

APPENDIX A

DATA QUALITY REVIEW

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A1.0	INTRODUCTION	1
A1.1	Background	1
A2.0	RESULTS	4
A2.1	Water Samples	4
A2.1.1	Sample Blanks	4
A2.1.2	Precision – Field Duplicates	5
A2.2	Sediment Samples	5
A2.2.1	Data Precision – Field Duplicate Samples	5
A2.3	Benthic Invertebrate Community Samples	6
A2.3.1	Subsampling Accuracy	6
A2.3.2	Organism Recovery	6
A3.0	DATA QUALITY STATEMENT	7

A1.0 INTRODUCTION

A1.1 Background

Data Quality Review (DQR) was conducted on data collected as part of the Mary River Project 2016 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 2016 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, the field and/or analytical sample data adequately reflected actual conditions and thus 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 method detection limit (MDL) 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.

A2.0 RESULTS

A2.1 Water Samples

A2.1.1 Sample Blanks

Trip blank samples were taken on field sampling campaigns a total of nine times during the 2016 CREMP, including during two winter lake monitoring events (April-May), one spring stream monitoring event (June), three summer lake/stream monitoring events (July), and three fall lake/stream monitoring events (August). Of the 767 total number of analyses conducted on the trip blank samples, only three (0.4%) resulted in analyte detection above the trip blank DQO of less than five-times the laboratory MDL (Appendix Table A.1). Barium and phenols were detected in trip blanks at concentrations that were above the DQO, but only during the summer sampling period. Bottle contamination or contaminated deionized source water were the most likely sources of contamination. The deionized water used to create trip blanks originated from on-site stock, and was cited as the most likely source of trip blank contamination in previous CREMP (KP 2015).

Field blanks for water samples were assessed a total of eight times during the 2016 CREMP, including on one winter lake monitoring event, one spring stream monitoring event, three summer lake/stream monitoring events, and five fall lake/stream monitoring events. Of the 683 analyses conducted, five (0.7%) resulted in analyte detection above the DQO of less than five-times the laboratory MDL (Appendix Table A.2). Similar to the trip blanks, barium and phenols were the only analytes for which concentrations above DQO were observed in the 2016 field blank samples, and only during the summer sampling period. A similar frequency of detection was observed between the trip and field blanks, which suggested that a similar source of contamination was common to both DQR sample types. These patterns suggest that laboratory water is the most likely source of contamination.

Equipment blank samples were assessed a total of 11 times during the 2016 CREMP, including on two winter lake monitoring events, five summer lake monitoring events, and four fall lake monitoring events. Of the 927 analyses conducted, 19 (2.0%) resulted in analyte detection above the DQO of less than five-times the laboratory MDL (Appendix Table A.3). Similar to the trip and/or field blanks, barium and phenols were frequently observed at concentrations above the DQO in the summer equipment blank samples. In addition to these parameters, turbidity, total aluminum, total manganese, and chlorophyll-a and phaeophytin-a were each detected above the DQO in an equipment blank sample. A greater frequency of detection was observed in the equipment blanks relative to the trip

Table A.1: Trip blank results, CREMP 2016. Highlighted values did not meet the data quality objective of ≤ five-times the laboratory method detection limit (MDL).

Client Sample ID			Lowest MDL ¹	JL0-07	BL0-01	L1-08	REF3-01	MRY-REF3	DL0-01-4	L0-01	BL0-01A	JL0-10
Date Sampled				25-Apr-2016	1-May-2016	27-Jun-2016	16-Jul-2016	25-Jul-2016	25-Jul-2016	19-Aug-2016	21-Aug-2016	22-Aug-2016
ALS Sample ID				L1761257-2	L1764345-3	L1790501-30	L1806585-3	L1805146-2	L1805153-4	L1816817-3	L1817107-6	L1818109-4
Physical Tests	Conductivity	umhos/cm	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Hardness (as CaCO ₃)	mg/L	10	<10	<10	<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	<2.0	<2.0	<2.0
	Total Dissolved Solids	mg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Turbidity	NTU	0.10	<0.10	<0.10	<0.10	<0.10	0.16	0.32	0.18	0.15	0.13
Anions and Nutrients	Alkalinity, Total (as CaCO ₃)	mg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	Ammonia, Total (as N)	mg/L	0.020	<0.020	<0.020	<0.020	<0.020	0.029	<0.020	<0.020	<0.020	0.027
	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	0.50	<0.50	<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	<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	<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	<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	<0.15	<0.15
	Phosphorus, Total	mg/L	0.0030	<0.0030	<0.0030	0.0035	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Sulfate (SO ₄)	mg/L	0.30	<0.30	<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	1.7	<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	<1.0	<1.0	<1.0
Total 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
	Antimony (Sb)	mg/L	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
	Barium (Ba)	mg/L	0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000284	0.000375	<0.000050	<0.000050	<0.000050
	Beryllium (Be)	mg/L	0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	0.000050	<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
	Cadmium (Cd)	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	0.050	<0.050	<0.050	<0.050	<0.050	0.091	0.124	<0.050	<0.050	<0.050
	Chromium (Cr)	mg/L	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
	Copper (Cu)	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)	mg/L	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
	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	0.050	<0.050	<0.050	<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	<0.000070	<0.000070	<0.000070
	Mercury (Hg)	mg/L	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	<0.000050	<0.000050	<0.000050
	Nickel (Ni)	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.050	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Selenium (Se)	mg/L	0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Silver (Ag)	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	0.050	<0.050	<0.050	<0.050	0.118	<0.050	<0.050	<0.050	<0.050	<0.050
	Strontium (Sr)	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Thallium (Tl)	mg/L	0.000010	<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	0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000010	<0.000010	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0031	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Aluminum (Al)	mg/L	0.00060	<0.0030	<0.00060	<0.0050	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)	mg/L	0.000020	<0.00010	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.000020	<0.00010	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.000030 - 0.00010	0.000072	0.000033	<0.00010	0.000316	0.000294	0.000363	<0.000050	<0.000050	<0.000050
	Beryllium (Be)	mg/L	0.000010	<0.00050	<0.000010	<0.00010	<0.00050	<0.00050				

Table A.2: Field blank results, CREMP 2015. Highlighted values did not meet the data quality objective of ≤ five-times the laboratory method detection limit (MDL).

Client Sample ID			Lowest MDL ¹	DL0-02-3	CLT-REF3	D1-00	JL0-09	BL0-06	C0-05	REF3-03	DL0-01-07
Date Sampled				29-Apr-2016	27-Jun-2016	19-Jul-2016	26-Jul-2016	28-Jul-2016	19-Aug-2016	20-Aug-2016	22-Aug-2016
ALS Sample ID				L1764338-7	L1790501-31	L1802460-2	L1806556-23	L1807078-3	L1816817-13	L1816829-7	L1818099-7
Physical Tests	Conductivity	umhos/cm	3.0	<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	<10
	pH	pH units	-	6.54	6.00	6.18	7.87	6.36	6.92	6.40	6.48
	Total Suspended Solids	mg/L	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids	mg/L	10	<10	<10	<20	<10	13	<10	<10	<10
	Turbidity	NTU	0.10	0.18	<0.10	<0.10	0.44	<0.10	0.23	0.16	<0.10
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L	10	<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	<0.020
	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	0.50	<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	<0.021
	Nitrate (as N)	mg/L	0.020	<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	<0.0050
	Total Kjeldahl Nitrogen	mg/L	0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.29	<0.15
	Phosphorus, Total	mg/L	0.0030	<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	<0.30	
Carbon	Dissolved Organic Carbon	mg/L	1.0	1.9	<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	<1.0	<1.0
Total Metals	Aluminum (Al)	mg/L	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
	Arsenic (As)	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.000050	<0.000050	<0.000050	0.000380	0.000418	0.000061	<0.000050	<0.000050	<0.000050
	Beryllium (Be)	mg/L	0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	0.000050	<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
	Cadmium (Cd)	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	0.050	<0.050	<0.050	0.121	0.121	<0.050	<0.050	<0.050	<0.050
	Chromium (Cr)	mg/L	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
	Copper (Cu)	mg/L	0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)	mg/L	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
	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	0.050	<0.050	<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	0.000099	<0.000070
	Mercury (Hg)	mg/L	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	<0.000050	<0.000050
	Nickel (Ni)	mg/L	0.00050	<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	<0.20	<0.20	<0.20	<0.20
	Selenium (Se)	mg/L	0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.050	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Silver (Ag)	mg/L	0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Strontium (Sr)	mg/L	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Thallium (Tl)	mg/L	0.000010	<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	0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000010	<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	<0.0010	<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
Dissolved Metals	Aluminum (Al)	mg/L	0.00060	0.00063	<0.0050	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)	mg/L	0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00003 - 0.00005	0.000043	<0.00010	0.000367	0.000325	0.000054	<0.000050	0.000054	<0.000050
	Beryllium (Be)	mg/L	0.000010	<0.000010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	0.0000050	<0.0000050	<0.000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	0.0050	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	0.020 - 0.050	<0.020	<0.050	0.128	0.124	<0.050	<0.050	<0.050	<0.050
	Chromium (Cr)	mg/L	0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0000050	<0.0000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00050	<0.00010	<0.00020	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)	mg/L	0.0010	<0.0010	<0.010	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	0.0000090	<0.0000090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.0005								

Table A.3: Equipment blank results, CREMP 2016. Highlighted values did not meet the data quality objective of ≤ five-times the laboratory method detection limit (MDL).

Client Sample ID			Lowest MDL ¹	DL0-02-4	JL0-10	JL0-02	DD-HAB-9-STN1	DD-HAB-9-STN1	BL0-05-A	BL0-03	REF3-02	BL0-01	BL0-09	BL0-03
				29-Apr-2016	7-May-2016	24-Jul-2016	24-Jul-2016	25-Jul-2016	30-Jul-2016	30-Jul-2016	19-Aug-2016	21-Aug-2016	23-Aug-2016	24-Aug-2016
				L1764338-3	L1766948-1	L1803150-10	L1803150-3	L1805153-1	L1807075-14	L1807075-7	L1816829-1	L1817107-1	L1820246-8	L1820248-3
Physical Tests	Conductivity	umhos/cm	3.0	<3.0	<3.0	<3.0	<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	<10	<10	<10	<10
	Total Suspended Solids	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	mg/L	10	<10	<10	<20	<20	<10	<10	<10	<10	<10	<10	<10
	Turbidity	NTU	0.10	1.42	<0.10	0.33	0.11	0.40	<0.10	0.13	0.24	0.20	0.38	<0.10
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L	10	<10	<10	<10	<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	<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	<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	<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	<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	<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	<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	<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	<0.0030	<0.0030	<0.0030	0.0031
	Sulfate (SO4)	mg/L	0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Carbon	Dissolved Organic Carbon	mg/L	1.0	1.8	<1.0	<1.0	<1.0	<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	<1.0	<1.0	<1.0	<1.0	<1.0
Total Metals	Aluminum (Al)-Total	mg/L	0.0030	<0.0030	<0.0030	0.00890	0.0036	<0.0030	<0.0030	0.0054	0.0212	0.0063	<0.0030	<0.0030
	Antimony (Sb)-Total	mg/L	0.00010	<0.00010	<0.00010	0.00017	<0.00010	<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	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total	mg/L	0.000050	0.000071	0.000218	0.000534	0.000604	0.000939	0.000339	0.000373	0.000221	0.000071	<0.000050	<0.000050
	Beryllium (Be)-Total	mg/L	0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<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	<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	<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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)-Total	mg/L	0.050	<0.050	0.084	0.188	0.151	0.158	0.127	0.060	<0.050	<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	<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	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total	mg/L	0.00050	<0.00050	<0.00050	<0.00050	0.00075	0.00088	<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	<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	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total	mg/L	0.050	<0.050	<0.050	0.053000	<0.050	<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	0.000228	0.000164	0.000122	0.000075	0.000082	0.000413	0.000128	<0.000070	<0.000070
	Mercury (Hg)-Total	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)-Total	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
	Nickel (Ni)-Total	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)-Total	mg/L	0.050	<0.20	<0.20	<0.20	<0.20	<0.20	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)-Total	mg/L	0.050	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	<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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total	mg/L	0.050	<0.050	<0.050	0.08100	0.15700	0.15400	<0.050	0.10400	0.073	<0.050	<0.050	0.067
	Strontium (Sr)-Total	mg/L	0.00010	<0.00010	<0.00010	0.00017	0.00020	0.00023	<0.00010	0.00011	<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	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total	mg/L	0.00010	0.00012	0.00011	0.00014	0.0002	0.00029	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<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	<0.000					

and field blanks, which suggested that field sampling techniques may occasionally be a source of contamination in samples. Overall, the trip, field and equipment blank analyses indicated that barium and phenols results should be interpreted with caution, but otherwise analyses of these blanks suggested limited sample contamination for the majority of parameters.

A2.1.2 Precision – Field Duplicates

A total of 17 field duplicates were collected over the course of the 2016 Mary River Project CREMP. These included three winter lake monitoring events, two spring stream monitoring events, six summer stream/lake monitoring events, and six fall stream/lake monitoring events. In general, close agreement in parameter concentrations was observed between duplicate samples, with 95% of field duplicate analyte pairs meeting the DQO of $\leq 25\%$ Relative Percent Difference (RPD) in parameter concentrations of the 1,477 duplicate analyses conducted (Table A.4). Total ammonia, total phosphorus, phenols, total aluminum and dissolved manganese were the key parameters which most frequently did not meet DQO between the duplicate samples (Table A.4). In approximately 45% of cases in which DQO were not met, measured concentrations in one or both duplicate samples were close to the MDL (i.e., two- to three-times the MDL) such that small differences in concentrations between duplicate samples resulted in relatively high RPD. For other parameters, the relatively high RPD between duplicate samples likely reflected natural variability in actual concentrations in the field or sampling related influences. However, 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 Samples

A2.2.1 Data Precision – Field Duplicate Samples

Field duplicate sediment samples were collected at each of Camp Lake (Station JLO-02), Sheardown Lake NW (Station DLO-01-2), Mary Lake (BLO-06) and Reference Lake 3 (REF03-9), which represented 9% of the total number of sediment quality monitoring stations sampled for the 2016 CREMP. Good agreement in parameter concentrations were observed between duplicate samples, with only twelve incidences (4.2%) in which the DQO of greater than 40% RPD between duplicate samples was not achieved (Table A.5). Relatively high RPD for arsenic, barium, lead, manganese, molybdenum and/or tin were observed between the field duplicate samples collected from Camp Lake, Sheardown Lake NW and Reference Lake 3 (Table A.5). The relatively high RPD between

Figure A.4: Water sample field duplicate results. Highlighted values did not meet the DQO of ≤ 25% RPD. Highlighted and bold values did not meet the DQO and were calculated from values that were > 10-times the MDL.

Sample ID		Lowest Detection Limit	MRY-REF2	MRY-REF201	RPD	CLT-REF4	CLT-REF401	RPD	REF3-02-S	REF3-02-S01	RPD
Date Sampled			27-Jun-16	27-Jun-16		24-Jul-16	24-Jul-16		28-Jul-16	28-Jul-16	
ALS Sample ID			L1790501-26	L1790501-32		L1803155-1	L1803155-2		L1806575-1	L1806575-3	
Conventional	Conductivity (lab)	3.0	39.5	39.7	0.5	81.4	82.4	1.2	76.6	76.2	0.5
	Hardness (as CaCO ₃)	10	18	18	0	39	39	0	35	35	0
	Total Suspended Solids (TSS)	2.0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids (TDS)	10	26	25	3.9	55	48	14	50	38	27
	Turbidity	0.10	0.67	0.66	1.5	2.35	2.70	14	0.25	0.25	0
	Alkalinity (as CaCO ₃)	10	18	21	15	38	37	2.7	36	37	2.7
Nutrients and Organics	Total Ammonia	0.020	<0.020	0.028	33	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrate	0.020	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrite	0.0050	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen (TKN)	0.15	<0.15	<0.15	0	<0.15	<0.15	0	0.15	0.20	29
	Nitrate and Nitrite (as N)	0.021	<0.021	<0.021	0	<0.021	<0.021	0	<0.021	<0.021	0
	Dissolved Organic Carbon	1.0	1.1	1.1	0	<1.0	<1.0	0	2.6	2.7	3.8
	Total Organic Carbon	1.0	1.3	1.3	0	<1.0	<1.0	0	2.6	2.6	0
	Total Phosphorus	0.0030	0.0303	0.0042	151	0.0044	0.0040	9.5	0.0035	0.0040	13
	Phenols	0.0010	0.0044	0.0031	35	<0.0010	0.0015	40	0.0016	0.0026	48
Anions	Bromide (Br)	0.10	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.50	0.58	0.57	1.7	<0.50	<0.50	0	1.28	1.89	38
	Sulphate (SO ₄)	0.30	0.32	0.30	6.5	0.72	0.71	1.4	4.16	5.16	21
Total Metals	Aluminum (Al)	0.0030	0.0182	0.0177	2.8	0.0996	0.0698	35	<0.0030	<0.0030	0
	Antimony (Sb)	0.00010	<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	0.00200	0.00201	0.5	0.00395	0.00374	5.5	0.00638	0.00678	6.1
	Beryllium (Be)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.010	<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)	0.050	3.69	3.74	1.3	8.01	8.06	0.6	6.96	7.13	2.4
	Cesium (Cs)	0.000010									
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	0.00057	<0.00050	13
	Cobalt (Co)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	0.00079	0.00076	3.9
	Iron (Fe)	0.030	<0.030	<0.030	0	0.045	0.032	34	<0.030	<0.030	0
	Lead (Pb)	0.000050	<0.000050	<0.000050	0	0.000058	0.000052	11	<0.000050	<0.000050	0
	Lithium (Li)	0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.050	2.07	2.16	4.3	4.54	4.48	1.3	4.55	4.37	4.0
	Manganese (Mn)	0.000070	0.000617	0.000593	4.0	0.000551	0.000499	9.9	0.000677	0.000637	6.1
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	<0.000050	<0.000050	0	0.000115	0.000106	8.1	0.000124	0.000125	0.8
	Nickel (Ni)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Phosphorus (P)	0.050									
	Potassium (K)	0.050	0.27	0.29	7.1	0.50	0.47	6.2	0.89	0.89	0
	Rubidium (Rb)	0.00020									
	Selenium (Se)	0.000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.33	0.34	3.0	0.84	0.76	10	0.43	0.45	4.5
	Silver (Ag)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.050	0.399	0.415	3.9	0.580	0.569	1.9	0.847	0.847	0
	Strontium (Sr)	0.00010	0.00283	0.00286	1.1	0.00617	0.00614	0.5	0.00780	0.00801	2.7
	Sulfur (S)	0.50									
	Tellurium (Te)	0.00020									
	Thallium (Tl)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Thorium (Th)	0.00010									
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.00030	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Tungsten (W)	0.00010									
	Uranium (U)	0.000010	0.000189	0.000199	5.2	0.00137	0.00136	0.7	0.000247	0.000256	3.6
	Vanadium (V)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.0030	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.00030									
Dissolved Metals	Aluminum (Al)	0.00050	0.0052	<0.00050	165	0.0117	0.0121	3.4	<0.0030	<0.0030	0
	Antimony (Sb)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000030	0.00190	0.00193	1.6	0.00352	0.00362	2.8	0.00656	0.00666	1.5
	Beryllium (Be)	0.000010	<0.00010	<0.00010	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.0000050	<0.000050	<0.000050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.0050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.0000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.020	3.67	3.74	1.9	8.16	8.04	1.5	6.96	7.00	0.6
	Cesium (Cs)	0.000010	<0.000010	<0.000010	0						
	Chromium (Cr)	0.00010	<0.00050	0.0405	195	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000050	<0.00010	0.00012	18	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00020	0.00027	0.00313	168	<0.00050	<0.00050	0	0.00078	0.00076	2.6
	Iron (Fe)	0.0010	<0.010	0.891	196	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.0000090	<0.000050	<0.000050	0	<0.000050	<0.000050	0	0.000066	<0.00050	153
	Lithium (Li)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.0050	2.19	2.19	0	4.55	4.64	2.0	4.34	4.37	0.7
	Manganese (Mn)	0.000070	<0.00050	0.0109	182	0.000125	0.000078	46	0.000223	0.000283	24
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000055	0.000403	152	0.00011919</					

Figure A.4: Water sample field duplicate results. Highlighted values did not meet the DQO of ≤ 25% RPD. Highlighted and bold values did not meet the DQO and were calculated from values that were > 10-times the MDL.

Sample ID		Lowest Detection Limit	REF3-0101	REF3-01-S	RPD	JL0-02 (S)	JL0-0201	RPD	DL0-01-1(S)	DL0-01-101	RPD
Date Sampled			20-Aug-16	20-Aug-16		23-Apr-16	23-Apr-16		26-Apr-16	26-Apr-16	
ALS Sample ID			L1816829-4	L1816829-5		L1761245-1	L1761245-2		L1762422-3	L1762422-5	
Conventional	Conductivity (lab)	3.0	76.7	77.0	0.4	161	162	0.6	151	151	0
	Hardness (as CaCO ₃)	10	35	35	0	81	80	1.2	73	71	2.8
	Total Suspended Solids (TSS)	2.0	<2.0	<2.0	0	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids (TDS)	10	39	37	5.3	107	105	1.9	87	88	1.1
	Turbidity	0.10	0.32	0.44	32	0.17	0.21	21	0.26	0.26	0
	Alkalinity (as CaCO ₃)	10	30	32	6.5	76	75	1.3	71	69	2.9
Nutrients and Organics	Total Ammonia	0.020	<0.020	<0.020	0	<0.020	0.026	26	<0.020	0.065	106
	Nitrate	0.020	<0.020	<0.020	0	<0.020	<0.020	0	0.033	0.034	3.0
	Nitrite	0.0050	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen (TKN)	0.15	<0.15	<0.15	0	<0.15	<0.15	0	0.18	0.17	5.7
	Nitrate and Nitrite (as N)	0.021	<0.021	<0.021	0	<0.021	<0.021	0	0.033	0.034	3.0
	Dissolved Organic Carbon	1.0	2.8	2.8	0	3.1	2.8	10	2.6	2.7	3.8
	Total Organic Carbon	1.0	2.9	2.8	3.5	2.1	2.0	4.9	2.2	2.0	9.5
	Total Phosphorus	0.0030	0.0043	0.0034	23	0.0031	<0.0030	3.3	0.0031	<0.0030	3.3
	Phenols	0.0010	0.0037	0.0027	31	0.0011	0.0023	71	<0.0010	<0.0010	0
Anions	Bromide (Br)	0.10	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.50	1.27	1.27	0	4.22	4.29	1.6	3.51	3.51	0
	Sulphate (SO ₄)	0.30	4.04	4.08	1.0	2.02	2.04	1.0	3.96	3.95	0.3
Total Metals	Aluminum (Al)	0.0030	0.0043	0.0035	21	0.0047	<0.0030	44	0.0100	0.0049	68
	Antimony (Sb)	0.00010	<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	0.00657	0.00665	1.2	0.00732	0.00738	0.8	0.00676	0.00638	5.8
	Beryllium (Be)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.010	<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)	0.050	7.02	7.00	0.3	16.4	16.3	0.6	14.4	14.6	1.4
	Cesium (Cs)	0.000010									
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	0.00085	52
	Cobalt (Co)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00082	0.00083	1.2	0.00112	0.00129	14	0.00091	0.00099	8.4
	Iron (Fe)	0.030	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.000050	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	0.0010	0
	Magnesium (Mg)	0.050	4.22	4.37	3.5	9.68	9.61	0.7	8.93	8.78	1.7
	Manganese (Mn)	0.000070	0.000566	0.000570	0.7	0.000426	0.000334	24	0.00176	0.00174	1.1
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000136	0.000130	4.5	0.000317	0.000327	3.1	0.000939	0.000950	1.2
	Nickel (Ni)	0.00050	<0.00050	<0.00050	0	0.00072	0.00065	10	0.00146	0.00232	46
	Phosphorus (P)	0.050									
	Potassium (K)	0.050	0.88	0.90	2.2	1.27	1.27	0	1.22	1.20	1.7
	Rubidium (Rb)	0.00020									
	Selenium (Se)	0.000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.39	0.40	2.5	0.42	0.42	0	0.64	0.66	3.1
	Silver (Ag)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.050	0.826	0.832	0.7	1.65	1.64	0.6	1.55	1.52	2.0
	Strontium (Sr)	0.00010	0.00811	0.00816	0.6	0.0115	0.0116	0.9	0.00974	0.00981	0.7
	Sulfur (S)	0.50									
	Tellurium (Te)	0.00020									
	Thallium (Tl)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Thorium (Th)	0.00010									
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	0.00024	0.00035	37
	Titanium (Ti)	0.00030	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Tungsten (W)	0.00010									
	Uranium (U)	0.000010	0.000285	0.000282	1.1	0.000931	0.000901	3.3	0.00115	0.00114	0.9
	Vanadium (V)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.0030	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.00030									
	Dissolved Metals	Aluminum (Al)	0.00050	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030
Antimony (Sb)		0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
Arsenic (As)		0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
Barium (Ba)		0.000030	0.00656	0.00630	4.0	0.00730	0.00729	0.1	0.00677	0.00661	2.4
Beryllium (Be)		0.000010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
Bismuth (Bi)		0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
Boron (B)		0.0050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
Cadmium (Cd)		0.0000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
Calcium (Ca)		0.020	7.12	6.92	2.8	16.5	16.1	2.5	14.0	14.2	1.4
Cesium (Cs)		0.000010									
Chromium (Cr)		0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
Cobalt (Co)		0.0000050	<0.00010	<0.00010	0	0.00012	<0.00010	18	<0.00010	<0.00010	0
Copper (Cu)		0.00020	0.00090	0.00090	0	0.00133	0.00116	14	0.00086	0.00081	6.0
Iron (Fe)		0.0010	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
Lead (Pb)		0.0000090	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
Lithium (Li)		0.00050	<0.0010	<0.0010	0	0.0010	0.0011	9.5	<0.0010	<0.0010	0
Magnesium (Mg)		0.0050	4.27	4.38	2.5	9.64	9.67	0.3	9.13	8.67	5.2
Manganese (Mn)		0.000070	0.000255	0.000244	4.4	0.00196	0.00274	33	0.000303	0.000215	34
Mercury (Hg)		0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
Molybdenum (Mo)		0.000050	0.000133	0.000133	0	0.000506	0.000467	8.0	0.000920	0.000900	2.2
Nickel (Ni)		0.000090	<0.00050	<0.00050	0	0.0121	0.00806	40	0.00099	0.00087	13
Phosphorus (P)		0.050									
Potassium (K)		0.									

Figure A.4: Water sample field duplicate results. Highlighted values did not meet the DQO of ≤ 25% RPD. Highlighted and bold values did not meet the DQO and were calculated from values that were > 10-times the MDL.

Sample ID		Lowest Detection Limit	BL0-09-B	BL0-09-B01	RPD	C0-10	C0-1001	RPD	JL0-07-S	JL0-07-S01	RPD
Date Sampled			6-May-16	6-May-16		25-Jun-16	25-Jun-16		26-Jul-16	26-Jul-16	
ALS Sample ID			L1766933-4	L1766933-5		L1790501-3	L1790501-4		L1806556-25	L1806556-26	
Conventional	Conductivity (lab)	3.0	82.6	82.7	0.1	19.9	20.0	0.5	132	132	0
	Hardness (as CaCO ₃)	10	43	40	7.2	<10	<10	0	64	65	1.6
	Total Suspended Solids (TSS)	2.0	<2.0	<2.0	0	2.8	2.8	0	<2.0	<2.0	0
	Total Dissolved Solids (TDS)	10	45	44	2.2	<10	<10	0	76	74	2.7
	Turbidity	0.10	0.20	0.19	5.1	3.94	3.95	0.3	0.34	0.41	19
	Alkalinity (as CaCO ₃)	10	41	40	2.5	11	12	8.7	65	66	1.5
Nutrients and Organics	Total Ammonia	0.020	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrate	0.020	0.076	0.069	9.7	0.048	0.033	37	<0.020	<0.020	0
	Nitrite	0.0050	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen (TKN)	0.15	<0.15	0.16	6.5	<0.15	<0.15	0	<0.15	<0.15	0
	Nitrate and Nitrite (as N)	0.021	0.076	0.069	9.7	0.048	0.033	37	<0.021	<0.021	0
	Dissolved Organic Carbon	1.0	1.2	1.3	8.0	<1.0	<1.0	0	1.5	1.5	0
	Total Organic Carbon	1.0	1.4	1.5	6.9	1.1	<1.0	9.5	1.7	1.7	0
	Total Phosphorus	0.0030	0.0043	<0.0030	36	0.0072	0.0074	2.7	0.0035	<0.0030	15
	Phenols	0.0010	0.0014	0.0015	6.9	0.0017	0.0011	43	0.0037	0.0066	56
Anions	Bromide (Br)	0.10	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.50	2.00	1.86	7.3	0.63	0.71	12	3.34	3.33	0.3
	Sulphate (SO ₄)	0.30	1.03	1.01	2.0	0.45	0.43	4.5	1.98	1.98	0
Total Metals	Aluminum (Al)	0.0030	0.0065	0.0071	8.8	0.0907	0.0826	9.3	0.0059	0.0069	16
	Antimony (Sb)	0.00010	<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	0.00486	0.00481	1.0	0.00202	0.00193	4.6	0.00639	0.00639	0
	Beryllium (Be)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.010	<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)	0.050	8.10	8.11	0.1	1.92	1.78	7.6	13.1	13.0	0.8
	Cesium (Cs)	0.000010									
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00066	0.00066	0	<0.00050	<0.00050	0	0.00076	0.00079	3.9
	Iron (Fe)	0.030	<0.030	<0.030	0	0.094	0.073	25	<0.030	<0.030	0
	Lead (Pb)	0.000050	<0.000050	<0.000050	0	0.000116	0.000093	22	<0.000050	<0.000050	0
	Lithium (Li)	0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	0	0.0012	0.0012	0
	Magnesium (Mg)	0.050	4.75	4.77	0.4	1.13	1.05	7.3	8.06	8.14	1.0
	Manganese (Mn)	0.000070	0.000786	0.000852	8.1	0.00263	0.00221	17	0.00273	0.00279	2.2
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000139	0.000147	5.6	<0.000050	<0.000050	0	0.000235	0.000241	2.5
	Nickel (Ni)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	0.00054	0.00055	1.8
	Phosphorus (P)	0.050									
	Potassium (K)	0.050	0.62	0.62	0	0.23	0.22	4.4	1.01	1.03	2.0
	Rubidium (Rb)	0.00020									
	Selenium (Se)	0.000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.69	0.64	7.5	0.36	0.34	5.7	0.37	0.37	0
	Silver (Ag)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.050	1.28	1.23	4.0	0.373	0.345	7.8	1.36	1.43	5.0
	Strontium (Sr)	0.00010	0.00650	0.00644	0.9	0.00176	0.00168	4.7	0.00933	0.00927	0.6
	Sulfur (S)	0.50									
	Tellurium (Te)	0.00020									
	Thallium (Tl)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Thorium (Th)	0.00010									
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.00030	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Tungsten (W)	0.00010									
	Uranium (U)	0.000010	0.000485	0.000517	6.4	0.000099	0.000094	5.2	0.000626	0.000640	2.2
	Vanadium (V)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.0030	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.00030									
Dissolved Metals	Aluminum (Al)	0.00050	<0.0030	0.0035	15	0.0113	0.0107	5.5	<0.0030	0.0089	99
	Antimony (Sb)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000030	0.00471	0.00480	1.9	0.00140	0.00147	4.9	0.00615	0.00630	2.4
	Beryllium (Be)	0.000010	<0.00050	<0.00050	0	<0.00010	<0.00010	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.0000050	<0.00050	<0.00050	0	<0.000050	<0.000050	0	<0.00050	<0.00050	0
	Boron (B)	0.0050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.0000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.020	8.73	8.17	6.6	1.75	1.73	1.1	12.7	12.9	1.6
	Cesium (Cs)	0.000010				<0.000010	<0.000010	0			
	Chromium (Cr)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00020	0.00077	0.00065	17	0.00027	0.00026	3.8	0.00076	0.00076	0
	Iron (Fe)	0.0010	<0.030	<0.030	0	<0.010	<0.010	0	<0.030	<0.030	0
	Lead (Pb)	0.0000090	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.0050	5.15	4.77	7.7	1.07	1.05	1.9	7.95	7.93	0.3
	Manganese (Mn)	0.000070	0.000203	0.000245	19	0.00100	0.00092	8.3	0.000553	0.000846	42
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000163	0.000139	16	<0.000050	<0.000050	0	0.		

Figure A.4: Water sample field duplicate results. Highlighted values did not meet the DQO of ≤ 25% RPD. Highlighted and bold values did not meet the DQO and were calculated from values that were > 10-times the MDL.

