted Mean	293	363	0.053	24
	Length-at-age	log[Fork Length (cm)]	log[Age (years)]	30	19	ANCOVA	0.040	<0.001	5	Predicted Mean	200	241	-	21
									15		390	377		-3.5
				29[e]	19	ANCOVA	0.035	<0.001	5	Predicted Mean	201	241	-	20
									15		383	377		-1.7
Energy Storage	Condition	log[Body Weight (g)]	log[Fork Length (cm)]	118	88	ANCOVA	0.924	<0.001	34.6	Adjusted Mean	361	384	<0.001	6.4

Indicates P-value < 0.1 (i.e., significant difference between data sets)

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for log_{10}-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(2017 mean - baseline mean) / baseline area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(2017 predicted mean - baseline predicted mean) / baseline predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between groups. A negative difference implies that 2017 has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that 2017 has fewer fish less than the length where the maximum difference in CFRDs was observed.

[e] Sample SLNW13-04 was detected as a statistical outlier (Studentized residual = 4.04 [weight-at-age] and 4.15 [length-at-age]) from the 2017 Sheardown Lake NW data set. The analysis is presented with both the inclusion and exclusion of this individual.

Table G.21: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE17-ACJ-01	7.2	7.8	4.128	1+	1.106
SDSE17-ACJ-02	10.6	11.4	9.894	2++	0.831
SDSE17-ACJ-03	10.1	11.0	8.992	2++	0.873
SDSE17-ACJ-04	6.3	6.8	2.292	1+	0.917
SDSE17-ACJ-05	7.1	7.6	3.202	1+	0.895
SDSE17-ACJ-06	4.3	4.5	0.676	0++	0.850
SDSE17-ACJ-07	4.5	4.8	0.867	0++	0.951
SDSE17-ACJ-08	7.6	8.0	4.094	1++	0.933
SDSE17-ACJ-09	8.8	9.5	6.638	2	0.974
SDSE17-ACJ-10	6.8	7.1	2.581	1+	0.821
SDSE17-ACJ-11	7.5	8.0	3.552	-	0.842
SDSE17-ACJ-12	4.3	4.5	0.768	-	0.966
SDSE17-ACJ-13	8.1	8.6	4.887	-	0.920
SDSE17-ACJ-14	7.7	8.1	3.994	-	0.875
SDSE17-ACJ-15	8.4	8.9	5.199	-	0.877
SDSE17-ACJ-16	7.2	7.7	3.518	-	0.943
SDSE17-ACJ-17	4.5	4.7	0.868	-	0.953
SDSE17-ACJ-18	4.7	4.9	0.881	-	0.849
SDSE17-ACJ-19	4.3	4.5	0.797	-	1.002
SDSE17-ACJ-20	4.5	4.7	0.904	-	0.992
SDSE17-ACJ-21	4.5	4.7	0.939	-	1.030
SDSE17-ACJ-22	7.2	7.6	3.318	-	0.889
SDSE17-ACJ-23	4.6	4.8	0.876	-	0.900
SDSE17-ACJ-24	4.1	4.3	0.626	-	0.908
SDSE17-ACJ-25	4.4	4.6	0.732	-	0.859
SDSE17-ACJ-26	4.3	4.5	0.808	-	1.016
SDSE17-ACJ-27	4.3	4.5	0.772	-	0.971
SDSE17-ACJ-28	3.8	4.0	0.576	-	1.050
SDSE17-ACJ-29	4.7	4.9	0.894	-	0.861
SDSE17-ACJ-30	4.4	4.6	0.807	-	0.947
SDSE17-ACJ-31	9.5	10.2	6.723	-	0.784
SDSE17-ACJ-32	7.7	8.1	4.178	-	0.915
SDSE17-ACJ-33	4.4	4.6	0.820	-	0.963
SDSE17-ACJ-34	4.4	4.6	0.827	-	0.971
SDSE17-ACJ-35	8.5	9.1	5.248	-	0.855
SDSE17-ACJ-36	7.6	8.1	6.903	-	1.573
SDSE17-ACJ-37	7.8	8.3	4.419	-	0.931
SDSE17-ACJ-38	7.5	7.9	3.707	-	0.879
SDSE17-ACJ-39	6.6	7.0	2.843	-	0.989
SDSE17-ACJ-40	4.2	4.4	0.658	-	0.888
SDSE17-ACJ-41	6.9	7.3	3.132	-	0.953
SDSE17-ACJ-42	4.4	4.6	0.841	-	0.987
SDSE17-ACJ-43	7.0	7.4	3.464	-	1.010
SDSE17-ACJ-44	9.0	9.7	5.604	-	0.769
SDSE17-ACJ-45	8.0	8.6	4.998	-	0.976
SDSE17-ACJ-46	7.4	7.7	3.586	-	0.885
SDSE17-ACJ-47	7.3	7.8	4.218	-	1.084
SDSE17-ACJ-48	4.6	4.9	1.019	-	1.047
SDSE17-ACJ-49	6.4	6.7	2.318	-	0.884
SDSE17-ACJ-50	7.5	8.0	3.960	-	0.939
SDSE17-ACJ-51	7.3	7.7	4.184	-	1.076
SDSE17-ACJ-52	7.4	7.9	3.468	-	0.856
SDSE17-ACJ-53	7.3	7.7	3.684	-	0.947
SDSE17-ACJ-54	3.9	4.1	0.698	-	1.177
SDSE17-ACJ-55	7.0	7.4	2.941	-	0.857
SDSE17-ACJ-56	4.3	4.5	0.786	-	0.989
SDSE17-ACJ-57	4.8	5.6	0.980	-	0.886
SDSE17-ACJ-58	6.4	6.8	2.739	-	1.045
SDSE17-ACJ-59	6.8	7.3	2.715	-	0.863

Table G.21: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE17-ACJ-60		7.4	7.9	3.844	-	0.949
SDSE17-ACJ-61		7.5	8.0	4.251	-	1.008
SDSE17-ACJ-62		7.5	7.9	4.009	-	0.950
SDSE17-ACJ-63		4.3	4.5	0.886	-	1.114
SDSE17-ACJ-64		7.3	7.7	3.549	-	0.912
SDSE17-ACJ-65		6.8	7.2	2.968	-	0.944
SDSE17-ACJ-66		6.3	6.6	2.521	-	1.008
SDSE17-ACJ-67		7.9	8.4	4.376	-	0.888
SDSE17-ACJ-68		8.6	9.2	6.179	-	0.971
SDSE17-ACJ-69		4.6	4.7	0.702	-	0.721
SDSE17-ACJ-70		4.3	4.5	0.644	-	0.810
SDSE17-ACJ-71		4.1	4.3	0.549	-	0.797
SDSE17-ACJ-72		7.1	7.5	3.356	-	0.938
SDSE17-ACJ-73		7.6	8.0	3.948	-	0.899
SDSE17-ACJ-74		7.4	7.9	3.638	-	0.898
SDSE17-ACJ-75		6.3	6.6	2.682	-	1.073
SDSE17-ACJ-76		4.0	4.2	0.704	-	1.100
SDSE17-ACJ-77		3.8	4.0	0.568	-	1.035
SDSE17-ACJ-78		7.8	8.2	4.125	-	0.869
SDSE17-ACJ-79		9.8	10.5	7.675	-	0.815
SDSE17-ACJ-80		7.6	8.2	3.874	-	0.883
SDSE17-ACJ-81		4.2	4.4	0.773	-	1.043
SDSE17-ACJ-82		4.2	4.4	0.696	-	0.939
SDSE17-ACJ-83		4.4	4.6	0.903	-	1.060
SDSE17-ACJ-84		4.8	5.1	1.153	-	1.043
SDSE17-ACJ-85		7.6	8.2	4.506	-	1.026
SDSE17-ACJ-86		6.6	7.0	2.754	-	0.958
SDSE17-ACJ-87		7.1	7.5	3.462	-	0.967
SDSE17-ACJ-88		8.2	8.8	5.088	-	0.923
SDSE17-ACJ-89		7.3	7.8	3.406	-	0.876
SDSE17-ACJ-90		4.5	4.7	0.978	-	1.073
SDSE17-ACJ-91		4.4	4.6	0.795	-	0.933
SDSE17-ACJ-92		3.8	4.0	0.508	-	0.926
SDSE17-ACJ-93		3.4	3.6	0.406	-	1.033
SDSE17-ACJ-94		5.0	5.2	1.112	-	0.890
SDSE17-ACJ-95		4.7	4.9	1.084	-	1.044
SDSE17-ACJ-96		4.4	4.6	0.749	-	0.879
SDSE17-ACJ-97		4.5	4.7	0.768	-	0.843
SDSE17-ACJ-98		7.7	8.1	3.774	-	0.827
SDSE17-ACJ-99		8.4	9.0	5.289	-	0.892
SDSE17-ACJ-100		7.2	7.6	3.128	-	0.838
Overall Catch Summary	Sample Size (N)	100	100	100	10	100
	Average	6.2	6.6	2.771	1.1	0.944
	Median	6.8	7.2	2.799	1	0.935
	Standard Deviation	1.8	1.9	2.056	1	0.106
	Standard Error	0.2	0.2	0.206	0.2	0.011
	Minimum	3.4	3.6	0.406	0	0.721
	Maximum	10.6	11.4	9.894	2	1.573
Young-of-the-Year Catch Summary	proportion of YOY			**42%**		
	Sample Size (N)	42	42	42	2	42
	Average	4.3	4.6	0.795	0	0.959
	Median	4.4	4.6	0.796	0	0.964
	Standard Deviation	0.3	0.3	0.160	0	0.095
	Standard Error	0.0	0.1	0.025	0	0.015
	Minimum	3.4	3.6	0.406	0	0.721
	Maximum	5.0	5.6	1.153	0	1.177

Table G.22: Results of Nearshore Arctic Charr Young-of-the-Year (YOY) and Non-YOY Health Endpoint Statistical Comparisons between Sheardown Lake SE (DLO-02) and Reference Lake 3 (REF), Mary River Project CREMP, August 2017