Sample ID		Lowest Detection Limit	DL0-02-8-B	DL0-02-8-B01	RPD	BL0-01-B-B	BL0-01-B-B01	RPD	E0-21	E0-2101	RPD
Date Sampled			26-Jul-16	26-Jul-16		26-Jul-16	26-Jul-16		18-Jul-16	18-Jul-16	
ALS Sample ID			L1806556-8	L1806556-9		L1806556-17	L1806556-18		L1800873-5	L1800873-6	
Conventional	Conductivity (lab)	3.0	88.0	87.9	0.1	92.7	93.3	0.6	61.4	61.5	0.2
	Hardness (as CaCO ₃)	10	42	42	0	45	45	0	27	27	0
	Total Suspended Solids (TSS)	2.0	10.4	8.4	21	<2.0	<2.0	0	<2.0	<2.0	0
	Total Dissolved Solids (TDS)	10	46	56	20	48	47	2.1	30	30	0
	Turbidity	0.10	6.33	5.70	10	1.01	9.11	160	7.46	7.47	0.1
	Alkalinity (as CaCO ₃)	10	43	42	2.4	48	51	6.1	41	33	22
Nutrients and Organics	Total Ammonia	0.020	<0.020	0.047	81	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrate	0.020	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrite	0.0050	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen (TKN)	0.15	<0.15	<0.15	0	<0.15	<0.15	0	<0.15	0.55	114
	Nitrate and Nitrite (as N)	0.021	<0.021	<0.021	0	<0.021	<0.021	0	<0.021	<0.021	0
	Dissolved Organic Carbon	1.0	1.1	1.3	17	<1.0	<1.0	0	<1.0	<1.0	0
	Total Organic Carbon	1.0	1.5	1.5	0	1.0	1.1	9.5	<1.0	<1.0	0
	Total Phosphorus	0.0030	0.0192	0.0156	21	0.0050	0.0059	17	0.0064	0.0060	6.5
Anions	Phenols	0.0010	0.0020	0.0011	58	0.0031	0.0037	18	0.0012	0.0017	34
	Bromide (Br)	0.10	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.50	1.69	1.71	1.2	1.22	1.18	3.3	1.03	1.03	0
Total Metals	Sulphate (SO ₄)	0.30	1.64	1.64	0	0.66	0.60	9.5	0.88	0.88	0
	Aluminum (Al)	0.0030	0.146	0.152	4.0	0.0396	0.0250	45	0.254	0.249	2.0
	Antimony (Sb)	0.00010	<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	0.00638	0.00629	1.4	0.00522	0.00535	2.5	0.00555	0.00594	6.8
	Beryllium (Be)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.010	<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)	0.050	8.46	8.73	3.1	9.40	9.12	3.0	5.70	5.81	1.9
	Cesium (Cs)	0.000010									
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.00010	0.00011	<0.00010	9.5	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00089	0.00089	0	0.00058	0.00059	1.7	0.00070	0.00068	2.9
	Iron (Fe)	0.030	0.173	0.175	1.1	0.035	<0.030	15	0.158	0.161	1.9
	Lead (Pb)	0.000050	0.000238	0.000238	0	<0.000050	<0.000050	0	0.000193	0.000173	11
	Lithium (Li)	0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.050	5.35	5.31	0.8	5.51	5.73	3.9	3.24	3.21	0.9
	Manganese (Mn)	0.000070	0.00659	0.00660	0.2	0.00232	0.00231	0.4	0.00168	0.00182	8.0
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000207	0.000236	13	0.000102	0.000094	8.2	0.000171	0.000182	6.2
	Nickel (Ni)	0.00050	0.00051	0.00053	3.8	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Phosphorus (P)	0.050									
	Potassium (K)	0.050	0.77	0.77	0	0.57	0.57	0	0.67	0.67	0
	Rubidium (Rb)	0.00020									
	Selenium (Se)	0.000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.67	0.69	2.9	0.66	0.63	4.7	1.00	1.01	1.0
	Silver (Ag)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.050	0.953	0.954	0.1	0.954	0.973	2.0	0.884	0.874	1.1
	Strontium (Sr)	0.00010	0.00640	0.00661	3.2	0.00614	0.00596	3.0	0.00611	0.00606	0.8
	Sulfur (S)	0.50									
	Tellurium (Te)	0.00020									
	Thallium (Tl)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Thorium (Th)	0.00010									
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.00030	<0.010	<0.010	0	<0.010	<0.010	0	0.010	<0.010	0
	Tungsten (W)	0.00010									
	Uranium (U)	0.000010	0.000680	0.000681	0.1	0.000578	0.000560	3.2	0.000437	0.000428	2.1
	Vanadium (V)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.0030	<0.0030	<0.0030	0	<0.0030	<0.0030	0	<0.0030	<0.0030	0
Zirconium (Zr)	0.00030										
Dissolved Metals	Aluminum (Al)	0.00050	0.0090	0.0090	0	0.0052	0.0049	5.9	0.0217	0.0269	21
	Antimony (Sb)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000030	0.00486	0.00479	1.5	0.00502	0.00488	2.8	0.00400	0.00431	7.5
	Beryllium (Be)	0.000010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.0050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.0000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.020	8.48	8.37	1.3	9.03	9.10	0.8	5.68	5.74	1.1
	Cesium (Cs)	0.000010									
	Chromium (Cr)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00020	0.00058	0.00056	3.5	0.00056	0.00055	1.8	<0.00050	<0.00050	0
	Iron (Fe)	0.0010	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.0000090	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.0050	5.06	5.08	0.4	5.36	5.43	1.3	3.14	3.14	0
	Manganese (Mn)	0.000070	0.000360	0.000390	8.0	0.00113	0.00114	0.9	0.000141	0.000148	4.8
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000306	0.000316	3.2	0.000106	0.000098	7.8	0.000178	0.000185	3.9
	Nickel (Ni)	0.000090	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Phosphorus (P)	0.050									
	Pot										

Figure A.4: Water sample field duplicate results. Highlighted values did not meet the DQO of ≤ 25% RPD. Highlighted and bold values did not meet the DQO and were calculated from values that were > 10-times the MDL.

Sample ID		Lowest Detection Limit	JL0-0101	JL0-01-B	RPD	J0-01	J0-0101	RPD	DL0-02-07-B	DL0-02-0701	RPD
Date Sampled			22-Aug-16	22-Aug-16		20-Aug-16	20-Aug-16		21-Aug-16	21-Aug-16	
ALS Sample ID			L1818109-1	L1818109-3		L1816817-18	L1816817-19		L1817109-8	L1817109-9	
Conventional	Conductivity (lab)	3.0	132	134	1.5	137	137	0	116	116	0
	Hardness (as CaCO ₃)	10	62	63	1.6	66	67	1.5	54	55	1.8
	Total Suspended Solids (TSS)	2.0	<2.0	<2.0	0	<2.0	<2.0	0	2.5	<2.0	22
	Total Dissolved Solids (TDS)	10	65	62	4.7	64	70	9.0	61	53	14
	Turbidity	0.10	0.92	0.95	3.2	0.34	0.45	28	2.15	2.16	0.5
	Alkalinity (as CaCO ₃)	10	64	62	3.2	64	63	1.6	52	55	5.6
Nutrients and Organics	Total Ammonia	0.020	0.022	0.054	84	<0.020	<0.020	0	<0.020	0.038	62
	Nitrate	0.020	<0.020	<0.020	0	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrite	0.0050	<0.0050	<0.0050	0	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen (TKN)	0.15	<0.15	<0.15	0	<0.15	<0.15	0	<0.15	<0.15	0
	Nitrate and Nitrite (as N)	0.021	<0.021	<0.021	0	<0.021	<0.021	0	<0.021	<0.021	0
	Dissolved Organic Carbon	1.0	1.5	1.5	0	1.7	1.7	0	1.5	1.5	0
	Total Organic Carbon	1.0	1.6	1.7	6.1	1.9	2.0	5.1	1.7	2.2	26
	Total Phosphorus	0.0030	0.0042	0.0043	2.4	0.0048	<0.0030	46	0.0280	0.0062	127
	Phenols	0.0010	0.0014	0.0015	6.9	0.0043	0.0033	26	0.0027	0.0022	20
Anions	Bromide (Br)	0.10	<0.10	<0.10	0	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.50	3.34	3.33	0.3	3.44	3.50	1.7	2.22	2.20	0.9
	Sulphate (SO ₄)	0.30	2.01	2.03	1.0	2.18	2.20	0.9	2.65	2.62	1.1
Total Metals	Aluminum (Al)	0.0030	0.0041	0.0036	13	0.0047	0.0046	2.2	0.058	0.048	19
	Antimony (Sb)	0.00010	<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	0.00598	0.00608	1.7	0.00663	0.00663	0	0.00634	0.00617	2.7
	Beryllium (Be)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00010	<0.00010	0
	Bismuth (Bi)	0.000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.000050	<0.000050	0
	Boron (B)	0.010	<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)	0.050	13.0	12.7	2.3	13.2	13.3	0.8	11.3	10.9	3.6
	Cesium (Cs)	0.000010							<0.000010	<0.000010	0
	Chromium (Cr)	0.00050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.00077	0.00076	1.3	0.00081	0.00082	1.2	0.0016	<0.0010	46
	Iron (Fe)	0.030	<0.030	<0.030	0	0.063	0.125	66	0.056	0.050	11
	Lead (Pb)	0.000050	<0.000050	<0.000050	0	<0.000050	<0.000050	0	0.00010	<0.00010	0
	Lithium (Li)	0.0010	0.0012	0.0012	0	0.0011	0.0011	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.050	7.53	7.54	0.1	8.21	8.23	0.2	6.47	6.22	3.9
	Manganese (Mn)	0.000070	0.00184	0.00175	5.0	0.00240	0.00314	27	0.00389	0.00350	11
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000245	0.000247	0.8	0.000268	0.000262	2.3	0.000520	0.000491	5.7
	Nickel (Ni)	0.00050	0.00055	0.00059	7.0	0.00069	0.00076	9.7	0.00083	0.00065	24
	Phosphorus (P)	0.050							<0.050	<0.050	0
	Potassium (K)	0.050	1.02	1.02	0	1.04	1.05	1.0	0.938	0.894	4.8
	Rubidium (Rb)	0.00020							0.00222	0.00212	4.6
	Selenium (Se)	0.000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.000050	<0.000050	0
	Silicon (Si)	0.050	0.35	0.36	2.8	0.38	0.38	0	0.619	0.608	1.8
	Silver (Ag)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000050	<0.000050	0
	Sodium (Na)	0.050	1.31	1.29	1.5	1.37	1.34	2.2	1.15	1.11	3.5
	Strontium (Sr)	0.00010	0.00977	0.00956	2.2	0.00975	0.00977	0.2	0.0087	0.0083	4.7
	Sulfur (S)	0.50							1.17	1.08	8.0
	Tellurium (Te)	0.00020							<0.00020	<0.00020	0
	Thallium (Tl)	0.000010	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.000010	<0.000010	0
	Thorium (Th)	0.00010							<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)	0.00030	<0.010	<0.010	0	<0.010	<0.010	0	0.00235	0.00191	21
	Tungsten (W)	0.00010							<0.00010	<0.00010	0
	Uranium (U)	0.000010	0.000696	0.000685	1.6	0.000788	0.000776	1.5	0.000821	0.000785	4.5
	Vanadium (V)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0	<0.00050	<0.00050	0
	Zinc (Zn)	0.0030	<0.0030	<0.0030	0	<0.0030	<0.0030	0	0.0044	<0.0030	38
	Zirconium (Zr)	0.00030							<0.00030	<0.00030	0
Dissolved Metals	Aluminum (Al)	0.00050	0.0040	<0.0030	29	<0.0030	<0.0030	0	0.0094	0.0085	10
	Antimony (Sb)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000030	0.00694	0.00619	11	0.00639	0.00681	6.4	0.00593	0.00599	1.0
	Beryllium (Be)	0.000010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.0050	<0.010	<0.010	0	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.0000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.020	12.5	12.7	1.6	13.3	13.4	0.7	11.0	11.1	0.9
	Cesium (Cs)	0.000010									
	Chromium (Cr)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00020	0.00076	0.00070	8.2	0.00079	0.00078	1.3	0.00081	0.00078	3.8
	Iron (Fe)	0.0010	<0.030	<0.030	0	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.0000090	<0.000050	<0.000050	0	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00050	0.0010	0.0011	9.5	0.0011	0.0011	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.0050	7.48	7.52	0.5	7.99	8.08	1.1	6.42	6.70	4.3
	Manganese (Mn)	0.000070	0.000172	0.000096	57	0.00114	0.00101	12	0.000427	0.000356	18
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.0								

Figure A.4: Water sample field duplicate results. Highlighted values did not meet the DQO of ≤ 25% RPD. Highlighted and bold values did not meet the DQO and were calculated from values that were > 10-times the MDL.

Sample ID		Lowest Detection Limit	G0-03	G0-0301	RPD	BL0-04-S	BL0-0401	RPD
Date Sampled			20-Aug-16	20-Aug-16		23-Aug-16	23-Aug-16	
ALS Sample ID			L1816817-24	L1816817-32		L1820246-1	L1820246-3	
Conventional	Conductivity (lab)	3.0	169	168	0.6	75.8	75.8	0
	Hardness (as CaCO ₃)	10	76	75	1.3	35	35	0
	Total Suspended Solids (TSS)	2.0	3.0	2.9	3.4	<2.0	<2.0	0
	Total Dissolved Solids (TDS)	10	94	95	1.1	38	43	12
	Turbidity	0.10	12.0	12.5	4.1	1.67	1.63	2.4
	Alkalinity (as CaCO ₃)	10	74	73	1.4	32	33	3.1
Nutrients and Organics	Total Ammonia	0.020	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrate	0.020	<0.020	<0.020	0	<0.020	<0.020	0
	Nitrite	0.0050	<0.0050	<0.0050	0	<0.0050	<0.0050	0
	Total Kjeldahl Nitrogen (TKN)	0.15	<0.15	<0.15	0	<0.15	<0.15	0
	Nitrate and Nitrite (as N)	0.021	<0.021	<0.021	0	<0.021	<0.021	0
	Dissolved Organic Carbon	1.0	1.2	1.3	8.0	1.3	1.2	8.0
	Total Organic Carbon	1.0	1.5	1.5	0	1.4	1.2	15
	Total Phosphorus	0.0030	0.0094	0.0083	12	0.0069	0.0063	9.1
	Phenols	0.0010	0.0034	0.0062	58	0.0021	0.0047	76
Anions	Bromide (Br)	0.10	<0.10	<0.10	0	<0.10	<0.10	0
	Chloride (Cl)	0.50	6.98	7.01	0.4	1.38	1.44	4.3
	Sulphate (SO ₄)	0.30	3.78	3.76	0.5	1.01	1.01	0
Total Metals	Aluminum (Al)	0.0030	0.292	0.290	0.7	0.0489	0.0537	9.4
	Antimony (Sb)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.00010	0.00011	0.00011	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000050	0.0127	0.0125	1.6	0.00474	0.00451	5.0
	Beryllium (Be)	0.00010	<0.00010	<0.00010	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.000050	<0.000050	<0.000050	0	<0.00050	<0.00050	0
	Boron (B)	0.010	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.050	15.6	15.8	1.3	7.30	7.19	1.5
	Cesium (Cs)	0.000010	0.000044	0.000046	4.4			
	Chromium (Cr)	0.00050	0.00074	0.00072	2.7	<0.00050	<0.00050	0
	Cobalt (Co)	0.00010	0.00015	0.00015	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00050	0.0015	0.0015	0	0.00165	0.00135	20
	Iron (Fe)	0.030	0.295	0.301	2.0	0.040	0.044	9.5
	Lead (Pb)	0.000050	0.00028	0.00030	6.9	0.000051	<0.000050	2.0
	Lithium (Li)	0.0010	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.050	8.90	8.81	1.0	4.32	4.33	0.2
	Manganese (Mn)	0.000070	0.00362	0.00367	1.4	0.00116	0.00110	5.3
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000420	0.000431	2.6	0.000135	0.000139	2.9
	Nickel (Ni)	0.00050	0.00074	0.00072	2.7	<0.00050	<0.00050	0
	Phosphorus (P)	0.050	<0.050	<0.050	0			
	Potassium (K)	0.050	1.34	1.34	0	0.60	0.60	0
	Rubidium (Rb)	0.00020	0.00265	0.00259	2.3			
	Selenium (Se)	0.000050	<0.000050	<0.000050	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	1.34	1.32	1.5	0.58	0.62	6.7
	Silver (Ag)	0.000010	<0.000050	<0.000050	0	<0.000010	<0.000010	0
	Sodium (Na)	0.050	3.73	3.69	1.1	1.01	1.02	1.0
	Strontium (Sr)	0.00010	0.0181	0.0177	2.2	0.00596	0.00583	2.2
	Sulfur (S)	0.50	1.36	1.33	2.2			
	Tellurium (Te)	0.00020	<0.00020	<0.00020	0			
	Thallium (Tl)	0.000010	0.000011	0.000010	9.5	<0.00010	<0.00010	0
	Thorium (Th)	0.00010	0.00043	0.00043	0			
	Tin (Sn)	0.00010	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.00030	0.0158	0.0165	4.3	<0.010	<0.010	0
	Tungsten (W)	0.00010	<0.00010	<0.00010	0			
	Uranium (U)	0.000010	0.00456	0.00465	2.0	0.000577	0.000580	0.5
	Vanadium (V)	0.00050	0.00072	0.00075	4.1	<0.0010	<0.0010	0
	Zinc (Zn)	0.0030	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.00030	0.00062	0.00063	1.6			
Dissolved Metals	Aluminum (Al)	0.00050	0.0086	0.0074	15	0.0084	0.0100	17
	Antimony (Sb)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Arsenic (As)	0.000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Barium (Ba)	0.000030	0.0106	0.0104	1.9	0.00421	0.00427	1.4
	Beryllium (Be)	0.000010	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Bismuth (Bi)	0.0000050	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Boron (B)	0.0050	<0.010	<0.010	0	<0.010	<0.010	0
	Cadmium (Cd)	0.0000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Calcium (Ca)	0.020	15.8	15.8	0	7.20	7.15	0.7
	Cesium (Cs)	0.000010						
	Chromium (Cr)	0.00010	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Cobalt (Co)	0.0000050	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Copper (Cu)	0.00020	0.00088	0.00093	5.5	0.00199	0.00275	32
	Iron (Fe)	0.0010	<0.030	<0.030	0	<0.030	<0.030	0
	Lead (Pb)	0.0000090	<0.000050	<0.000050	0	<0.000050	<0.000050	0
	Lithium (Li)	0.00050	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Magnesium (Mg)	0.0050	8.88	8.74	1.6	4.22	4.24	0.5
	Manganese (Mn)	0.000070	0.000131	0.000131	0	0.000172	0.000205	18
	Mercury (Hg)	0.000010	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Molybdenum (Mo)	0.000050	0.000412	0.000420	1.9	0.000135	0.000132	2.2
	Nickel (Ni)	0.000090	<0.00050	<0.00050	0	<0.00050	<0.00050	0
	Phosphorus (P)	0.050						
	Potassium (K)	0.050	1.20	1.21	0.8	0.58	0.58	0
	Rubidium (Rb)	0.00020						
	Selenium (Se)	0.000040	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Silicon (Si)	0.050	0.87	0.87	0	0.49	0.50	2.0
	Silver (Ag)	0.0000050	<0.000010	<0.000010	0	<0.000010	<0.000010	0
	Sodium (Na)	0.020	3.76	3.63	3.5	1.00	1.00	0
	Strontium (Sr)	0.000050	0.0167	0.0167	0	0.00591	0.00603	2.0
	Sulfur (S)	0.50						
	Tellurium (Te)	0.00020						
	Thallium (Tl)	0.0000020	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Thorium (Th)	0.00010						
	Tin (Sn)	0.000030	<0.00010	<0.00010	0	<0.00010	<0.00010	0
	Titanium (Ti)	0.00030	<0.010	<0.010	0	<0.010	<0.010	0
	Tungsten (W)	0.00010						
	Uranium (U)	0.0000070	0.00423	0.00433	2.3	0.000564	0.000540	4.3
	Vanadium (V)	0.000050	<0.0010	<0.0010	0	<0.0010	<0.0010	0
	Zinc (Zn)	0.00050	<0.0030	<0.0030	0	<0.0030	<0.0030	0
	Zirconium (Zr)	0.00010						
Other	Chlorophyll a	0.10	0.22	0.24	8.7	1.02	0.71	36
	Phaeophytin a	0.10	0.37	0.4	7.8	0.49	0.5	2.0

Figure A.5: Sediment sample field duplicate results. Highlighted values did not meet the data quality objective of $\leq 40\%$ Relative Percent Difference (RPD).

Parameter	Lowest Detection Limit	Units	REF-03-9	REF-03-DUP	% RPD	JLO-02	JLO-DUP	% RPD	DLO-01-02	DLO-01-DUP	% RPD	BLO-06	BLO-DUP	% RPD
			16-Aug-2016	16-Aug-2016		11-Sep-2016	11-Sep-2016		13-Aug-2016	13-Aug-2016		15-Aug-2016	15-Aug-2016	
Total Organic Carbon	0.10	%	4.46	4.36	2	3.03	3.68	19	1.90	1.93	2	1.23	1.06	15
Aluminum (Al)	50	µg/g	22,600	21,100	7	19,800	14,200	33	19,700	17,400	12	25,700	25,300	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	5.64	6.24	10	12.1	7.2	51	4.41	4.05	9	3.95	3.91	1
Barium (Ba)	0.50	µg/g	148	179	19	155.0	184	17	86.4	130.0	40	105.0	107.0	2
Beryllium (Be)	0.10	µg/g	0.94	0.87	8	0.87	0.91	4	1.02	0.88	15	1.38	1.33	4
Bismuth (Bi)	0.20	µg/g	<0.20	<0.20	0	0.27	0.30	11	0.23	0.23	0	0.25	0.24	4
Boron (B)	5.0	µg/g	17.0	17.3	2	20.9	24.1	14	30.0	23.9	23	39.5	33.5	16
Cadmium (Cd)	0.020	µg/g	0.161	0.194	19	0.249	0.284	13	0.215	0.267	22	0.140	0.139	1
Calcium (Ca)	50	µg/g	5,640	5,710	1	4,340	5,460	23	4,570	4,320	6	4,900	4,600	6
Chromium (Cr)	0.50	µg/g	74.6	68.1	9	80.9	63.7	24	73.7	67.7	8	89.2	85.7	4
Cobalt (Co)	0.10	µg/g	16.3	18.4	12	23.3	18.4	24	15.4	15.4	0	17.2	17.2	0
Copper (Cu)	0.50	µg/g	92.8	83.6	10	51.4	45.3	13	41.7	38.5	8	33.9	34.2	1
Iron (Fe)	50	µg/g	46,800	61,000	26	54,100	44,000	21	37,300	35,500	5	42,100	41,800	1
Lead (Pb)	0.50	µg/g	21.4	33.3	44	19.9	21.2	6	22.3	53.2	82	35.0	37.4	7
Lithium (Li)	2.0	µg/g	39.2	37.4	5	27.6	30.1	9	35.9	32.1	11	51.9	51.1	2
Magnesium (Mg)	20	µg/g	15,000	13,400	11	15,800	12,300	25	12,800	11,300	12	16,800	17,000	1
Manganese (Mn)	1.0	µg/g	1,090	6,010	139	1,530	3,550	80	1,140	4,480	119	745	693	7
Mercury (Hg)	0.0050	µg/g	0.0703	0.0770	9	0.0414	0.0501	19	0.0342	0.0341	0	0.0524	0.0513	2
Molybdenum (Mo)	0.10	µg/g	2.41	6.57	93	1.55	2.48	46	2.72	8.79	105	0.92	0.80	14
Nickel (Ni)	0.50	µg/g	51.7	50.0	3	87.8	74	18	67.4	70.6	5	60.1	60.0	0
Phosphorus (P)	50	µg/g	972	1,060	9	1,870	1,290	37	881	789	11	751	782	4
Potassium (K)	100	µg/g	5,520	4,990	10	4,380	3,730	16	4,890	4,380	11	6,490	6,240	4
Selenium (Se)	0.20	µg/g	0.82	0.92	11	0.40	0.46	14	0.36	0.33	9	0.24	0.22	9
Silver (Ag)	0.10	µg/g	0.26	0.22	17	0.11	0.11	0	0.13	0.13	0	0.14	0.13	7
Sodium (Na)	50	µg/g	430	382	12	210	169	22	294	249	17	395	384	3
Strontium (Sr)	0.50	µg/g	14.7	14.8	1	8.7	10.2	16	11.9	10.2	15	15.9	14.6	9
Sulfur (S)	5000	µg/g	<5,000	<5,000	0	<5,000	<5,000	0	<5,000	<5,000	0	<5,000	<5,000	0
Thallium (Tl)	0.050	µg/g	0.754	0.789	5	0.485	0.622	25	0.543	0.595	9	0.647	0.632	2
Tin (Sn)	2.0	µg/g	6.6	23.7	113	3	<2.0	40	3.1	49.2	176	17.7	23.1	26
Titanium (Ti)	1.0	µg/g	1,210	1,200	1	1,070	800	29	1,240	1,040	18	1,680	1,640	2
Uranium (U)	0.050	µg/g	23.0	22.6	2	6.05	7.90	27	6.47	6.10	6	10.70	9.46	12
Vanadium (V)	0.20	µg/g	65.8	60.9	8	67.8	51.7	27	57.3	51.0	12	70.2	69.3	1
Zinc (Zn)	2.0	µg/g	94.7	87.7	8	67.0	54.3	21	67.1	63.2	6	85.3	84.6	1
Zirconium (Zr)	1.0	µg/g	4.3	3.1	32	5.6	6.7	18	4.4	5.4	20	24.8	24.2	2

duplicate samples for these parameters potentially reflected a combination of naturally high spatial variability of these parameters in lake sediments and/or inadequate sediment sample homogenization in the field and/or during laboratory sample preparation. Concentrations of lead, manganese, molybdenum and tin exhibited the highest between-duplicate variability (i.e., RPD), including those collected at Reference Lake 3, and therefore results for these parameters should take this variability into account during data interpretation. For all other metals, data precision was 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 27 of 68 stream samples (40%) and 12 of 31 lake samples (39%; total of 39%) with the sorted fraction for these samples ranging between 12.5% (1/8) to 50% (1/2) of the sample material (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 $\leq 20\%$ (Table A.6). Only one of the six paired sub-sample comparisons resulted in precision and 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 $\leq 20\%$. 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 98% for each of the eight lotic and three lentic samples evaluated (Table A.7a,b). Sorting efficiency for these samples achieved the DQO of $\geq 90\%$ recovery, and therefore the benthic invertebrate community sample recovery was considered acceptable.

Table A.6: Subsampling error for benthic macroinvertebrate samples, Mary River Project CREMP, 2016.

a) Lotic (creek and river) 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
CLT1-US-B2	19	109	130	-	-	239	16.2	-	8.8	-
CLT1-US-B5	24	175	185	-	-	360	5.4	-	2.8	-
SDLT9-B3	-	188	189	-	-	377	0.5	-	0.3	-
REF-CRK-B5	8	88	90	-	-	178	2.2	-	1.1	-
SDLT1-B2	2	83	96	-	-	179	13.5	-	7.3	-

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
REF-03-1	0	77	96	100	104	377	3.8	26.0	1.9	18.3
DLO-02-1	0	97	100	111	112	420	0.9	13.4	4.8	7.6
DLO-02-9	0	166	168	193	195	722	1.0	14.9	6.9	8.0

* whole large organisms excluded in calculations.

min = minimum absolute % error. max = maximum absolute % error.

Table A.7: Percent recovery of benthic macroinvertebrate samples, Mary River Project CREMP, 2016.

(a) Lotic (creek and river) samples

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
CLT1-US-B4	314	320	98.1%
CLT2-US-B2	136	140	97.1%
REF-CRK-B2	195	200	97.5%
SDLT1-R1-B3	230	232	99.1%
SDLT9-DS-B3	383	392	97.7%
CO-05-B4	407	415	98.1%
EO-01-B5	92	93	98.9%
GO-09-B3	199	201	99.0%
Average % Recovery			98.2%

b) Lentic (lake) samples

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
REF-03-3	99	104	95.2%
JLO-30	124	126	98.4%
BLO-21	155	155	100.0%
Average % Recovery			97.9%

Table A.8: Sample fractions sorted for benthic macroinvertebrates samples, Mary River Project CREMP, 2016.
Any samples not listed were sorted in their entirety (total of 68 lotic and 31 lentic samples).

(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-B1	1/2	CLT1-L2-B2	1/4	SDLT1-R1-B2	1/2	REF-03-2	1/ 4	DLO-02-3	1/ 4
CLT1-US-B3	1/2	CLT1-L2-B3	1/4	SDLT1-R1-B3	1/4	JLO-02	1/ 4	DLO-02-11	1/ 4
CLT1-US-B4	1/2	CLT1-L2-B4	1/8	SDLT1-R1-B4	1/2	JLO-21	1/ 4	BLO-20	1/ 2
CLT1-US-B5	1/2	CLT1-L2-B5	1/8	SDLT1-R1-B5	1/2	JLO-30	1/ 2		
CLT1-DS-B1	1/4	REF-CRK-B1	1/4	SDLT9-DS-B1	1/2	JLO-31	1/ 2		
CLT1-DS-B2	1/2	REF-CRK-B2	1/2	SDLT9-DS-B2	1/4	JLO-32	1/ 4		
CLT1-DS-B3	1/4	REF-CRK-B3	1/2	SDLT9-DS-B3	1/2	DD-Hab 9	1/ 4		
CLT1-DS-B4	1/4	REF-CRK-B4	1/2	SDLT9-DS-B4	1/2	DLO-01-3	1/ 4		
CLT1-L2-B1	1/4	SDLT1-R1-B1	1/4	SDLT9-DS-B5	1/4	DLO-01-9	1/ 8		

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.

A3.0 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 MDL which led to relatively small incremental differences in concentrations between replicates resulting in failure to meet DQO. However, key exceptions to this occurred for barium and phenols concentrations, 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. Although it was unclear as to the source of barium and phenols in the blank samples, the deionized water used to create blanks has been cited as the most likely source of blank contamination in previous CREMP (KP 2015). The benthic invertebrate community data quality was also acceptable, meeting all required precision, accuracy and percent recovery benchmarks. Overall, the data associated with the 2016 CREMP were considered defensible and acceptable for interpretation and derivation of conclusions with a reasonable level of confidence.

APPENDIX B

**REFERENCE AREA DESCRIPTIVE
OVERVIEW**

APPENDIX B: REFERENCE AREA OVERVIEW

B.0	OVERVIEW OF REFERENCE CONDITIONS	1
B.1	Reference Areas	1
B.1.1	Creek/Tributary Environments	1
B.1.2	River Environments	2
B.1.3	Lake Environments	3
B.2	Background Water Quality	4
B.2.1	Creek/Tributary Environments	4
B.2.2	River Environments	5
B.2.3	Lake Environments (Reference Lake 3)	6
B.3	Background Sediment Quality Observations	8
B.3.1	Lotic Environments	8
B.3.2	Lake Environments (Reference Lake 3)	8
B.4	Phytoplankton Productivity (Chlorophyll a) Observations	9
B.4.1	Lotic Environments	9
B.4.2	Lentic Environments (Reference Lake 3)	10
B.5	Benthic Invertebrate Community	10
B.5.1	Creek/Tributary Environments	10
B.5.2	River Environments	12
B.5.3	Lentic Environments (Reference Lake 3)	13
B.6	Fish Population Survey	14
B.6.1	Lotic Environments	14
B.6.2	Lentic Environments (Reference Lake 3)	14
B.7	Implications for the Mary River Project CREMP	15

LIST OF FIGURES

After Page ...

Figure B.1:	Seasonal variation in water chemistry at stream reference stations	B.5
Figure B.2:	Seasonal variation in water chemistry at Mary River reference stations	B.6
Figure B.3:	In-situ water quality profiles from Reference Lake 3, 2016	B.6
Figure B.4:	Top versus bottom water chemistry at Reference Lake 3, 2016	B.7
Figure B.5:	Sediment quality at littoral and profundal areas of Reference Lake 3	B.8
Figure B.6:	Reference area chlorophyll concentrations by season, 2015 - 2016	B.9
Figure B.7:	Reference Lake 3 top and bottom chlorophyll concentrations, 2016	B.10
Figure B.8:	Length-frequency distributions for reference lake Arctic charr	B.14

LIST OF TABLES**After Page ...**

Table B.1:	Physical features of mine lakes compared to Reference Lake 3.....	B.3
Table B.2:	Water chemistry at stream reference stations, 2016	B.4
Table B.3:	Water chemistry at Mary River reference stations, 2016.....	B.5
Table B.4:	Water chemistry at Reference Lake 3, 2016	B.7
Table B.5:	Physical sediment quality comparison for Reference Lake 3	B.8
Table B.6:	Sediment quality at Reference Lake 3 littoral and profundal zones	B.8
Table B.7:	Phytoplankton monitoring data for the lotic reference stations, 2016.....	B.9
Table B.8:	Reference area chlorophyll a seasonal statistical comparisons	B.9
Table B.9:	Benthic invertebrate features at lotic reference waterbodies, 2016.....	B.11
Table B.10:	Benthic comparisons for reference lake littoral and profundal zones ...	B.13
Table B.11:	Benthic comparisons between reference lake data for 2015 - 2016 ...	B.13
Table B.12:	Fish population comparisons for the reference lake, 2015 - 2016.....	B.14

B.0 OVERVIEW OF REFERENCE CONDITIONS

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 descriptive.

B.1 Reference Areas

B.1.1 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 2014¹ (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 previous 2015 study and the current 2016 study (see Table 2.1). In 2016, 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, the mid-portion area of this tributary served as a benthic reference creek (REF-CRK) in comparisons to the various mine-exposed tributaries as part of the 2016 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

¹ No baseline (2005 – 2013) water chemistry, phytoplankton (chlorophyll a), benthic invertebrate community, or fish population data are available for the CLT-REF and MRY-REF reference creek stations, nor for Reference Lake 3, precluding evaluation of mine-related effects at various mine-exposed lotic and lentic systems based on a before-after control-impact (BACI) approach. In addition, because no intensive physico-chemical or biological sampling was conducted at Reference Lake 3 in 2014, no statistical comparisons were able to be conducted between the mine-construction period data (2014) and the 2015 – 2016 data.

as dictated by localized topography and associated gradient. The wetted width and depth of the benthic reference tributary averaged 9.0 m and 0.13 m, respectively, during the August survey in 2016 (Appendix Table F.1). The corresponding water velocities across a representative riffle area of the benthic reference tributary ranged from 0.05 – 0.49 m/s in August 2016 (average of 0.30 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 to surficial substrate in areas providing suitable growing conditions.

B.1.2 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.

The Mary River reference area is a moderate gradient erosional environment characterized mainly by roughly equal proportions of riffle, run, and rapid stream morphology (Appendix Table F.1). Depending on flow conditions, average wetted width and average depth of the Mary River reference area has ranged from 33 – 55 m and 0.25 - 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, with cobble and large pebble comprising the surficial substrate at much of the remaining area (Appendix Table F.1). In-stream vegetation at the Mary River GO-09 reference area is sparse, and generally includes a relatively thin layer of algae/periphyton attached to surficial substrate in areas providing suitable growing conditions.

B.1.3 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 community 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 (Table B.1).

Table B.1: Comparison of lake physical characteristics for mine-exposed lakes and Reference Lake 3 (data reproduced from NSC 2015b).

Lake Feature		Mine Exposed Lakes			Reference Lake
		Camp	Sheardown NW	Sheardown SE	Reference Lake 3
Physical Characteristics	Drainage Basin Area (km ²)	26.5	6.6	-	23.2
	Lake Area (km ²)	2.21	0.68	0.25	2.05
	Drainage Basin: Lake Area Ratio	11.98	9.66	-	11.32
	Mean Depth (m)	13.0	12.1	7.4	11.8
	Maximum Depth (m)	35.1	30.1	14.8	38.3
	Volume (1,000,000 m ³)	27.5	8.18	1.8	22.6

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, 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 which 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% 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.

B.2 Background Water Quality

B.2.1 Creek/Tributary Environments

Water chemistry at the reference creek stations showed occasionally elevated phenol and aluminum concentrations compared to WQG and AEMP benchmarks for lotic environments (Appendix Table B.2). Phenols can be formed naturally through the decomposition of organic matter or through synthesis in plants and fungi in the presence of hydrogen peroxide and inorganic chlorine (Michalowicz and Duda 2007). In natural waters, phenol concentrations commonly range from 0.01 to 2 µg/L, and therefore concentrations at the reference creek stations in 2016 appeared to be naturally high, but were not unlike those observed previously in 2015 (i.e., 2015 and 2016 average of 2.6 and 3.2 µg/L, respectively). Spearman's rank correlations conducted using the 2016 reference creek station data indicated a significant positive relationship between phenol concentrations and nitrate and dissolved organic carbon (DOC) concentrations ($r = 0.59$ and 0.75 , respectively). This suggested that the elevated phenol concentrations at the stream reference area likely reflected influences associated with natural vegetative decomposition processes.

Total aluminum concentrations at the stream reference stations showed a significant, positive correlation with turbidity (Spearman's Rank $p = 0.017$; $r = 0.67$), suggesting that a high proportion of aluminum was likely bound to, and/or composed, the suspended particulate materials (e.g., aluminosilicate clay minerals). This was supported by examination of the ratio between dissolved and total aluminum concentrations, which indicated that a higher proportion of aluminum was associated with the total (particulate) fraction in 2016 (i.e., 75%, on average; compare Appendix Tables B.2 and C.4). Therefore, despite occasional elevation of total aluminum at the reference creek stations

Table B.2: Water chemistry at reference creek stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark	Spring Sampling Event				Summer Sampling Event				Fall Sampling Event			
					CLT-REF4 27-Jun-2016	CLT-REF3 27-Jun-2016	MRY-REF3 27-Jun-2016	MRY-REF2 27-Jun-2016	CLT-REF4 24-Jul-2016	CLT-REF3 24-Jul-2016	MRY-REF3 25-Jul-2016	MRY-REF2 25-Jul-2016	CLT-REF4 20-Aug-2016	CLT-REF3 20-Aug-2016	MRY-REF3 20-Aug-2016	MRY-REF2 20-Aug-2016
Conventional ^b	Conductivity (lab)	umho/cm	-	-	22.2	35.3	16.0	39.6	81.9	71.7	56.6	97.2	137	116	111	136
	pH (lab)	pH	6.5 - 9.0	-	7.22	7.38	6.80	7.41	7.90	7.75	7.33	7.78	8.15	7.95	7.78	8.09
	Hardness (as CaCO ₃)	mg/L	-	-	10	16	<10	18	39	34	21	46	67	57	41	66
	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
	Total Dissolved Solids (TDS)	mg/L	-	-	18	16	20	26	52	45	32	<13	68	56	60	75
	Turbidity	NTU	-	-	0.82	0.51	3.80	0.67	2.53	1.09	9.87	1.71	0.86	0.91	0.69	1.92
	Alkalinity (as CaCO ₃)	mg/L	-	-	<10	17	<10	20	38	35	15	44	72	55	34	67
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	<0.020	<0.020	<0.020	0.028	<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	0.022	0.023	<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	<0.15	<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	<0.021	<0.021	<0.021	<0.021	0.022	0.023	<0.021	<0.021
	Dissolved Organic Carbon	mg/L	-	-	<1.0	1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	1.0	1.3	1.1	1.6
	Total Organic Carbon	mg/L	-	-	<1.0	1.2	1.1	1.3	<1.0	1.3	<1.0	1.1	1.2	1.5	1.3	1.9
	Total Phosphorus	mg/L	0.020 ^d	-	0.0058	0.0044	0.0087	0.0173	0.0042	<0.0030	0.0100	0.0042	0.0031	0.0083	0.0047	0.0075
Anions	Phenols	mg/L	0.004 ^d	-	0.0034	0.0024	0.0026	0.0038	0.0013	<0.0010	<0.0010	0.0012	0.0041	0.0073	0.0038	0.0067
	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	1.07	0.58	<0.50	<0.50	2.48	1.19	0.60	<0.50	7.15	1.74
Total Metals	Sulphate (SO ₄)	mg/L	218 ^β	218	<0.30	0.36	1.25	0.31	0.72	1.06	5.27	1.46	1.69	2.64	11.1	2.14
	Aluminum (Al)	mg/L	0.100	0.179	0.0250	0.0202	0.0631	0.0180	0.0847	0.0284	0.263	0.0649	0.0364	0.0318	0.0969	0.066
	Antimony (Sb)	mg/L	0.020 ^d	-	<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	-	-	0.00121	0.00224	0.00217	0.00201	0.00385	0.00457	0.00684	0.00580	0.00562	0.00647	0.0106	0.00847
	Beryllium (Be)	mg/L	0.011 ^d	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<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	<0.000050
	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	-	-	2.12	3.37	1.24	3.72	8.04	6.91	4.71	9.03	14.3	11.6	9.16	14.1
	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 ^d	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	<0.00050	0.00063	<0.00050	<0.00050	<0.00050	0.00096	0.00116	0.00057	0.00064	0.00115	0.00121	<0.0010
	Iron (Fe)	mg/L	0.30	0.326	<0.030	<0.030	0.062	<0.030	0.039	0.039	0.209	0.042	<0.030	0.044	0.073	0.057
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	0.000079	0.000100	<0.000050	0.000055	0.000116	0.000251	<0.000050	<0.000050	0.000087	0.000148	<0.00010
	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	-	-	1.18	1.93	0.632	2.12	4.51	4.08	2.44	5.37	7.91	6.75	4.49	7.91
	Manganese (Mn)	mg/L	0.935 ^β	-	0.000475	0.000394	0.00239	0.000605	0.000525	0.00107	0.00257	0.000842	0.000194	0.00124	0.000886	0.00110
	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	0.000149	0.000066	<0.000050	0.000111	0.000391	0.000205	0.000144	0.000287	0.000576	0.000382	0.000273
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00054	<0.00050	<0.00050	<0.00050	0.00074	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	<0.20	0.29	0.24	0.28	0.49	0.53	0.73	0.64	0.69	0.75	1.03	0.904
	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	<0.000050
	Silicon (Si)	mg/L	-	-	0.27	0.49	0.36	0.34	0.80	0.80	1.30	0.80	0.79	0.99	1.13	0.880
	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
	Sodium (Na)	mg/L	-	-	0.211	0.277	0.568	0.407	0.575	0.576	1.73	1.09	1.27	0.989	3.47	1.59
	Strontium (Sr)	mg/L	-	-	0.00165	0.00234	0.00283	0.00285	0.00616	0.00452	0.0103	0.00754	0.0109	0.00770	0.0195	0.0115
	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	<0.000010
	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	0.012	<0.010	<0.010	<0.010	<0.010	0.00196
	Tungsten (W)	mg/L	0.030 ^d	-												<0.00010
	Uranium (U)	mg/L	0.015	-	0.000095	0.000212	0.000232	0.000194	0.00137	0.000646	0.000537	0.000962	0.00736	0.00312	0.00154	0.00261
	Vanadium (V)	mg/L	0.006 ^d	0.006	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050
	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

^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.

in 2016, these metals were unlikely to be biologically available. No other parameters were observed at concentrations above WQG or the AEMP benchmarks at the reference creek stations in 2016. Notably, manganese also showed a higher proportion in the total fraction compared to the dissolved fraction (i.e., 56%, on average, in the total fraction) at the reference creek stations in 2016, suggesting that a large proportion of aqueous manganese concentrations were also naturally associated with particulate matter in lotic waters near the Mary River Project.

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 2016 (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 and 2015 water quality monitoring conducted at reference creek stations showed similar seasonal patterns (KP 2014b; Minnow 2016a). Temporal comparison of mean water chemistry for the reference creek stations showed no substantial changes in water quality from 2014 to 2016, suggesting that water chemistry at the reference creek stations was relatively consistent year-to-year taking seasonal sampling timing into account. 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.

B.2.2 River Environments

Water chemistry at the Mary River reference stations (GO-09 series) showed elevated phenol, aluminum, iron and total phosphorus concentrations compared to WQG and/or applicable AEMP benchmarks in at least one seasonal sampling event in 2016 (Appendix Table B.3). Similar to the reference creek stations, significant positive relationships between phenol and DOC concentrations at the Mary River GO-09 reference stations in 2016 (Spearman Rank Correlation $p = 0.01$ and $r = 0.80$) suggested that elevated phenol concentrations at the Mary River reference area were associated with influences from natural decomposition of vegetation. Mary River GO-09 reference station total aluminum and iron concentrations, as well as total concentrations of other metals including chromium, cobalt, copper, lead, nickel and titanium, showed strong positive correlations

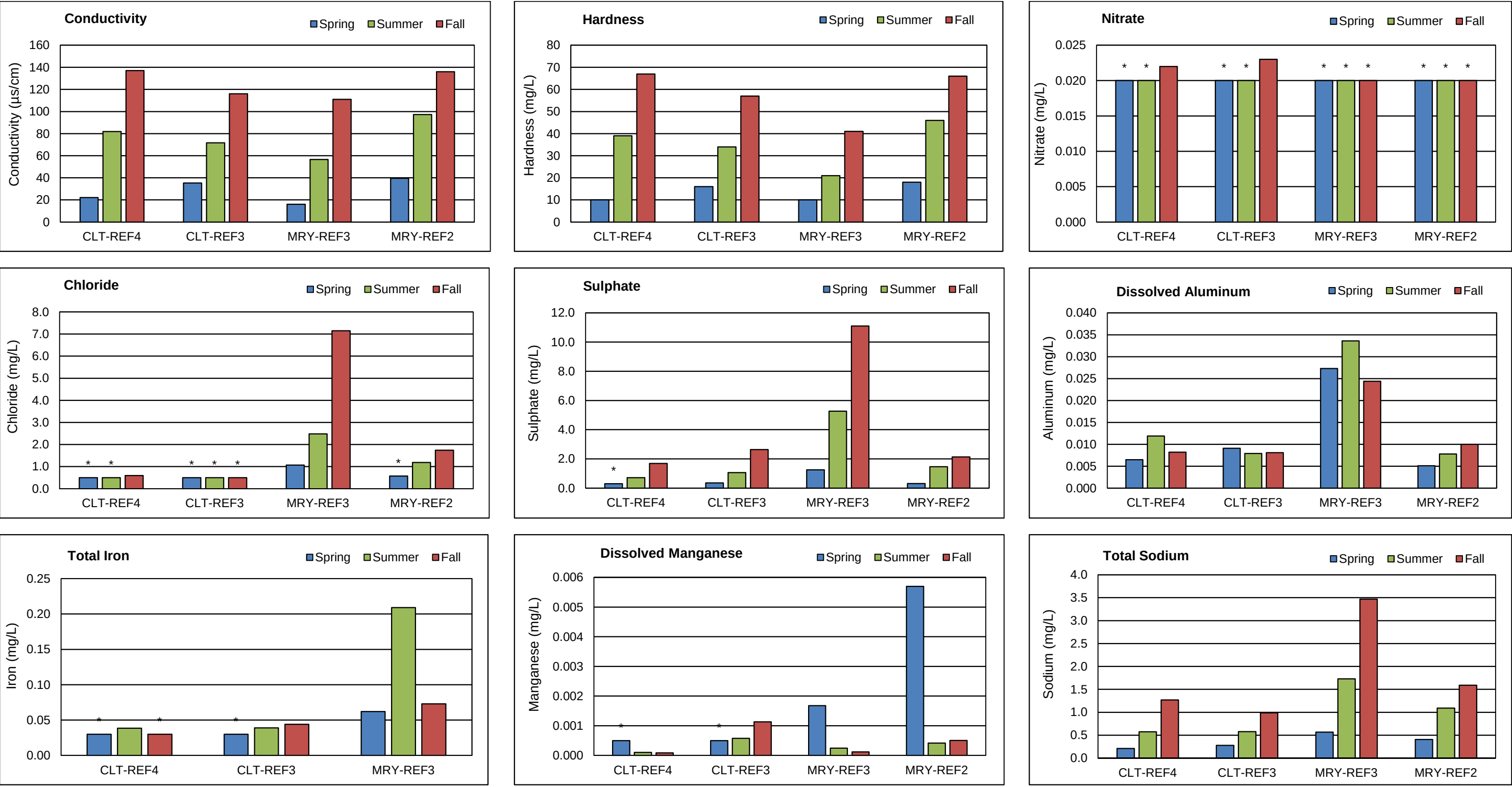


Figure B.1: Seasonal variation in water chemistry at stream/tributary reference stations, Mary River Project CREMP, 2016. Asterisk (*) indicates that the parameter concentration was below the method detection limit.

Table B.3: Water chemistry at Mary River GO-09 series reference stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark	Spring Sampling Event			Summer Sampling Event			Fall Sampling Event		
					G0-09-A 29-Jun-2015	G0-09 29-Jun-2015	G0-09-B 29-Jun-2015	G0-09-A 19-Jul-2015	G0-09 19-Jul-2015	G0-09-B 19-Jul-2015	G0-09-A 13-Aug-2015	G0-09 13-Aug-2015	G0-09-B 13-Aug-2015
Conventional ^b	Conductivity (lab)	umho/cm	-	-	21.4	25.6	23.9	104	72.3	72.2	138	147	140
	pH (lab)	pH	6.5 - 9.0	-	6.86	6.94	7.06	7.97	7.905	7.94	8.03	8.01	8.01
	Hardness (as CaCO ₃)	mg/L	-	-	<10	13	11	49	33.5	33	62	65	66
	Total Suspended Solids (TSS)	mg/L	-	-	46.4	13.6	12.8	<2.0	2.2	2.8	5.6	3.2	4.4
	Total Dissolved Solids (TDS)	mg/L	-	-	<20	<20	<20	51	59	43	70	73	73
	Turbidity	NTU	-	-	16.6	8.08	8.75	2.05	10.05	9.67	16.5	13.8	17.7
	Alkalinity (as CaCO ₃)	mg/L	-	-	<10	11	<10	52	35.5	35	57	59	59
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.021	<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	0.16
	Dissolved Organic Carbon	mg/L	-	-	<1.0	1.3	1.1	<1.0	<1.0	<1.0	1.3	1.4	1.4
	Total Organic Carbon	mg/L	-	-	1.1	1.5	1.1	<1.0	<1.0	<1.0	1.1	1.3	1.3
	Total Phosphorus	mg/L	0.020 ^d	-	0.0862	0.0214	0.021	0.0056	0.00895	0.0134	0.0122	0.0079	0.0115
	Phenols	mg/L	0.004 ^d	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0048	0.0040	0.0050
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	<0.50	<0.50	<0.50	1.54	1.07	1.09	6.48	5.38	5.21
	Sulphate (SO ₄)	mg/L	218 ^β	218	0.33	<0.30	0.31	1.0	0.8	0.9	3.77	3.34	3.23
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	0.374	0.159	0.213	0.0815	0.135	0.119	0.695	0.425	1.01
	Antimony (Sb)	mg/L	0.020 ^d	-	<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	0.00012
	Barium (Ba)	mg/L	-	-	0.00553	0.00296	0.00368	0.0067	0.0060	0.0060	0.012	0.0111	0.0136
	Beryllium (Be)	mg/L	0.011 ^d	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<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
	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	-	-	2.63	2.94	2.65	10	7	7	13.1	14.1	13.9
	Chromium (Cr)	mg/L	0.0089	0.0089	0.00083	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00109	0.00077	0.00168
	Cobalt (Co)	mg/L	0.0009 ^d	0.004	0.00031	0.00011	0.00016	<0.00010	<0.00010	<0.00010	0.00024	0.00017	0.00032
	Copper (Cu)	mg/L	0.002	0.0022	0.00119	0.00061	0.00078	0.0008	0.0008	0.0009	0.0014	0.0013	0.0019
	Iron (Fe)	mg/L	0.30	0.326	0.512	0.155	0.256	0.046	0.114	0.100	0.559	0.367	0.75
	Lead (Pb)	mg/L	0.001	0.001	0.000602	0.000278	0.000303	0.00006	0.00018	0.00016	0.00044	0.00033	0.00052
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	0.0012
	Magnesium (Mg)	mg/L	-	-	1.58	1.56	1.48	5.48	3.77	3.77	7.53	8.21	8.17
	Manganese (Mn)	mg/L	0.935 ^β	-	0.0137	0.0055	0.00683	0.00065	0.00147	0.00132	0.0066	0.0046	0.0085
	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	<0.000050	0.00016	0.00015	0.00015	0.00041	0.00034	0.00044
	Nickel (Ni)	mg/L	0.025	0.025	0.00068	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00083	0.0006	0.00111
	Potassium (K)	mg/L	-	-	0.44	0.34	0.39	0.86	0.78	0.76	1.4	1.27	1.5
	Selenium (Se)	mg/L	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	0.79	0.55	0.63	0.90	0.74	0.72	1.72	1.29	2.47
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	0.334	0.217	0.328	1.610	1.130	1.120	3.38	3.24	3.24
	Strontium (Sr)	mg/L	-	-	0.00265	0.00208	0.00243	0.009	0.008	0.008	0.0166	0.0158	0.0166
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.000014	0.000011	0.000017
	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	-	-	0.028	<0.010	0.016	<0.010	<0.010	<0.010	0.0326	0.022	0.0449
	Uranium (U)	mg/L	0.015	-	0.000356	0.000135	0.00021	0.0011	0.0010	0.0009	0.00437	0.00408	0.00388
	Vanadium (V)	mg/L	0.006 ^d	0.006	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00126	0.00091	0.00158
	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
	Zirconium (Zr)	mg/L	-	-				<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.

with turbidity (Spearman Rank Correlation $p \leq 0.01$, $r \geq 0.80$). This, combined with the fact that no significant correlations were indicated between the dissolved concentrations of these metals and turbidity, suggested that total metal concentrations were largely associated with suspended particulate matter and that elevation of total metal concentrations above WQG reflected naturally turbid conditions. Comparison of the ratio between dissolved and total concentrations of aluminum and iron also indicated a high proportion of these metals was in the total (particulate) fraction in 2016 (i.e., 86% and 83%, respectively, on average; compare Appendix Tables B.3 and C.52).

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 2016, and in previous baseline (2005 – 2013) and 2015 water quality monitoring data collected at the Mary River GO-09 series reference stations (KP 2014b; Minnow 2016). The seasonal changes in the Mary River reference station parameter concentrations likely reflected greater dilution during the spring snowmelt period, and lower precipitation 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 2016 were comparable to, or in the upper range of, those observed during the baseline period and previous operating mine conditions based on fall monitoring data (Figure 5.2; Appendix Figure C.20). The occurrence of relatively high parameter concentrations in 2016 at the Mary River GO-09 reference station potentially reflected greater turbidity compared to previous studies, and suggested that water chemistry of Mary River is naturally variable as a result of the factors that affect turbidity. Nevertheless, on the whole, 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 stations and/or study areas.

B.2.3 Lake Environments (Reference Lake 3)

In-situ water temperature profiles conducted at Reference Lake 3 indicated a thermally stratified water column at the main lake basin in the summer, and throughout the lake in the fall of 2016 (Appendix Figure B.3). The thermocline was present between depths of approximately 5 and 8 m in the summer, and approximately 11 and 14 m in the fall (Appendix Figure B.3). Despite the occurrence of thermal stratification in 2016, 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., $\geq 95\%$) throughout the entire water column in both the summer and fall profiles (Appendix Figure

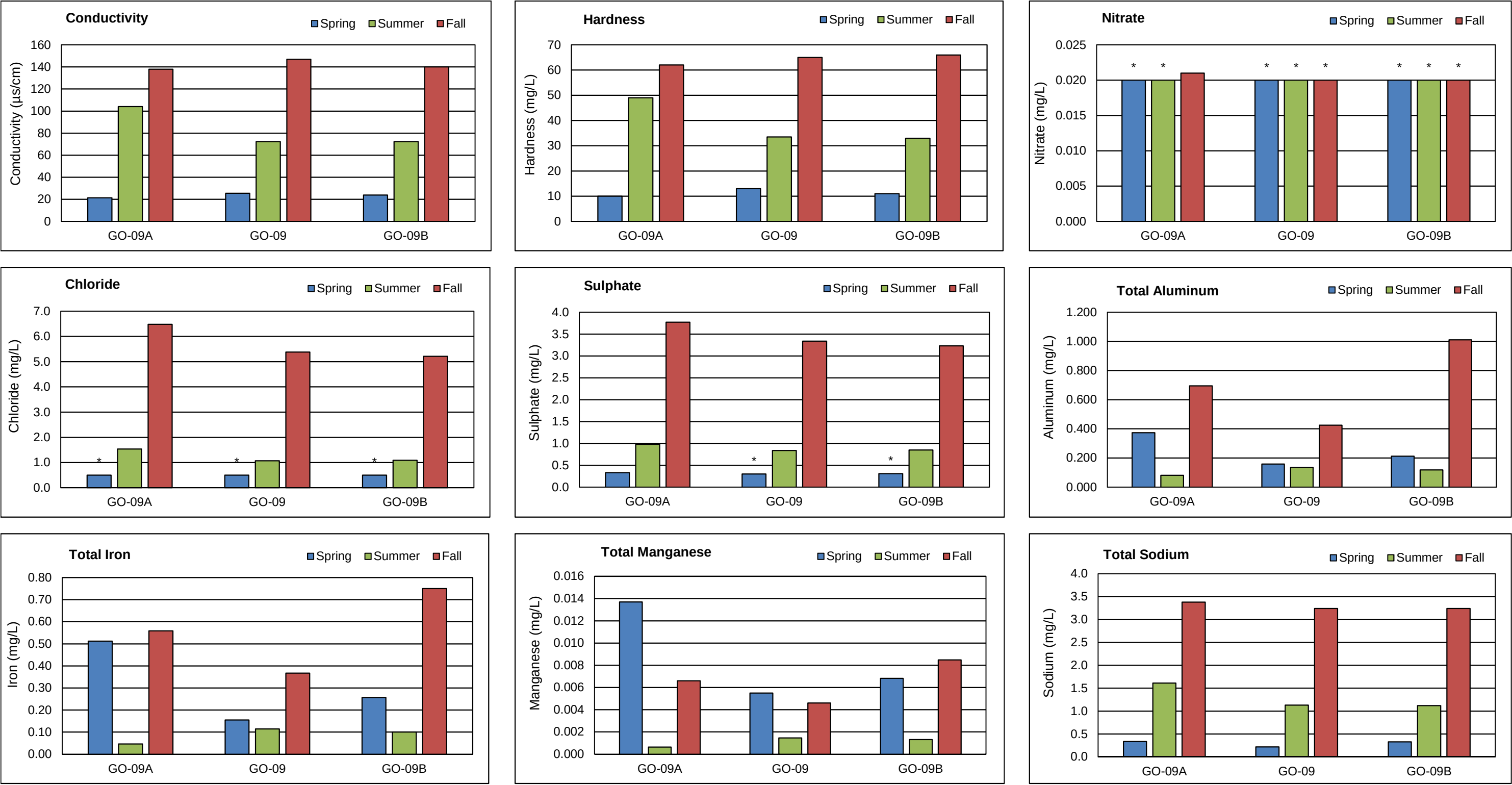


Figure B.2: Seasonal variation in water chemistry at Mary River (GO-09) reference stations, Mary River Project CREMP, 2016. Asterisk (*) indicates that the parameter concentration was below the method detection limit.

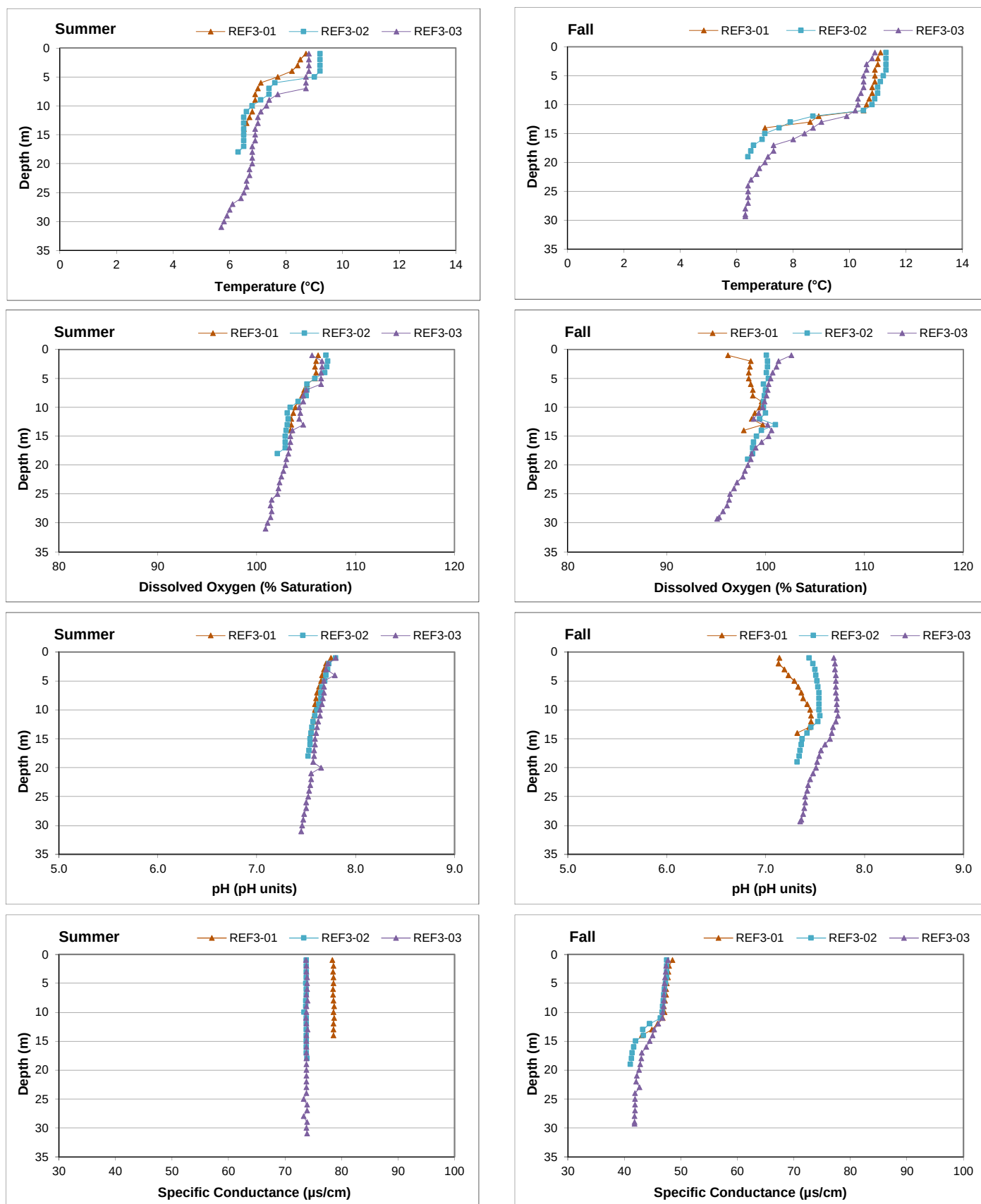


Figure B.3: *In-situ* water quality with depth from surface at Reference Lake 3 during summer and fall sampling events, Mary River Project CREMP, 2016.

B.3). The 2016 water quality profiles also showed only minor changes in pH and specific conductance among stations and with depth in each of the summer and fall sampling events (Appendix Figure B.3). Overall, the *in-situ* water quality profiles suggested relatively thorough lateral mixing within Reference Lake 3 and that, despite development of thermal stratification in 2016, no substantial influences on dissolved oxygen, pH or conductivity were associated with the changes in temperature with depth.

The evaluation of water chemistry at Reference Lake 3 showed that, consistent with observations at the lotic reference stations, aqueous phenol concentrations were occasionally elevated above WQG (Appendix Table B.4). In addition, similar to the Mary River GO-09 series reference stations, total phosphorus concentrations were elevated above WQG at Reference Lake 3, albeit in only one of six samples taken in 2016 (Appendix Table B.4). No other parameters were observed at concentrations above WQG at Reference Lake 3 in 2016. 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 2016, 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 (KP 2014a,c; Minnow 2016a).

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 (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 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.

Table B.4: Water chemistry at Reference Lake 3, Mary River Project CREMP, 20116.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Summer Sampling Event						Fall Sampling Event					
					REF3-01 surface 16-Jul-2016	REF3-01 bottom 16-Jul-2016	REF3-02 surface 28-Jul-2016	REF3-02 bottom 28-Jul-2016	REF3-03 surface 28-Jul-2016	REF3-03 bottom 28-Jul-2016	REF3-01 surface 20-Aug-2016	REF3-01 bottom 20-Aug-2016	REF3-02 surface 19-Aug-2016	REF3-02 bottom 19-Aug-2016	REF3-03 surface 20-Aug-2016	REF3-03 bottom 20-Aug-2016
Conventional ^b	Conductivity (lab)	umho/cm	-	-	76.5	76.4	76.4	76.3	76.6	76.0	123.5	76.2	76.7	76.4	76.5	76.6
	pH (lab)	pH	6.5 - 9.0	-	7.67	7.63	7.70	7.67	7.71	7.55	7.77	7.72	7.74	7.53	7.77	7.53
	Hardness (as CaCO ₃)	mg/L	-	-	36	35	35	35	35	36	35	34	35	35	34	35
	Total Suspended Solids (TSS)	mg/L	-	-	3.0	<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	-	-	43	49	44	47	46	49	37	33	39	40	41	41
	Turbidity	NTU	-	-	0.21	0.23	0.25	0.22	0.22	0.22	0.44	0.43	0.28	0.31	0.29	0.25
	Alkalinity (as CaCO ₃)	mg/L	-	-	37	34	37	33	31	29	32	32	31	32	35	36
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	0.046	0.043	0.060	0.050
	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	0.18	<0.15	0.21	0.23	<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	-	-	2.5	2.4	2.7	2.8	2.6	2.5	2.8	2.7	2.6	2.7	2.6	2.7
	Total Organic Carbon	mg/L	-	-	2.7	2.7	2.6	2.7	2.7	2.7	2.8	2.8	2.7	2.8	2.8	2.8
	Total Phosphorus	mg/L	0.020 ^a	-	0.0055	0.0044	0.0038	0.0052	0.0099	0.0037	0.0034	<0.0030	<0.0030	<0.0030	<0.0030	0.0440
	Phenols	mg/L	0.004 ^a	-	0.0018	0.0028	0.0021	0.0023	0.0029	0.0037	0.0027	0.0017	0.0038	0.0050	0.0016	0.0038
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	1.28	1.37	1.59	1.30	1.33	1.31	1.27	1.28	1.26	1.28	1.26	1.29
	Sulphate (SO ₄)	mg/L	218 ^β	218	4.21	4.29	4.66	4.20	4.24	4.23	4.08	4.08	4.05	4.10	4.03	4.10
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	0.0058	0.0031	<0.0030	0.0069	0.0034	0.0034	0.0035	<0.0030	0.0045	0.0084	<0.0030	<0.0030
	Antimony (Sb)	mg/L	0.020 ^a	-	<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	-	-	0.00638	0.00676	0.00658	0.00661	0.00690	0.00666	0.00665	0.00647	0.00647	0.00661	0.00649	0.00647
	Beryllium (Be)	mg/L	0.011 ^a	-	<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	-	-	7.10	7.15	7.05	6.91	7.15	7.14	7.00	6.91	7.29	7.01	6.90	6.83
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.00050	<0.00050	0.000535	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^a	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	0.00070	0.00072	0.00078	0.00081	0.00081	0.00081	0.00083	0.00097	0.00078	0.00077	0.00073	0.00084
	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	-	-	4.16	4.36	4.46	4.28	4.51	4.62	4.37	4.34	4.11	4.32	4.29	4.14
	Manganese (Mn)	mg/L	0.935 ^β	-	0.000646	0.000756	0.000657	0.000777	0.000823	0.000788	0.000570	0.000559	0.000582	0.000897	0.000535	0.000571
	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	-	0.000118	0.000115	0.000125	0.000123	0.000157	0.000120	0.000130	0.000132	0.000133	0.000182	0.000125	0.000116
	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	-	-	0.82	0.88	0.89	0.88	0.89	0.89	0.90	0.88	0.89	0.89	0.88	0.87
	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	-	-	0.43	0.45	0.44	0.45	0.44	0.47	0.40	0.40	0.39	0.46	0.39	0.48
	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	-	-	0.790	0.846	0.847	0.839	0.855	0.847	0.832	0.840	0.841	0.836	0.831	0.835
	Strontium (Sr)	mg/L	-	-	0.00805	0.00800	0.00791	0.00780	0.00802	0.00801	0.00816	0.00802	0.00841	0.00815	0.00799	0.00798
	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	-	0.000249	0.000249	0.000252	0.000249	0.000258	0.000253	0.000282	0.000266	0.000280	0.000269	0.000275	0.000247
	Vanadium (V)	mg/L	0.006 ^a	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
	Zirconium (Zr)	mg/L	-	-												

^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.