Group	Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
			Response	Covariate	REF	DLO-02		Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]	Statistic	REF	DLO-02		
								Interaction P-value	Covariate P-value						
All Fish	Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	100	100	K-S	-	-	-	-	-	-	0.010	23
YOY	Body Size	Fork Length	Fork Length (cm)	-	26	41	M-W	-	-	-	Median	3.65	4.4	<0.001	21
		Body Weight	Body Weight (g)	-	26	41	M-W	-	-	-	Median	0.476	0.795	<0.001	67
	Energy Storage	Condition [e]	log[Body Weight (g)]	log[Fork Length (cm)]	26	41	ANCOVA	0.680	<0.001	4.03	Adjusted Mean	0.597	0.642	0.189	7.5
			log[Body Weight (g)]	log[Fork Length (cm)]	25	41	ANCOVA	0.064	<0.001	4.05	Adjusted Mean	0.604	0.639	0.240	5.8
Non-YOY	Survival	Length Frequency Distribution	Fork Length (cm)	-	74	59	K-S	-	-	-	-	-	-	<0.001	47
	Body Size	Fork Length	Fork Length (cm)	-	74	59	M-W	-	-	-	Median	6.6	7.4	<0.001	12
		Body Weight	Body Weight (g)	-	74	59	M-W	-	-	-	Median	2.49	3.84	<0.001	55
	Energy Storage	Condition [f]	log[Body Weight (g)]	log[Fork Length (cm)]	74	59	ANCOVA	0.189	<0.001	7.20	Adjusted Mean	3.18	3.48	<0.001	9.5
			log[Body Weight (g)]	log[Fork Length (cm)]	73	58	ANCOVA	0.068	<0.001	7.21	Adjusted Mean	3.17	3.45	<0.001	9.0

Indicates P-value < 0.1 (i.e., significant difference between data sets)

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for log_{10}-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

[e] Sample REF317-ACJ-25 was detected as a statistical outlier (Studentized residual = 5.13) from the 2017 Reference Lake 3 data set. The analysis is presented with both the inclusion and exclusion of this individual.

[f] Samples REF317-ACJ-56 and SDSE17-ACJ-36 were detected as a statistical outliers (Studentized residual = 4.57 [REF] and 6.67 [SDSE]) from the 2017 Reference Lake 3 and Sheardown Lake SE data sets, respectively. The analysis is presented with both the inclusion and exclusion of these individuals.

Table G.23: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Sheardown Lake SE Using 2017 Data Relative to Reference Lake 3 (2017) Data or Sheardown Lake SE Baseline (2006 - 2013) Data with α=β=0.1, Mary River Project CREMP, 2017

Comparison	Group	Indicator	Endpoint	Variables		Test	S[a]	COV (%)[b]	Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1								
				Response	Covariate				log(Response)	5%	10%	20%	25%	30%	33%	40%	50%	100%
										-5%	-9%	-17%	-20%	-23%	-25%	-29%	-33%	-50%
									Response	±5%	±10%	±20%	±25%	±30%	±33%	±40%	±50%	±100%
Nearshore Arctic Charr (Electrofishing Data) versus Reference Lake 3, 2017 Data	YOY	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	7.650	Response	48	13	5	4	4	4	3	3	3
			Body Weight	Body Weight (g)	-	M-W	-	31.95	Response	811	204	53	34	25	20	14	10	4
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.05925	-	log(Response)	136	37	12	9	7	6	5	4	3
				log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.05137	-	log(Response)	103	29	9	7	6	5	5	4	3
	Non-YOY	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	19.48	Response	303	77	20	14	11	9	6	5	3
			Body Weight	Body Weight (g)	-	M-W	-	100.5	Response	8,007	2,003	502	322	224	182	127	82	22
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.04030	-	log(Response)	64	18	7	5	5	4	4	4	3
				log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.03247	-	log(Response)	42	13	5	4	4	4	4	3	3
Nearshore Arctic Charr (Electrofishing Data) 2017 versus Baseline	Non-YOY	Body Size	Fork Length	log[Fork Length (cm)]	-	t-test	0.05098	-	log(Response)	100	27	8	6	5	4	4	3	2
			Body Weight	Body Weight (g)	-	M-W	-	60.96	Response	2,948	739	186	120	84	68	48	32	10
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.05446	-	log(Response)	115	32	10	8	6	6	5	4	3
Littoral/Profundal Arctic Charr (Gill Netting Data) 2017 versus Baseline	All fish	Body Size	Fork Length	Fork Length (mm)	-	M-W	-	11.43	Response	106	28	9	6	5	5	4	4	3
			Body Weight	Body Weight (g)	-	M-W	-	31.40	Response	784	197	50	33	24	19	14	10	4
		Growth	Weight-at-age	log[Adjusted Body Weight (g)]	log[Age (years)]	ANCOVA	0.07911	-	log(Response)	241	65	19	14	11	9	7	6	4
			Length-at-age	log[Fork Length (mm)]	log[Age (years)]	ANCOVA	0.03191	-	log(Response)	41	12	5	4	4	4	4	3	3
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (mm)]	ANCOVA	0.04787	-	log(Response)	90	25	9	7	5	5	4	4	3

[a] Pooled standard deviation of the regression residuals

[b] Coefficient of variation (pooled standard deviation/reference mean)×100%

Table G.24: Gill Netting Catch Records for Sheardown Lake SE, Mary River Project CREMP, August 2017

Gill Net Set ID	Location (NAD83, UTM Zone 17W)		Length (m)	Set Date	Lift Date	Set Time	Lift Time	Fishing Hours	Effort (m*hrs/100 m)	Arctic Charr Catch Per Mesh Size			Total Catch	CPUE
	Easting	Northing								1½"	2"	3"		
SDSE17-GN-1	561034	7912010	91.4	18-Aug-17	18-Aug-17	12:45	14:20	1.58	1.45	1	2	4	7	4.83
				18-Aug-17	18-Aug-17	14:35	16:40	2.08	1.90	3	0	7	10	5.25
SDSE17-GN-2	560788	7912169	91.4	18-Aug-17	18-Aug-17	13:00	14:40	1.67	1.52	2	6	7	15	9.84
				18-Aug-17	18-Aug-17	15:08	17:00	1.87	1.71	0	4	4	8	4.69
				19-Aug-17	19-Aug-17	8:20	9:45	1.42	1.30	1	4	3	8	6.18
SDSE17-GN-3	560945	7912083	91.4	18-Aug-17	18-Aug-17	13:05	15:20	2.25	2.06	3	5	4	12	5.83
				19-Aug-17	19-Aug-17	8:25	10:00	1.58	1.45	2	5	0	7	4.83
SDSE17-GN-4	561183	7911763	91.4	18-Aug-17	18-Aug-17	13:11	15:30	2.32	2.12	3	2	3	8	3.78
SDSE17-GN-5	561325	7911887	91.4	18-Aug-17	18-Aug-17	13:15	16:00	2.75	2.51	4	8	8	20	7.95
				19-Aug-17	19-Aug-17	8:30	10:15	1.75	1.60	0	5	4	9	5.62
								Total	**17.62**	**19**	**41**	**44**	**104**	**5.88**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Table G.25: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE17-AC-01	3	42.1	45.2	700	-	0.938
SDSE17-AC-02	3	37.8	40.2	539	-	0.998
SDSE17-AC-03	3	37.9	40.6	379	-	0.696
SDSE17-AC-04	3	36.3	39.3	455	-	0.951
SDSE17-AC-05	2	27.8	30.4	215	-	1.001
SDSE17-AC-06	2	35.3	38.5	405	-	0.921
SDSE17-AC-07	1½	19.0	20.2	68	-	0.991
SDSE17-AC-08	3	38.2	41.1	525	-	0.942
SDSE17-AC-09	3	39.0	40.8	550	-	0.927
SDSE17-AC-10	3	36.5	39.4	440	-	0.905
SDSE17-AC-11	3	38.1	41.0	540	-	0.976
SDSE17-AC-12	3	41.3	44.2	565	-	0.802
SDSE17-AC-13	3	35.9	38.8	420	-	0.908
SDSE17-AC-14	3	37.6	40.1	515	-	0.969
SDSE17-AC-15	2	36.2	39.2	465	-	0.980
SDSE17-AC-16	2	31.5	34.4	325	8+	1.040
SDSE17-AC-17	2	32.5	35.3	323	8+	0.941
SDSE17-AC-18	2	39.8	42.7	575	-	0.912
SDSE17-AC-19	2	26.0	28.0	173	-	0.984
SDSE17-AC-20	2	32.8	35.2	303	13+	0.859
SDSE17-AC-21	1½	34.7	37.5	368	-	0.881
SDSE17-AC-22	1½	19.5	20.9	55	-	0.742
SDSE17-AC-23	3	36.9	40.2	485	-	0.965
SDSE17-AC-24	3	42.2	45.0	695	-	0.925
SDSE17-AC-25	3	34.6	37.9	400	-	0.966
SDSE17-AC-26	3	35.2	38.0	445	-	1.020
SDSE17-AC-27	2	35.5	38.5	425	-	0.950
SDSE17-AC-28	2	34.6	37.7	375	9++	0.905
SDSE17-AC-29	2	35.9	38.6	358	-	0.774
SDSE17-AC-30	2	37.8	40.1	410	13+	0.759
SDSE17-AC-31	2	33.2	35.9	363	10++	0.992
SDSE17-AC-32	1½	31.1	33.6	285	-	0.947
SDSE17-AC-33	1½	38.7	41.8	540	-	0.932
SDSE17-AC-34	1½	34.8	37.7	398	-	0.944
SDSE17-AC-35	3	39.9	43.4	515	-	0.811
SDSE17-AC-36	3	37.1	40.0	545	-	1.067
SDSE17-AC-37	3	34.7	37.5	430	-	1.029
SDSE17-AC-38	2	39.6	42.9	560	-	0.902
SDSE17-AC-39	2	32.9	35.6	358	-	1.005
SDSE17-AC-40	1½	36.8	40.0	465	-	0.933
SDSE17-AC-41	1½	20.3	22.0	73	-	0.873
SDSE17-AC-42	1½	27.9	30.0	199	-	0.916
SDSE17-AC-43	3	37.3	40.5	465	-	0.896
SDSE17-AC-44	3	39.5	42.2	690	-	1.120
SDSE17-AC-45	3	36.1	39.0	408	-	0.867
SDSE17-AC-46	3	36.4	39.4	475	-	0.985
SDSE17-AC-47	3	33.5	36.7	395	-	1.051
SDSE17-AC-48	3	38.9	41.9	695	-	1.181
SDSE17-AC-49	3	38.1	40.8	523	-	0.946
SDSE17-AC-50	3	36.1	39.6	430	-	0.914
SDSE17-AC-51	2	33.5	36.3	410	-	1.091
SDSE17-AC-52	2	34.9	37.2	380	-	0.894
SDSE17-AC-53	2	35.5	38.2	415	-	0.928
SDSE17-AC-54	2	35.5	38.5	438	-	0.979
SDSE17-AC-55	2	33.5	36.5	408	15++	1.085
SDSE17-AC-56	2	35.3	38.2	425	-	0.966

Table G.25: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE17-AC-57	2	38.2	41.5	475	15+	0.852
SDSE17-AC-58	1½	40.2	43.5	480	-	0.739
SDSE17-AC-59	1½	21.5	23.0	85	-	0.855
SDSE17-AC-60	1½	25.4	28.0	153	-	0.934
SDSE17-AC-61	1½	33.4	36.0	410	-	1.100
SDSE17-AC-62	3	36.5	39.5	485	-	0.997
SDSE17-AC-63	3	37.3	40.0	545	-	1.050
SDSE17-AC-64	3	36.5	39.4	505	-	1.039
SDSE17-AC-65	3	35.6	38.5	438	-	0.971
SDSE17-AC-66	3	35.7	38.9	445	-	0.978
SDSE17-AC-67	3	36.9	40.5	480	-	0.955
SDSE17-AC-68	3	37.5	40.8	473	-	0.897
SDSE17-AC-69	1½	32.5	35.1	465	-	1.355
SDSE17-AC-70	1½	35.2	38.7	430	-	0.986
SDSE17-AC-71	1½	33.0	35.9	400	-	1.113
SDSE17-AC-72	3	39.8	43.5	605	-	0.960
SDSE17-AC-73	3	35.7	39.0	428	-	0.941
SDSE17-AC-74	3	38.5	42.1	475	-	0.832
SDSE17-AC-75	3	37.0	40.1	450	-	0.888
SDSE17-AC-76	2	27.2	29.5	205	-	1.019
SDSE17-AC-77	2	45.2	48.8	700	-	0.758
SDSE17-AC-78	2	36.4	39.6	460	-	0.954
SDSE17-AC-79	2	34.0	36.6	383	-	0.974
SDSE17-AC-80	3	39.8	42.7	478	-	0.758
SDSE17-AC-81	3	37.0	40.0	470	-	0.928
SDSE17-AC-82	3	34.5	37.6	378	-	0.921
SDSE17-AC-83	2	35.3	38.0	379	14+	0.862
SDSE17-AC-84	2	27.2	29.1	175	-	0.870
SDSE17-AC-85	2	37.1	40.1	455	-	0.891
SDSE17-AC-86	2	36.3	40.1	450	-	0.941
SDSE17-AC-87	1½	37.2	40.0	430	-	0.835
SDSE17-AC-88	2	33.1	35.9	305	-	0.841
SDSE17-AC-89	2	36.4	39.3	413	-	0.856
SDSE17-AC-90	2	35.0	38.0	390	-	0.910
SDSE17-AC-91	2	34.5	37.3	410	-	0.998
SDSE17-AC-92	2	31.8	34.6	299	-	0.930
SDSE17-AC-93	1.5	38.1	41.8	465	-	0.841
SDSE17-AC-94	1.5	64.1	67.5	1,690	-	0.642
SDSE17-AC-95	3	36.7	39.4	448	-	0.906
SDSE17-AC-96	3	36.0	38.7	478	-	1.025
SDSE17-AC-97	3	38.2	41.5	495	-	0.888
SDSE17-AC-98	3	38.2	41.3	528	-	0.947
SDSE17-AC-99	2	36.4	39.7	413	-	0.856
SDSE17-AC-100	2	38.2	41.8	515	-	0.924
SDSE17-AC-101	2	32.5	35.3	339	-	0.988
SDSE17-AC-102	2	35.9	38.9	380	-	0.821
SDSE17-AC-103	2	36.1	39.3	405	-	0.861
SDSE17-AC-104	2	32.6	34.8	280	-	0.808
Overall Catch Summary	Sample Size (N)	104	104	104	9	104
	Average	35.5	38.3	435	11.7	0.932
	Median	36.1	39.1	430	13	0.933
	Standard Deviation	5.3	5.6	177	2.9	0.101
	Standard Error	0.5	0.5	17.40	1.0	0.010
	Minimum	19.0	20.2	55	8	0.642
	Maximum	64.1	67.5	1,690	15	1.355

Table G.26: Additional Meristics Collected from Adult Arctic Charr Incidental Mortalities at Sheardown Lake SE, Mary River Project CREMP, August 2017

Specimen ID		Age (years)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Adjusted Body Weight (g)	Fulton's Condition Factor (K)	Sex	Liver Weight (g)	Liver Somatic Index (LSI)	Gonad Weight (g)	Gonad Somatic Index (GSI)	Gill Net Mesh Size (inches)	Abnormalities[a]
SDSE17-AC-16		8+	31.5	34.4	325	321	1.040	i	4.342	1.35	-	-	2	iw (S)
SDSE17-AC-17		8+	32.5	35.3	323	320	0.941	i	2.791	0.87	-	-	2	iw (S)
SDSE17-AC-28		9++	34.6	37.7	375	371	0.905	i	3.670	0.99	-	-	2	iw (C)
SDSE17-AC-30		13+	37.8	40.1	410	406	0.759	i	4.055	1.00	-	-	2	iw (VA)
SDSE17-AC-39		-	32.9	35.6	358	354	1.005	i	3.857	1.09	-	-	2	-
SDSE17-AC-57		15+	38.2	41.5	475	470	0.852	i	4.608	0.98	-	-	2	iw (S)
SDSE17-AC-20		13+	32.8	35.2	303	298	0.859	F	2.303	0.77	2.206	0.739	2	iw (A)
SDSE17-AC-31		10++	33.2	35.9	363	356	0.992	F	4.308	1.21	2.881	0.810	2	iw (A)
SDSE17-AC-55		15++	33.5	36.5	408	361	1.085	F	7.588	2.10	39.698	11.005	2	iw (S)
SDSE17-AC-83		14+	35.3	38.0	379	371	0.862	F	4.085	1.10	3.435	0.925	2	iw (A)
Adult Non-Spawner Statistics	Average	10.6	34.6	37.4	378	374	0.92	-	3.887	1.05	-	-	-	-
	Standard deviation	3.2	2.8	2.9	58	57	0.10	-	0.633	0.17	-	-	-	-
	Minimum	8	31.5	34.4	323	320	0.76	-	2.791	0.87	-	-	-	-
	Maximum	15	38.2	41.5	475	470	1.04	-	4.608	1.35	-	-	-	-
	Sample Size (N)	5	6	6	6	6	6	6	6	6	-	-	-	-
Females Statistics	Average	13.0	33.7	36.4	363	347	0.95	-	4.571	1.30	12.055	3.370	-	-
	Standard deviation	2.2	1.1	1.2	44	33	0.11	-	2.202	0.57	18.436	5.091	-	-
	Minimum	10	32.8	35.2	303	298	0.86	-	2.303	0.77	2.206	0.739	-	-
	Maximum	15	35.3	38.0	408	371	1.09	-	7.588	2.10	39.698	11.005	-	-
	Sample Size (N)	4	4	4	4	4	4	4	4	4	4	4	-	-

[a] - Abnormalities include internal worms (iw) in body cavity; letter in parentheses indicates Scarce (1-5), Common (6-15), Abundant (16-50) and Very Abundant (>50) observation.
Sex - Female (F), Indeterminate (i).

Table G.27: Results of Adult (Littoral/Profundal) Arctic Charr Health Endpoint Statistical Comparisons for Sheardown Lake SE (DLO-02) between 2017 and the Mine Baseline (2006 - 2013) Period, Mary River Project CREMP, 2017

Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test *P*-value	Magnitude of Difference (%)[c,d]
		Response	Covariate	Baseline	2017		Interaction Model Interaction *p*-value	Parallel Slope Model Covariate *p*-value	Covariate Value for Comparisons[a]	Statistic	Baseline	2017		
Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	90	104	K-S	-	-	-	-	-	-	<0.001	-34
Body Size	Fork Length	Fork Length (cm)	-	90	104	M-W	-	-	-	Median	37.9	36.1	<0.001	-4.6
	Body Weight	Body Weight (g)	-	90	104	M-W	-	-	-	Median	518	434	<0.001	-16
Growth	Length-at-age	log[Fork Length (cm)]	log[Age]	9	9	ANCOVA	0.560	0.017	12.1	Adjusted Mean	342	348	0.673	1.6
	Weight-at-age	log[Body Weight (g)]	log[Age]	9	9	ANCOVA	0.254	0.012	12.1	Adjusted Mean	352	383	0.365	8.7
Energy Storage	Condition	log[Body Weight (g)]	log[Fork Length (cm)]	90	104	ANCOVA	0.005[e]	<0.001	36.3	Adjusted Mean	474	446	0.007	-5.9

Indicates P-value < 0.1 (i.e., significant difference between data sets)

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for log_{10}-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(2017 mean - baseline mean) / baseline area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(2017 predicted mean - baseline predicted mean) / baseline predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between groups. A negative difference implies that 2017 has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that 2017 has fewer fish less than the length where the maximum difference in CFRDs was observed.

[e] The R^2 of the interaction model was 0.934 and the R^2 of the parallel slope model was 0.931 (difference of 0.03%) so the ANCOVA proceeded under the assumption that the slopes are practically parallel.