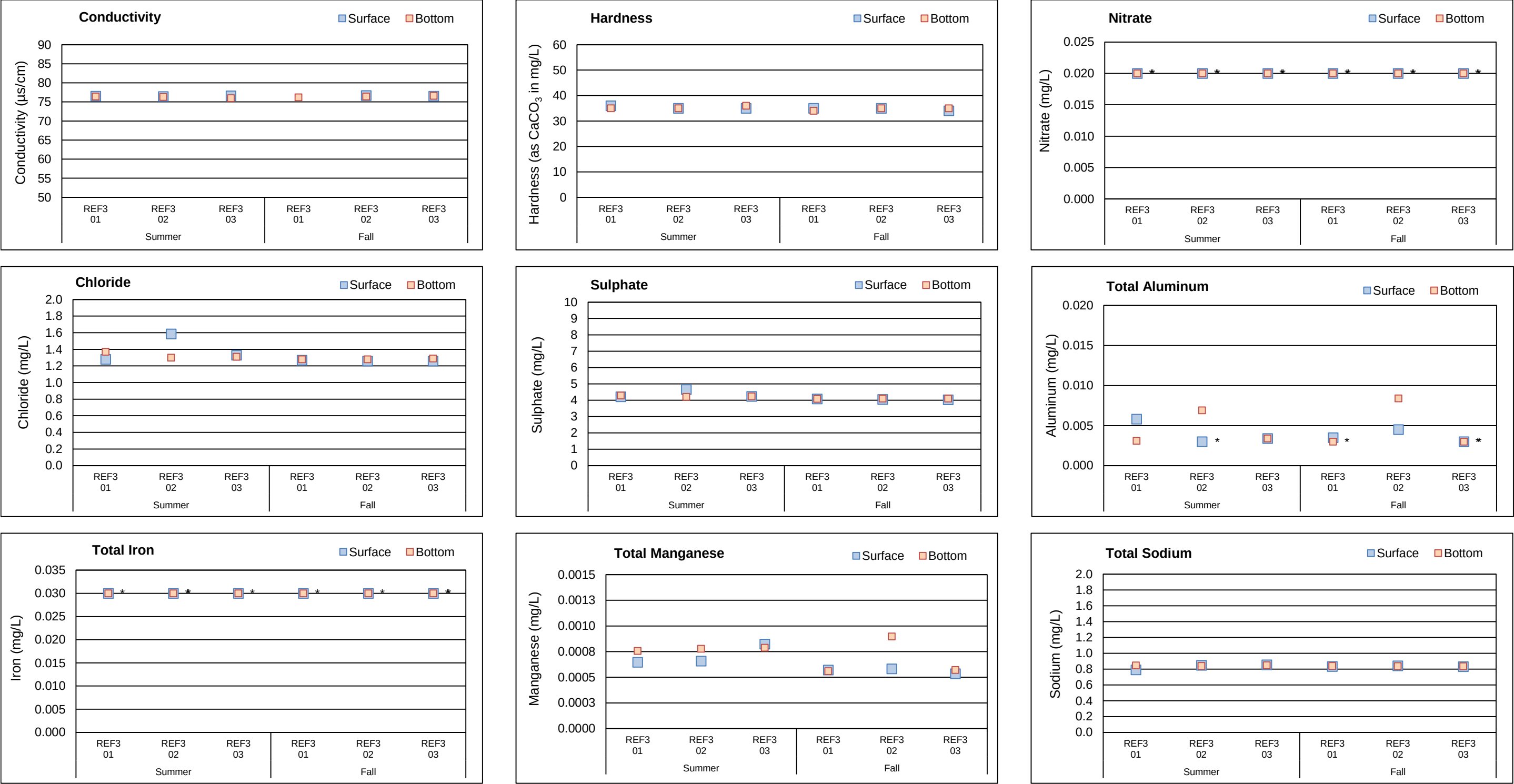


Figure B.4: Water chemistry comparison between the surface and the bottom of the water column at Reference Lake 3 routine monitoring stations during summer and fall, Mary River Project CREMP, 2016. Asterisk (*) indicates that the parameter concentration was below the laboratory method detection limit.

B.3 Background Sediment Quality Observations

B.3.1 Lotic Environments

The Mary River Project CREMP had proposed sediment chemistry sampling at lotic areas of the Camp Lake tributaries, Sheardown Lake tributaries, and the Mary River to provide qualitative information to support the lake sediment chemistry data analysis (KP 2014a, 2015). However, these watercourses were found to contain very limited depositional habitat during field studies conducted in 2014 and 2015 (KP 2015; Minnow 2016a), as well as in the current 2016 study. The general absence of any substantial accumulation of fine sediments within these watercourses precluded any meaningful assessment of potential mine-related influences on sediment chemistry within, along and/or between watercourses, and therefore no sediment chemistry sampling was conducted at lotic environments as part of the 2016 CREMP.

B.3.2 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 and 2016 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. Substrate particle size differed significantly between the Reference Lake 3 littoral and profundal habitats, with a significantly higher and lower proportion of sand- and clay-sized material, respectively, present at littoral stations compared to profundal stations (Appendix Table B.5). No significant differences in sediment TOC content occurred between the littoral and profundal habitats. 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 sediments of Reference Lake 3 (Appendix Tables D.1 - D.3). 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.2 and D.3). The physical properties of sediment observed at Reference Lake 3 in 2016 were consistent with those of the 2015 study (Minnow 2016a).

Sediment metal concentrations 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.6; Appendix Figure B.5). The differences in sediment metal concentrations between the littoral and profundal station depths likely reflected a

Table B.5: Statistical comparison of substrate physical properties between littoral and profundal sediment stations of Reference Lake 3, Mary River Project CREMP, August 2016.

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	Sand (% by weight)	YES	0.009	β	Littoral	5	42.5	18.1	8.1	19.9	66.6
					Profundal	5	16.7	3.5	1.5	13.0	20.5
	Silt (% by weight)	YES	0.012	β, γ	Littoral	5	53.1	16.3	7.3	31.1	74.0
					Profundal	5	76.1	3.1	1.4	72.3	78.4
	Clay (% by weight)	YES	0.036	β, δ	Littoral	5	4.4	2.2	1.0	2.3	7.4
					Profundal	5	7.2	0.9	0.4	6.3	8.7
	TOC (%)	NO	0.824	α, δ	Littoral	5	4.8	2.0	0.9	3.3	8.0
					Profundal	5	4.6	0.3	0.1	4.3	5.0

^a Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data logit 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.



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

Table B.6: Sediment particle size, total organic carbon, and metal concentrations at Reference Lake 3 (REF-03) sediment stations, Mary River Project CREMP, August 2016.

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	%	-	-	66.6	32.9	39.8	53.5	19.9	42.5	8.1	20.5	13.0	15.2	13.4	20.2	16.5	1.15
	Silt	%	-	-	31.1	59.8	56.5	43.9	74.0	53.1	7.29	72.3	78.3	78.4	78.2	73.1	76.1	0.97
	Clay	%	-	-	2.30	7.4	3.70	2.70	6.10	4.4	0.99	7.2	8.7	6.3	8.4	6.7	7.5	0.33
	Moisture	%	-	-	95.4	99.0	89.8	97.7	66.6	89.7	5.99	72.9	70.5	93.2	72.5	97.6	81.3	4.10
	Total Organic Carbon	%	10 ^α	-	5.39	8.04	3.30	4.09	3.42	4.85	0.88	4.31	4.82	5.03	4.36	4.65	4.63	0.096
Metals	Aluminum (Al)	mg/kg	-	-	15,200	17,700	16,600	16,400	16,500	16,480	397	23,700	30,300	25,500	21,100	24,400	25,000	1,068
	Antimony (Sb)	mg/kg	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	0.19	<0.10	<0.10	<0.10	<0.10	<0.10	0
	Arsenic (As)	mg/kg	17	5.9 - 6.2 ^c	2.74	3.87	4.23	3.67	4.04	3.71	0.26	5.96	7.24	6.98	6.24	6.25	6.53	0.173
	Barium (Ba)	mg/kg	-	-	115	153	96.4	96.6	98.4	112	11	144	187	167	179	147	165	6.02
	Beryllium (Be)	mg/kg	-	-	0.61	0.70	0.70	0.69	0.67	0.67	0.02	0.96	1.20	1.04	0.87	0.99	1.01	0.039
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.00	<0.20	0.22	0.21	<0.20	<0.20	0.21	0.0028
	Boron (B)	mg/kg	-	-	11.4	16.4	12.1	12.4	12.9	13.0	0.9	17.8	22.4	20.3	17.3	18.1	19.2	0.68
	Cadmium (Cd)	mg/kg	3.5	1.5	0.135	0.284	0.095	0.096	0.121	0.146	0.035	0.165	0.200	0.205	0.194	0.153	0.183	0.007
	Calcium (Ca)	mg/kg	-	-	6,190	6,310	4,230	4,150	4,760	5,128	470	6,000	6,630	6,040	5,710	6,210	6,118	106.9
	Chromium (Cr)	mg/kg	90	79 - 98 ^c	57.2	57.7	52.6	51.8	55.5	55.0	1.2	74.3	93.8	84.2	68.1	76.1	79.3	3.14
	Cobalt (Co)	mg/kg	-	-	8.87	8.86	11.6	11.2	10.2	10.1	0.6	16.9	20.9	18.6	18.4	17.0	18.4	0.51
	Copper (Cu)	mg/kg	197	50 - 58 ^c	55	96	60	64	58	66	7	94.6	121	105	83.6	98.1	100	4.38
	Iron (Fe)	mg/kg	40,000 ^α	34,400 - 52,400 ^c	21,400	21,400	34,900	37,400	34,100	29,840	3,488	49,200	60,700	55,200	61,000	48,900	55,000	1,867
	Lead (Pb)	mg/kg	91.3	35	15.2	95.9	79.9	24.2	15.0	46.0	17.4	25.5	26.7	48.8	33.3	19.2	30.7	3.57
	Lithium (Li)	mg/kg	-	-	27.4	28.3	27.9	26.9	26.1	27.3	0.4	37.4	49.4	42.8	37.4	40.8	41.6	1.57
	Magnesium (Mg)	mg/kg	-	-	11,600	11,200	10,700	9,960	10,800	10,852	274	15,300	19,000	16,700	13,400	15,600	16,000	650
	Manganese (Mn)	mg/kg	1,100 ^{α,β}	657 - 4,370	286	297	686	767	442	496	99	1,170	1,420	2,020	6,010	1,170	2,358	654.9
	Mercury (Hg)	mg/kg	0.486	0.17	0.0475	0.0515	0.0199	0.0234	0.0353	0.0355	0.0063	0.0633	0.0699	0.0738	0.0770	0.0687	0.0705	0.00165
	Molybdenum (Mo)	mg/kg	-	-	0.72	1.36	3.18	2.72	2.97	2.19	0.49	2.75	3.20	3.35	6.57	2.56	3.69	0.520
	Nickel (Ni)	mg/kg	75 ^{α,β}	66 - 77 ^c	40.1	44.4	35.8	35.7	37.1	38.6	1.6	53.3	65.1	59.1	50.0	53.0	56.1	1.90
	Phosphorus (P)	mg/kg	2,000 ^α	1,278 - 1,958 ^c	781	760	827	810	1,020	840	47	1,050	1,320	1,180	1,060	1,040	1,130	38.1
	Potassium (K)	mg/kg	-	-	3,280	4,260	4,170	3,820	3,940	3,894	172	5,460	6,870	6,040	4,990	5,830	5,838	221.8
	Selenium (Se)	mg/kg	-	-	0.45	0.69	0.36	0.39	0.55	0.49	0.06	0.67	0.93	1.00	0.92	0.78	0.86	0.042
	Silver (Ag)	mg/kg	-	-	0.11	0.16	<0.10	<0.10	0.11	0.12	0.01	0.24	0.32	0.28	0.22	0.26	0.26	0.012
	Sodium (Na)	mg/kg	-	-	254	403	260	250	313	296	29	412	527	491	382	437	450	18.6
	Strontium (Sr)	mg/kg	-	-	12.1	12.9	10.3	10.0	11.5	11.4	0.5	14.7	17.8	16.3	14.8	15.5	15.8	0.40
	Sulphur (S)	mg/kg	-	-	<5,000	<5,000	<5,000	<5,000	<5,000	5,000	0	<5,000	<5,000	<5,000	<5,000	<5,000	5,000	0
	Thallium (Tl)	mg/kg	-	-	0.325	0.389	0.418	0.362	0.445	0.388	0.021	0.723	0.916	0.845	0.789	0.748	0.804	0.0246
	Tin (Sn)	mg/kg	-	-	5.9	137	116	17.9	4.8	56.3	28.9	9.9	7.9	46.4	23.7	2.3	18.0	5.597
	Titanium (Ti)	mg/kg	-	-	1,050	1,060	1,010	1,030	1,210	1,072	36	1,280	1,580	1,370	1,200	1,220	1,330	48.9
	Uranium (U)	mg/kg	-	-	8.73	10.9	17.5	9.95	12.4	11.9	1.5	26.4	31.6	29.5	22.6	26.0	27.2	1.09
	Vanadium (V)	mg/kg	-	-	45.0	50.7	51.6	52.5	50.1	50.0	1.3	68.6	84.0	75.4	60.9	68.8	71.5	2.74
	Zinc (Zn)	mg/kg	315	123 - 135 ^c	67.3	82.2	70.0	77.0	72.0	73.7	0.5	101	122	109	87.7	101	104.1	3.98
	Zirconium (Zr)	mg/kg	-	-	5.0	6.5	3.3	3.2	3.7	4.1	0.1	3.6	4.6	4.2	3.1	3.9	3.9	0.2

^a Canadian Sediment Quality Guideline, probable effects level (PEL; CCME 2016) 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 Baffinland Mary River Project Aquatic Effects Monitoring Program (AEMP) sediment quality benchmarks (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, respective, parameters.

Indicates parameter concentration above Sediment Quality Guideline (SQG).

BOLD

 Indicates parameter concentration above the AEMP Benchmark.

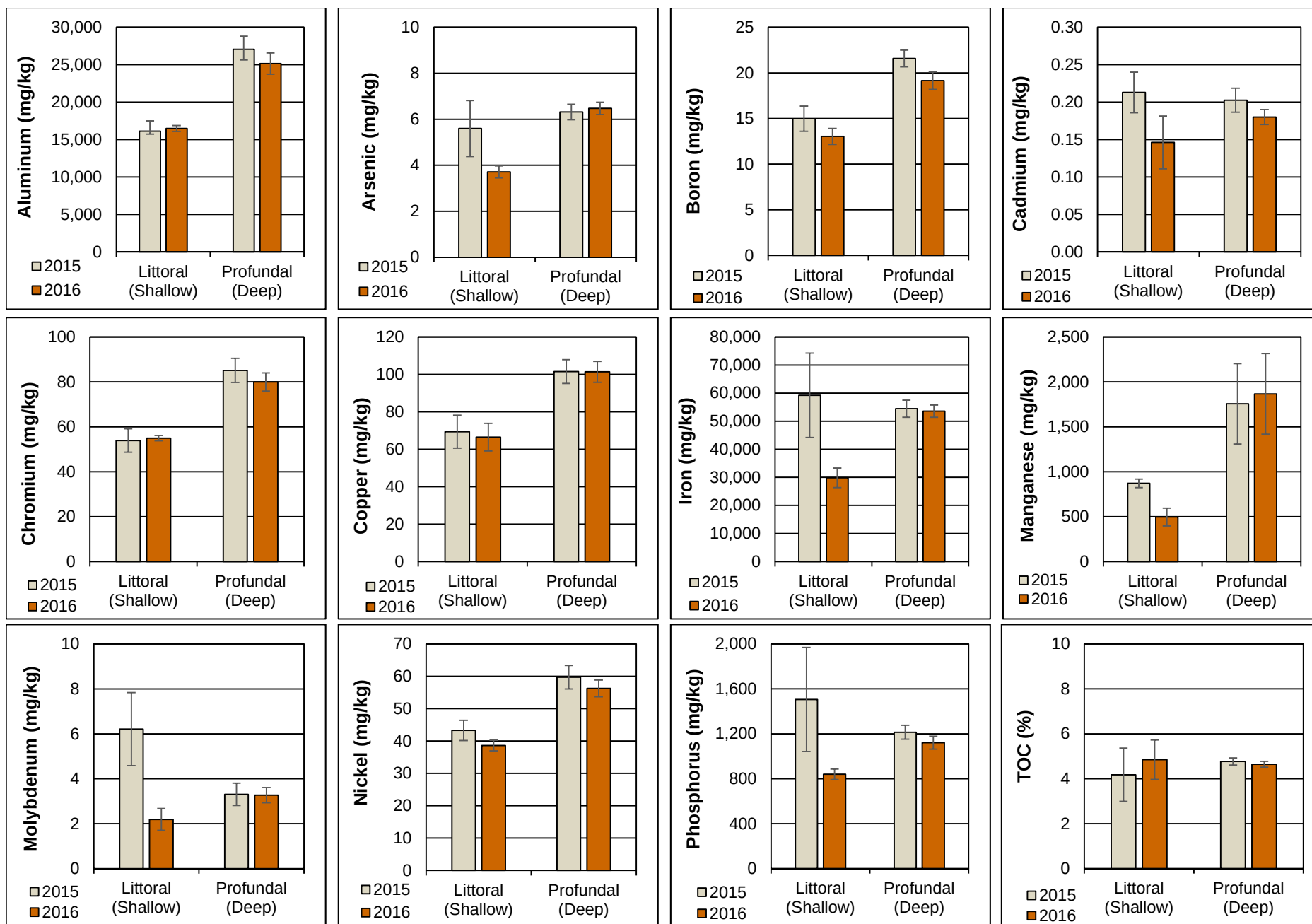


Figure B.5: Sediment metal concentrations (mean $\pm$ SE) at littoral (<12m depth) and profundal (>12m depth) monitoring stations of Reference Lake 3 (REF03), Mary River Project CREMP, August 2016.

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 and manganese were elevated above respective SQG only at profundal stations of Reference Lake 3 in 2016 (Appendix Table B.6). Sediment chromium and lead concentrations were also elevated above SQG at a single profundal and littoral station of Reference Lake 3, respectively (Appendix Table B.6). Therefore, compared to SQG, high concentrations of iron and manganese, and chromium and lead to a lesser extent, appear to occur naturally in sediments of Mary River Project LSA lakes. Mean copper and lead concentrations at littoral stations, and mean arsenic, chromium, 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.6). This suggested that the AEMP sediment benchmarks for these metals were conservative.

B.4 Phytoplankton Productivity (Chlorophyll a) Observations

B.4.1 Lotic Environments

Chlorophyll a concentrations, which were used as a surrogate for phytoplankton abundance, ranged from approximately 0.14 – 0.59 µg/L at the reference creek and river stations among spring, summer and fall sampling events in 2016 (Appendix Table B.7). 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 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 2016 (Appendix Table B.2). However, a trophic status classification of 'mesotrophic' was suggested at the Mary River GO-09 series reference area based on an aqueous total phosphorus concentration falling between 10 – 20 µg/L for these same sampling events in 2016 (Appendix Table B.3). Seasonally, chlorophyll a concentrations did not differ significantly for the reference creek stations or the Mary River GO-09 series reference stations among the spring, summer and fall sampling events (Appendix Table B.8).

Comparisons between 2015 and 2016 chlorophyll a concentrations for like-season data indicated significantly higher concentrations in 2016 than 2015 at reference creek stations for the summer sampling event, but no differences for the spring and fall sampling events (Appendix Figure B.6). At the Mary River reference stations, significantly lower and higher

Table B.7: Phytoplankton monitoring data (i.e., chlorophyll a and phaeophytin a concentrations) collected at lotic reference stations, Mary River Project CREMP, 2016.

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	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	26-Jun-16	26-Jun-16	26-Jun-16
	Summer	24-Jul-16	24-Jul-16	25-Jul-16	25-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16
	Fall	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16
Chlorophyll a (µg/L)	Spring	0.18	0.17	0.14	0.45	0.35	0.26	0.23
	Summer	0.41	0.31	0.56	0.37	0.29	0.24	0.22
	Fall	0.41	0.28	0.18	0.35	0.59	0.29	0.23
	Average	0.33	0.25	0.29	0.39	0.41	0.26	0.23
	Standard Deviation	0.13	0.07	0.23	0.05	0.16	0.03	0.01
	Standard Error	0.08	0.04	0.13	0.03	0.09	0.01	0.00
Phaeophytin a (µg/L)	Spring	0.28	0.29	0.28	0.45	0.39	0.35	0.31
	Summer	0.43	0.37	0.54	0.39	0.44	0.42	0.40
	Fall	0.34	0.30	0.30	0.33	0.46	0.40	0.33
	Average	0.35	0.32	0.37	0.39	0.43	0.39	0.35
	Standard Deviation	0.08	0.04	0.14	0.06	0.04	0.04	0.05
	Standard Error	0.04	0.03	0.08	0.03	0.02	0.02	0.03

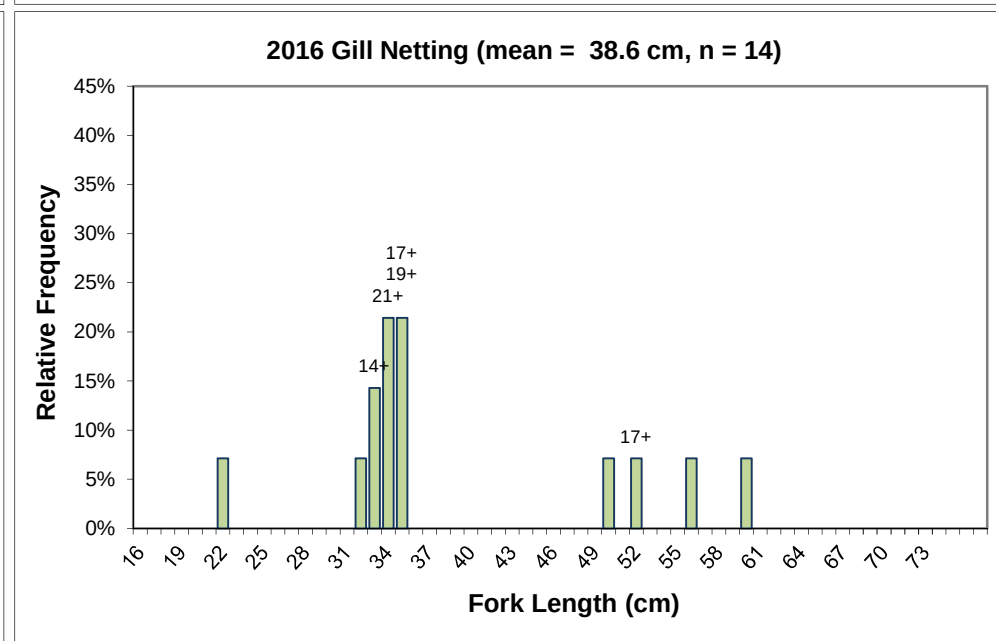
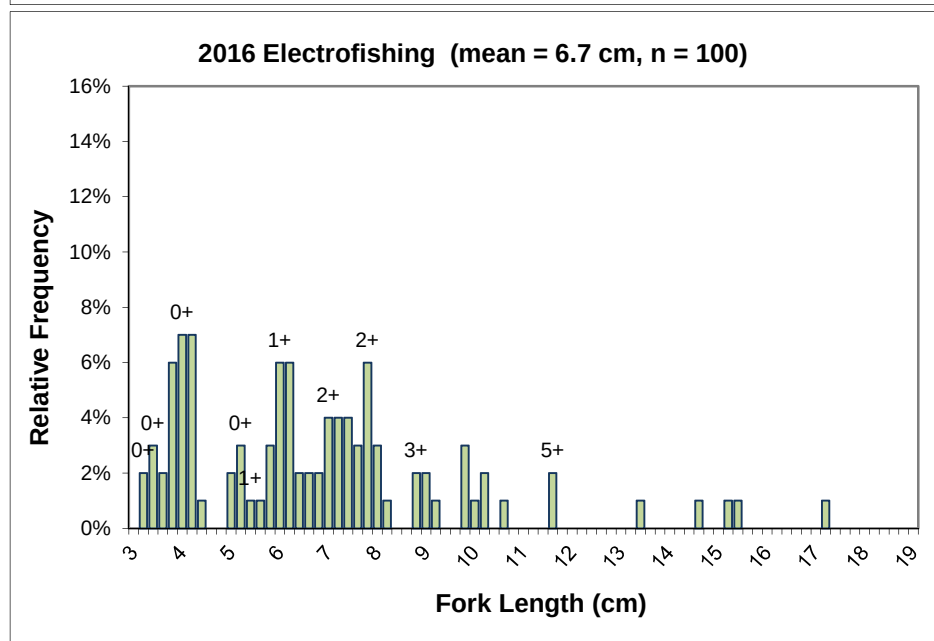
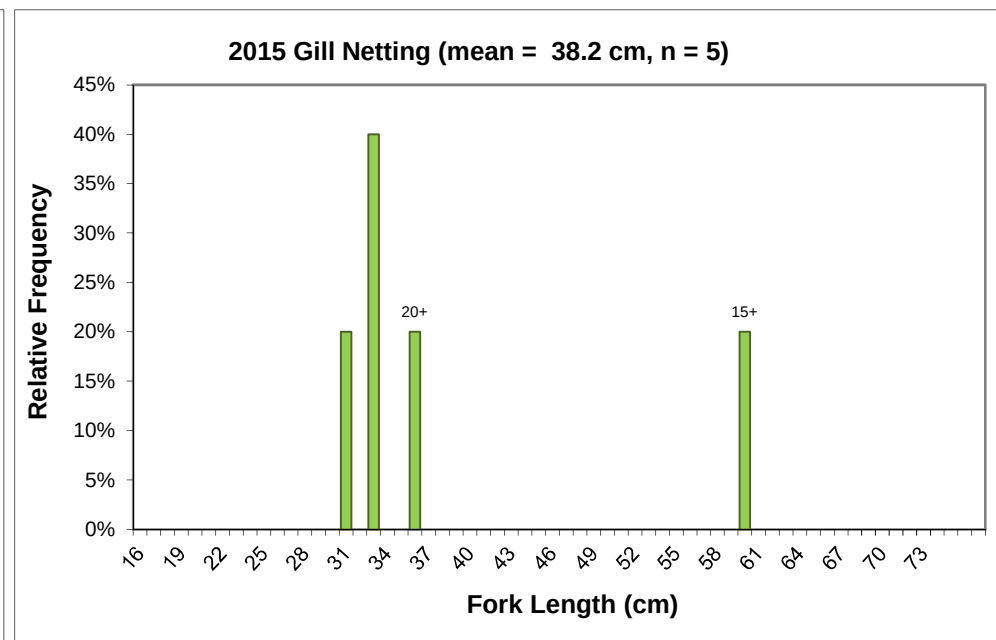
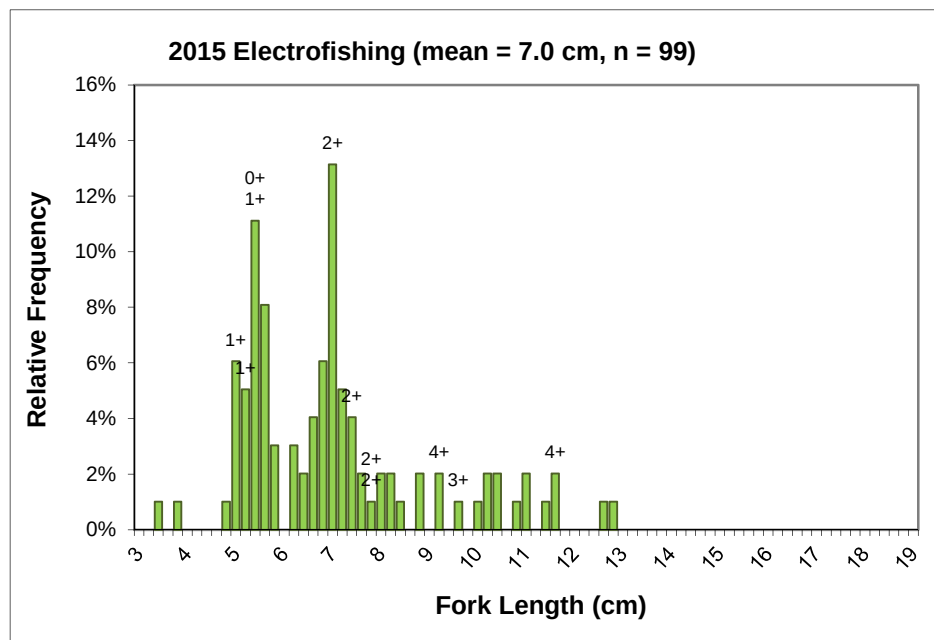


Figure B.8: Length-frequency distributions for Arctic charr captured by backpack electrofishing and gill netting at Reference Lake 3 in August 2015 and August 2016, Mary River Project CREMP. Fish ages are shown above the bars, where available.

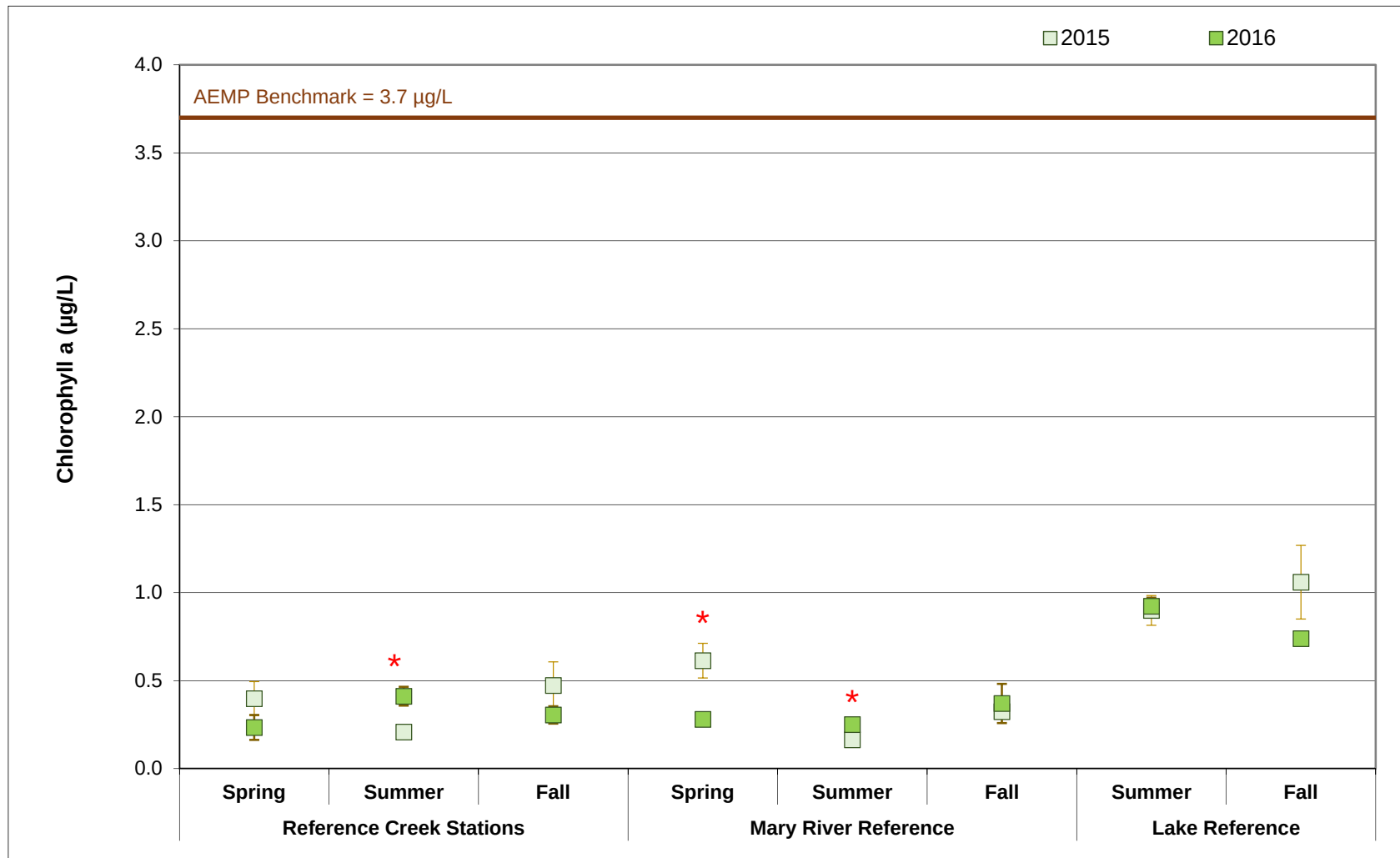


Figure B.6: Chlorophyll a concentration seasonal comparison between 2015 and 2016 at creek, river and lake reference phytoplankton monitoring stations, Mary River Project CREMP. Asterisks above data points indicate a significant difference between years for indicated season.

chlorophyll a concentrations were shown in spring and summer, respectively, during the 2016 sampling events compared to 2015 (Appendix Figure B.6). The variability in response among seasons between years at the lotic reference areas suggested that chlorophyll a concentrations exhibit naturally high spatial and temporal variability within the Mary River Project mine LSA.

B.4.2 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 2016 (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 0.92 µg/L in summer and 0.74 µg/L in fall 2016, and were consistently well below the AEMP benchmark of 3.7 µg/L (Appendix Figure B.7). Similar to the lotic reference stations, mean chlorophyll a concentrations observed at Reference Lake 3 in 2016 suggested 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 2016 (Appendix Table B.4). Chlorophyll a concentrations were significantly higher in summer compared to the fall at Reference Lake 3 in 2016 (Appendix Table B.8), which differed from results of the 2015 study in which chlorophyll a concentrations were statistically comparable between the summer and fall seasons (Appendix Figure B.6). Although chlorophyll a concentrations were generally comparable between the 2015 and 2016 studies for like seasons at Reference Lake 3, the relative seasonal changes in chlorophyll a concentrations suggested naturally variable temporal patterns in phytoplankton abundance can expected at Mary River Project mine LSA lakes.

B.5 Benthic Invertebrate Community

B.5.1 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

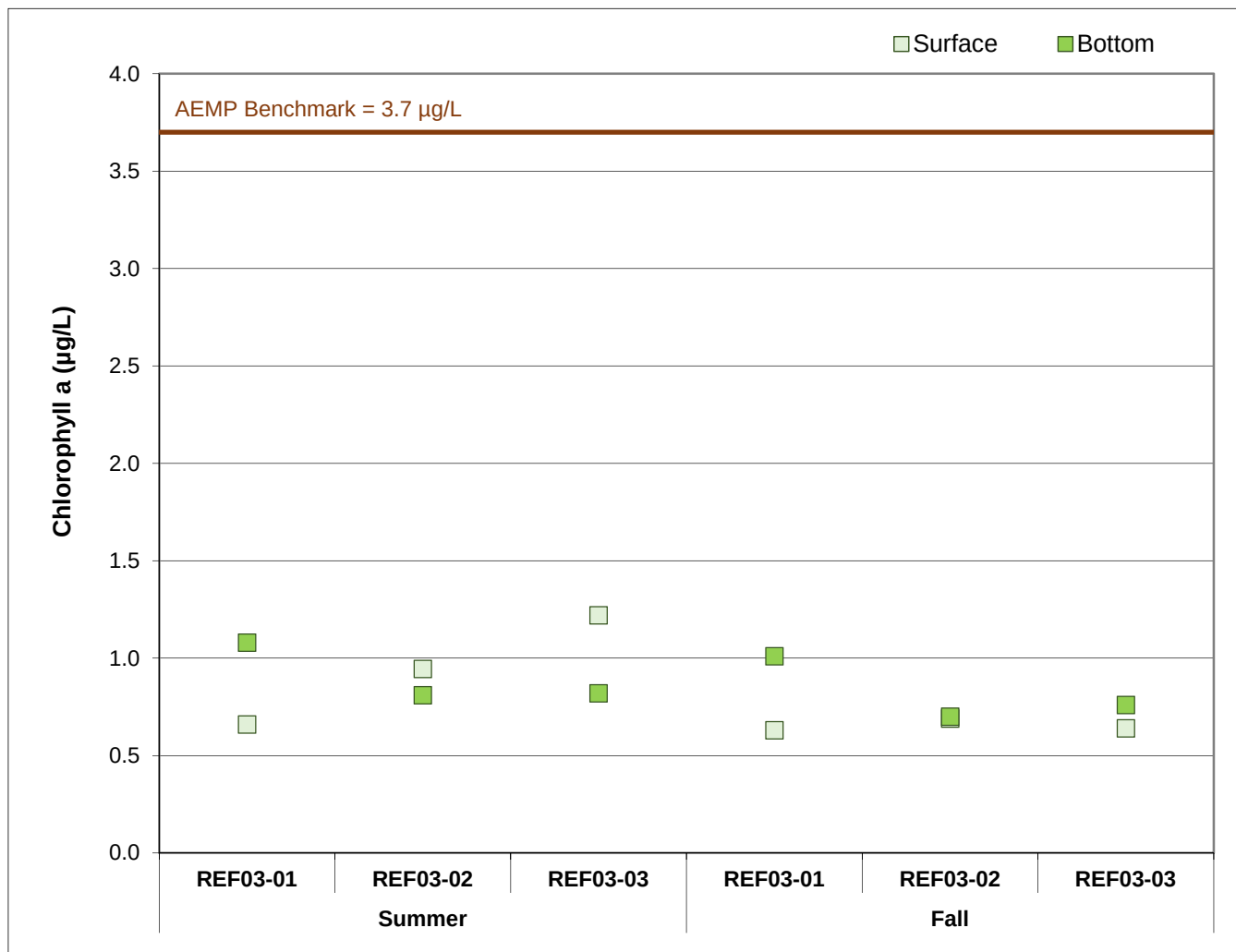


Figure B.7: Chlorophyll a concentrations at the surface and bottom of the water column at Reference Lake 3 phytoplankton monitoring stations during summer and fall sampling events, Mary River Project CREMP, 2016.