Table G.28: Catch Record for Electrofishing Conducted Within the Mary River System as Part of the Mary River Project EEM, August 2017

Watercourse	Station ID	Date	Location			Effort (seconds)	Fish Species				Total (all species)	
			Coordinates		Station Length (m)		Arctic Charr		Ninespine Stickleback			
			Easting	Northing			Catch	CPUE	Catch	CPUE	Total Catch	CPUE
Mary River Tributary-F	MRTF-EXP-F1	26-Aug-17	564945	7915557	167	1,254	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F2	26-Aug-17	564913	7915917	193	730	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F3	26-Aug-17	564470	7913003	55	355	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F4	26-Aug-17	564457	7913229	125	866	0	0.00	0	0.00	0	0.00
	MRTF-EXP-F5	26-Aug-17	564702	7913980	138	952	0	0.00	0	0.00	0	0.00
					Total	**4,157**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**
Mary River Near-field	MR-EXP-F1	27-Aug-17	562188	7911661	129	2,086	40	1.15	0	0.00	40	1.15
	MR-EXP-F2	27-Aug-17	562309	7911796	55	481	7	0.87	0	0.00	7	0.87
	MR-EXP-F3	27-Aug-17	562436	7911831	133	1,093	26	1.43	0	0.00	26	1.43
	MR-EXP-F4	27-Aug-17	562501	7911860	71	927	27	1.75	0	0.00	27	1.75
					Total	**4,587**	**100**	**1.30**	**0**	**0.00**	**100**	**1.30**
Mary River Far-Field	MR-REF-F1	28-Aug-17	557037	7906734	159	1,754	27	0.92	0	0.00	27	0.92
	MR-REF-F2	28-Aug-17	557118	7906835	331	2,794	22	0.47	2	0.04	24	0.52
	MR-REF-F3	28-Aug-17	556991	7906745	218	3,792	56	0.89	1	0.02	57	0.90
					Total	**8,340**	**105**	**0.76**	**3**	**0.02**	**108**	**0.78**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per electrofishing minute.

Table G.29: Arctic Charr Measurements from Fish Captured at the Mary River Near-Field Area by Electrofishing as Part of the Mary River Project EEM, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MR-NF-AC-01	12.6	13.7	19.174	-	0.959
MR-NF-AC-02	12.4	13.4	16.362	-	0.858
MR-NF-AC-03	14.4	15.5	25.868	-	0.866
MR-NF-AC-04	13.0	13.9	18.810	-	0.856
MR-NF-AC-05	10.9	11.7	13.933	-	1.076
MR-NF-AC-06	11.9	12.7	16.775	-	0.995
MR-NF-AC-07	11.3	12.3	15.096	-	1.046
MR-NF-AC-08	10.5	11.5	10.572	-	0.913
MR-NF-AC-09	15.7	17.2	35.921	-	0.928
MR-NF-AC-10	10.0	10.8	10.311	-	1.031
MR-NF-AC-11	10.4	11.1	11.483	-	1.021
MR-NF-AC-12	12.6	13.9	17.439	-	0.872
MR-NF-AC-13	11.0	11.9	14.160	-	1.064
MR-NF-AC-14	13.1	14.3	21.184	-	0.942
MR-NF-AC-15	11.4	12.3	15.075	-	1.018
MR-NF-AC-16	15.7	17.0	33.560	-	0.867
MR-NF-AC-17	13.7	14.8	23.778	-	0.925
MR-NF-AC-18	11.5	12.5	14.966	-	0.984
MR-NF-AC-19	12.3	13.2	16.097	-	0.865
MR-NF-AC-20	14.7	15.9	30.004	-	0.945
MR-NF-AC-21	13.8	14.6	24.608	-	0.936
MR-NF-AC-22	9.9	10.6	10.375	-	1.069
MR-NF-AC-23	13.8	15.1	25.628	-	0.975
MR-NF-AC-24	14.9	16.2	34.875	-	1.054
MR-NF-AC-25	14.0	15.2	23.108	-	0.842
MR-NF-AC-26	17.7	19.2	50	-	0.902
MR-NF-AC-27	18.0	19.5	45	-	0.772
MR-NF-AC-28	12.2	13.2	19.444	-	1.071
MR-NF-AC-29	13.8	14.9	24.217	-	0.921
MR-NF-AC-30	13.0	14.0	20.587	-	0.937
MR-NF-AC-31	11.8	12.9	16.323	-	0.993
MR-NF-AC-32	12.3	13.3	19.558	-	1.051
MR-NF-AC-33	11.5	12.5	13.621	-	0.896
MR-NF-AC-34	8.3	8.9	6.450	-	1.128
MR-NF-AC-35	12.3	13.3	16.185	-	0.870
MR-NF-AC-36	16.4	17.9	44	-	0.998
MR-NF-AC-37	11.0	11.9	13.349	-	1.003
MR-NF-AC-38	11.7	12.5	15.999	-	0.999
MR-NF-AC-39	10.9	11.8	14.006	-	1.082
MR-NF-AC-40	9.4	10.1	7.783	-	0.937
MR-NF-AC-41	15.2	16.5	35.126	-	1.000
MR-NF-AC-42	13.5	14.6	25.016	-	1.017
MR-NF-AC-43	12.3	13.5	20.696	-	1.112
MR-NF-AC-44	14.8	16.0	28.649	-	0.884
MR-NF-AC-45	14.0	15.2	24.043	-	0.876
MR-NF-AC-46	10.5	11.3	11.822	-	1.021
MR-NF-AC-47	10.3	11.1	10.947	-	1.002
MR-NF-AC-48	13.8	14.9	22.302	-	0.849
MR-NF-AC-49	14.0	15.4	28.457	-	1.037
MR-NF-AC-50	16.0	17.4	36.283	-	0.886
MR-NF-AC-51	14.7	15.9	33.098	-	1.042
MR-NF-AC-52	15.8	17.2	36.468	-	0.925
MR-NF-AC-53	9.3	9.8	7.393	-	0.919
MR-NF-AC-54	13.9	14.7	26.469	-	0.986
MR-NF-AC-55	15.0	16.3	33.729	-	0.999
MR-NF-AC-56	11.2	12.1	15.798	-	1.124
MR-NF-AC-57	12.9	14.1	21.952	-	1.023
MR-NF-AC-58	12.1	13.1	18.452	-	1.042
MR-NF-AC-59	11.5	12.3	13.467	-	0.885

Table G.29: Arctic Charr Measurements from Fish Captured at the Mary River Near-Field Area by Electrofishing as Part of the Mary River Project EEM, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MR-NF-AC-60		18.4	19.9	47	-	0.754
MR-NF-AC-61		8.2	8.7	5.649	1	1.025
MR-NF-AC-62		13.4	14.4	24.484	-	1.018
MR-NF-AC-63		13.7	15.0	23.966	-	0.932
MR-NF-AC-64		15.9	16.9	34.709	-	0.863
MR-NF-AC-65		11.7	12.7	15.638	-	0.976
MR-NF-AC-66		9.0	9.5	7.509	-	1.030
MR-NF-AC-67		9.3	10.0	7.918	-	0.984
MR-NF-AC-68		14.2	15.3	25.522	-	0.891
MR-NF-AC-69		24.3	26.2	122	-	0.850
MR-NF-AC-70		10.4	11.2	12.021	-	1.069
MR-NF-AC-71		11.3	12.5	14.909	-	1.033
MR-NF-AC-72		12.6	13.3	16.920	-	0.846
MR-NF-AC-73		12.6	13.6	18.579	3	0.929
MR-NF-AC-74		14.2	15.5	29.376	-	1.026
MR-NF-AC-75		9.5	10.3	8.864	-	1.034
MR-NF-AC-76		13.6	14.5	22.717	-	0.903
MR-NF-AC-77		12.8	13.9	20.361	-	0.971
MR-NF-AC-78		11.9	12.9	16.975	-	1.007
MR-NF-AC-79		11.5	12.6	16.252	-	1.069
MR-NF-AC-80		12.9	14.0	21.412	-	0.997
MR-NF-AC-81		13.9	15.0	25.734	-	0.958
MR-NF-AC-82		14.6	15.8	30.065	-	0.966
MR-NF-AC-83		12.1	13.0	17.180	-	0.970
MR-NF-AC-84		17.4	18.9	48	-	0.911
MR-NF-AC-85		12.8	13.8	19.908	-	0.949
MR-NF-AC-86		13.5	14.6	24.067	-	0.978
MR-NF-AC-87		10.5	11.3	12.084	-	1.044
MR-NF-AC-88		15.6	16.9	36.058	-	0.950
MR-NF-AC-89		12.0	13.1	17.858	-	1.033
MR-NF-AC-90		12.0	12.8	13.647	3	0.790
MR-NF-AC-91		10.5	11.2	11.712	2	1.012
MR-NF-AC-92		9.1	10.0	8.578	2	1.138
MR-NF-AC-93		11.4	21.3	15.316	2	1.034
MR-NF-AC-94		17.3	18.7	52	4	1.004
MR-NF-AC-95		14.3	15.4	28.430	3	0.972
MR-NF-AC-96		13.9	15.0	24.611	3	0.916
MR-NF-AC-97		14.4	15.6	28.965	4	0.970
MR-NF-AC-98		11.5	12.5	16.483	-	1.084
MR-NF-AC-99		11.8	12.7	16.841	-	1.025
MR-NF-AC-100		12.4	13.4	20.578	-	1.079
Overall Catch Summary	**total number**	**100**	**100**	**100**	**10**	**100**
	average	**12.9**	**14.0**	**22.567**	**2.7**	**0.971**
	median	**12.6**	**13.8**	**19.501**	**3.0**	**0.981**
	standard deviation	**2.4**	**2.8**	**14.264**	**0.9**	**0.081**
	standard error	**0.2**	**0.3**	**1.426**	**0.3**	**0.008**
	minimum	**8.2**	**8.7**	**5.649**	**1**	**0.754**
	maximum	**24.3**	**26.2**	**122.000**	**4**	**1.138**

Table G.30: Arctic Charr Measurements from Fish Captured at the Mary River Far-Field Area by Electrofishing as Part of the Mary River Project EEM, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MR-FF-AC-01	14.5	15.7	29.707	-	0.974
MR-FF-AC-02	12.4	13.4	20.865	-	1.094
MR-FF-AC-03	15.9	17.3	40	-	0.995
MR-FF-AC-04	12.9	14.0	17.009	-	0.792
MR-FF-AC-05	19.8	21.5	62	-	0.799
MR-FF-AC-06	15.9	17.2	37	-	0.920
MR-FF-AC-07	12.5	13.6	19.920	-	1.020
MR-FF-AC-08	12.7	13.7	20.811	-	1.016
MR-FF-AC-09	13.1	14.2	26.242	-	1.167
MR-FF-AC-10	13.6	14.6	26.714	-	1.062
MR-FF-AC-11	13.8	14.9	24.405	-	0.929
MR-FF-AC-12	10.3	11.0	11.707	-	1.071
MR-FF-AC-13	13.9	15.0	25.934	-	0.966
MR-FF-AC-14	12.4	13.4	22.428	-	1.176
MR-FF-AC-15	11.5	12.4	16.697	-	1.098
MR-FF-AC-16	15.0	16.2	31.273	-	0.927
MR-FF-AC-17	12.8	14.0	21.380	-	1.019
MR-FF-AC-18	10.5	11.3	11.128	-	0.961
MR-FF-AC-19	9.3	10.0	8.654	-	1.076
MR-FF-AC-20	10.9	11.7	13.423	-	1.037
MR-FF-AC-21	11.4	12.3	17.076	-	1.153
MR-FF-AC-22	13.5	14.6	22.042	-	0.896
MR-FF-AC-23	11.7	12.7	18.479	-	1.154
MR-FF-AC-24	12.2	13.2	16.414	-	0.904
MR-FF-AC-25	11.5	12.6	17.321	-	1.139
MR-FF-AC-26	10.9	11.6	13.475	-	1.041
MR-FF-AC-27	11.3	12.2	15.022	-	1.041
MR-FF-AC-28	13.1	14.1	23.621	-	1.051
MR-FF-AC-29	12.9	14.0	20.777	-	0.968
MR-FF-AC-30	19.0	20.6	57	-	0.831
MR-FF-AC-31	11.1	12.0	14.529	-	1.062
MR-FF-AC-32	15.2	16.5	30.388	-	0.865
MR-FF-AC-33	16.9	18.4	45	-	0.932
MR-FF-AC-34	19.2	20.8	60	-	0.848
MR-FF-AC-35	11.7	12.8	15.888	-	0.992
MR-FF-AC-36	13.0	14.2	23.379	-	1.064
MR-FF-AC-37	13.8	14.8	27.605	-	1.050
MR-FF-AC-38	13.8	14.9	26.785	-	1.019
MR-FF-AC-39	14.6	15.7	26.954	-	0.866
MR-FF-AC-40	11.8	12.7	18.854	-	1.148
MR-FF-AC-41	10.4	11.2	12.919	2	1.148
MR-FF-AC-42	11.6	12.5	16.920	-	1.084
MR-FF-AC-43	12.3	13.2	18.558	-	0.997
MR-FF-AC-44	11.5	12.6	18.175	-	1.195
MR-FF-AC-45	11.4	12.4	16.587	-	1.120
MR-FF-AC-46	13.9	15.0	28.827	-	1.073
MR-FF-AC-47	11.2	12.0	13.942	-	0.992
MR-FF-AC-48	8.2	8.8	6.579	-	1.193
MR-FF-AC-49	13.0	14.0	22.087	-	1.005
MR-FF-AC-50	11.5	12.3	16.566	-	1.089
MR-FF-AC-51	12.2	13.2	17.889	-	0.985
MR-FF-AC-52	13.9	15.0	28.129	-	1.047
MR-FF-AC-53	10.9	11.9	14.052	-	1.085
MR-FF-AC-54	15.5	16.8	29.487	-	0.792
MR-FF-AC-55	15.5	16.9	36.551	-	0.982
MR-FF-AC-56	12.2	13.1	21.402	-	1.179
MR-FF-AC-57	12.6	13.6	19.925	-	0.996
MR-FF-AC-58	13.0	14.0	22.926	-	1.044
MR-FF-AC-59	15.0	16.5	30.585	-	0.906

Table G.30: Arctic Charr Measurements from Fish Captured at the Mary River Far-Field Area by Electrofishing as Part of the Mary River Project EEM, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
MR-FF-AC-60		11.3	12.1	15.386	-	1.066
MR-FF-AC-61		12.4	13.4	22.403	-	1.175
MR-FF-AC-62		15.6	16.9	32.972	-	0.869
MR-FF-AC-63		13.0	13.9	20.955	-	0.954
MR-FF-AC-64		12.5	13.5	23.753	-	1.216
MR-FF-AC-65		13.1	14.1	27.020	-	1.202
MR-FF-AC-66		11.6	12.5	16.457	-	1.054
MR-FF-AC-67		18.3	19.8	56	-	0.914
MR-FF-AC-68		8.2	8.8	6.518	-	1.182
MR-FF-AC-69		16.3	17.7	36.480	-	0.842
MR-FF-AC-70		13.0	14.0	20.302	-	0.924
MR-FF-AC-71		10.2	11.0	12.626	-	1.190
MR-FF-AC-72		13.0	14.1	23.922	-	1.089
MR-FF-AC-73		13.7	14.8	25.515	-	0.992
MR-FF-AC-74		17.3	18.6	49	-	0.946
MR-FF-AC-75		12.4	13.3	18.645	-	0.978
MR-FF-AC-76		13.3	14.3	21.957	-	0.933
MR-FF-AC-77		13.3	14.4	22.383	-	0.951
MR-FF-AC-78		12.9	13.9	20.245	-	0.943
MR-FF-AC-79		10.4	11.2	13.070	-	1.162
MR-FF-AC-80		17.8	19.4	52	-	0.922
MR-FF-AC-81		12.0	13.0	20.633	-	1.194
MR-FF-AC-82		12.6	13.6	19.636	-	0.982
MR-FF-AC-83		17.6	19.0	45	-	0.825
MR-FF-AC-84		16.8	18.0	37	-	0.780
MR-FF-AC-85		17.4	18.9	52	-	0.987
MR-FF-AC-86		15.2	16.5	30.117	-	0.858
MR-FF-AC-87		16.7	18.1	35	-	0.751
MR-FF-AC-88		13.8	14.8	23.499	-	0.894
MR-FF-AC-89		16.8	18.5	42	-	0.886
MR-FF-AC-90		10.9	11.6	14.225	-	1.098
MR-FF-AC-91		11.0	11.8	15.461	-	1.162
MR-FF-AC-92		11.4	12.2	16.260	2	1.098
MR-FF-AC-93		10.1	10.8	10.986	2	1.066
MR-FF-AC-94		8.6	9.2	7.659	1	1.204
MR-FF-AC-95		9.5	10.2	9.949	2	1.160
MR-FF-AC-96		16.8	18.3	44	4	0.928
MR-FF-AC-97		14.1	15.3	28.108	3	1.003
MR-FF-AC-98		13.6	14.6	22.804	3	0.907
MR-FF-AC-99		10.6	11.3	11.906	2	1.000
MR-FF-AC-100		8.3	8.7	5.963	1	1.043
Overall Catch Summary	**total number**	**100**	**100**	**100**	**10**	**100**
	average	**13.1**	**14.2**	**24.198**	**2.2**	**1.014**
	median	**12.9**	**14.0**	**21.391**	**2.0**	**1.011**
	standard deviation	**2.5**	**2.7**	**12.116**	**0.9**	**0.114**
	standard error	**0.2**	**0.3**	**1.212**	**0.3**	**0.011**
	minimum	**8.2**	**8.7**	**5.963**	**1**	**0.751**
	maximum	**19.8**	**21.5**	**62.000**	**4**	**1.216**

Table G.31: Non-Lethal Endpoint Statistical Comparison Results for Arctic Charr Collected from Mary River Near- and Far-Field Study Areas as Part of the Mary River Project EEM, August 2017

Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Statistics			Summary Statistics			Test *P*-value (Area)	Magnitude of Difference (%)[a]	Estimated Minimum Detectable Difference (% Relative to Reference) with α=β=0.1	
		Response	Covariate	Far-Field Area	Near-Field Area		Interaction Model	Parallel Slope Model	Covariate Value for Comparisons							
							Interaction P-value	Covariate P-value		Statistic	Far-Field Area	Near-Field Area			Decrease	Increase
Survival/ Recruitment	Length Frequency Distribution All Fish	Fork Length (cm)	n/a	102	100	K-S	-	-	-	-	-	-	0.936	-	-	-
	Length Frequency Distribution Non-YOY only	Fork Length (cm)	n/a	100	100	K-S	-	-	-	-	-	-	0.906	-	-	-
Body Size	Fork Length (Non-YOY)	$\log_{10}$[Fork Length (cm)]	n/a	100	100	t-test	-	-	-	Geometric Mean	12.9	12.7	0.523	-1.6	-7.4	8.0
	Body Weight (Non-YOY)	$\log_{10}$[Body Weight (g)]	n/a	100	100	t-test	-	-	-	Geometric Mean	21.6	19.7	0.200	-8.7	-19	23
Energy Storage	Condition (Non-YOY)	$\log_{10}$[Body Weight (g)]	$\log_{10}$[Fork Length (cm)]	100	100	ANCOVA	0.001[b]	<0.001	12.8	Adjusted Mean	21.1	20.1	<0.001	-4.5	-2.3	2.3

= P-value < 0.05 for ANCOVA interaction and covariate terms and P-value < 0.1 for overall test for area

[a] For ANCOVA: Calculated as the difference in adjusted mean between areas (effluent-exposed minus reference), expressed as a percentage of the reference area mean

[b] The R^2 of the interaction model was 0.9766 and the R^2 of the parallel slope model was 0.9753 (difference of 0.13%) so the ANCOVA proceeded under the assumption that the slopes are practically parallel, as per Environment Canada (2012) guidance.