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 CREMP benthic invertebrate community study component 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 2016 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 Table F.1) 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 670 – 2,179 individuals/m², which is considered moderate to high for Arctic streams (Craig and McCart 1975). Unnamed Reference Creek also showed moderate richness and Simpson's Evenness, which was consistent with low production in Arctic streams as a result of constraints associated with naturally low seasonal temperatures and nutrients, as well as food limitation (Huryn and Wallace 2000). Chironomidae (non-biting midges) were the dominant group observed among the Unnamed Reference Creek benthic stations, with the relative abundance of this group ranging from 57 – 81% of individuals (mean of 71%), of which 5 – 19% were represented by metal-sensitive taxa among stations (Appendix Table B.9). Collector-gatherers were the dominant benthic invertebrate functional feeding group (FFG) present at Unnamed Reference Creek (Appendix Table B.9), suggesting greatest reliance upon deposited fine particulate organic matter as a food source for benthic invertebrates. Shredders constituted a moderate proportion of the Unnamed Reference Creek benthic invertebrate community (Appendix Table B.9), suggesting that live and/or decomposing leaf material was also an important food source. In terms of benthic invertebrate habitat preference groups (HPG), clingers and sprawlers were co-dominant groups at Unnamed Reference Creek (Appendix Table B.9) suggesting that most invertebrates were associated with substrate surfaces and were not deeply embedded in the substrate (i.e., non-burrowers).

Table B.9: Benthic invertebrate community summary statistics for Unnamed Reference Creek and Mary River (GO-09) reference areas, Mary River Project CREMP, August 2016.

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	1,645	619	277	876	2,414	670	2,179
	Mary River GO-09 Reference	5	662	320	143	265	1,059	334	1,162
Richness (Number of Taxa)	Unnamed Reference Creek	5	18.6	0.9	0.4	17.5	19.7	17.0	19.0
	Mary River GO-09 Reference	5	14.0	1.6	0.7	12.0	16.0	12.0	16.0
Simpson's Evenness	Unnamed Reference Creek	5	0.873	0.070	0.031	0.786	0.960	0.764	0.940
	Mary River GO-09 Reference	5	0.907	0.023	0.010	0.878	0.935	0.875	0.932
Bray-Curtis Index	Unnamed Reference Creek	5	0.237	0.130	0.058	0.076	0.398	0.092	0.437
	Mary River GO-09 Reference	5	0.277	0.097	0.043	0.156	0.397	0.142	0.385
Oligochaeta (% of community)	Unnamed Reference Creek	5	2.5%	0.5%	0.2%	1.9%	3.2%	2.0%	3.3%
	Mary River GO-09 Reference	5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hydracarina (% of community)	Unnamed Reference Creek	5	11.7%	3.8%	1.7%	7.1%	16.4%	9.0%	18.2%
	Mary River GO-09 Reference	5	4.8%	2.1%	1.0%	2.2%	7.5%	2.5%	7.3%
Chironomidae (% of community)	Unnamed Reference Creek	5	70.8%	9.2%	4.1%	59.4%	82.2%	56.6%	81.4%
	Mary River GO-09 Reference	5	84.2%	4.6%	2.1%	78.4%	90.0%	78.2%	88.3%
Metal Sensitive Chironomidae (% of community)	Unnamed Reference Creek	5	8.9%	5.9%	2.7%	1.6%	16.3%	4.6%	19.3%
	Mary River GO-09 Reference	5	23.4%	12.3%	5.5%	8.1%	38.6%	11.5%	43.3%
Tipulidae (% of community)	Unnamed Reference Creek	5	4.3%	2.6%	1.2%	1.1%	7.6%	1.8%	8.5%
	Mary River GO-09 Reference	5	1.9%	1.6%	0.7%	0.0%	3.9%	0.0%	4.2%
Shredder FFG (% of community)	Unnamed Reference Creek	5	25.4%	3.2%	1.5%	21.4%	29.5%	20.4%	28.2%
	Mary River GO-09 Reference	5	12.0%	3.7%	1.6%	7.5%	16.6%	7.8%	15.3%
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	5	53.9%	7.5%	3.4%	44.5%	63.2%	44.6%	64.6%
	Mary River GO-09 Reference	5	75.4%	9.1%	4.1%	64.0%	86.7%	61.8%	84.2%
Filterer FFG (% of community)	Unnamed Reference Creek	5	2.9%	1.1%	0.5%	1.5%	4.2%	1.0%	3.8%
	Mary River GO-09 Reference	5	7.3%	4.3%	1.9%	2.0%	12.6%	2.1%	13.4%
Clinger HPG (% of community)	Unnamed Reference Creek	5	41.0%	7.1%	3.2%	32.2%	49.8%	30.9%	47.0%
	Mary River GO-09 Reference	5	22.3%	8.7%	3.9%	11.4%	33.1%	13.3%	34.9%
Sprawler HPG (% of community)	Unnamed Reference Creek	5	50.4%	8.8%	3.9%	39.5%	61.3%	39.4%	62.9%
	Mary River GO-09 Reference	5	73.7%	8.3%	3.7%	63.4%	83.9%	61.8%	81.0%
Burrower HPG (% of community)	Unnamed Reference Creek	5	8.6%	3.6%	1.6%	4.2%	13.0%	5.9%	14.5%
	Mary River GO-09 Reference	5	4.1%	2.0%	0.9%	1.5%	6.6%	1.2%	6.3%

B.5.2 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 2016 CREMP (see Table 2.5; Figure 2.4).

Benthic invertebrate density at the Mary River reference area in 2016 ranged from 334 – 1,162 individuals/m², which is considered 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 invertebrate group observed at the Mary River reference area, with the relative abundance of this group ranging from 78 – 88% of individuals (mean of 84%) and taxa considered metal-sensitive constituting 11 – 43% of the community (Appendix Table B.9). Similar to the reference creek, collector-gatherers were the dominant FFG present at the Mary River reference area (Appendix Table B.9), 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.9), 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) 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 5.6). 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). 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.

B.5.3 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 2016. As in the previous 2015 study, significantly higher benthic invertebrate density, richness and Simpson's Evenness was observed at littoral stations compared to profundal stations in 2016, most at Critical Effect Sizes outside of ± 2 SD (Appendix Table B.10). In addition, marked differences in benthic invertebrate community structure occurred between sampling depths as indicated by significantly differing Bray-Curtis Index and supported by lower relative abundance of Chironomidae (non-biting midges), FFG collector-gatherers, and HPG sprawlers at littoral stations compared to profundal stations (Appendix Table B.10). The considerable difference in benthic invertebrate community metrics and assemblage features between the littoral and profundal stations observed at Reference Lake 3 in both 2015 and 2016 validated changes implemented to the CREMP benthic invertebrate community survey in 2016. Specifically, the 2016 benthic invertebrate community survey focussed 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 both 2015 and 2016. Comparison of littoral habitat benthic invertebrate communities at Reference Lake 3 between the 2015 and 2016 studies for key metrics indicated no significant differences in density, richness, Simpson's Evenness, Bray-Curtis Index, relative abundance of dominant FFG and HPG, and the relative abundance of all dominant groups except Ostracoda (seed shrimp; Appendix Table B.11). Although the relative abundance of seed shrimp 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 between the 2015 and 2016 studies.

Table B.10: Benthic invertebrate community statistical comparison results between littoral and profundal stations at Reference Lake 3 Mary River Project CREMP, August 2016.

Metric	Statistical Test Results				Summary Statistics					
	Significant Difference Between Areas?	p-value	Statistical Analysis ^a	Magnitude of Difference ^b (No. of SD)	Area	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Density (Individuals/m ²)	YES	0.015	ϵ	-1.4	Reference Lake littoral	2,390	1,396	624	897	4,240
					Reference Lake profundal	452	55	24	406	543
Richness (Number of Taxa)	YES	0.000	α	-7.3	Reference Lake littoral	12.2	1.1	0.5	11.0	14.0
					Reference Lake profundal	4.2	1.5	0.7	2.0	6.0
Simpson's Evenness (E)	YES	0.000	ζ	-2.6	Reference Lake littoral	0.758	0.189	0.084	0.420	0.849
					Reference Lake profundal	0.267	0.041	0.018	0.235	0.337
Bray-Curtis Index	YES	0.000	ϵ	4.8	Reference Lake littoral	0.334	0.122	0.054	0.245	0.527
					Reference Lake profundal	0.921	0.011	0.005	0.907	0.933
Nemata (%)	NO	0.126	β	-	Reference Lake littoral	4.0%	5.6%	2.5%	0.0%	13.5%
					Reference Lake profundal	0.0%	0.0%	0.0%	0.0%	0.0%
Hydracarina (%)	NO	0.177	δ	-	Reference Lake littoral	3.6%	2.0%	0.9%	1.8%	6.7%
					Reference Lake profundal	2.1%	2.1%	1.0%	0.0%	4.4%
Ostracoda (%)	YES	0.000	γ	-2.4	Reference Lake littoral	46.9%	17.5%	7.8%	37.8%	78.0%
					Reference Lake profundal	5.7%	1.8%	0.8%	3.9%	8.4%
Chironomidae (%)	YES	0.000	β	2.5	Reference Lake littoral	45.4%	18.8%	8.4%	15.4%	59.2%
					Reference Lake profundal	92.2%	3.2%	1.4%	87.2%	95.9%
Metal-Sensitive Chironomidae (%)	YES	0.005	δ	-2.1	Reference Lake littoral	19.3%	8.3%	3.7%	7.7%	28.1%
					Reference Lake profundal	1.7%	1.7%	0.8%	0.0%	4.1%
Shredders (%)	YES	0.023	γ	-1.1	Reference Lake littoral	4.4%	3.2%	1.4%	1.1%	9.6%
					Reference Lake profundal	0.8%	1.2%	0.5%	0.0%	2.2%
Collector-Gatherers (%)	YES	0.001	β	1.9	Reference Lake littoral	75.0%	11.4%	5.1%	61.1%	89.7%
					Reference Lake profundal	97.1%	2.4%	1.1%	93.9%	100.0%
Filterers (%)	YES	0.000	δ	-1.9	Reference Lake littoral	16.1%	8.4%	3.8%	7.0%	26.4%
					Reference Lake profundal	0.0%	0.0%	0.0%	0.0%	0.0%
Clingers (%)	YES	0.007	δ	-2.3	Reference Lake littoral	19.2%	7.6%	3.4%	8.8%	28.3%
					Reference Lake profundal	2.1%	2.1%	1.0%	0.0%	4.4%
Sprawlers (%)	YES	0.000	γ	2.6	Reference Lake littoral	65.7%	12.1%	5.4%	57.2%	85.7%
					Reference Lake profundal	97.1%	2.8%	1.2%	93.9%	100.0%
Burrowers (%)	YES	0.001	γ	-2.3	Reference Lake littoral	15.1%	6.2%	2.8%	5.5%	22.2%
					Reference Lake profundal	0.8%	1.1%	0.5%	0.0%	2.0%

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

^b Magnitude calculated by comparing the difference between the reference area and effluent-exposed area means divided by the reference area standard deviation.

^c Minimum effect size detectable calculated based on variance as square root of MSE from ANOVA and $\alpha = \beta = 0.10$.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10 that were also outside of a Critical Effect Size of ± 2 SD, suggesting an ecologically important difference.

BOLD Bold text values indicate significant difference between study areas based on ANOVA p-value less than 0.10, but a Critical Effect Size within ± 2 SD, suggesting the difference is not ecologically meaningful.

Table B.11: Benthic invertebrate community statistical comparison results between 2015 and 2016 at littoral stations of Reference Lake 3, Mary River Project CREMP.

Metric	Statistical Test Results				Summary Statistics					
	Significant Difference Between Areas?	p-value	Statistical Analysis ^a	Magnitude of Difference ^b (No. of SD)	Year	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Density (Individuals/m ²)	NO	0.155	η	-	2015	1,278	888	397	553	2,819
					2016	2,390	1,396	624	897	4,240
Richness (Number of Taxa)	NO	0.838	ε	-	2015	12.6	4.1	1.8	9.0	18.0
					2016	12.2	1.1	0.5	11.0	14.0
Simpson's Evenness (E)	NO	0.257	ζ	-	2015	0.865	0.052	0.023	0.804	0.936
					2016	0.758	0.189	0.084	0.420	0.849
Bray-Curtis Index	NO	0.620	α	-	2015	0.382	0.170	0.076	0.219	0.662
					2016	0.334	0.122	0.054	0.245	0.527
Nemata (%)	NO	0.617	β	-	2015	8.1%	7.4%	3.3%	0.0%	17.2%
					2016	4.0%	5.6%	2.5%	0.0%	13.5%
Hydracarina (%)	NO	0.873	β	-	2015	4.2%	2.7%	1.2%	1.0%	7.5%
					2016	3.6%	2.0%	0.9%	1.8%	6.7%
Ostracoda (%)	YES	0.044	γ	1.4	2015	20.9%	18.5%	8.3%	4.1%	45.2%
					2016	46.9%	17.5%	7.8%	37.8%	78.0%
Chironomidae (%)	NO	0.110	β	-	2015	66.5%	18.9%	8.4%	40.6%	91.0%
					2016	45.4%	18.8%	8.4%	15.4%	59.2%
Metal-Sensitive Chironomidae (%)	NO	0.153	β	-	2015	11.4%	12.6%	5.6%	1.5%	32.2%
					2016	19.3%	8.3%	3.7%	7.7%	28.1%
Shredders (%)	YES	0.043	δ	1.3	2015	1.4%	2.4%	1.1%	0.0%	5.5%
					2016	4.4%	3.2%	1.4%	1.1%	9.6%
Collector-Gatherers (%)	NO	0.335	β	-	2015	81.4%	17.1%	7.7%	53.7%	95.2%
					2016	75.0%	11.4%	5.1%	61.1%	89.7%
Filterers (%)	NO	0.256	β	-	2015	11.4%	12.6%	5.6%	1.5%	32.2%
					2016	16.1%	8.4%	3.8%	7.0%	26.4%
Clingers (%)	NO	0.248	β	-	2015	13.5%	11.8%	5.3%	4.0%	33.9%
					2016	19.2%	7.6%	3.4%	8.8%	28.3%
Sprawlers (%)	NO	0.619	γ	-	2015	70.1%	14.9%	6.7%	47.1%	84.3%
					2016	65.7%	12.1%	5.4%	57.2%	85.7%
Burrowers (%)	NO	0.750	β	-	2015	16.4%	6.8%	3.0%	8.3%	25.8%
					2016	15.1%	6.2%	2.8%	5.5%	22.2%

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

^b Magnitude calculated by comparing the difference between the reference area and effluent-exposed area means divided by the reference area standard deviation.

^c Minimum effect size detectable calculated based on variance as square root of MSE from ANOVA and alpha = beta = 0.10.

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10 that were also outside of a Critical Effect Size of ±2 SD, suggesting an ecologically important difference.

BOLD Bold text values indicate significant difference between study areas based on ANOVA p-value less than 0.10, but a Critical Effect Size within ±2 SD, suggesting the difference is not ecologically meaningful.

B.6 Fish Population Survey

B.6.1 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 under the Metal Mining Effluent Regulations (Baffinland 2014; Minnow 2016c).

B.6.2 Lentic Environments (Reference Lake 3)

The Reference Lake 3 fish community was composed of Arctic charr and ninespine stickleback. As in 2015, 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 2016 (Appendix Tables G.1 and G.2). Suitable numbers of Arctic charr were captured at nearshore habitat of Reference Lake 3 (i.e., 101 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). Therefore, population comparisons of nearshore Arctic charr captured between the mine-exposed and reference lakes in 2016 were completed separately for YOY and non-YOY data sets (2016 data), and using the full data set (to allow comparability between the 2015 and 2016 studies). Temporal comparisons of the 2015 and 2016 nearshore Arctic charr data did not indicate any significantly differing population endpoints that were not also outside of accepted CES (Appendix Table B.12). This not only indicated relatively good continuity in fish population features at Reference Lake 3 year-to-year supporting its use as a suitable reference lake for the CREMP, but also indicated that fish population CES that are generally used for EEM under the MMER are relevant, and could be suitably applied, to the Mary River Project CREMP.

Very low numbers of Arctic charr were captured at littoral/profundal areas of Reference Lake 3 in 2016 (i.e., 14 individuals; Appendix Table G.2). Due to the small sample size,

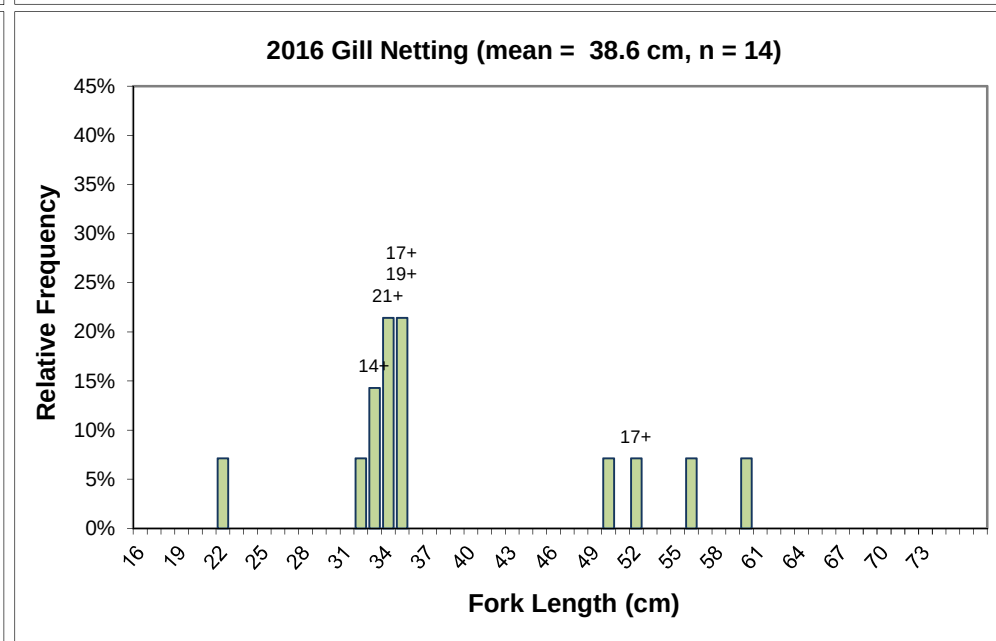
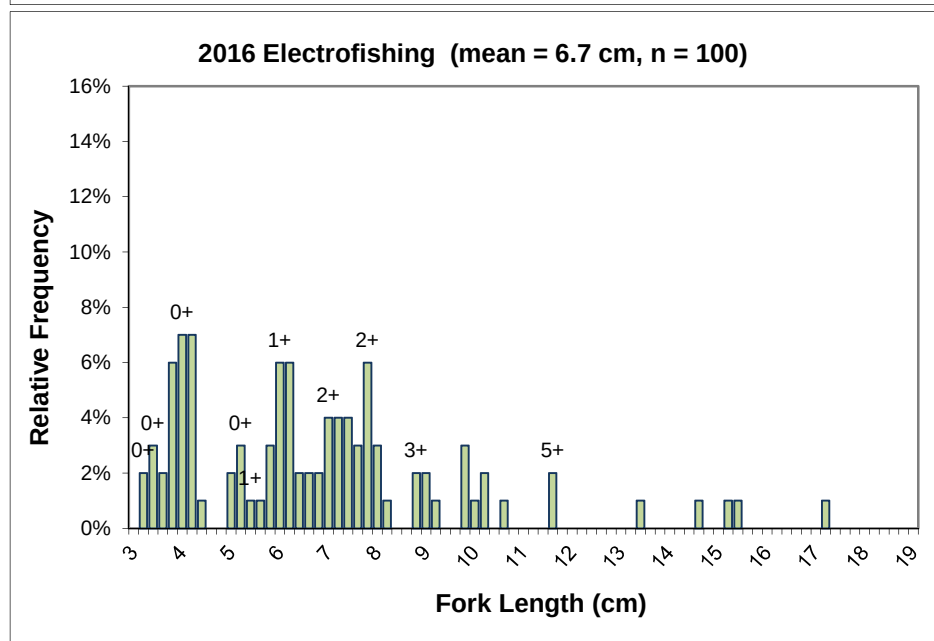
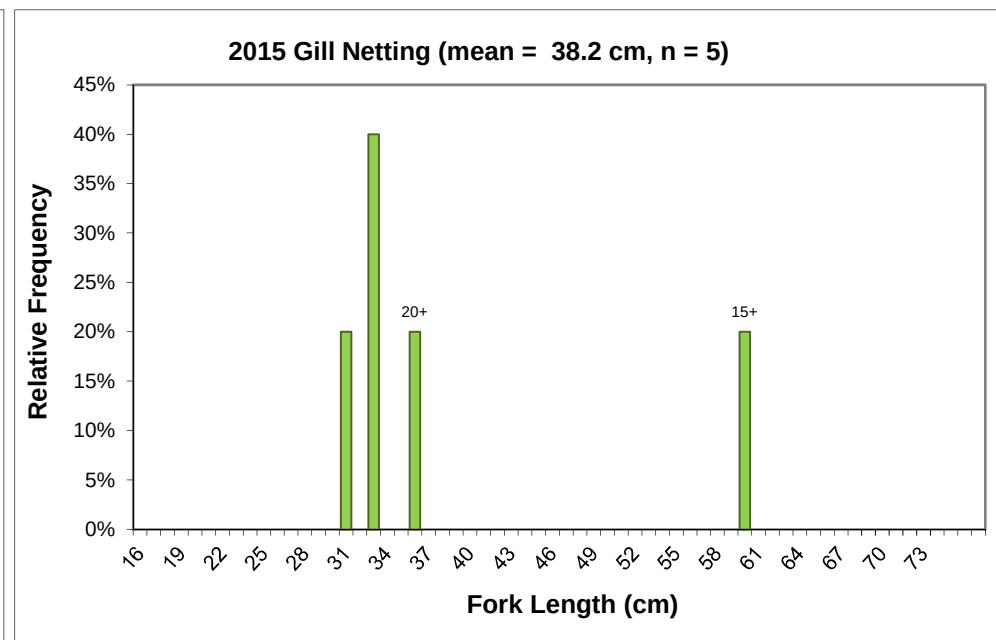
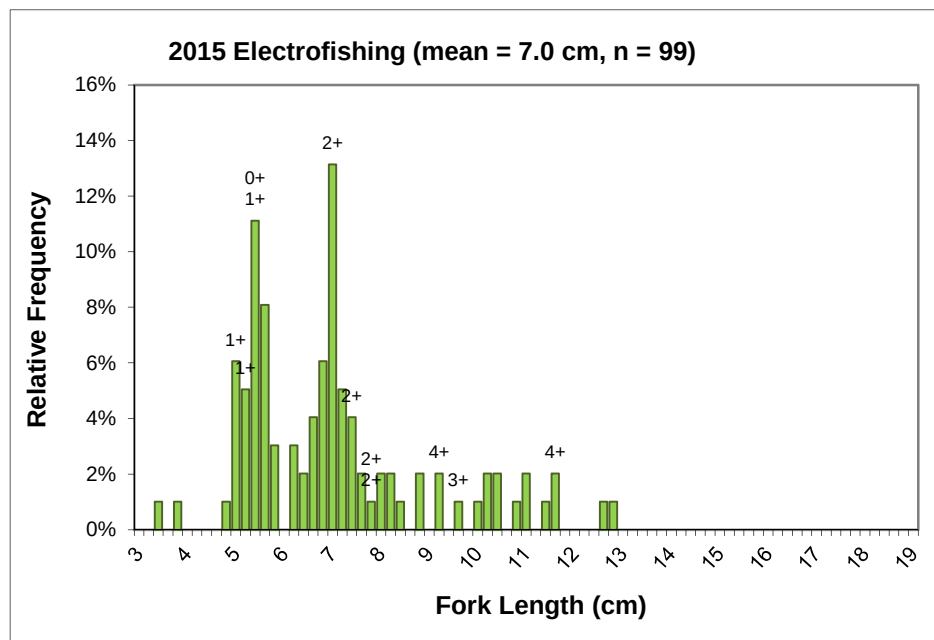


Figure B.8: Length-frequency distributions for Arctic charr captured by backpack electrofishing and gill netting at Reference Lake 3 in August 2015 and August 2016, Mary River Project CREMP. Fish ages are shown above the bars, where available.

Table B.12: Results of fish population endpoint statistical comparisons for nearshore (juvenile) Arctic charr captured at Reference Lake 3 in August 2015 and August 2016, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	2015	2016	2015		2016					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	99	99	-	-	-	-	K-S Test	Yes	0.002	-
	Log ₁₀ Age (years)	none	11	10	-	-	-	-	ANOVA	No	0.177	-
Energy Use	Log ₁₀ Body Weight (g)	none	99	99	-	-	-	-	ANOVA	Yes	0.075	0.555
	Log ₁₀ Fork Length (cm)	none	99	99	-	-	-	-	ANOVA	Yes	0.065	0.582
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years)	11	10	0.732	0.001	0.930	0.000	ANCOVA	No	0.522	-
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ^e	9	9	0.991	0.000	0.980	0.000	ANCOVA	Yes	0.000	-
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years)	11	10	0.743	0.001	0.903	0.000	ANCOVA	No	0.957	-
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years) ^{e,f}	8	9	0.996	0.000	0.978	0.000	ANCOVA	Yes	0.001	-
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	99	99	0.989	0.000	0.989	0.000	ANCOVA	No	0.572	-

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	2015	2016		2015	2016		Increase	Decrease
Survival	Age (years)	none	11	10	Mean	1.6	0.9	-	277.9	-73.5
Energy Use	Body Weight (g)	none	99	99	Mean	2.619	2.022	-22.8	-	-
	Fork Length (cm)	none	99	99	Mean	6.8	6.2	-8.3	-	-
	Body Weight (g)	Age (years)	11	10	Adjusted Mean	2.821	3.285	-	82.2	-45.1
	Body Weight (g)	Age (years) ^e	9	9	Predicted Values	11.953	9.479	Max overlap	-	-
						1.004	1.722	Min overlap		
	Fork Length (cm)	Age (years)	11	10	Adjusted Mean	7.0	7.1	-	23.3	-18.9
	Fork Length (cm)	Age (years) ^{e,f}	8	9	Predicted Values	11.3	10.1	Max overlap	-	-
						5.0	5.7	Min overlap		
Energy Storage	Body Weight (g)	Fork Length (cm)	99	99	Adjusted Mean	2.295	2.313	-	4.6	-4.4

 - indicates a significant (*p* < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the *r*² for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

^e Studentized outliers REF3-ACJ-1, REF3 ACJ-96, and REF316-ACJ-8 removed.

^f Studentized outlier REF3-ACJ-2 removed.

meaningful evaluation of mine-related effects on the population of reproductive-aged Arctic charr was not possible using data from the mine-exposed lakes and Reference Lake 3 in 2016. Because Arctic charr can show differential growth rates between the sexes (females grow faster; Jonsson et al. 1999; Skúlason 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).

B.7 Implications for the Mary River Project CREMP

This overview of reference conditions was included 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 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 consistently indicated a significant, positive relationship between phenol and both nitrate and DOC concentrations, 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 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, and historically as part of baseline studies. Significant positive correlations between total concentrations of these metals and turbidity were identified using the 2015 and 2016 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 and 2016. Accordingly, greater emphasis was placed on comparison of dissolved metal concentrations for assessing potential mine-related influences on water quality for the 2016 CREMP analysis.
- **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 and 2016 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 sampling event. 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.
- **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 or 2016. Therefore, the evaluation of water chemistry and phytoplankton productivity among stations and study areas for the 2016 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.
- **Discontinue creek sediment chemistry monitoring.** Lotic habitats included in the Mary River Project CREMP contain minimal depositional habitat based on

investigations conducted during baseline (2005 – 2013), mine construction (2014) and mine-operational (2015, 2016) studies. The general lack of any substantial accumulation of fine sediments within these watercourses precludes any meaningful assessment of potential mine-related influences on sediment chemistry. Therefore, no sediment chemistry sampling was conducted at lotic environments as part of the 2016 CREMP.

- **Focus lake benthic invertebrate community survey on littoral zone.** Benthic invertebrate community data collected at Reference Lake 3 in 2015 and 2016 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 served as the focus for the lake benthic invertebrate community survey as part of the 2016 CREMP.

APPENDIX C

WATER QUALITY DATA

Table C.1: *In-situ* water quality data collected from lotic environments for the Mary River Project CREMP, spring 2016.

Study Area		Station	Sampling Date	<i>In-situ</i> Water Quality Parameter				
				Temperature (°C)	Dissolved Oxygen (% saturation)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Camp Lake System	Reference Creek Stations	CLT-REF4	27-Jun-16	3.0	103.6	7.41	25.3	0.70
		CLT-REF3	27-Jun-16	2.8	103.5	7.20	39.7	0.50
		MRY-REF3	27-Jun-16	2.0	104.6	7.79	18.3	2.40
		MRY-REF2	27-Jun-16	5.0	104.0	7.44	44.5	0.50
	CLT-1	L1-08	27-Jun-16	2.3	102.4	7.28	44.0	1.40
		L1-02	27-Jun-16	4.1	101.8	7.42	60.8	-
		L2-03	27-Jun-16	5.0	96.2	7.22	246.8	2.80
		L1-09	27-Jun-16	4.5	100.4	7.48	71.4	1.60
		L1-05	27-Jun-16	5.0	100.2	7.27	75.2	1.20
		L0-01	27-Jun-16	6.5	102.8	6.75	84.0	1.30
	CLT-2	K0-01	25-Jun-16	8.4	98.5	7.21	77.5	1.00
	Camp Lake	J0-01	26-Jun-16	4.6	103.8	7.16	127.0	0.10
Sheardown Lake System	SDL Tribs	D1-05	27-Jun-16	5.1	95.9	7.67	154.7	0.50
		D1-00	27-Jun-16	6.1	12.3	7.55	185.3	1.70
	Tom River	I0-01	25-Jun-16	6.8	103.8	7.07	31.5	2.40
Mary River/Lake System	Mary River	G0-09-A	26-Jun-16	1.2	98.2	7.58	20.4	8.20
		G0-09	26-Jun-16	1.6	99.0	7.58	21.4	5.80
		G0-09-B	26-Jun-16	1.4	99.5	7.82	26.1	3.70
		G0-03	25-Jun-16	5.2	100.6	7.07	22.0	4.50
		G0-01	26-Jun-16	2.6	102.7	7.51	22.4	2.90
		F0-01	26-Jun-16	2.2	100.5	7.34	44.0	6.10
		E0-10	26-Jun-16	2.7	102.4	7.10	27.7	3.70
		E0-03	26-Jun-16	2.2	102.3	7.54	23.6	2.80
		E0-20	25-Jun-16	4.7	102.5	7.22	21.9	2.60
		E0-21	25-Jun-16	4.8	102.0	7.20	20.7	3.30
		C0-10	25-Jun-16	4.3	102.7	7.40	22.7	2.36
		C0-05	25-Jun-16	4.3	105.4	7.54	33.3	2.60
		C0-01	25-Jun-16	4.6	105.4	8.15	30.8	2.80

Table C.2: *In-situ* water quality data collected from lotic environments for the Mary River Project CREMP, summer 2016.

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	24-Jul-16	7.90	99.7	7.9	80.7	0.9
		CLT-REF3	24-Jul-16	6.20	100.8	7.75	72.2	-1.7
		MRY-REF3	25-Jul-16	7.70	101.0	7.33	64.6	8.2
		MRY-REF2	25-Jul-16	8.80	102.4	7.55	96.4	-1.5
	CLT-1	L1-08	20-Jul-16	5.00	100.8	7.83	84.4	1.4
		L1-02	19-Jul-16	7.70	99.2	7.96	147.2	0.3
		L2-03	19-Jul-16	8.20	96.6	7.81	371.2	2.2
		L1-09	19-Jul-16	8.20	99.0	7.95	211.3	0.7
		L1-05	20-Jul-16	10.90	100.8	8.11	210.1	0.3
		L0-01	20-Jul-16	11.10	100.7	8.14	219.2	0.3
	CLT-2	K0-01	20-Jul-16	9.70	100.1	8.02	186.5	0.9
	Camp Lake	J0-01	20-Jul-16	9.20	106.5	7.84	132.1	0.5
Sheardown Lake System	SDL Tribs	D1-05	19-Jul-16	6.40	93.2	7.64	280.4	0.3
		D1-00	19-Jul-16	9.00	-	7.66	310.5	1
Mary River/Lake System	Tom River	I0-01	20-Jul-16	9.40	103.1	7.92	88.5	1.4
	Mary River	G0-09-A	18-Jul-16	9.40	98.7	7.72	57.4	10.4
		G0-09	18-Jul-16	8.90	95.7	7.73	65.9	8.2
		G0-09-B	18-Jul-16	9.20	95.7	7.84	62.1	8.3
		G0-03	18-Jul-16	9.40	95.7	7.79	62.6	6.3
		G0-01	18-Jul-16	8.90	97.3	7.72	64.0	5.8
		F0-01	18-Jul-16	7.30	97.0	8.08	154.6	3.6
		E0-10	18-Jul-16	8.60	98.9	7.8	84.2	6.1
		E0-03	18-Jul-16	8.10	99.0	7.7	69.6	6.1
		E0-20	18-Jul-16	9.40	100.4	7.7	67.6	6.4
		E0-21	18-Jul-16	8.70	100.0	7.7	64.9	6.4
		C0-10	18-Jul-16	9.30	101.8	7.72	66.3	6.7
		C0-05	18-Jul-16	10.80	100.7	7.7	67.5	7.2
		C0-01	18-Jul-16	11.40	99.6	7.57	-	-

Table C.3: *In-situ* water quality data collected from lotic environments for the Mary River Project CREMP, fall 2016.

Study Area		Station	Sampling Date	<i>In-situ</i> Water Quality Parameter				
				Temperature (°C)	Dissolved Oxygen (% saturation)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Camp Lake System	Reference Creek Stations	CLT-REF4	20-Aug-16	4.0	96.0	7.81	98.0	-2.0
		CLT-REF3	20-Aug-16	6.9	96.2	8.11	115.0	-2.1
		MRY-REF3	20-Aug-16	11.1	98.0	7.93	115.0	-1.0
		MRY-REF2	20-Aug-16	8.2	97.3	7.92	92.0	4.6
	CLT-1	L1-08	20-Aug-16	1.5	91.6	7.62	125.0	-2.4
		L1-02	19-Aug-16	4.6	95.9	8.01	212.9	-2.7
		L2-03	19-Aug-16	6.6	95.8	7.94	441.3	0.3
		L1-09	19-Aug-16	5.8	97.1	8.04	302.4	-2.0
		L1-05	19-Aug-16	4.1	96.7	8.01	307.6	-2.0
		L0-01	19-Aug-16	4.0	96.1	8.05	305.6	-1.9
	CLT-2	K0-01	19-Aug-16	3.7	95.4	8.09	263.4	-2.8
	Camp Lake	J0-01	20-Aug-16	10.0	93.0	6.77	114.0	-2.5
Sheardown Lake System	SDL Tribs	D1-05	19-Aug-16	4.1	92.5	7.75	239.2	-2.5
		D1-00	19-Aug-16	5.2	95.8	7.94	314.5	4.9
Mary River/Lake System	Tom River	I0-01	19-Aug-16	7.8	99.9	8.10	196.7	-2.8
	Mary River	G0-09-A	20-Aug-16	8.7	95.3	8.12	160.0	18.6
		G0-09	20-Aug-16	8.8	96.4	8.15	159.0	8.6
		G0-09-B	20-Aug-16	8.6	96.2	8.11	159.0	9.2
		G0-03	20-Aug-16	5.8	95.5	7.95	142.0	11.4
		G0-01	20-Aug-16	4.5	94.4	7.52	148.0	15.9
		F0-01	20-Aug-16	5.3	95.7	8.14	225.0	10.7
		E0-10	20-Aug-16	4.8	96.4	7.98	157.0	16.5
		E0-03	19-Aug-16	7.2	96.5	8.04	176.0	13.7
		E0-20	19-Aug-16	7.2	97.5	8.08	175.1	16.3
		E0-21	19-Aug-16	6.9	97.2	8.07	175.7	14.7
		C0-10	19-Aug-16	8.9	98.8	8.15	173.3	35.9
		C0-05	19-Aug-16	8.0	101.6	8.03	172.6	51.1
		C0-01	19-Aug-16	8.4	99.5	8.07	172.5	15.1

Table C.4: Dissolved metals concentrations at reference creek monitoring stations, Mary River Project CREMP, 2016.

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
			L1790501-27	L1790501-28	27-Jun-2016	27-Jun-2016	27-Jun-2016	27-Jun-2016	24-Jul-2016	24-Jul-2016	25-Jul-2016	25-Jul-2016	20-Aug-2016	20-Aug-2016
Dissolved Metals	Aluminum (Al)	mg/L	0.0065	0.0091	0.0273	0.0051	0.0119	0.0079	0.0336	0.0078	0.0082	0.0081	0.0244	0.0100
	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	0.00110	0.00212	0.00201	0.00192	0.00357	0.00450	0.00527	0.00538	0.00555	0.00628	0.00999	0.00816
	Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<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	2.11	3.35	1.30	3.71	8.10	7.02	4.69	9.32	14.3	11.8	9.20	13.6
	Cesium (Cs)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010								
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	0.0205	<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	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	<0.00020	0.00063	0.00063	0.00170	<0.00050	0.00092	0.00085	<0.00050	0.00063	0.00107	0.00100	0.00072
	Iron (Fe)	mg/L	<0.010	<0.010	0.027	0.451	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	0.000056	<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	1.23	1.97	0.657	2.19	4.60	4.03	2.36	5.43	7.67	6.63	4.46	7.78
	Manganese (Mn)	mg/L	<0.00050	<0.00050	0.00168	0.0057	0.0001	0.000574	0.000244	0.000416	0.000087	0.00113	0.000117	0.000505
	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	0.000125	0.000064	0.000229	0.000117	0.000406	0.000236	0.000143	0.000329	0.000639	0.000429	0.000242
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	0.00106	<0.00050	0.00050	<0.00050	<0.00050	<0.00050	0.00067	<0.00050	<0.00050
	Phosphorus (P)	mg/L	<0.050	<0.050	<0.050	<0.050								
	Potassium (K)	mg/L	0.190	0.292	0.249	0.284	0.465	0.52	0.62	0.62	0.67	0.75	1.02	0.87
	Rubidium (Rb)	mg/L	0.00022	0.00065	0.00041	0.00042								
	Selenium (Se)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.231	0.481	0.290	0.317	0.64	0.76	0.84	0.69	0.73	0.92	1.03	0.80
	Silver (Ag)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	<0.50	<0.50	0.62	<0.50	0.587	0.570	1.72	1.08	1.27	0.985	3.48	1.56
	Strontium (Sr)	mg/L	0.0016	0.0023	0.0028	0.0028	0.00607	0.00458	0.0100	0.00761	0.0109	0.00795	0.0191	0.0108
	Sulfur (S)	mg/L	<0.50	<0.50	<0.50	<0.50								
	Tellurium (Te)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020								
	Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Thorium (Th)	mg/L	<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	<0.00030	<0.00030	0.00058	<0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Tungsten (W)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010								
	Uranium (U)	mg/L	0.000088	0.000201	0.000194	0.000188	0.001315	0.000625	0.000382	0.000932	0.00755	0.00311	0.00145	0.00230
	Vanadium (V)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.0010	<0.0010	0.0032	<0.0010	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)	mg/L	<0.00030	<0.00030	<0.00030	<0.00030								

Table C.5: *In-situ* water quality profile data collected at Reference Lake 3 water quality monitoring stations in summer^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)			Dissolved Oxygen (% Saturation)			pH (pH units)			Specific Conductance (µS/cm)		
	REF3-01 ^b	REF3-02 ^b	REF3-03 ^b	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03
1.0	8.7	9.2	8.8	106.2	107.0	105.6	7.75	7.80	7.80	78.4	73.8	73.7
2.0	8.5	9.2	8.8	106.0	107.2	106.6	7.70	7.73	7.72	78.6	73.8	73.8
3.0	8.4	9.2	8.8	105.9	107.1	106.6	7.68	7.72	7.70	78.5	73.8	73.8
4.0	8.2	9.2	8.8	106.0	106.9	106.5	7.66	7.70	7.79	78.6	73.8	73.9
5.0	7.7	9.0	8.7	105.9	105.9	106.5	7.65	7.69	7.68	78.6	73.7	73.9
6.0	7.1	7.6	8.7	105.1	105.1	106.5	7.63	7.66	7.68	76.5	73.8	73.9
7.0	7.0	7.4	8.7	104.8	105.1	105.0	7.61	7.65	7.68	78.5	73.8	73.8
8.0	6.9	7.4	7.7	104.6	105.0	104.7	7.60	7.65	7.67	78.6	73.7	74.0
9.0	6.9	7.1	7.4	104.2	104.2	104.7	7.59	7.63	7.66	78.7	73.7	73.8
10.0	6.8	6.8	7.3	103.9	103.4	104.3	7.59	7.61	7.64	78.6	73.4	73.8
11.0	6.8	6.6	7.1	103.7	103.1	104.4	7.58	7.59	7.64	78.7	73.8	73.7
12.0	6.7	6.5	7.0	103.5	103.2	104.3	7.58	7.57	7.62	78.6	73.8	73.8
13.0	6.6	6.5	7.7	103.5	103.1	104.7	7.56	7.56	7.61	78.6	73.8	74.0
14.0	6.5	6.5	6.9	103.4	103.0	103.6	7.55	7.55	7.60	78.6	73.8	73.8
15.0		6.5	6.9		102.9	103.4		7.54	7.59		73.8	73.8
16.0		6.5	6.9		102.9	103.4		7.54	7.59		73.8	73.8
17.0		6.5	6.8		102.9	103.3		7.53	7.58		73.8	73.8
18.0		6.3	6.8		102.1	103.2		7.52	7.58		73.9	73.8
19.0			6.8			103.0			7.57			73.8
20.0			6.8			102.9			7.65			73.8
21.0			6.7			102.7			7.55			73.8
22.0			6.7			102.5			7.55			73.8
23.0			6.6			102.3			7.54			73.8
24.0			6.6			102.2			7.53			73.8
25.0			6.5			102.1			7.52			73.3
26.0			6.4			101.5			7.50			73.9
27.0			6.1			101.4			7.50			73.9
28.0			6.0			101.5			7.48			73.3
29.0			5.9			101.4			7.47			73.9
30.0			5.8			101.1			7.46			73.8
31.0			5.7			100.9			7.45			73.9

^a Sampling conducted on 16-July (REF3-01) and 28-July (REF3-02, REF3-03), 2016.

^b Total depth at Stations REF3-01, REF3-02, and REF3-03 were 15.1, 18.6, and 31.4 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^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)			Dissolved Oxygen (% Saturation)			pH (pH units)			Specific Conductance (µS/cm)		
	REF3-01 ^b	REF3-02 ^b	REF3-03 ^b	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03	REF3-01	REF3-02	REF3-03
1.0	11.1	11.3	10.9	96.2	100.1	102.6	7.40	7.44	7.69	48.5	47.5	47.7
2.0	11.0	11.3	10.8	98.5	100.2	101.3	7.13	7.48	7.70	47.9	47.5	47.4
3.0	11.0	11.3	10.6	98.4	100.2	101.1	7.19	7.50	7.70	47.8	47.5	47.3
4.0	10.9	11.3	10.6	98.3	100.1	100.7	7.23	7.51	7.71	47.7	47.5	47.2
5.0	10.9	11.2	10.5	98.3	100.3	100.5	7.29	7.52	7.71	47.5	47.3	47.1
6.0	10.9	11.1	10.5	98.5	99.8	100.3	7.33	7.53	7.71	47.4	47.1	47.1
7.0	10.8	11.0	10.5	98.7	100.0	100.2	7.36	7.54	7.71	37.4	47.0	47.0
8.0	10.8	11.0	10.4	98.7	99.9	100.1	7.38	7.54	7.72	47.2	46.9	47.0
9.0	10.7	10.9	10.3	99.6	99.8	99.9	7.42	7.54	7.72	47.0	46.8	46.9
10.0	10.6	10.8	10.3	99.4	99.8	99.7	7.45	7.54	7.72	47.1	46.7	46.8
11.0	10.5	10.5	10.2	98.9	100.0	99.3	7.46	7.55	7.73	46.8	46.4	46.7
12.0	8.9	8.7	9.9	98.6	99.4	98.8	7.46	7.53	7.71	45.9	44.5	46.0
13.0	8.6	7.9	9.0	99.7	101.0	100.2	7.44	7.46	7.68	44.9	43.3	45.3
14.0	7.0	7.5	8.7	97.8	99.6	100.6	7.32	7.42	7.67	43.1	43.4	45.0
15.0		7.0	8.4		99.1	100.3		7.37	7.65		42.0	44.5
16.0		6.9	8.0		98.8	99.6		7.36	7.60		41.7	43.9
17.0		6.6	7.3		98.7	99.0		7.35	7.56		41.4	43.1
18.0		6.5	7.3		98.7	98.6		7.34	7.54		41.3	43.0
19.0		6.4	7.1		98.2	98.5		7.32	7.52		41.1	42.8
20.0			7.0			98.2			7.51			42.6
21.0			6.8			97.9			7.48			42.2
22.0			6.7			97.7			7.45			42.1
23.0			6.5			97.1			7.43			42.7
24.0			6.4			96.8			7.42			41.9
25.0			6.4			96.4			7.40			41.9
26.0			6.4			96.3			7.40			41.9
27.0			6.4			96.1			7.39			41.9
28.0			6.3			95.7			7.38			41.8
29.0			6.3			95.3			7.36			41.8
29.3			6.3			95.1			7.35			41.8

^a Sampling conducted on 19-August and 20-August, 2016.

^b Total depth at stations REF3-01, REF3-02, and REF3-03 were 14.1, 20.7, and 30.3 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 2016.

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	16-Aug-16	9.0	9.0	clear, colourless	surface	12.9	8.77	83.5	7.88	75
					bottom	10.2	9.28	82.6	7.86	74
REF 03-2	16-Aug-16	8.1	8.1	clear, colourless	surface	11.8	10.50	97.0	7.19	74
					bottom	9.8	10.92	96.1	7.28	74
REF 03-3	16-Aug-16	10.0	10.0	clear, colourless	surface	12.3	10.61	99.2	7.71	74
					bottom	9.5	11.34	99.1	7.74	74
REF 03-4	16-Aug-16	8.8	8.8	clear, colourless	surface	12.5	10.89	100.4	7.80	75
					bottom	10.4	10.33	91.9	7.57	74
REF 03-5	16-Aug-16	10.7	8.5	clear, colourless	surface	11.6	10.81	99.6	7.83	74
					bottom	9.7	9.86	86.9	7.77	74
REF 03-6	16-Aug-16	19.5	8.3	clear, colourless	surface	12.8	10.19	96.1	7.86	75
					bottom	6.5	11.27	91.6	7.70	74
REF 03-7	16-Aug-16	22.9	8.0	clear, colourless	surface	12.7	8.80	82.9	7.90	75
					bottom	6.0	9.37	74.9	7.61	74
REF 03-8	16-Aug-16	18.6	8.0	clear, colourless	surface	12.4	10.28	96.3	7.87	74
					bottom	6.6	11.17	90.1	7.75	74
REF 03-9	16-Aug-16	21.6	7.8	clear, colourless	surface	12.2	10.59	98.6	7.87	74
					bottom	7.0	10.37	84.7	7.67	74
REF 03-10	16-Aug-16	19.8	8.1	clear, colourless	surface	12.5	9.88	94.4	7.88	75
					bottom	6.9	12.71	104.4	7.74	74

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 2016.

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)	YES	0.035	α	Littoral	5	8.9	0.7	0.3	8.1	10.0
					Profundal	5	8.0	0.2	0.1	7.8	8.3
	Temperature (°C)	YES	0.000	α	Littoral	5	9.9	0.4	0.2	9.5	10.4
					Profundal	5	6.6	0.4	0.2	6.0	7.0
	Dissolved Oxygen (mg/L)	NO	0.368	α	Littoral	5	10.3	0.8	0.4	9.3	11.3
					Profundal	5	11.0	1.2	0.6	9.4	12.7
	Dissolved Oxygen (% saturation)	NO	0.710	α	Littoral	5	91.3	6.7	3.0	82.6	99.1
					Profundal	5	89.1	10.8	4.8	74.9	104.4
	pH (units)	NO	0.648	α, δ	Littoral	5	7.64	0.23	0.10	7.28	7.86
					Profundal	5	7.69	0.06	0.03	7.61	7.75
	Specific Conductance (umho/cm)	NO	1.000	α	Littoral	5	74.0	0.0	0.0	74.0	74.0
					Profundal	5	74.0	0.0	0.0	74.0	74.0

^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.



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

Table C.9: Dissolved metals concentrations at Reference Lake 3 monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Summer Sampling Event						Fall Sampling Event						
			REF3-01S1 surface	REF3-01B1 bottom	REF3-02S1 surface	REF3-02B1 bottom	REF3-03S1 surface	REF3-03B1 bottom	REF3-01S1 surface	REF3-01B1 bottom	REF3-02S1 surface	REF3-02B1 bottom	REF3-03-S1 surface	REF3-03-B1 bottom	
			16-Jul-2016	16-Jul-2016	28-Jul-2016	28-Jul-2016	28-Jul-2016	28-Jul-2016	20-Aug-2016	20-Aug-2016	19-Aug-2016	19-Aug-2016	20-Aug-2016	20-Aug-2016	
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	0.00672	0.00647	0.00661	0.00668	0.00676	0.00690	0.0063	0.0064	0.0065	0.00646	0.00649	0.00656	
	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	7.00	6.99	6.98	7.02	7.03	7.19	6.92	7	7.06	6.9	6.83	7.04	
	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	0.00068	0.00077	0.00075	0.00075	0.00079	0.0009	0.00081	0.00081	0.00081	0.00081	0.00078	0.00093
	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
	Lead (Pb)	mg/L	<0.000050	<0.000050	0.000058	<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	4.40	4.30	4.36	4.35	4.33	4.33	4.38	4.13	4.23	4.23	4.02	4.27	
	Manganese (Mn)	mg/L	0.000280	0.000208	0.000253	0.000195	0.000272	0.000233	0.000244	0.000123	0.000214	0.000121	0.0002	0.000195	
	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
	Molybdenum (Mo)	mg/L	0.000121	0.000113	0.000128	0.000112	0.000115	0.000120	0.000133	0.000128	0.000131	0.000127	0.000126	0.00013	
	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
	Potassium (K)	mg/L	0.91	0.89	0.90	0.89	0.89	0.90	0.89	0.88	0.87	0.88	0.86	0.89	
	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
	Silicon (Si)	mg/L	0.42	0.44	0.43	0.45	0.43	0.45	0.4	0.4	0.38	0.44	0.4	0.47	
	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
	Sodium (Na)	mg/L	0.864	0.850	0.849	0.852	0.841	0.847	0.84	0.828	0.829	0.838	0.816	0.85	
	Strontium (Sr)	mg/L	0.00806	0.00814	0.00807	0.00811	0.00802	0.00816	0.00805	0.00822	0.00818	0.00805	0.0079	0.00822	
	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
	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	<0.010	<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	0.000252	0.000246	0.000257	0.000244	0.000252	0.000246	0.000276	0.000264	0.000282	0.00026	0.000267	0.00025	
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	
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	

Table C.10: Average Relative Percent Difference (RPD) values between water chemistry samples taken at the top and bottom of the water column at lentic (lake) monitoring stations, Mary River Project CREMP, 2016. Gray shaded values indicate RDP >30%.

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
Conventional ^b	Conductivity (lab)	0.3	16	3.9	0.5	2.4	2	0	3	2.4	0.6	1.4	1.3	4.2	3.1	7.3	7.5	14
	pH (lab)	1.0	2.2	2.7	6.6	1.4	0.6	1.2	1.9	0.9	0.7	1.3	3.9	0.5	0.4	0.8	0.9	1.4
	Hardness (as CaCO ₃)	1.9	1.9	3.2	2.8	3.2	1.9	2.0	3.2	1.3	1.4	0.9	4.5	5.3	5.2	8.5	5.8	13
	Total Suspended Solids (TSS)	13	0	6.7	0	7.3	0	0	0	0	59	16	0	0	0	0	0	3.2
	Total Dissolved Solids (TDS)	8.7	4.7	5.2	5.0	2.8	8.5	7.3	5.3	1.8	1.6	4.4	0.4	5.2	4.2	15	16	18
	Turbidity	7.3	9.1	51	37	29	63	6.1	12	35	78	9.6	74	47	19	38	18	24
	Alkalinity (as CaCO ₃)	8.4	2.0	2.3	3.5	4.3	3.8	7.6	2.2	40	3.7	5.9	4.1	6.8	3.4	6.1	18	16
Nutrients and Organics	Total Ammonia	0	8.3	49	26	17	33	15	32	0	23	40	52	0	18	0	25	0
	Nitrate	0	0	28	0	0	27	0	14	29	22	3.6	41	0	0	19	4.6	0.7
	Nitrite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Kjeldahl Nitrogen (TKN)	18	0	0	0	0	6.1	24	3.0	0	2.5	1.3	0	0	0	31	0	0
	Nitrate and Nitrite (as N)	0	0	28	0	0	27	0	14	26	21	2.7	41	0	0	19	3.2	0
	Dissolved Organic Carbon	4.5	3.7	14	2.6	4.7	12	2.5	9.6	14	7.0	13	8.5	0	5.6	11	23	7.7
	Total Organic Carbon	1.3	1.2	8.9	23	21	6.4	13	11	22	8.9	9.8	4.0	1.6	5.1	17	12	14
	Total Phosphorus	49	62	22	34	27	2.8	43	58	25	42	63	17	9.7	17	17	36	28
Anions	Phenols	26	51	22	28	45	6.8	34	74	37	71	83	16	72	1.4	25	33	94
	Bromide (Br)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chloride (Cl)	9.4	1.6	18	1.2	3.2	2.8	1.2	3.8	5.3	3.3	2.8	3.6	2.0	10	7.8	7.2	10
Total Metals	Sulphate (SO ₄)	4.2	1.0	3.4	2.3	5.1	2.4	2.3	13	5.1	1.9	1.2	14	6.3	5.9	7.8	15	22
	Aluminum (Al)	46	25	51	48	17	25	36	24	25	95	19	0	20	11	33	39	17
	Antimony (Sb)	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0
	Arsenic (As)	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Barium (Ba)	3.3	1.7	6.4	0.9	1.6	2.3	1.9	4.2	3.7	20	2.5	4.2	10	2.8	6.3	8.7	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)	0.9	2.1	9.3	1.2	2.6	2.0	0.6	4.0	2.2	4.8	2.6	1.6	5.8	4.7	6.7	7.4	14
	Cesium (Cs)											7.0			0			
	Chromium (Cr)	2.3	0	66	0	0	40	0	0	29	0	0	18	0	0	0	0	0
	Cobalt (Co)	0	0	17	0	0	0	0	0	0	1.0	0	0	0	0	0	0	0
	Copper (Cu)	2.4	10	12	4.1	5.8	9.1	22	76	5.9	21	7.1	22	6.9	6.3	9.3	15	74
	Iron (Fe)	0	0	31	0	0	0	0	0	16	87	20	43	13	0	0	12	10
	Lead (Pb)	0	0	33	0	0	0	0	0	0	66	1.9	0	1.3	0	0	21	19
	Lithium (Li)	0	0	5.2	4.7	11	3.2	0	7.4	0	0	0	0	0	0	0	0	0
	Magnesium (Mg)	3.7	3.1	8.0	0.5	3.8	0.6	1.5	2.1	2.4	2.1	3.1	4.1	5.5	3.2	7.9	7.5	13
	Manganese (Mn)	12	17	111	18	25	34	7.4	14	40	38	23	99	6.8	15	38	21	41
	Mercury (Hg)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0
	Molybdenum (Mo)	10	13	15	6.3	4.5	4.5	2.3	5.3	12	21	5.3	19	10	5.0	8.7	16	18
	Nickel (Ni)	0	0	56	3.7	3.4	36	5.2	2.4	1.4	0.8	8.1	21	0	5.0	0	4.2	0
	Phosphorus (P)											0			0			
	Potassium (K)	2.7	1.1	4.9	0.8	2.7	1.5	1.3	1.3	4.3	4.1	2.0	6.2	5.3	2.7	9.7	6.4	9.1
	Rubidium (Rb)											3.5			3.2			
	Selenium (Se)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Silicon (Si)	4.5	12	33	0.6	5.6	9.8	6.0	9.0	16	31	13	28	5.6	1.7	13	5.1	10
	Silver (Ag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sodium (Na)	2.9	0.7	23	1.1	4.8	0.9	1.4	2.2	2.5	4.0	2.1	5.2	2.3	5.3	7.1	5.9	12
	Strontium (Sr)	0.7	1.7	13	2.5	3.4	2.0	0.9	4.5	2.0	9.0	2.2	4.8	4.5	3.0	6.9	9.0	15
	Sulfur (S)											7.3			13			
	Tellurium (Te)											0			0			
	Thallium (Tl)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Thorium (Th)											0			0			
	Tin (Sn)	0	0	96	0	0	40	0	0	0	0	0	9.1	0	0	0	0	0
	Titanium (Ti)	0	0	0	0	0	0	0	0	0	0	27	0	0	7.8	0	0	0
	Tungsten (W)											0			0			
	Uranium (U)	1.0	6.9	11	2.3	8.6	4.9	2.1	7.4	8.4	18	4.2	15	15	8.0	11	17	31
	Vanadium (V)	0	0	1.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zinc (Zn)	0	0	0	0	0	21	0	0	7.1	0	4.2	0	0	0	0.5	0	0

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 2016.

Study Area	Station	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	pH (pH units)	Specific Conductance (µS/cm)
Unnamed Reference Creek	REF-CRK B1	11.9	10.64	98.6	7.77	101
	REF-CRK B2	11.3	10.78	98.6	7.76	101
	REF-CRK B3	11.0	10.78	97.8	7.73	101
	REF-CRK B4	10.7	10.85	97.8	7.73	101
	REF-CRK B5	10.5	10.91	98.0	7.78	101
Camp Lake Tributary 1 Upstream	CLT-1 US B1	8.8	11.48	98.7	8.01	172
	CLT-1 US B2	8.6	11.50	98.4	8.03	173
	CLT-1 US B3	7.8	11.66	98.0	7.96	173
	CLT-1 US B4	7.6	11.56	96.5	7.99	173
	CLT-1 US B5	7.3	11.83	98.1	7.93	174
Camp Lake Tributary 1 L2 Mine Exposed	CLT-1 L2 B1	19.0	10.22	110.1	8.02	357
	CLT-1 L2 B2	18.6	10.25	109.7	8.00	356
	CLT-1 L2 B3	18.2	10.38	110.2	7.97	355
	CLT-1 L2 B4	17.5	10.44	109.2	7.95	354
	CLT-1 L2 B5	16.3	10.45	106.7	7.90	352
Camp Lake Tributary 1 Downstream	CLT-1 DS B1	8.2	11.82	100.1	7.98	233
	CLT-1 DS B2	8.9	11.70	100.9	7.99	233
	CLT-1 DS B3	10.0	11.37	100.2	8.02	232
	CLT-1 DS B4	7.0	12.07	99.2	7.90	234
	CLT-1 DS B5	12.6	10.45	98.3	7.95	229
Camp Lake Tributary 2 Upstream	CLT-2 US B1	14.3	10.26	100.3	8.11	198
	CLT-2 US B2	14.4	10.17	99.4	8.14	198
	CLT-2 US B3	14.8	10.11	99.5	8.16	197
	CLT-2 US B4	14.2	10.02	97.6	8.14	201
	CLT-2 US B5	14.0	10.05	97.5	8.15	201
Camp Lake Tributary 2 Downstream	CLT-2 DS B1	11.6	10.91	100.5	8.06	200
	CLT-2 DS B2	12.2	10.73	100.00	8.09	200
	CLT-2 DS B3	12.7	10.66	100.5	8.10	200
	CLT-2 DS B4	13.3	10.56	101.8	8.11	200
	CLT-2 DS B5	13.7	10.43	100.4	8.11	200

Table C.12: *In-situ* water quality summary statistics for the Camp Lake Tributary benthic stations, Mary River Project CREMP, August 2016. Five stations were sampled at each study area.

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Temperature (°C)	Unnamed Reference Creek	11.1	0.5	0.2	10.4	11.8	10.5	11.9
	CLT1-US North Branch	8.0	0.6	0.3	7.2	8.8	7.3	8.8
	CLT1-L2 Upper Main Stem	17.9	1.1	0.5	16.6	19.2	16.3	19.0
	CLT1-DS Lower Main Stem	9.3	2.1	0.9	6.7	12.0	7.0	12.6
	CLT2-US Upstream	14.3	0.3	0.1	14.0	14.7	14.0	14.8
	CLT2-DS Downstream	12.7	0.8	0.4	11.7	13.7	11.6	13.7
Dissolved Oxygen (mg/L)	Unnamed Reference Creek	10.79	0.10	0.05	10.67	10.92	10.64	10.91
	CLT1-US North Branch	11.61	0.14	0.06	11.43	11.78	11.48	11.83
	CLT1-L2 Upper Main Stem	10.35	0.11	0.05	10.22	10.48	10.22	10.45
	CLT1-DS Lower Main Stem	11.48	0.63	0.28	10.70	12.26	10.45	12.07
	CLT2-US Upstream	10.12	0.10	0.04	10.00	10.24	10.02	10.26
	CLT2-DS Downstream	10.66	0.18	0.08	10.43	10.88	10.43	10.91
Dissolved Oxygen (% Saturation)	Unnamed Reference Creek	98.2	0.4	0.2	97.7	98.7	97.8	98.6
	CLT1-US North Branch	97.9	0.9	0.4	96.9	99.0	96.5	98.7
	CLT1-L2 Upper Main Stem	109.2	1.4	0.6	107.4	111.0	106.7	110.2
	CLT1-DS Lower Main Stem	99.7	1.0	0.5	98.5	101.0	98.3	100.9
	CLT2-US Upstream	98.9	1.2	0.6	97.3	100.4	97.5	100.3
	CLT2-DS Downstream	100.6	0.7	0.3	99.8	101.5	100.0	101.8
pH (units)	Unnamed Reference Creek	7.75	0.02	0.01	7.73	7.78	7.73	7.78
	CLT1-US North Branch	7.98	0.04	0.02	7.93	8.03	7.93	8.03
	CLT1-L2 Upper Main Stem	7.97	0.05	0.02	7.91	8.03	7.90	8.02
	CLT1-DS Lower Main Stem	7.97	0.05	0.02	7.91	8.02	7.90	8.02
	CLT2-US Upstream	8.14	0.02	0.01	8.12	8.16	8.11	8.16
	CLT2-DS Downstream	8.09	0.02	0.01	8.07	8.12	8.06	8.11
Specific Conductance (µS/cm)	Unnamed Reference Creek	101.0	0.2	0.1	100.7	101.3	100.6	101.2
	CLT1-US North Branch	172.9	0.6	0.3	172.1	173.6	172.1	173.8
	CLT1-L2 Upper Main Stem	354.8	1.8	0.8	352.6	357.1	352.1	356.6
	CLT1-DS Lower Main Stem	232	2	1	230	235	229	234
	CLT2-US Upstream	199	2	1	197	201	197	201
	CLT2-DS Downstream	200	0	0	200	200	200	200

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 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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 2 Areas?	p-value	Statistical Test
Water Temperature (°C)	YES	0.0000	α	Unnamed Reference Creek	CLT1 North Branch	YES	0.0071	Tukey's HSD
				Unnamed Reference Creek	CLT1 Upper Main Stem	YES	0.0000	
				Unnamed Reference Creek	CLT1 Lower Main Stem	NO	0.1705	
				CLT1 North Branch	CLT1 Upper Main Stem	YES	0.0000	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.3778	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	YES	0.0000	
Dissolved Oxygen (% saturation)	YES	0.0000	α	Unnamed Reference Creek	CLT1 North Branch	NO	0.9849	Tukey's HSD
				Unnamed Reference Creek	CLT1 Upper Main Stem	YES	0.0000	
				Unnamed Reference Creek	CLT1 Lower Main Stem	YES	0.0973	
				CLT1 North Branch	CLT1 Upper Main Stem	YES	0.0000	
				CLT1 North Branch	CLT1 Lower Main Stem	YES	0.0508	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	YES	0.0000	
pH (units)	YES	0.0000	α	Unnamed Reference Creek	CLT1 North Branch	YES	0.0000	Tukey's HSD
				Unnamed Reference Creek	CLT1 Upper Main Stem	YES	0.0000	
				Unnamed Reference Creek	CLT1 Lower Main Stem	YES	0.0000	
				CLT1 North Branch	CLT1 Upper Main Stem	NO	0.9192	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.9192	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	NO	1.0000	
Specific Conductance (µS/cm)	YES	0.0000	α	Unnamed Reference Creek	CLT1 North Branch	YES	0.0000	Tukey's HSD
				Unnamed Reference Creek	CLT1 Upper Main Stem	YES	0.0000	
				Unnamed Reference Creek	CLT1 Lower Main Stem	YES	0.0000	
				CLT1 North Branch	CLT1 Upper Main Stem	YES	0.0000	
				CLT1 North Branch	CLT1 Lower Main Stem	YES	0.0000	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	YES	0.0000	

^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 - transformed, single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transform test conducted; β - data logit transformed, single factor ANOVA test conducted;

Table C.14: Water chemistry at Iotic Camp Lake Tributary (CLT) monitoring stations, Mary River Project CREMP, 2016.