Table G.32: Estimated Minimum Sample Sizes to Detect Various Effect Sizes for Arctic Charr Health Endpoints between Mary River Near- and Far-Field Areas Based on the Observed Variability in the EEM Study, 2017

Indicator	Endpoint	Variables		Sample Size		Model	S[a]	Minimum Sample Size to Detect an Effect Size (% Increase [i] or Decrease [d] Relative to Reference) with α=β=0.1							
		Response	Covariate	Far-Field	Near-Field			i=5%	i=10%	i=20%	i=25%	i=30%	i=40%	i=50%	i=100%
								d=5%	d=9%	d=17%	d=20%	d=23%	d=29%	d=33%	d=50%
Body Size	Fork Length	$\log_{10}$[Fork Length (cm)]	n/a	100	100	t-test	0.0803	247	66	19	13	10	6	5	3
	Body Weight	$\log_{10}$[Body Weight (g)]	n/a	100	100	t-test	0.2161	1,782	468	129	86	63	39	27	10
Energy Storage	Condition	$\log_{10}$[Body Weight (g)]	$\log_{10}$[Fork Length (cm)]	100	100	ANCOVA	0.0342	46	13	5	4	3	3	2	2

[a] Pooled standard deviation of the residuals.

Table G.33: Arctic Charr Measurements from Fish Captured at Mary Lake by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID	Fork Length (cm)	Total Length (cm)	Total Length (mm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
ML17-ACJ-01	13.4	14.3	143	23.802	3++	0.989
ML17-ACJ-02	10.3	11.0	110	9.218	2++	0.844
ML17-ACJ-03	7.5	7.9	79	3.745	1	0.888
ML17-ACJ-04	12.0	12.8	128	13.849	2++	0.801
ML17-ACJ-05	8.2	8.8	88	5.380	1+	0.976
ML17-ACJ-06	8.8	9.4	94	5.843	1++	0.857
ML17-ACJ-07	6.8	7.1	71	2.517	1+	0.800
ML17-ACJ-08	5.8	6.1	61	1.605	1	0.823
ML17-ACJ-09	4.2	4.4	44	0.495	0++	0.668
ML17-ACJ-10	3.7	3.9	39	0.487	0++	0.961
ML17-ACJ-11	3.6	3.8	38	0.370	-	0.793
ML17-ACJ-12	9.6	10.3	103	6.516	-	0.736
ML17-ACJ-13	9.5	10.1	101	7.052	-	0.823
ML17-ACJ-14	9.3	9.9	99	6.910	-	0.859
ML17-ACJ-15	7.5	8.1	81	3.649	-	0.865
ML17-ACJ-16	8.4	9.0	90	5.154	-	0.870
ML17-ACJ-17	6.3	6.6	66	2.212	-	0.885
ML17-ACJ-18	8.0	8.6	86	4.565	-	0.892
ML17-ACJ-19	6.0	6.5	65	2.011	-	0.931
ML17-ACJ-20	6.3	6.6	66	2.062	-	0.825
ML17-ACJ-21	6.0	6.5	65	1.871	-	0.866
ML17-ACJ-22	10.1	10.9	109	9.004	-	0.874
ML17-ACJ-23	9.8	10.5	105	8.284	-	0.880
ML17-ACJ-24	8.2	8.9	89	4.880	-	0.885
ML17-ACJ-25	9.1	9.8	98	6.747	-	0.895
ML17-ACJ-26	6.9	7.4	74	2.987	-	0.909
ML17-ACJ-27	6.3	6.6	66	2.364	-	0.945
ML17-ACJ-28	6.2	6.6	66	2.123	-	0.891
ML17-ACJ-29	9.3	10.2	102	6.804	-	0.846
ML17-ACJ-30	7.0	7.5	75	3.378	-	0.985
ML17-ACJ-31	6.0	6.4	64	1.998	-	0.925
ML17-ACJ-32	10.5	11.6	116	9.707	-	0.839
ML17-ACJ-33	10.5	11.3	113	9.169	-	0.792
ML17-ACJ-34	11.0	11.7	117	11.569	-	0.869
ML17-ACJ-35	4.1	4.3	43	0.728	-	1.056
ML17-ACJ-36	4.2	4.4	44	0.745	-	1.006
ML17-ACJ-37	4.3	4.5	45	0.744	-	0.936
ML17-ACJ-38	6.0	6.4	64	1.919	-	0.888
ML17-ACJ-39	6.7	7.1	71	2.324	-	0.773
ML17-ACJ-40	6.7	7.1	71	2.105	-	0.700
ML17-ACJ-41	6.0	6.5	65	1.836	-	0.850
ML17-ACJ-42	10.8	11.6	116	12.558	-	0.997
ML17-ACJ-43	6.2	6.6	66	2.015	-	0.845
ML17-ACJ-44	6.2	6.6	66	2.213	-	0.929
ML17-ACJ-45	7.6	8.1	81	3.746	-	0.853
ML17-ACJ-46	9.5	10.2	102	6.755	-	0.788
ML17-ACJ-47	5.9	6.3	63	1.745	-	0.850
ML17-ACJ-48	4.6	4.8	48	0.923	-	0.948
ML17-ACJ-49	4.1	4.3	43	0.684	-	0.992
ML17-ACJ-50	9.0	9.6	96	5.681	-	0.779
ML17-ACJ-51	6.4	6.8	68	2.269	-	0.866
ML17-ACJ-52	8.6	9.3	93	5.476	-	0.861
ML17-ACJ-53	4.8	5.1	51	1.028	-	0.930
ML17-ACJ-54	5.6	5.9	59	1.409	-	0.802
ML17-ACJ-55	6.0	6.4	64	1.940	-	0.898
ML17-ACJ-56	4.4	4.6	46	0.790	-	0.927
ML17-ACJ-57	4.0	4.2	42	0.536	-	0.838

Table G.33: Arctic Charr Measurements from Fish Captured at Mary Lake by Electrofishing, Mary River Project CREMP, August 2017

Specimen ID		Fork Length (cm)	Total Length (cm)	Total Length (mm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
ML17-ACJ-58		6.4	6.8	68	2.081	-	0.794
ML17-ACJ-59		6.4	6.9	69	2.436	-	0.929
ML17-ACJ-60		6.0	6.5	65	1.959	-	0.907
ML17-ACJ-61		6.1	6.5	65	2.128	-	0.938
ML17-ACJ-62		7.9	8.4	84	4.226	-	0.857
ML17-ACJ-63		5.6	6.0	60	1.810	-	1.031
ML17-ACJ-64		3.8	4.0	40	0.494	-	0.900
ML17-ACJ-65		4.6	4.9	49	0.809	-	0.831
ML17-ACJ-66		8.1	8.6	86	4.534	-	0.853
ML17-ACJ-67		10.5	11.3	113	10.168	-	0.878
ML17-ACJ-68		10.5	11.2	112	9.684	-	0.837
ML17-ACJ-69		9.5	10.2	102	7.114	-	0.830
ML17-ACJ-70		8.2	8.8	88	4.779	-	0.867
ML17-ACJ-71		5.8	6.2	62	1.862	-	0.954
ML17-ACJ-72		6.9	7.3	73	2.669	-	0.812
ML17-ACJ-73		5.0	5.3	53	1.248	-	0.998
ML17-ACJ-74		8.7	9.3	93	5.704	-	0.866
ML17-ACJ-75		8.5	9.1	91	4.818	-	0.785
ML17-ACJ-76		6.7	7.1	71	2.569	-	0.854
ML17-ACJ-77		9.7	10.4	104	7.542	-	0.826
ML17-ACJ-78		8.5	9.1	91	5.076	-	0.827
ML17-ACJ-79		7.7	8.2	82	3.741	-	0.819
ML17-ACJ-80		8.5	9.0	90	4.396	-	0.716
ML17-ACJ-81		7.5	8.0	80	3.632	-	0.861
ML17-ACJ-82		6.9	7.3	73	2.310	-	0.703
ML17-ACJ-83		6.1	6.4	64	1.898	-	0.836
ML17-ACJ-84		4.0	4.2	42	0.442	-	0.691
ML17-ACJ-85		3.9	4.1	41	0.418	-	0.705
ML17-ACJ-86		9.1	9.7	97	6.556	-	0.870
ML17-ACJ-87		7.7	8.2	82	4.118	-	0.902
ML17-ACJ-88		8.4	9.0	90	4.875	-	0.823
ML17-ACJ-89		8.0	8.5	85	4.288	-	0.838
ML17-ACJ-90		9.6	10.2	102	7.620	-	0.861
ML17-ACJ-91		8.5	8.9	89	5.348	-	0.871
ML17-ACJ-92		5.7	6.0	60	1.796	-	0.970
ML17-ACJ-93		6.3	6.6	66	2.116	-	0.846
ML17-ACJ-94		6.0	6.3	63	1.741	-	0.806
ML17-ACJ-95		4.0	4.2	42	0.639	-	0.998
ML17-ACJ-96		4.9	5.1	51	1.176	-	1.000
ML17-ACJ-97		3.7	3.9	39	0.444	-	0.877
ML17-ACJ-98		3.9	4.1	41	0.504	-	0.850
Overall Catch Summary	Sample Size (N)	98	98	98	98	10	98
	Average	7.1	7.6	75.9	3.982	1.2	0.867
	Median	6.8	7.1	71.0	2.477	1	0.863
	Standard Deviation	2.2	2.3	23.5	3.627	0.9	0.077
	Standard Error	0.2	0.2	2.4	0.366	0.3	0.008
	Minimum	3.6	3.8	38.0	0.370	0	0.668
	Maximum	13.4	14.3	143.0	23.802	3	1.056
Young-of-the-Year Catch Summary	proportion of YOY	**20%**					
	Sample Size (N)	20	20	20	20	2	20
	Average	4.2	4.4	44.1	0.685	0.0	0.895
	Median	4.1	4.3	43.0	0.662	0	0.928
	Standard Deviation	0.4	0.4	4.3	0.254	0	0.113
	Standard Error	0.1	0.1	1.0	0.057	0	0.025
	Minimum	3.6	3.8	38.0	0.370	0	0.668
	Maximum	5.0	5.3	53.0	1.248	0	1.056

Table G.34: Results of Nearshore Arctic Charr Young-of-the-Year (YOY) and Non-YOY Health Endpoint Statistical Comparisons between Mary Lake (BLO) and Reference Lake 3 (REF), Mary River Project CREMP, August 2017

Group	Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
			Response	Covariate	REF	Mary Lake		Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]	Statistic	REF	Mary Lake		
								Interaction P-value	Covariate P-value						
All Fish	Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	100	98	K-S	-	-	-	-	-	-	0.004	25
YOY	Body Size	Fork Length	log[Fork Length (cm)]	-	26	19	t-test	-	-	-	Geometric Mean	3.62	4.13	<0.001	14
		Body Weight	log[Body Weight (g)]	-	26	19	t-test	-	-	-	Geometric Mean	0.446	0.622	<0.001	40
	Energy Storage	Condition[e]	log[Body Weight (g)]	log[Fork Length (cm)]	26	19	ANCOVA	0.350	<0.001	3.83	Adjusted Mean	0.531	0.490	0.224	-7.7
			log[Body Weight (g)]	log[Fork Length (cm)]	25	19	ANCOVA	0.985	<0.001	3.84	Adjusted Mean	0.534	0.486	0.087	-9.0
Non-YOY	Survival	Length Frequency Distribution	Fork Length (cm)	-	74	79	K-S	-	-	-	-	-	-	0.004	29
	Body Size	Fork Length	Fork Length (cm)	-	74	79	M-W	-	-	-	Median	6.60	7.70	0.014	17
		Body Weight	Body Weight (g)	-	74	79	M-W	-	-	-	Median	2.48	3.75	0.012	51
	Energy Storage	Condition[f]	log[Body Weight (g)]	log[Fork Length (cm)]	74	79	ANCOVA	0.680	<0.001	7.32	Adjusted Mean	3.33	3.38	0.277	1.4
			log[Body Weight (g)]	log[Fork Length (cm)]	73	79	ANCOVA	0.772	<0.001	7.32	Adjusted Mean	3.32	3.39	0.133	1.9

Indicates P-value < 0.1 (i.e., significant difference between data sets)

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for $\log_{10}$-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

[e] Sample REF317-ACJ-25 was determined to be a statistical outlier (Studentized residual = 4.33) from the 2017 Reference Lake 3 data set. The analysis was conducted with both the inclusion and exclusion of this individual.

[f] Sample REF317-ACJ-56 was determined to be a statistical outlier (Studentized residual = 4.64) from the 2017 Reference Lake 3 data set. The analysis is presented with both the inclusion and exclusion of this individual.

Table G.35: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Mary Lake Using 2017 Data Relative to Reference Lake 3 (2017) Data or Mary Lake Baseline (2006 - 2013) Data with α=β=0.1, Mary River Project CREMP, 2017

Comparison	Group	Indicator	Endpoint	Variables		Test	S[a]	COV (%)[b]	Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1									
				Response	Covariate				log(Response)	5%	10%	20%	25%	30%	33%	40%	50%	100%
										-5%	-9%	-17%	-20%	-23%	-25%	-29%	-33%	-50%
									Response	±5%	±10%	±20%	±25%	±30%	±33%	±40%	±50%	±100%
Nearshore Arctic Charr (Electrofishing Data) versus Reference Lake 3, 2017 Data	YOY	Body Size	Fork Length	log[Fork Length (cm)]	-	t-test	0.03321	-	log(Response)	43	12	4	4	3	3	3	2	2
			Body Weight	log[Adjusted Body Weight (g)]	-	t-test	0.12408	-	log(Response)	588	155	43	29	22	18	14	10	4
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.07194	-	log(Response)	200	54	16	12	9	8	7	5	4
				log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.05961	-	log(Response)	138	38	12	9	7	6	5	4	3
	Non-YOY	Body Size	Fork Length	Fork Length (cm)	-	M-W	-	23.77	Response	450	114	29	20	14	12	9	6	4
			Body Weight	Body Weight (g)	-	M-W	-	100.7	Response	8,035	2,010	504	323	225	182	128	83	22
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.03450	-	log(Response)	48	14	6	5	4	4	4	3	3
				log[Adjusted Body Weight (g)]	log[Fork Length (cm)]	ANCOVA	0.03236	-	log(Response)	42	13	5	4	4	4	4	3	3
Littoral/Profundal Arctic Charr (Gill Netting Data) 2017 versus Baseline	All fish	Body Size	Fork Length	Fork Length (mm)	-	M-W	-	21.81	Response	379	97	26	17	12	11	7	6	4
			Body Weight	Body Weight (g)	-	M-W	-	72.00	Response	4,113	1,029	259	166	116	94	66	43	12
		Growth	Weight-at-age	log[Adjusted Body Weight (g)]	log[Age (years)]	ANCOVA	0.25191	-	log(Response)	2,423	637	176	118	86	72	53	37	14
			Length-at-age	log[Fork Length (mm)]	log[Age (years)]	ANCOVA	0.08535	-	log(Response)	280	75	22	16	12	10	8	6	4
		Energy Storage	Condition	log[Adjusted Body Weight (g)]	log[Fork Length (mm)]	ANCOVA	0.05584	-	log(Response)	121	33	11	8	6	6	5	4	3

[a] Pooled standard deviation of the regression residuals

[b] Coefficient of variation (pooled standard deviation/reference mean)×100%

Table G.36: Gill Netting Catch Records for Mary Lake, Mary River Project CREMP, August 2017

Gill Net Set ID	Location (NAD83, UTM Zone 17W)		Length (m)	Set Date	Lift Date	Set Time	Lift Time	Fishing Hours	Effort (m*hrs/100 m)	Arctic Charr Catch per Mesh Size			Total Catch	CPUE
	Easting	Northing								1½"	2"	3"		
ML17-GN-1	555112	7905861	91.4	17-Aug-17	17-Aug-17	10:55	12:15	1.33	1.22	0	3	4	7	5.74
				17-Aug-17	17-Aug-17	12:25	14:35	2.17	1.98	1	2	2	5	2.52
				17-Aug-17	17-Aug-17	15:00	16:25	1.42	1.30	0	0	2	2	1.54
				18-Aug-17	18-Aug-17	9:45	11:10	1.42	1.30	0	1	3	4	3.09
ML17-GN-2	555054	7905720	91.4	17-Aug-17	17-Aug-17	11:05	12:40	1.58	1.45	1	2	4	7	4.83
				17-Aug-17	17-Aug-17	12:50	15:15	2.42	2.21	3	1	1	5	2.26
ML17-GN-3	555134	7905118	91.4	17-Aug-17	17-Aug-17	11:15	13:00	1.75	1.60	1	2	4	7	4.37
ML17-GN-4	555921	7904056	91.4	17-Aug-17	17-Aug-17	11:30	13:30	2.00	1.83	1	1	1	3	1.64
ML17-GN-5	556119	7903866	91.4	17-Aug-17	17-Aug-17	11:45	13:45	2.00	1.83	3	3	2	8	4.37
ML17-GN-6	554909	7905977	91.4	17-Aug-17	17-Aug-17	14:20	16:15	1.92	1.75	1	1	1	3	1.71
ML17-GN-7	554592	7906297	91.4	17-Aug-17	17-Aug-17	15:30	18:50	3.33	3.05	2	7	3	12	3.94
				18-Aug-17	18-Aug-17	9:30	10:55	1.42	1.30	2	4	1	7	5.40
ML17-GN-8	554601	7906508	91.4	17-Aug-17	17-Aug-17	15:45	19:05	3.33	3.05	6	0	3	9	2.95
				18-Aug-17	18-Aug-17	9:20	10:25	1.08	0.99	0	1	5	6	6.06
ML17-GN-8	554396	7906450	91.4	17-Aug-17	17-Aug-17	16:35	19:15	2.67	2.44	0	4	3	7	2.87
				18-Aug-17	18-Aug-17	9:05	10:00	0.92	0.84	0	0	1	1	1.19
								Total	**28.12**	**21**	**32**	**40**	**93**	**3.41**

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Table G.37: Arctic Charr Measurements from Fish Captured at Mary Lake by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor
ML17-AC-01	2	39.3	42.8	620	-	1.021
ML17-AC-02	2	37.4	40.5	470	12+	0.898
ML17-AC-03	2	38.9	41.6	540	-	0.917
ML17-AC-04	3	37.2	40.2	510	-	0.991
ML17-AC-05	3	37.0	39.9	540	-	1.066
ML17-AC-06	3	41.5	45.0	580	-	0.811
ML17-AC-07	3	42.0	45.4	620	-	0.837
ML17-AC-08	3	37.6	40.6	520	-	0.978
ML17-AC-09	3	37.4	40.6	540	-	1.032
ML17-AC-10	3	37.5	40.8	520	-	0.986
ML17-AC-11	3	38.4	41.3	480	-	0.848
ML17-AC-12	2	38.6	41.4	470	-	0.817
ML17-AC-13	2	34.0	36.8	380	-	0.967
ML17-AC-14	1½	40.0	43.4	600	-	0.938
ML17-AC-15	3	45.0	49.0	750	-	0.823
ML17-AC-16	3	36.5	39.6	460	-	0.946
ML17-AC-17	3	40.0	43.2	570	-	0.891
ML17-AC-18	3	39.5	43.5	590	-	0.957
ML17-AC-19	2	39.8	42.5	610	-	0.968
ML17-AC-20	2	38.8	41.5	590	-	1.010
ML17-AC-21	1½	40.0	44.0	520	-	0.813
ML17-AC-22	2	39.1	42.5	580	-	0.970
ML17-AC-23	3	39.5	42.7	600	15++	0.974
ML17-AC-24	1½	21.8	23.6	88	5++	0.849
ML17-AC-25	1½	60.0	63.6	2,050	-	0.949
ML17-AC-26	1½	36.5	39.7	500	-	1.028
ML17-AC-27	1½	36.1	39.1	440	11++	0.935
ML17-AC-28	2	61.0	64.4	2,100	-	0.925
ML17-AC-29	2	41.4	44.9	630	-	0.888
ML17-AC-30	2	38.2	41.4	560	-	1.005
ML17-AC-31	3	36.6	39.6	520	-	1.061
ML17-AC-32	3	37.5	40.2	490	-	0.929
ML17-AC-33	1½	37.6	40.8	460	-	0.865
ML17-AC-34	2	37.5	40.5	500	-	0.948
ML17-AC-35	2	30.0	32.4	230	-	0.852
ML17-AC-36	3	41.0	44.1	660	-	0.958
ML17-AC-37	3	37.5	40.1	520	12+	0.986
ML17-AC-38	1½	25.8	30.9	230	-	1.339
ML17-AC-39	1½	29.1	31.5	220	-	0.893
ML17-AC-40	1½	41.8	44.2	610	-	0.835
ML17-AC-41	2	40.5	43.9	570	-	0.858
ML17-AC-42	3	36.5	39.0	510	-	1.049
ML17-AC-43	3	34.5	37.5	410	-	0.998
ML17-AC-44	2	38.5	42.2	560	-	0.981
ML17-AC-45	1½	35.6	38.5	470	-	1.042
ML17-AC-46	3	41.0	44.3	630	-	0.914
ML17-AC-47	3	36.5	38.5	490	-	1.008
ML17-AC-48	3	38.0	41.1	520	-	0.948
ML17-AC-49	3	37.6	41.2	640	-	1.204
ML17-AC-50	3	39.8	43.2	530	15+	0.841
ML17-AC-51	2	30.3	32.8	250	-	0.899
ML17-AC-52	2	40.1	43.2	600	-	0.931
ML17-AC-53	2	33.0	35.6	460	12+	1.280
ML17-AC-54	2	24.0	25.6	130	-	0.940