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	L1-08	L1-02	L2-03	L1-09	L1-05	L0-01	K0-01
					27-Jun-2016	27-Jun-2016	27-Jun-2016	27-Jun-2016	27-Jun-2016	27-Jun-2016	25-Jun-2016	20-Jul-2016	19-Jul-2016	19-Jul-2016	19-Jul-2016	20-Jul-2016	20-Jul-2016	20-Jul-2016	20-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016
Conventional	Conductivity (lab)	umho/cm	-	-	39.2	54.3	224	64	66.9	70.3	69.9	82	145	365	204	209	215	183	147	209	431	293	298	296	255
	pH (lab)	pH	6.5 - 9.0	-	7.44	7.58	7.84	7.64	7.66	7.68	7.63	7.78	8.08	8.01	8.07	8.18	8.22	8.17	7.97	8.21	7.99	8.16	8.11	8.17	8.27
	Hardness (as CaCO ₃)	mg/L	-	-	18	25	87	29	30	32	32	40	74	156	97	99	105	93	72	105	176	136	138	138	130
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	2	<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	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	24	36	127	42	42	47	29	40	95	195	105	205	115	87	77	94	230	156	159	143	123
	Turbidity	NTU	-	-	1.94	1.55	3.76	1.68	1.71	1.63	1.95	1.12	0.37	2.6	0.57	0.55	0.54	0.3	0.34	0.26	2.88	0.97	0.93	0.95	0.29
	Alkalinity (as CaCO ₃)	mg/L	-	-	17	24	70	22	28	31	30	40	79	131	87	84	94	82	72	104	140	119	116	116	125
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	<0.020	<0.020	0.11	<0.020	<0.020	<0.020	<0.020	<0.020	0.036	0.141	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	0.237	0.048	0.047	0.042	0.031
	Nitrate	mg/L	13	13	0.036	<0.020	0.579	0.03	0.036	0.028	0.039	0.120	<0.020	0.520	0.037	0.096	0.107	0.048	0.079	<0.020	1.67	0.353	0.411	0.38	0.048
	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	< 0.009	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0203	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	<0.15	0.35	<0.15	0.16	<0.15	<0.15	<0.15	<0.15	0.44000	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.56	0.2	0.24	<0.15	<0.15
	Nitrate and Nitrite (as N)	mg/L	-	-	0.036	<0.021	0.579	0.03	0.036	0.028	0.039	0.12000	<0.021	0.52870	0.03700	0.09600	0.10700	0.04800	0.079	<0.021	1.6903	0.353	0.411	0.38	0.048
	Dissolved Organic Carbon	mg/L	-	-	<1.0	<1.0	2.7	<1.0	<1.0	1.1	<1.0	1.4	1.7	4.2	2.1	2.2	2.1	1.4	1.8	2.4	4.6	3	3	2.9	3
	Total Organic Carbon	mg/L	-	-	<1.0	<1.0	3.1	1.2	1.2	1.3	1.1	1.4	2.7	5	2.7	2.3	2.4	2	1.9	2.6	4.6	3.2	3.4	3.1	3.2
	Total Phosphorus	mg/L	0.020 ^d	-	0.006	0.0035	0.0075	<0.0030	<0.0030	<0.0030	0.0046	0.0057	0.0162	0.0049	<0.0030	<0.0030	0.0046	<0.0030	0.0087	<0.0030	0.0096	0.0033	0.0059	0.0031	0.0108
Phenols	mg/L	0.004 ^d	-	0.0024	0.0021	0.0034	0.0019	0.0025	0.0021	0.0024	<0.0010	0.022	0.0074	0.0023	0.0019	<0.0010	<0.0010	0.007	0.0067	0.0076	0.0041	0.0038	0.0025	0.0067	
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	<0.50	<0.50	16.8	1.37	1.65	1.44	0.61	0.91	0.88	26.10	13.00	11.60	10.80	1.81	1.91	2.13	36.7	18.4	18.9	17.2	5.11
	Sulphate (SO ₄)	mg/L	218 ^β	218	0.45	1.88	13.5	2.05	2.04	2.14	5.51	1.5	2.4	24.6	4.7	5.6	5.7	8.1	2.98	4.83	18.4	7.84	8.25	7.7	5.29
Total Metals	Aluminum (Al)	mg/L	0.100	0.179	0.0467	0.0182	0.0577	0.0242	0.023	0.0229	0.0342	0.0191	0.0091	0.0174	0.0075	0.0106	0.0152	0.0083	0.0137	0.0071	0.031	0.0098	0.011	0.0154	0.008
	Antimony (Sb)	mg/L	0.020 ^d	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<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	0.000	<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	-	-	0.00313	0.00345	0.00901	0.00388	0.00401	0.00428	0.00382	0.0068	0.0095	0.0155	0.0129	0.0121	0.0126	0.0107	0.0109	0.0128	0.0168	0.0163	0.0155	0.0157	0.0142
	Beryllium (Be)	mg/L	0.011 ^e	-	<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	<0.00010	<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	<0.000050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	< 0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.02	<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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	-	3.58	4.68	16.8	5.75	6.02	6.42	6.26	8	15	30	22	21	22	18	14.2	20.3	34.3	28.3	27.9	28.8	25.2
	Chromium (Cr)	mg/L	0.0089	0.000856	<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	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	0.004	<0.00010	<0.00010	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010													

Table C.15: Dissolved metals concentrations at Camp Lake Tributary water quality monitoring stations, Mary River Project CREMP, 2016.

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	L1-08	L1-02	L2-03	L1-09	L1-05	L0-01	K0-01	
			27-Jun-2016	27-Jun-2016	27-Jun-2016	27-Jun-2016	27-Jun-2016	27-Jun-2016	25-Jun-2016	20-Jul-2016	19-Jul-2016	19-Jul-2016	19-Jul-2016	20-Jul-2016	20-Jul-2016	20-Jul-2016	20-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016
Dissolved Metals	Aluminum (Al)	mg/L	0.0062	<0.0050	0.0053	<0.0050	<0.0050	<0.0050	<0.0050	0.0068	0.0034	0.0041	0.0041	0.0053	0.0043	0.0031	0.00630	0.00470	0.00430	0.00470	0.00560	<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	<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	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00304	0.00350	0.00837	0.00373	0.00392	0.00398	0.00375	0.00699	0.00949	0.0153	0.0127	0.0119	0.0126	0.0106	0.0108	0.0126	0.0167	0.016	0.0159	0.0154	0.0140	
	Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<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	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<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	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.02	<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	<0.000010
	Calcium (Ca)	mg/L	3.49	4.90	16.9	5.62	5.97	6.32	6.11	7.79	14.7	30.0	21.5	20.7	21.8	18.7	14.3	21	34.7	29	28.6	28.7	26.3	
	Cesium (Cs)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010															
	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	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00023	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00031	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00101	0.00087	0.00072	0.00089	0.00093	0.00088	0.00060	0.00183	0.00164	0.00082	0.00162	0.00156	0.00150	0.00097	0.00222	0.00222	0.00112	0.00185	0.00193	0.00178	0.00168	
	Iron (Fe)	mg/L	<0.010	<0.010	0.066	<0.010	<0.010	<0.010	<0.010	<0.030	<0.030	0.199	0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.158	0.06	0.051	0.037	<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	<0.000050
	Lithium (Li)	mg/L	<0.0010	<0.0010	0.0021	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0033	0.0029	0.0026	0.0024	0.0013	<0.0010	0.0012	0.0039	0.0035	0.0036	0.0033	0.0015	
	Magnesium (Mg)	mg/L	2.22	3.09	10.8	3.57	3.75	3.90	4.06	4.94	8.97	19.8	10.6	11.4	12.3	11.1	8.76	12.7	21.7	15.5	16.2	16.2	15.6	
	Manganese (Mn)	mg/L	<0.00050	<0.00050	0.0267	0.00087	0.00072	0.00052	<0.00050	0.000304	0.000359	0.0782	0.00603	0.00161	0.00109	0.000307	0.000438	0.00068	0.0498	0.0103	0.00763	0.00441	0.000802	
	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	<0.000010
	Molybdenum (Mo)	mg/L	0.000142	0.000132	0.00142	0.000182	0.000198	0.000186	0.000154	0.000505	0.000420	0.00155	0.000496	0.000524	0.000504	0.000340	0.000885	0.000679	0.00318	0.00125	0.0012	0.00102	0.000460	
	Nickel (Ni)	mg/L	<0.00050	<0.00050	0.00081	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00057	0.00119	0.00077	0.00077	0.00083	<0.00050	<0.00050	0.00069	0.00133	0.00093	0.00099	0.00103	0.00062	
	Phosphorus (P)	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050															
	Potassium (K)	mg/L	0.669	0.692	2.11	0.768	0.794	0.789	0.622	1.56	1.55	3.22	1.74	1.84	1.88	1.50	2.19	2.05	3.43	2.51	2.36	2.3	1.82	
	Rubidium (Rb)	mg/L	0.00196	0.00187	0.00263	0.00182	0.00199	0.00190	0.00130															
	Selenium (Se)	mg/L	<0.000050	<0.000050	0.000060	<0.000050	<0.000050	<0.000050	<0.000050	<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	0.368	0.336	0.443	0.346	0.354	0.365	0.360	0.59	0.80	0.76	0.83	0.90	0.95	0.75	0.82	1.08	1.28	1.2	1.25	1.29	1.03	
	Silver (Ag)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<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	<0.50	<0.50	7.55	0.68	0.72	0.69	0.50	0.389	0.867	11.7	1.97	2.24	2.37	1.49	0.595	1.56	16.4	5.47	5.54	4.96	2.85	
	Strontium (Sr)	mg/L	0.0020	0.0026	0.0203	0.0044	0.0049	0.0049	0.0037	0.00436	0.00710	0.0340	0.0458	0.0339	0.0293	0.0106	0.00823	0.0108	0.0393	0.0491	0.0475	0.0415	0.0151	
	Sulfur (S)	mg/L	<0.50	0.61	4.09	0.67	0.64	0.69	1.83															
	Tellurium (Te)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020															
	Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Thorium (Th)	mg/L	<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	<0.00010	
Titanium (Ti)	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<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	
Tungsten (W)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010																
Uranium (U)	mg/L	0.000096	0.000085	0.00609	0.000301	0.000284	0.000261	0.000135	0.000725	0.000935	0.00678	0.00148	0.00168	0.00169	0.00119	0.00385	0.00271	0.0166	0.00583	0.0056	0.00498	0.00232		
Vanadium (V)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0036	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0112	<0.0030	<0.0030	<0.0030	0.0038	<0.0030	<0.0030	0.0073		
Zirconium (Zr)	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030																

Table C.16: Summary of the magnitude of difference in aqueous metal concentrations between the Camp Lake Tributaries and mean reference creek station data for spring summer, and fall sampling events, Mary River Project CREMP, 2016.

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)	1.7	7.9	2.4	2.5	1.5	4.7	2.7	2.4	1.4	3.4	2.4	2.0
Hardness (as CaCO ₃)	1.6	6.4	2.2	2.4	1.6	4.5	2.9	2.7	1.5	3.0	2.4	2.3
Total Suspended Solids (TSS)	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 Dissolved Solids (TDS)	1.5	6.4	2.2	1.5	1.9	5.5	4.0	2.5	1.3	3.6	2.4	1.9
Turbidity	1.2	2.6	1.2	1.3	0.2	0.7	0.1	0.1	0.3	2.6	0.9	0.3
Alkalinity (as CaCO ₃)	1.5	5.0	1.9	2.1	1.8	4.0	2.7	2.5	1.5	2.5	2.1	2.2
Total Ammonia	0.9	5.0	0.9	0.9	1.4	7.1	1.0	1.0	1.0	12	2.3	1.6
Nitrate	1.4	29	1.6	2.0	3.5	26	4.0	2.4	2.3	79	18	2.3
Nitrite	1.0	1.0	1.0	1.0	1.0	1.7	1.0	1.0	1.0	4.1	1.0	1.0
Total Kjeldahl Nitrogen (TKN)	1.0	2.3	1.0	1.0	1.0	2.9	1.0	1.0	1.0	3.7	1.3	1.0
Dissolved Organic Carbon	1.0	2.6	1.0	1.0	1.6	4.2	2.1	1.4	1.7	3.7	2.4	2.4
Total Organic Carbon	0.9	2.7	1.1	1.0	1.9	4.5	2.2	1.8	1.5	3.1	2.2	2.2
Total Phosphorus	0.5	0.8	0.3	0.5	2.0	0.9	0.7	0.6	1.0	1.6	0.7	1.8
Phenols	0.7	1.1	0.7	0.8	10	6.7	1.6	0.9	1.3	1.4	0.6	1.2
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)	0.8	25	2.2	0.9	0.8	22	10	1.6	0.8	15	7.3	2.0
Sulphate (SO ₄)	2.1	24	3.7	9.9	0.9	12	2.5	3.8	0.9	4.2	1.8	1.2
Aluminum (Al)	1.0	1.8	0.7	1.1	0.1	0.2	0.1	0.1	0.2	0.5	0.2	0.1
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	1.1	1.0	1.0	1.0	1.4	1.0	1.0
Barium (Ba)	1.7	4.7	2.1	2.0	1.5	2.9	2.4	2.0	1.5	2.2	2.0	1.8
Beryllium (Be)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	0.3	1.3	1.3
Bismuth (Bi)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	0.1	1.3	1.3
Boron (B)	1.0	1.2	1.0	1.0	1.0	1.6	1.0	1.0	1.0	2.0	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)	1.6	6.4	2.3	2.4	1.6	4.2	3.0	2.5	1.4	2.8	2.3	2.1
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	1.7	1.0	1.0	1.0	2.3	1.0	1.0	1.0	3.4	1.0	1.0
Copper (Cu)	1.9	1.5	1.8	1.2	2.2	1.1	2.0	1.3	2.3	1.3	1.9	1.6
Iron (Fe)	1.1	5.9	1.0	1.2	0.4	5.4	0.5	0.4	0.6	9.0	2.1	0.6
Lead (Pb)	0.9	1.5	0.7	0.7	0.4	0.4	0.4	0.4	0.5	1.0	0.5	0.5
Lithium (Li)	1.0	1.6	1.0	1.0	1.1	3.4	2.7	1.4	1.2	3.1	3.6	1.6
Magnesium (Mg)	1.7	7.1	2.4	2.6	1.7	4.7	2.8	2.7	1.6	3.1	2.3	2.3
Manganese (Mn)	1.0	32	1.4	1.6	0.4	63	2.8	0.3	0.8	60	9.5	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)	1.8	20	2.7	2.2	2.1	7.6	2.4	1.5	2.0	9.3	2.9	1.1
Nickel (Ni)	1.0	1.7	1.0	1.0	1.1	2.4	1.5	1.0	1.1	2.6	1.8	1.2
Potassium (K)	2.5	8.2	3.0	2.4	2.6	5.2	3.1	2.5	2.5	3.9	2.8	2.1
Selenium (Se)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	0.2	1.3	1.3
Silicon (Si)	1.0	1.4	1.0	1.1	0.8	0.9	1.0	0.8	1.0	1.3	1.3	1.1
Silver (Ag)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	2.5	0.5	0.5
Sodium (Na)	0.6	19	1.8	1.3	0.6	11	2.2	1.5	0.6	8.9	2.9	1.5
Strontium (Sr)	0.9	8.7	2.0	1.6	0.8	4.7	5.1	1.5	0.8	3.3	3.6	1.2
Thallium (Tl)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	0.1	1.3	1.3
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
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	0.1	1.3	1.3
Uranium (U)	0.6	35	1.7	0.8	1.0	8.1	1.8	1.3	0.9	4.7	1.5	0.6
Vanadium (V)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	0.6	1.1	1.1
Zinc (Zn)	1.0	1.0	1.0	1.1	1.0	1.0	1.0	3.7	1.0	1.0	1.0	2.7

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

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

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

Table C.17: *In-situ* water quality statistical comparisons among Camp Lake Tributary 2 and Unnamed Reference Creek study areas, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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 Temperature (°C)	YES	0.0000	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0000	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0030	
				CLT2 Upstream	CLT2 Downstream	YES	0.0028	
Dissolved Oxygen (mg/L)	YES	0.0000	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0000	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	NO	0.2795	
				CLT2 Upstream	CLT2 Downstream	YES	0.0001	
Dissolved Oxygen (% saturation)	YES	0.0018	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.6388	Tamhane's
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0009	
				CLT2 Upstream	CLT2 Downstream	YES	0.0874	
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	YES	0.0117	
Specific Conductance (µS/cm)	YES	0.0000	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0000	Tamhane's
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0000	
				CLT2 Upstream	CLT2 Downstream	NO	0.7946	

^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 - transformed, single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data logit transformed, single factor ANOVA test conducted;

Table C.18: *In-situ* water quality profile data collected at Camp Lake water quality monitoring stations in winter^a, Mary River Project CREMP, 2016.

Station JLO-02 ^{b,c}					Station JLO-10 ^{b,c}					Station JLO-01 ^{b,c}					Station JLO-07 ^{b,c}					Station JLO-09 ^{b,c}				
Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)
3.15	1.0	15.1	7.8	152.5	2.85	1.1	14.9	7.9	148.2	3.20	1.1	14.5	7.8	145.7	3.10	1.3	13.9	7.9	156.4	2.90	0.5	14.2	8.1	161.3
4.15	1.3	15.1	7.7	152.1	3.85	1.2	14.7	7.8	147.3	4.20	1.2	14.5	7.8	146.3	4.10	1.3	14.1	7.6	151.8	3.90	0.8	14.1	7.9	154.5
5.15	1.3	15.1	7.8	151.5	4.85	1.3	14.7	7.8	146.8	5.20	1.2	14.6	7.8	147.0	5.10	1.3	14.2	7.6	151.7	4.90	1.2	14.3	7.8	151.4
6.15	1.3	15.0	7.8	150.1	5.85	1.3	14.6	7.8	146.7	6.20	1.2	14.7	7.8	147.3	6.10	1.3	14.1	7.6	151.1	5.90	1.3	14.2	7.8	150.7
7.15	1.3	14.9	7.8	149.8	6.85	1.3	14.6	7.8	146.3	7.20	1.3	14.7	7.8	147.0	7.10	1.3	14.3	7.6	151.6	6.90	1.3	14.1	7.8	149.4
8.15	1.3	14.9	7.8	149.9	7.85	1.3	14.5	7.8	145.7	8.20	1.3	14.6	7.8	146.6	8.10	1.3	14.4	7.6	152.4	7.90	1.4	14.0	7.8	148.7
9.15	1.3	14.9	7.8	149.9	8.85	1.3	14.7	7.8	148.1	9.20	1.3	14.6	7.8	146.5	9.10	1.3	14.3	7.6	151.9	8.90	1.4	13.9	7.8	148.1
10.15	1.3	14.9	7.8	149.9	9.85	1.3	14.8	7.8	149.3	10.20	1.3	14.5	7.8	146.0	10.10	1.3	14.1	7.6	150.1	9.90	1.4	13.8	7.8	147.7
11.15	1.4	15.0	7.8	149.6	10.85	1.3	14.9	7.8	149.6	11.20	1.4	14.4	7.8	145.8	11.10	1.4	13.8	7.6	149.1	10.90	1.5	13.7	7.7	148.3
12.15	1.4	14.9	7.7	149.1						12.20	1.4	14.4	7.8	146.0	12.10	1.5	13.7	7.6	148.3	11.90	1.5	13.7	7.7	148.3
										13.20	1.4	14.2	7.8	144.8	13.10	1.5	13.4	7.6	147.1	12.90	1.5	13.6	7.7	148.4
										14.20	1.5	13.8	7.8	142.7	14.10	1.5	13.3	7.6	146.5	13.90	1.5	13.4	7.7	149.1
										15.20	1.6	13.4	7.8	141.3	15.10	1.6	13.0	7.6	145.9	14.90	1.6	13.1	7.7	148.1
										16.20	1.7	13.2	7.7	141.0	16.10	1.7	12.8	7.6	145.4	15.90	1.6	13.0	7.7	146.7
															17.10	1.8	12.3	7.6	144.8	16.90	1.7	12.6	7.7	145.8
															18.10	1.8	11.9	7.5	144.4	17.90	1.8	12.3	7.6	144.8
															19.10	1.8	11.7	7.5	144.2					
															20.10	1.8	11.4	7.5	144.2					
															21.10	1.9	11.1	7.5	144.9					
															22.10	1.9	11.0	7.4	145.5					
															23.10	1.9	10.9	7.4	146.4					
															24.10	1.9	10.5	7.4	146.4					
															25.10	2.0	10.0	7.4	146.0					
															26.10	2.1	9.4	7.4	145.9					
															27.10	2.2	8.6	7.3	147.1					
															28.10	2.3	7.8	7.3	150.8					
															29.10	2.4	7.1	7.3	152.5					
															30.10	2.5	5.9	7.2	155.4					
															31.10	2.5	5.0	7.2	159.9					
															32.10	2.6	2.6	7.1	168.9					

^a Sampling conducted on 23-April and 25-April, 2016.

^b Total depth at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 were 14.15, 12, 16.8, 32.24, and 18.8 m, respectively, at the time of winter sampling.

^c Ice thickness at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 were 2.15, 1.85, 2.23, 1.53, and 1.91 m, respectively, at the time of winter sampling.

Table C.19: *In-situ* water quality profile data collected at Camp Lake water quality monitoring stations in summer^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	JLO-02 ^b	JLO-10 ^b	JLO-01 ^b	JLO-07 ^b	JLO-09 ^b	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
1.0	8.9	8.4	8.2	9.2	8.9	106.8	106.4	105.1	104.7	104.9	7.80	7.86	7.89	7.85	7.79	131.2	129.2	129.0	227.0	275.0
2.0	8.9	8.4	8.2	8.3	8.4	106.9	106.9	106.2	104.9	105.3	7.82	7.88	7.89	7.87	7.82	131.0	129.2	129.1	275.7	275.3
3.0	8.9	8.3	8.1	8.2	8.2	107.2	106.8	106.5	105.1	105.4	7.83	7.87	7.88	7.88	7.83	131.0	129.2	129.1	275.5	275.7
4.0	8.9	8.2	8.2	7.9	7.9	107.0	106.8	106.7	104.9	105.0	7.84	7.88	7.88	7.89	7.84	131.1	129.2	129.2	274.7	274.8
5.0	8.9	8.2	8.1	7.7	7.6	107.0	106.6	106.7	105.0	104.8	7.84	7.87	7.88	7.89	7.85	130.6	129.5	129.1	274.8	274.4
6.0	8.8		8.1	7.6	7.6	107.0		106.7	104.8	104.8	7.85		7.89	7.89	7.86	130.0		129.1	274.5	274.4
7.0	8.7		8.1	7.6	7.6	106.8		106.7	104.7	104.7	7.85		7.89	7.89	7.86	129.7		129.1	274.5	274.3
8.0	8.5		8.1	7.5	7.6	106.6		106.6	104.5	104.6	7.85		7.88	7.88	7.86	129.3		129.1	274.4	274.4
9.0	8.0		8.0	7.5	7.6	105.3		106.2	104.4	104.5	7.85		7.89	7.88	7.87	129.4		129.1	274.5	274.4
10.0	7.1		7.8	7.5	7.6	105.2		106.2	104.3	104.4	7.83		7.88	7.88	7.87	129.3		129.1	274.5	274.3
11.0	6.9		7.8	7.5	7.5	104.7		106.2	104.2	104.3	7.81		7.87	7.87	7.87	129.2		129.1	274.5	274.4
12.0	6.8		7.5	7.5	7.5	104.6		105.8	104.0	104.2	7.80		7.86	7.88	7.87	129.2		129.1	274.3	274.3
13.0			7.6	7.4	7.5			106.2	103.9	104.2			7.86	7.87	7.87			129.3	274.4	274.3
14.0			7.6	7.4	7.5			99.6	103.9	104.2			7.81	7.87	7.88			129.5	274.4	274.3
15.0				7.4	7.5				103.8	104.2				7.87	7.87				274.3	274.3
16.0				7.4	7.5				103.8	104.2				7.87	7.87				274.4	274.2
17.0				7.4					103.7					7.87					274.4	
18.0				7.4					103.6					7.87					274.4	
19.0				7.3					103.5					7.87					274.3	
20.0				7.3					103.4					7.87					274.5	
21.0				7.3					103.3					7.87					274.4	
22.0				7.3					103.2					7.86					274.4	
23.0				7.3					103.2					7.86					274.4	
24.0				7.3					103.1					7.86					274.4	
25.0				7.3					103.0					7.86					274.4	
26.0				7.2					103.0					7.86					274.4	
27.0				7.2					102.9					7.85					274.5	
28.0				7.1					102.6					7.84					274.7	
29.0				7.0					102.4					7.83					274.6	
30.0				6.8					102.2					7.82					274.6	
31.0				6.7					102.1					7.81					274.6	
32.0				6.7					102.0					7.80					274.6	

^a Sampling conducted on 24-July and 26-July, 2016.

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

Table C.20: *In-situ* water quality profile data collected at Camp Lake water quality monitoring stations in fall^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	JLO-02 ^b	JLO-10 ^b	JLO-01 ^b	JLO-07 ^b	JLO-09 ^b	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
1.0	11.3	11.0	10.8	11.8	11.3	102.6	103.3	103.1	103.9	104.0	8.09	7.95	7.95	8.03	8.01	129.4	127.6	125.3	130.0	128.7
2.0	11.1	11.0	10.8	11.5	11.1	103.1	103.1	102.9	103.4	103.7	8.00	7.97	7.95	8.01	8.00	129.1	127.3	125.2	128.5	128.1
3.0	11.0	10.9	10.8	11.1	11.1	103.2	103.3	102.9	104.0	103.7	8.00	7.98	7.96	8.01	8.00	128.3	127.0	125.0	128.5	127.8
4.0	10.9	10.8	10.7	11.0	11.0	103.2	103.1	102.7	103.6	103.7	8.00	7.98	7.96	8.01	8.00	131.1	126.6	125.2	128.4	127.3
5.0	10.7	10.8	10.6	10.7	10.9	103.2	102.9	102.6	103.5	103.7	8.00	7.98	7.96	8.00	8.00	130.3	126.4	125.0	128.4	127.0
6.0	10.6	10.7	10.5	10.6	10.9	102.9	102.9	102.7	103.5	103.5	8.00	7.99	7.96	8.00	8.00	129.7	126.6	125.1	128.4	126.7
7.0	10.5	10.5	10.5	10.6	10.8	103.1	102.8	102.6	103.3	103.3	8.00	7.99	7.96	8.00	8.00	129.5	126.9	125.3	128.3	126.6
8.0	10.4	10.4	10.4	10.4	10.7	103.0	102.9	102.5	103.4	102.9	7.99	7.99	7.96	7.99	8.00	128.5	126.9	125.5	128.1	126.8
9.0	10.3		10.3	10.4	10.4	103.0		102.5	103.2	102.8	7.98		7.95	7.99	8.00	127.6		125.3	127.8	127.0
10.0	10.2		10.3	10.3	10.3	102.7		102.3	102.9	102.7	7.98		7.94	7.99	7.99	127.3		125.2	128.2	126.4
11.0	10.1		10.1	10.2	10.0	102.8		102.4	102.8	102.9	7.97		7.93	7.99	7.98	128.6		125.7	127.3	125.6
12.0	10.0		9.8	9.9	9.8	102.8		102.4	102.1	102.9	7.96		7.91	7.97	7.96	128.0		125.2	125.3	125.1
13.0	9.6		9.4	9.0	9.5	102.5		102.6	102.4	102.3	7.94		7.88	7.92	7.93	126.6		123.8	124.1	124.4
14.0			8.8	8.7	8.9			102.4	102.6	102.5			7.84	7.89	7.90			123.2	123.7	123.2
15.0			8.4	8.5	8.3*			101.9	102.4	102.1*			7.79	7.85	7.84*			122.7	123.5	122.3*
16.0			8.1*	8.4				101.2*	102.1				7.76	7.84				122.3*	123.1	
17.0				8.1					101.1					7.80					122.5	
18.0				7.8					100.3					7.77					122.2	
19.0				7.7					99.5					7.75					121.3	
20.0				7.7					99.3					7.74					121.2	
21.0				7.6					99.0					7.72					121.2	
22.0				7.5					98.6					7.71					121.1	
23.0				7.5					98.0					7.69					121.0	
24.0				7.4					97.4					7.68					120.9	
25.0				7.4					97.1					7.67					120.8	
26.0				7.4					96.8					7.66					120.7	
27.0				7.4					96.5					7.66					120.7	
28.0				7.3					95.9					7.64					120.8	
29.0				7.3					95.2					7.63					120.8	
30.0				7.3					94.6					7.61					120.7	
31.0				7.3					94.1					7.6					120.5	
32.0				7.2					93.3					7.58					120.5	

^a Sampling conducted on 22-August, 2016.

^b Total depth at Stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 were 12.4, 9.3, 16.5, 32.7, and 14.9 m, respectively, at the time of fall sampling.

* The deepest *in situ* water quality reading at stations JLO-01 and JLO-09 were taken at 15.5 m and 14.5 m, respectively, at the time of fall sampling.

Table C.21: 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 2016.

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.)		
JLO-02	11-Aug-16	10.6	8.2	clear, slight blue-green colouration	surface	11.92	11.42	105.9	7.98	133
					bottom	9.23	12.01	104.5	7.88	134
JLO-21	11-Aug-16	11.1	7.8	clear, slight blue-green colouration	surface	11.88	11.39	105.5	8.04	133
					bottom	9.28	12.03	104.8	8.03	134
JLO-32	11-Aug-16	9.9	8.1	clear, slight blue-green colouration	surface	12.26	11.51	106.7	8.05	133
					bottom	9.16	12.23	106.3	8.00	132
JLO-31	11-Aug-16	11.7	8.3	clear, slight blue-green colouration	surface	12.01	11.81	109.6	8.05	132
					bottom	8.98	12.18	105.0	7.98	131
JLO-30	11-Aug-16	10.6	7.3	clear, slight blue-green colouration	surface	11.46	11.47	105.2	8.03	131
					bottom	9.31	11.94	104.1	7.99	131

Table C.22: Water depth and *in-situ* water quality summary statistics for littoral (<12 m) lake benthic stations, Mary River Project CREMP, August 2016. Five replicate littoral stations were sampled at all but Mary Lake, where six littoral stations were sampled.

Metric	Lake	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Depth (m)	Reference 3	9.32	1.03	0.46	8.04	10.60	8.10	10.70
	Camp	10.78	0.67	0.30	9.95	11.61	9.90	11.70
	Sheardown NW	9.36	1.52	0.68	7.48	11.24	7.50	11.40
	Sheardown SE	10.42	2.92	1.31	6.79	14.05	6.70	13.90
	Mary	10.69	1.05	0.43	9.58	11.79	9.10	11.60
Water Temperature (°C)	Reference 3	9.92	0.37	0.17	9.46	10.38	9.50	10.40
	Camp	9.19	0.13	0.06	9.03	9.36	8.98	9.31
	Sheardown NW	10.55	0.37	0.17	10.09	11.02	9.99	10.95
	Sheardown SE	10.49	0.67	0.30	9.65	11.33	9.91	11.36
	Mary	10.17	1.25	0.51	8.86	11.48	9.23	12.63
Dissolved Oxygen (mg/L)	Reference 3	10.35	0.82	0.37	9.33	11.36	9.28	11.34
	Camp	12.08	0.12	0.05	11.93	12.23	11.94	12.23
	Sheardown NW	10.97	0.36	0.16	10.52	11.42	10.34	11.19
	Sheardown SE	9.81	0.58	0.26	9.08	10.54	9.15	10.42
	Mary	10.11	1.61	0.66	8.42	11.79	7.79	11.69
Dissolved Oxygen (% saturation)	Reference 3	91.3	6.7	3.0	83.0	99.6	82.6	99.1
	Camp	104.9	0.8	0.4	103.9	106.0	104.1	106.3
	Sheardown NW	99.2	2.5	1.1	96.1	102.3	94.9	101.3
	Sheardown SE	88.1	6.6	3.0	79.9	96.4	80.9	95.3
	Mary	88.8	15.0	6.1	73.0	104.5	63.7	102.5
pH (pH units)	Reference 3	7.64	0.23	0.10	7.36	7.93	7.28	7.86
	Camp	7.98	0.06	0.03	7.91	8.05	7.88	8.03
	Sheardown NW	7.80	0.18	0.08	7.57	8.03	7.51	7.93
	Sheardown SE	7.65	0.17	0.07	7.44	7.86	7.45	7.82
	Mary	7.56	0.31	0.13	7.24	7.89	7.19	7.94
Specific Conductance (µS/cm)	Reference 3	74.0	0.0	0.0	74.0	74.0	74.0	74.0
	Camp	132.4	1.5	0.7	130.5	134.3	131.0	134.0
	Sheardown NW	125.6	0.5	0.2	124.9	126.3	125.0	126.0
	Sheardown SE	108.8	4.0	1.8	103.9	113.7	105.0	115.0
	Mary	80.7	19.6	8.0	60.1	101.3	69.0	120.0
Secchi Depth (m)	Reference 3	8.88	0.71	0.32	8.00	9.76	8.10	10.00
	Camp	7.94	0.43	0.19	7.41	8.47	7.28	8.31
	Sheardown NW	5.03	0.16	0.07	4.82	5.23	4.78	5.24
	Sheardown SE	2.15	0.08	0.04	2.05	2.25	2.03	2.24
	Mary	3.46	0.46	0.19	2.97	3.94	2.86	3.99

Table C.23: Statistical comparison of bottom *in-situ* water quality between littoral stations of Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Areas?	p-value	Statistical Analysis ^a	Lake	n	Mean (n = 5)	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	Yes	0.035	α , δ , γ	Reference	5	8.88	0.71	0.32	8.10	10.00
				Camp	5	7.94	0.43	0.19	7.28	8.31
Temperature (°C)	Yes	0.004	α , ϵ , γ	Reference	5	9.92	0.37	0.17	9.50	10.40
				Camp	5	9.19	0.13	0.06	8.98	9.31
Dissolved Oxygen (mg/L)	Yes	0.002	α , ϵ , γ	Reference	5	10.3	0.8	0.4	9.3	11.3
				Camp	5	12.1	0.1	0.1	11.9	12.2
Dissolved Oxygen (% saturation)	Yes	0.002	α , ϵ , γ	Reference	5	91.3	6.7	3.0	82.6	99.1
				Camp	5	104.9	0.8	0.4	104.1	106.3
pH (units)	Yes	0.014	α , ϵ , γ	Reference	5	7.64	0.23	0.10	7.28	7.86
				Camp	5	7.98	0.06	0.03	7.88	8.03
Specific Conductance (umho/cm)	Yes	0.000	α , ϵ , γ	Reference	5	74.0	0.0	0.0	74.0	74.0
				Camp	5	132.4	1.5	0.7	131.0	134.0

^a Data analysis included: α - data untransformed; β - data logit transformed; ι - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ϵ - t-test assuming unequal variance; γ - ANOVA test validated using Mann Whitney U-test.