Table G.37: Arctic Charr Measurements from Fish Captured at Mary Lake by Gill Netting, Mary River Project CREMP, August 2017

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor
ML17-AC-55	2	30.8	33.0	315	8+	1.078
ML17-AC-56	2	37.5	40.0	550	17+	1.043
ML17-AC-57	2	31.6	34.2	290	-	0.919
ML17-AC-58	1½	16.0	17.0	45	-	1.099
ML17-AC-59	1½	37.9	40.6	590	-	1.084
ML17-AC-60	1½	36.0	38.9	520	13+	1.115
ML17-AC-61	1½	31.4	33.0	280	-	0.904
ML17-AC-62	1½	37.0	39.9	560	14+	1.106
ML17-AC-63	1½	28.2	30.5	220	-	0.981
ML17-AC-64	1½	28.1	30.4	200	-	0.901
ML17-AC-65	1½	30.6	33.6	305	13+	1.064
ML17-AC-66	3	36.6	37.2	450	-	0.918
ML17-AC-67	3	40.1	43.5	590	-	0.915
ML17-AC-68	3	36.6	39.6	420	-	0.857
ML17-AC-69	3	35.4	38.5	450	-	1.014
ML17-AC-70	3	34.9	37.9	430	-	1.012
ML17-AC-71	3	38.2	41.3	510	-	0.915
ML17-AC-72	3	39.9	44.9	580	-	0.913
ML17-AC-73	2	23.5	25.7	130	-	1.002
ML17-AC-74	2	31.4	34.0	280	-	0.904
ML17-AC-75	2	36.8	39.4	500	-	1.003
ML17-AC-76	2	28.8	30.9	200	-	0.837
ML17-AC-77	3	35.4	38.2	480	-	1.082
ML17-AC-78	2	35.8	38.2	440	-	0.959
ML17-AC-79	3	39.1	42.2	510	-	0.853
ML17-AC-80	3	40.0	43.7	530	-	0.828
ML17-AC-81	3	38.7	42.3	490	-	0.845
ML17-AC-82	3	37.0	40.1	500	-	0.987
ML17-AC-83	3	36.5	39.6	470	-	0.967
ML17-AC-84	3	37.1	40.7	490	-	0.960
ML17-AC-85	2	37.6	40.5	480	-	0.903
ML17-AC-86	2	34.0	36.4	300	10++	0.763
ML17-AC-87	2	38.0	41.2	480	-	0.875
ML17-AC-88	2	36.5	39.8	430	-	0.884
ML17-AC-89	1½	19.6	21.1	71	-	0.943
ML17-AC-90	1½	18.7	19.9	52	-	0.795
ML17-AC-91	2	37.0	40.2	520	-	1.027
ML17-AC-92	3	35.4	38.5	470	-	1.059
ML17-AC-93	3	41.0	44.0	600	-	0.871
ML17-AC-94	3	34.5	37.5	400	-	0.974
Overall Catch Summary	Sample Size (N)	94	94	94	13	94
	Average	36.3	39.2	493	12.1	0.9
	Median	37.3	40.2	500	12	0.9
	andard Deviation	6.4	6.8	278	3.1	0.1
	Standard Error	0.7	0.7	28.7	0.9	0.0
	Minimum	16.0	17.0	45	5	0.6
	Maximum	61.0	64.4	2,100	17	1.3

Table G.38: Additional Meristics Collected from Arctic Charr Incidental Mortalities at Mary Lake, Mary River Project CREMP, August 2017

Specimen ID		Age (years)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Adjusted Body Weight (g)	Fulton's Condition Factor (K)	Sex	Liver Weight (g)	Liver Somatic Index (LSI)	Gonad Weight (g)	Gonad Somatic Index (GSI)	Gill Net Mesh Size (inches)	Abnormalities[a]
ML17-AC-50		15+	39.8	43.2	530	525	0.841	M	4.262	0.81	0.775	0.148	3	iw (S)
ML17-AC-23		15++	39.5	42.7	600	594	-0.151	i	6.459	1.09	-	-	3	iw (C)
ML17-AC-24		5++	21.8	23.6	88	87	0.849	i	0.943	1.08	-	-	1½	iw (S)
ML17-AC-37		12+	37.5	40.1	520	514	0.986	i	6.100	1.19			3	iw (C)
ML17-AC-55		8+	30.8	33.0	315	313	1.078	i	2.450	0.78			2	iw (C), tw (C)
ML17-AC-56		17+	37.5	40.0	550	543	1.043	i	6.787	1.25	-	-	2	iw (A)
ML17-AC-60		13+	36.0	38.9	520	515	1.115	i	4.716	0.92	-	-	1½	iw (C)
ML17-AC-86		10++	34.0	36.4	300	296	0.763	i	3.734	1.26	-	-	2	iw (S)
ML17-AC-65		13+	30.6	33.6	305	302	1.064	i	3.276	1.09			1½	iw (VA)
ML17-AC-02		12+	37.4	40.5	470	463	0.898	F	4.806	1.04	2.226	0.481	2	iw (C)
ML17-AC-27		11++	36.1	39.1	440	388	0.935	F	9.506	2.45	42.699	11.011	1½	iw (C)
ML17-AC-53		12+	33.0	35.6	460	454	1.280	F	4.750	1.05	1.704	0.376	2	iw (S)
ML17-AC-62		14+	37.0	39.9	560	549	1.106	F	6.927	1.26	3.870	0.705	1½	iw (VA)
Adult Non-Spawner Statistics	Average	11.6	33.5	36.0	399.8	395.4	0.8	-	4.3	1.1	-	-	-	-
	Standard deviation	3.9	5.7	6.0	175.2	173.2	0.4	-	2.1	0.2	-	-	-	-
	Minimum	5	21.8	23.6	88.0	87.1	-0.2	-	0.9	0.8	-	-	-	-
	Maximum	17	39.5	42.7	600.0	593.5	1.1	-	6.8	1.3	-	-	-	-
	Sample Size (N)	8	8	8	8	8	8	8	8	8	-	-	-	-
Females Statistics	Average	12.3	35.9	38.8	482.5	463.4	1.1	-	6.5	1.4	12.6	3.1	-	-
	Standard deviation	1.3	2.0	2.2	53.2	66.3	0.2	-	2.2	0.7	20.1	5.2	-	-
	Minimum	11	33.0	35.6	440.0	387.8	0.9	-	4.8	1.0	1.7	0.4	-	-
	Maximum	14	37.4	40.5	560.0	549.2	1.3	-	9.5	2.5	42.7	11.0	-	-
	Sample Size (N)	4	4	4	4	4	4	4	4	4	4	4	-	-

[a] Abnormalities include internal worms (iw) and tapeworms (tw) in body cavity; letter in parentheses indicates Scarce (1-5), Common (6-15), Abundant (16-50) and Very Abundant (>50) observation.
Sex - Female (F), Male (M), Indeterminate (i).

Table G.39: Results of Adult (Littoral/Profundal) Arctic Charr Health Endpoint Statistical Comparisons for Mary Lake (BLO) between 2017 and the Mine Baseline (2006 - 2013) Period, Mary River Project CREMP, 2017

Indicator	Endpoint	Variables		Sample Size		Test	ANCOVA Model Statistics			Summary Statistics[b]			Test P-value	Magnitude of Difference (%)[c,d]
		Response	Covariate	Baseline	2017		Interaction Model	Parallel Slope Model	Covariate Value for Comparisons[a]	Statistic	Baseline	2017		
							Interaction P-value	Covariate P-value						
Recruitment/ Survival	Length Frequency Distribution	Fork Length (cm)	-	161	94	K-S	-	-	-	-	-	-	<0.001	-29
Body Size	Fork Length	Fork Length (cm)	-	161	94	M-W	-	-	-	Median	39.2	37.3	0.002	-4.8
	Body Weight	Body Weight (g)	-	161	94	M-W	-	-	-	Median	550	500	0.057	-9.1
Growth	Length-at-age	log[Fork Length (cm)]	log[Age (years)]	79	13	ANCOVA	0.178	<0.001	13.0	Adjusted Mean	371	371	0.984	-0.12
	Weight-at-age	log[Body Weight (g)]	log[Age (years)]	79	13	ANCOVA	0.335	<0.001	13.0	Adjusted Mean	477	499	0.804	4.5
Energy Storage	Condition	log[Body Weight (g)]	log[Fork Length (cm)]	161	94	ANCOVA	0.332	<0.001	36.8	Adjusted Mean	449	470	0.008	4.6

Indicates P-value < 0.1 (i.e., significant difference between data sets)

[a] The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

[b] The median, mean (geometric mean for log_{10}-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

[c] The magnitude of difference calculated as: [(2017 mean - baseline mean) / baseline area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(2017 predicted mean - baseline predicted mean) / baseline predicted mean] x 100.

[d] Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between groups. A negative difference implies that 2017 has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that 2017 has fewer fish less than the length where the maximum difference in CFRDs was observed.