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

Table C.24: Water chemistry at Camp Lake (JLO) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Winter Sampling Event										Summer Sampling Event					
					JL0-02 surface	JL0-02 bottom	JL0-10 surface	JL0-10 bottom	JL0-01 surface	JL0-01 bottom	JL0-07 surface	JL0-07 bottom	JL0-09 surface	JL0-09 bottom	JL0-02 surface	JL0-02 bottom	JL0-10 surface	JL0-10 bottom	JL0-01 surface	JL0-01 bottom
					23-Apr-16	23-Apr-16	23-Apr-16	23-Apr-16	23-Apr-16	23-Apr-16	25-Apr-16	25-Apr-16	25-Apr-16	25-Apr-16	24-Jul-16	24-Jul-16	24-Jul-16	24-Jul-16	24-Jul-16	24-Jul-16
Conventionals	Conductivity (lab)	umho/cm	-	-	162	159	160	158	156	151	158	171	163	154	134	132	131	131	131	131
	pH (lab)	pH	6.5 - 9.0	-	7.81	7.83	7.71	7.81	7.80	7.61	7.95	7.29	7.86	7.91	8.03	7.96	7.99	8.01	8.02	7.99
	Hardness (as CaCO ₃)	mg/L	-	-	80.5	79	80	79	76	73	78	76	80	75	63	59	60	62	61	62
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	2.8	<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	-	-	106	101	105	105	99	96	100	114	103	98	62	67	65	70	70	65
	Turbidity	NTU	-	-	0.19	0.42	0.16	0.23	0.17	0.61	0.23	0.31	0.16	0.16	0.93	0.69	0.64	0.75	0.74	0.66
	Alkalinity (as CaCO ₃)	mg/L	-	-	76	77	74	74	75	74	73	74	77	72	65	62	57	60	61	57
Nutrients and Organics	Total Ammonia	mg/L	variable	0.855	0.023	0.025	0.026	0.022	0.064	0.027	0.041	<0.020	0.042	<0.020	0.097	<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	0.116	<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	<0.15	<0.15
	Nitrate and Nitrite (as N)	mg/L	-	-	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	0.116	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021	<0.021
	Dissolved Organic Carbon	mg/L	-	-	3.0	3.3	3.2	2.7	2.7	3.0	2.9	2.3	3.0	2.7	1.4	1.4	1.6	1.7	1.6	1.6
	Total Organic Carbon	mg/L	-	-	2.1	2.3	2.3	2.1	2.1	2.0	2.1	2.2	2.2	1.9	1.6	4.4	1.7	1.7	1.6	2.0
	Total Phosphorus	mg/L	0.020 ^d	-	0.0031	0.0045	0.0030	<0.0030	<0.0030	0.0048	0.0032	0.0039	<0.0030	0.0032	0.0038	0.0036	0.0046	0.0038	<0.0030	0.0127
Phenols	mg/L	0.004 ^d	-	0.0017	0.0015	0.0022	0.0019	0.0019	0.0020	0.0034	0.0026	0.0033	0.0020	<0.0010	<0.0010	<0.0010	0.0012	0.0012	<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
	Chloride (Cl)	mg/L	120	120	4.26	4.34	4.20	4.15	4.07	3.91	4.12	8.94	4.26	3.97	3.48	3.32	3.33	3.32	3.32	3.32
	Sulphate (SO ₄)	mg/L	218 ^b	218	2.03	2.03	1.99	1.97	1.95	1.86	1.96	2.04	2.02	1.88	2.13	1.98	2.01	2.00	1.99	1.99
Total Metals	Aluminum (Al)	mg/L	0.100	0.1	0.0039	0.115	<0.0030	<0.0030	<0.0030	0.0060	<0.0030	<0.0030	<0.0030	<0.0030	0.0062	0.0078	0.0061	0.0110	0.0052	0.0146
	Antimony (Sb)	mg/L	0.020 ^d	-	<0.00010	<0.00010	<0.00010	<0.00010	<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	0.00023	<0.00010	<0.00010	<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	-	-	0.00735	0.00804	0.00735	0.00697	0.00724	0.00680	0.00719	0.00758	0.00728	0.00684	0.00638	0.00642	0.00616	0.00609	0.00604	0.00608
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<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	-	-	16.4	22.3	16.5	15.7	15.7	15.0	15.9	15.7	16.0	15.2	12.7	12.6	12.2	12.3	12.2	12.1
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.00050	0.00419	0.00077	0.00120	0.00069	0.00051	<0.00050	<0.00050	<0.00050	0.00144	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	0.004	<0.00010	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
	Copper (Cu)	mg/L	0.002	0.004	0.00121	0.00181	0.00110	0.00106	0.00104	0.00102	0.00106	0.00095	0.00101	0.00098	0.00082	0.00080	0.00080	0.00083	0.00078	0.00085
	Iron (Fe)	mg/L	0.30	0.300	<0.030	0.249	<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	0.000523	<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	<0.0010	<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	-	-	9.65	12.7	9.52	9.41	9.26	8.92	9.50	9.28	9.65	9.13	7.54	7.61	7.62	7.60	7.58	7.61
	Manganese (Mn)	mg/L	0.935 ^b	-	0.000380	0.0100	0.000606	0.00104	0.000626	0.00182	0.000661	0.00971	0.000721	0.00116	0.00272	0.00279	0.00285	0.00442	0.00268	0.00396
	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	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.000322	0.000477	0.000398	0.000366	0.000355	0.000308	0.000367	0.000323	0.000360	0.000353	0.000244	0.000249	0.000242	0.000229	0.000254	0.000224
	Nickel (Ni)	mg/L	0.025	0.025	0.00069	0.0114	0.00266	0.00358	0.00210	0.00190	0.00194	0.00170	0.00164	0.00272	0.00061	0.00061	0.00055	0.00061	0.00060	0.00062
	Potassium (K)	mg/L	-	-	1.27	1.32	1.26	1.22	1.21	1.15	1.26	1.18	1.26	1.19	1.02	1.04	1.02	1.02	1.02	1.02
	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	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	-	-	0.42	0.58	0.42	0.41	0.41	0.42	0.41	1.87	0.42	0.42	0.36	0.36	0.35	0.36	0.35	0.35
	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	-	-	1.65	1.86	1.63	1.59	1.57	1.52	1.61	4.37	1.65	1.55	1.29	1.33	1.31	1.31	1.30	1.30
	Strontium (Sr)	mg/L	-	-	0.0116	0.0156	0.0119	0.0114	0.0111	0.0108	0.0115	0.0139	0.0118	0.0110	0.00973	0.00928	0.00919	0.00914	0.00926	0.00900
	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	0.00186	0.00011	0.00027	0.00058	0.00013	0.00020	0.00011	0.00014	<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	0.015	-	0.000916	0.000913	0.000900	0.000856	0.000895	0.000829	0.000859	0.000584	0.000883	0.000839	0.000668	0.000639	0.000641	0.000654	0.000630	0.000641
	Vanadium (V)	mg/L	0.006 ^d	0.006	<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	<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.25: Dissolved metal concentrations at Camp Lake water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Winter Sampling Event										Spring Sampling	Summer Sampling Event					
			JL0-02 surface 23-Apr-16	JL0-02 bottom 23-Apr-16	JL0-10 surface 23-Apr-16	JL0-10 bottom 23-Apr-16	JL0-01 surface 23-Apr-16	JL0-01 bottom 23-Apr-16	JL0-07 surface 25-Apr-16	JL0-07 bottom 25-Apr-16	JL0-09 surface 25-Apr-16	JL0-09 bottom 25-Apr-16	J0-01 outlet 26-Jun-16	JL0-02 surface 24-Jul-16	JL0-02 bottom 24-Jul-16	JL0-10 surface 24-Jul-16	JL0-10 bottom 24-Jul-16	JL0-01 surface 24-Jul-16	JL0-01 bottom 24-Jul-16
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	<0.0050	0.0037	0.0114	<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	0.00730	0.00717	0.00708	0.00719	0.00681	0.00684	0.00721	0.00748	0.00713	0.00693	0.00511	0.00635	0.00616	0.00613	0.00616	0.00611	0.00607
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<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	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<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	15.8	16.4	16.1	15.5	14.8	15.5	15.2	16.3	15.1	10.6	12.5	11.8	12.1	12.3	12.0	12.4
	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	<0.00050
	Cobalt (Co)	mg/L	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<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	0.00125	0.00106	0.00095	0.00093	0.00091	0.00089	0.00097	0.00086	0.00098	0.00093	0.00065	0.00079	0.00110	0.00077	0.00077	0.00076	0.00075
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.010	<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	0.0011	<0.0010	0.0011	0.0013	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0019	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	9.66	9.53	9.54	9.38	9.20	8.84	9.57	9.35	9.51	8.94	6.83	7.64	7.18	7.36	7.49	7.62	7.58
	Manganese (Mn)	mg/L	0.00235	0.00147	0.000589	0.000807	0.000199	0.000622	0.000579	0.000706	0.000323	0.000301	0.00124	0.000997	0.00117	0.000756	0.000747	0.000711	0.000520
	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
	Molybdenum (Mo)	mg/L	0.000487	0.000406	0.000362	0.000390	0.000334	0.000353	0.000462	0.000328	0.000383	0.000355	0.000210	0.000247	0.000222	0.000233	0.000239	0.000226	0.000249
	Nickel (Ni)	mg/L	0.01008	0.00423	0.00171	0.00199	0.00102	0.00156	0.00201	0.00165	0.00109	0.00108	0.00054	0.00061	0.00071	0.00054	0.00054	0.00056	0.00055
	Potassium (K)	mg/L	1.28	1.23	1.25	1.23	1.20	1.17	1.26	1.18	1.25	1.16	0.910	1.02	0.99	0.98	1.00	1.03	1.02
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.42	0.40	0.41	0.41	0.40	0.40	0.40	1.86	0.41	0.43	0.333	0.35	0.32	0.34	0.34	0.35	0.33
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.90	1.67	1.65	1.68	1.57	1.52	1.63	4.37	1.63	1.53	1.15	1.32	1.25	1.26	1.29	1.31	1.31
	Strontium (Sr)	mg/L	0.0126	0.0115	0.0119	0.0115	0.0111	0.0109	0.0114	0.0137	0.0115	0.0113	0.0081	0.00946	0.00879	0.00912	0.00933	0.00918	0.00914
	Thallium (Tl)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	0.00100	0.00024	<0.00010	<0.00010	<0.00010	<0.00010	0.00035	0.00013	0.00010	0.00011	<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	<0.00030	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000902	0.000875	0.000909	0.000915	0.000867	0.000807	0.000854	0.000544	0.000915	0.000813	0.000560	0.000674	0.000612	0.000629	0.000637	0.000602	0.000646
	Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<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	<0.0010	<0.0030	0.0068	0.0032	0.0050	<0.0030	<0.0030

Table C.25: Dissolved metal concentrations at Camp Lake water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Summer Sampling Event					Fall Sampling Event										
			JL0-07-S1 surface	JL0-07-B1 bottom	JL0-09-S1 surface	JL0-09-B1 bottom	J0-01 outlet	JL0-02-S1 surface	JL0-02-B1 bottom	JL0-10-S1 surface	JL0-10-B1 bottom	JL0-01-S1 surface	JL0-01-B1 bottom	JL0-07-S1 surface	JL0-07-B1 bottom	JL0-09-S1 surface	JL0-09-B1 bottom	J0-01 outlet
			26/Jul/2016	26/Jul/2016	26/Jul/2016	26/Jul/2016	20/Jul/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016	22/Aug/2016
Dissolved Metals	Aluminum (Al)	mg/L	0.0089	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0033	<0.0030	0.0035	<0.0030	<0.0030	0.0034	<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	0.00623	0.00611	0.00615	0.00610	0.00639	0.00636	0.00644	0.00657	0.00630	0.00627	0.00657	0.00649	0.00604	0.00647	0.00654	0.00660
	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	12.8	12.6	12.5	12.7	12.9	13.1	13.3	13.2	13.7	13.4	12.6	13.4	13.0	13.3	13.6	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	0.00076	0.00073	0.00081	0.00142	0.00073	0.00078	0.00076	0.00089	0.00078	0.00080	0.00073	0.00078	0.00067	0.00081	0.00081	0.00079
	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
	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	0.0011	0.0012	0.0013	0.0011	0.0013	0.0012	0.0011	0.0012	0.0013	0.0011	0.0013	0.0011
	Magnesium (Mg)	mg/L	7.94	7.93	7.79	7.84	7.91	7.72	7.95	8.13	7.92	7.77	7.50	7.81	7.54	7.82	8.06	8.04
	Manganese (Mn)	mg/L	0.000700	0.000226	0.000552	0.000385	0.00136	<0.000070	<0.000070	0.000226	0.000133	0.000247	0.000134	0.000296	0.000094	0.000313	<0.000070	0.00108
	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	0.000239	0.000233	0.000237	0.000222	0.000240	0.000254	0.000272	0.000269	0.000264	0.000270	0.000238	0.000275	0.000260	0.000266	0.000284	0.000276
	Nickel (Ni)	mg/L	0.00055	0.00053	0.00058	0.00057	0.00059	0.00058	0.00057	0.00058	0.00058	0.00057	0.00055	0.00058	0.00052	0.00059	0.00057	0.00061
	Potassium (K)	mg/L	1.05	1.03	1.02	1.02	1.04	1.04	1.06	1.05	1.04	1.04	1.02	1.06	1.01	1.06	1.06	1.07
	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	0.36	0.37	0.34	0.35	0.37	0.34	0.36	0.33	0.34	0.32	0.35	0.34	0.42	0.34	0.34	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
	Sodium (Na)	mg/L	1.34	1.36	1.32	1.33	1.32	1.38	1.40	1.40	1.37	1.35	1.32	1.37	1.38	1.39	1.40	1.37
	Strontium (Sr)	mg/L	0.0095	0.00940	0.00951	0.00936	0.00919	0.00980	0.0105	0.0100	0.0103	0.0102	0.00947	0.0101	0.00966	0.0101	0.0104	0.00980
	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	0.000658	0.000633	0.000644	0.000626	0.000672	0.000728	0.000824	0.000763	0.000785	0.000775	0.000691	0.000780	0.000674	0.000789	0.000801	0.000771
	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.26: Magnitude of difference in aqueous metal concentrations between Camp Lake and Reference Lake 3 in 2016, and between Camp Lake 2016 and baseline (2005 - 2013) period data for winter, summer and fall sampling events, Mary River Project CREMP. No reference lake data were collected in winter 2016.

Variable	Camp Lake vs Reference Lake 3 in 2016		Camp Lake 2016 vs Baseline		
	Summer	Fall	Winter	Summer	Fall
Conductivity (lab)	1.7	1.6	1.3	1.1	1.1
Hardness (as CaCO ₃)	1.8	1.9	1.2	1.1	1.1
Total Suspended Solids (TSS)	0.9	1.0	1.0	1.0	1.0
Total Dissolved Solids (TDS)	1.5	1.8	1.3	0.9	0.9
Turbidity	2.5	1.5	1.4	1.1	1.7
Alkalinity (as CaCO ₃)	1.9	1.9	1.1	1.1	1.1
Total Ammonia	1.4	0.6	0.6	0.4	1.0
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	1.5	0.8	0.9
Total Organic Carbon	0.7	0.7	1.1	1.0	1.1
Total Phosphorus	0.8	0.5	0.6	1.0	1.0
Phenols	0.8	0.8	2.3	1.5	2.3
Bromide (Br)	1.0	1.0	1.1	0.4	0.4
Chloride (Cl)	2.4	2.7	3.3	1.7	1.6
Sulphate (SO ₄)	0.5	0.5	1.4	1.4	0.8
Aluminum (Al)	1.7	1.2	9.0	0.6	0.8
Antimony (Sb)	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.1	1.0	1.0
Barium (Ba)	0.9	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)	1.8	1.9	1.3	1.1	1.1
Chromium (Cr)	1.0	1.0	8.9	1.0	1.0
Cobalt (Co)	1.0	1.0	1.2	1.0	0.9
Copper (Cu)	1.0	1.1	1.1	0.3	1.0
Iron (Fe)	1.0	1.2	1.9	1.1	1.7
Lead (Pb)	1.0	1.0	1.3	0.6	1.0
Lithium (Li)	1.1	1.3	0.2	0.2	
Magnesium (Mg)	1.8	1.9	1.3	1.1	1.1
Manganese (Mn)	4.1	2.6	3.2	1.5	1.0
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0
Molybdenum (Mo)	1.9	1.9	1.8	1.3	1.2
Nickel (Ni)	1.1	1.2	4.5	0.8	1.0
Potassium (K)	1.2	1.2		1.2	1.2
Selenium (Se)	1.0	1.0			
Silicon (Si)	0.8	0.9	1.2	0.8	0.9
Silver (Ag)	1.0	1.0	1.1	1.6	2.7
Sodium (Na)	1.6	1.7		1.5	1.4
Strontium (Sr)	1.2	1.2	1.7	1.3	1.3
Thallium (Tl)	1.0	1.0	1.1	1.3	3.2
Tin (Sn)	1.0	1.0	0.3	0.2	0.1
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0
Uranium (U)	2.5	2.8	1.9	1.4	1.5
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 variable concentration 3 to 5 times higher than respective mean reference or baseline period value).

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

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

Table C.27: *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 2016.

Study Area	Station	Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)	pH (pH units)	Specific Conductance (µS/cm)
Unnnamed Reference Creek	REF CRK B1	11.9	10.64	98.6	7.77	101
	REF CRK B2	11.3	10.78	98.6	7.76	101
	REF CRK B3	11.0	10.78	97.8	7.73	101
	REF CRK B4	10.7	10.85	97.8	7.73	101
	REF CRK B5	10.5	10.91	98.0	7.78	101
Sheardown Lake Tributary 1 Reach 1	SDLT-1-R1 B1	13.7	10.19	98.4	7.92	246
	SDLT-1-R1 B2	13.4	10.34	99.1	7.94	251
	SDLT-1-R1 B3	12.6	10.40	98.0	7.97	257
	SDLT-1-R1 B4	12.2	10.56	98.6	7.92	262
	SDLT-1-R1 B5	11.9	10.65	98.6	7.91	261
Sheardown Lake Tributary 12 Downstream	SDLT-12-DS B1	10.7	10.10	91.0	7.74	246
	SDLT-12-DS B2	10.5	10.18	91.3	7.78	244
	SDLT-12-DS B3	7.8	10.25	85.8	7.77	244
Sheardown Lake Tributary 9 Upstream	SDLT-9-DS B1	12.2	9.58	80.3	7.81	173
	SDLT-9-DS B2	10.0	9.55	84.7	7.53	181
	SDLT-9-DS B3	9.5	10.09	88.4	7.58	179
	SDLT-9-DS B4	9.1	10.28	89.1	7.61	178
	SDLT-9-DS B5	8.8	10.74	92.4	7.68	178

Table C.28: *In-situ* water quality summary statistics for the Sheardown Lake Tributary benthic stations, Mary River Project CREMP, August 2016. Five stations were sampled at each study area except Tributary 9, where three stations were sampled.

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Temperature (°C)	Unnamed Reference Creek	11.1	0.5	0.2	10.4	11.8	10.5	11.9
	Sheardown Lake Tributary 1 (SDLT1)	12.8	0.8	0.3	11.8	13.7	11.9	13.7
	Sheardown Lake Tributary 9 (SDLT9)	9.9	1.4	0.6	8.2	11.6	8.8	12.2
	Sheardown Lake Tributary 12 (SDLT12)	9.7	1.6	0.9	5.6	13.7	7.8	10.7
Dissolved Oxygen (mg/L)	Unnamed Reference Creek	10.79	0.10	0.05	10.67	10.92	10.64	10.91
	Sheardown Lake Tributary 1 (SDLT1)	10.43	0.18	0.08	10.20	10.65	10.19	10.65
	Sheardown Lake Tributary 9 (SDLT9)	10.05	0.50	0.22	9.43	10.67	9.55	10.74
	Sheardown Lake Tributary 12 (SDLT12)	10.18	0.08	0.04	9.99	10.36	10.10	10.25
Dissolved Oxygen (% Saturation)	Unnamed Reference Creek	98.2	0.4	0.2	97.7	98.7	97.8	98.6
	Sheardown Lake Tributary 1 (SDLT1)	98.5	0.4	0.2	98.0	99.0	98.0	99.1
	Sheardown Lake Tributary 9 (SDLT9)	87.0	4.6	2.1	81.2	92.7	80.3	92.4
	Sheardown Lake Tributary 12 (SDLT12)	89.4	3.1	1.8	81.7	97.0	85.8	91.3
pH (units)	Unnamed Reference Creek	7.75	0.02	0.01	7.73	7.78	7.73	7.78
	Sheardown Lake Tributary 1 (SDLT1)	7.93	0.02	0.01	7.90	7.96	7.91	7.97
	Sheardown Lake Tributary 9 (SDLT9)	7.64	0.11	0.05	7.51	7.78	7.53	7.81
	Sheardown Lake Tributary 12 (SDLT12)	7.76	0.02	0.01	7.71	7.82	7.74	7.78
Specific Conductance (µS/cm)	Unnamed Reference Creek	101	0.2	0.1	100.7	101.3	100.6	101.2
	Sheardown Lake Tributary 1 (SDLT1)	255	7	3	247	264	246	262
	Sheardown Lake Tributary 9 (SDLT9)	178	3	1	174	182	173	181
	Sheardown Lake Tributary 12 (SDLT12)	245	1	1	242	248	244	246

Table C.29: *In-situ* water quality statistical comparisons among the Sheardown Lake Tributaries and Unnamed Reference Creek study areas, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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	0.0028	α	Unnamed Reference Creek	Sheardown Tributary 1	NO	0.1081	Tukey's HSD
				Unnamed Reference Creek	Sheardown Tributary 9	NO	0.3558	
				Unnamed Reference Creek	Sheardown Tributary 12	NO	0.3126	
				Sheardown Tributary 1	Sheardown Tributary 9	YES	0.0045	
				Sheardown Tributary 1	Sheardown Tributary 12	YES	0.0071	
				Sheardown Tributary 9	Sheardown Tributary 12	NO	0.9878	
Dissolved Oxygen (% saturation)	YES	0.0000	α	Unnamed Reference Creek	Sheardown Tributary 1	NO	0.6848	Tamhane's
				Unnamed Reference Creek	Sheardown Tributary 9	YES	0.0327	
				Unnamed Reference Creek	Sheardown Tributary 12	NO	0.2055	
				Sheardown Tributary 1	Sheardown Tributary 9	YES	0.0290	
				Sheardown Tributary 1	Sheardown Tributary 12	NO	0.1911	
				Sheardown Tributary 9	Sheardown Tributary 12	NO	0.9609	
pH (units)	YES	0.0000	α	Unnamed Reference Creek	Sheardown Tributary 1	YES	0.0000	Tamhane's
				Unnamed Reference Creek	Sheardown Tributary 9	NO	0.3990	
				Unnamed Reference Creek	Sheardown Tributary 12	NO	0.9947	
				Sheardown Tributary 1	Sheardown Tributary 9	YES	0.0191	
				Sheardown Tributary 1	Sheardown Tributary 12	YES	0.0009	
				Sheardown Tributary 9	Sheardown Tributary 12	NO	0.3340	
Specific Conductance (µS/cm)	YES	0.0000	α	Unnamed Reference Creek	Sheardown Tributary 1	YES	0.0000	Tamhane's
				Unnamed Reference Creek	Sheardown Tributary 9	YES	0.0000	
				Unnamed Reference Creek	Sheardown Tributary 12	YES	0.0001	
				Sheardown Tributary 1	Sheardown Tributary 9	YES	0.0000	
				Sheardown Tributary 1	Sheardown Tributary 12	NO	0.1326	
				Sheardown Tributary 9	Sheardown Tributary 12	YES	0.0000	

^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 - transformed, single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data logit transformed, single factor ANOVA test conducted;

Table C.30: Water chemistry at Sheardown Lake Tributary 1 (SDLT1) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Spring Sampling Event		Summer Sampling Event		Fall Sampling Event	
					D1-05	D1-00	D1-05	D1-00	D1-05	D1-00
					27-Jun-2016	27-Jun-2016	19-Jul-2016	19-Jul-2016	19-Aug-2016	19-Aug-2016
Conventional	Conductivity (lab)	umho/cm	-	-	139	168	274	308	232	308
	pH (lab)	pH	6.5 - 9.0	-	7.71	7.93	7.75	8.05	7.85	8.08
	Hardness (as CaCO ₃)	mg/L	-	-	63	77	131	147	108	144
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	82	91	141	186	118	166
	Turbidity	NTU	-	-	0.43	1.32	0.41	0.98	0.27	0.65
	Alkalinity (as CaCO ₃)	mg/L	-	-	52	70	85	114	83	114
Nutrients and Organics	Total Ammonia	mg/L	variable	0.855	<0.020	<0.020	<0.020	0.057	0.030	<0.020
	Nitrate	mg/L	13	13	0.162	0.114	0.959	0.722	0.733	0.946
	Nitrite	mg/L	0.06	0.06	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	<0.15	0.22	<0.15	0.23	0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	2.4	2.6	2.0	2.5	2.7	3.1
	Total Organic Carbon	mg/L	-	-	3.3	2.8	2.4	2.8	2.8	3.2
	Total Phosphorus	mg/L	0.020 ^d	-	0.0036	0.0062	0.0048	0.0039	0.0110	0.0032
Anions	Phenols	mg/L	0.004 ^d	-	0.0023	0.0034	0.0010	0.0064	0.0110	0.0042
	Bromide (Br)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Chloride (Cl)	mg/L	120	120	2.48	3.79	6.67	9.42	6.41	9.47
Total Metals	Sulphate (SO ₄)	mg/L	218 ^β	218	11.1	8.95	43.6	36.8	22.6	26.8
	Aluminum (Al)	mg/L	0.100	0.179	0.0111	0.0323	0.0058	0.0115	0.0082	0.0138
	Antimony (Sb)	mg/L	0.020 ^d	-	<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
	Barium (Ba)	mg/L	-	-	0.00686	0.00912	0.0136	0.0184	0.0115	0.0170
	Beryllium (Be)	mg/L	0.011 ^d	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	1.5	-	<0.010	<0.010	0.011	0.012	0.012	0.012
	Cadmium (Cd)	mg/L	0.00012	0.00008	0.000029	<0.000010	0.000041	0.000012	0.000037	0.000011
	Calcium (Ca)	mg/L	-	-	11.2	14.7	23.1	28.7	19.5	27.9
	Chromium (Cr)	mg/L	0.0089	0.00856	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	0.004	<0.00010	<0.00010	0.00011	0.00015	<0.00010	0.00011
	Copper (Cu)	mg/L	0.002	0.0022	0.00277	0.00264	0.00266	0.00197	0.00310	0.00222
	Iron (Fe)	mg/L	0.30	0.326	<0.030	0.088	<0.030	0.145	<0.030	0.098
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	0.0013	0.0019	0.0013	0.0018
	Magnesium (Mg)	mg/L	-	-	7.69	9.72	17.3	20.3	14.1	18.9
	Manganese (Mn)	mg/L	0.935 ^β	-	0.000348	0.00484	0.000421	0.00768	0.000436	0.00559
	Mercury (Hg)	mg/L	0.000026	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.00218	0.00190	0.00220	0.00182	0.00325	0.00243
	Nickel (Ni)	mg/L	0.025	0.025	0.00114	0.00136	0.00121	0.00146	0.00114	0.00146
	Potassium (K)	mg/L	-	-	1.53	1.84	2.38	2.57	2.33	2.41
	Selenium (Se)	mg/L	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	-	-	0.87	0.73	1.25	1.35	1.36	1.59
	Silver (Ag)	mg/L	0.00025	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.07	1.55	2.78	3.59	2.98	3.88
	Strontium (Sr)	mg/L	-	-	0.00757	0.0107	0.0149	0.0170	0.0130	0.0169
	Thallium (Tl)	mg/L	0.0008	0.0008	<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
	Titanium (Ti)	mg/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.015	-	0.00158	0.00211	0.00511	0.00384	0.00654	0.00532
	Vanadium (V)	mg/L	0.006 ^d	0.006	<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

^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 Intrinsic (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.31: Dissolved metal concentrations at Sheardown Lake Tributary water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Spring Sampling Event		Summer Sampling Event		Fall Sampling Event	
			D1-05	D1-00	D1-05	D1-00	D1-05	D1-00
			27-Jun-2016	27-Jun-2016	19-Jul-2016	19-Jul-2016	19-Aug-2016	19-Aug-2016
Dissolved Metals	Aluminum (Al)	mg/L	0.0069	<0.0050	0.0036	0.0030	0.0048	0.0041
	Antimony (Sb)	mg/L	<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
	Barium (Ba)	mg/L	0.00916	0.00683	0.0172	0.0137	0.0166	0.0114
	Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.000050	<0.000050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	0.011	<0.010	0.012	0.011	0.012	0.011
	Cadmium (Cd)	mg/L	<0.000010	0.000031	<0.000010	0.000041	0.000014	0.000039
	Calcium (Ca)	mg/L	14.6	11.7	27.8	23.6	26.9	19.6
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	<0.00010	<0.00010	0.00013	0.00011	0.00012	<0.00010
	Copper (Cu)	mg/L	0.00256	0.00274	0.00182	0.00263	0.00220	0.00317
	Iron (Fe)	mg/L	0.044	<0.010	0.077	<0.030	0.070	<0.030
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.0012	<0.0010	0.0017	0.0012	0.0017	0.0012
	Magnesium (Mg)	mg/L	9.97	8.29	18.9	17.4	18.6	14.4
	Manganese (Mn)	mg/L	0.00398	<0.00050	0.00712	0.000417	0.00525	0.000420
	Mercury (Hg)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.00169	0.00205	0.00179	0.00224	0.00242	0.00338
	Nickel (Ni)	mg/L	0.00126	0.00115	0.00139	0.00122	0.00151	0.00117
	Potassium (K)	mg/L	1.87	1.61	2.39	2.41	2.45	2.35
	Selenium (Se)	mg/L	0.00007	0.000058	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.698	0.917	1.32	1.27	1.59	1.31
	Silver (Ag)	mg/L	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.6	1.16	3.34	2.81	3.99	3.01
	Strontium (Sr)	mg/L	0.0104	0.0078	0.0174	0.0147	0.0168	0.0131
	Thallium (Tl)	mg/L	0.000011	0.000014	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.00030	<0.00030	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.00198	0.00156	0.00373	0.00514	0.00515	0.00646
	Vanadium (V)	mg/L	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.0014	<0.0010	<0.0030	<0.0030	<0.0030	<0.0030

Table C.32: Magnitude of difference in aqueous metal concentrations between SDLT1 and reference creek stations in 2016, and at SDLT1 between 2016 and the baseline period, for spring, summer, and fall sampling events, Mary River Project CREMP.

Variable	SDLT1 Station D1-05 (Reach 4)						SDLT1 Station D1-00 (Reach 1)					
	2016 vs Reference Creek			2016 vs Baseline			2016 vs Reference Creek			2016 vs Baseline		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Conductivity (lab)	4.9	3.6	1.9	2.0	1.9	1.1	5.9	4.0	2.5	2.0	1.6	1.2
Hardness (as CaCO ₃)	4.7	3.7	1.9	1.8	1.8	1.1	5.7	4.2	2.5	1.8	1.4	1.1
Total Suspended Solids (TSS)	1.0	0.8		1.0	1.0	1.0	1.0	0.8		1.0	1.0	1.0
Total Dissolved Solids (TDS)	4.1	3.3	1.8	1.9	1.5	0.9	4.6	4.3	2.6	1.7	1.5	1.0
Turbidity	0.3	0.1	0.2	0.6	1.2	0.8	0.9	0.3	0.6	0.3	1.5	1.9
Alkalinity (as CaCO ₃)	3.7	2.6	1.5	1.8	1.3	1.0	5.0	3.5	2.0	1.8	1.2	1.0
Total Ammonia	0.9			0.1	0.2	0.5	0.9			0.1	1.0	0.7
Nitrate	8.1		33	1.9	10	5.1	5.7		42	1.1	7.2	9.0
Nitrite	1.0			1.0		0.7	1.0			1.0		0.8
Total Kjeldahl Nitrogen (TKN)	1.0			1.1	1.3	1.4	1.5			1.0	1.3	1.2
Dissolved Organic Carbon	2.3		2.2	0.7	0.8	1.2	2.5		2.5	0.6	0.9	1.3
Total Organic Carbon	2.9	2.0	1.9	1.0	0.9	1.2	2.4	2.3	2.2	0.6	0.9	1.2
Total Phosphorus	0.4	0.8	1.9	0.3	1.0	3.7	0.7	0.6	0.5	0.6	0.8	0.5
Phenols	0.8	0.8	2.0				1.1	5.2	0.8			
Bromide (Br)	1.0			0.4			1.0			0.4		
Chloride (Cl)	3.8	3.6	2.0	0.6	2.0	0.7	5.7	5.1	3.0		2.0	1.3
Sulphate (SO ₄)	20	21	5.1	14	9.5	2.4	16	17	6.1		6.7	3.1
Aluminum (Al)	0.4	0.1	0.1	0.3	0.4	0.8	1.0	0.1	0.2	0.2	0.5	1.3
Antimony (Sb)	1.0			0.5	0.7	0.7	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
Barium (Ba)	3.6	2.6	1.5	1.6	1.8	1.2	4.8	3.5	2.2	1.7	1.6	1.4
Beryllium (Be)	1.0			5.0			1.0			5.0		
Bismuth (Bi)	1.0			1.0			1.0			1.0		
Boron (B)	1.0			1.0	0.7	0.7	1.0			0.9	0.7	0.9
Cadmium (Cd)	2.9			1.0	1.2	1.0	1.0			0.7	0.7	0.8
Calcium (Ca)	4.3	3.2	1.6	1.7	1.7	1.0	5.6	4.0	2.3	1.8	1.5	1.1
Chromium (Cr)	1.0			3.0	2.4	3.8	1.0			1.0	1.7	3.3
Cobalt (Co)	1.0			0.6	0.8	0.8	1.0			0.8	1.5	1.1
Copper (Cu)	5.2	3.0	3.1	0.9	0.9	1.3	5.0	2.2	2.2	0.9	0.8	1.3
Iron (Fe)	0.8	0.4	0.5	0.5	1.2	1.2	2.3	1.8	1.7	0.5	1.4	1.9
Lead (Pb)	0.7	0.4	0.4	0.2	0.5	0.6	0.7	0.4	0.4	0.1	0.9	1.0
Lithium (Li)	1.0			2.0	1.5	1.4	1.0			2.0	1.5	1.6
Magnesium (Mg)	5.3	4.2	2.1	1.8	1.9	1.1	6.6	5.0	2.8	1.8	1.6	1.3
Manganese (Mn)	0.4	0.3	0.5	0.4	0.6	0.9	5.0	6.1	6.5	1.2	2.9	3.8
Mercury (Hg)	1.0			1.0			1.0			1.0		
Molybdenum (Mo)	28	10	8.6	2.5	0.9	1.1	24	8.6	6.4	1.5	0.9	1.3
Nickel (Ni)	2.3	2.2	1.5	0.7	1.1	1.2	2.7	2.7	2.0	0.6	1.1	1.3
Potassium (K)	6.1	4.0	2.8	1.7	1.5	1.2	7.3	4.3	2.9	1.9	1.5	1.4
Selenium (Se)	1.0						1.0					
Silicon (Si)	2.4	1.4	1.4	1.0	1.1	1.1	2.0	1.5	1.7	0.6	1.0	1.2
Silver (Ag)	1.0			0.9			1.0					
Sodium (Na)	2.9	2.8	1.6	3.6	2.9	1.4	4.2	3.6	2.1	3.1	2.9	1.8
Strontium (Sr)	3.1	2.1	1.0	2.2	1.9	1.1	4.4	2.4	1.4	2.1	1.4	1.2
Thallium (Tl)	1.0			10	7.4	7.1	1.0			10	9.1	
Tin (Sn)	1.0			1.0			1.0			1.0		
Titanium (Ti)	1.0	0.8	5.1	1.0			1.0	0.8	5.1	1.0		
Uranium (U)	8.6	5.8	1.8	2.5	2.0	0.9	12	4.4	1.5	3.4	1.5	1.2
Vanadium (V)	1.0			1.0			1.0			1.0		
Zinc (Zn)	1.0			2.2	1.2	1.4	1.0			3.0	0.7	1.1



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

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

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

Table C.33: *In-situ* water quality profile data collected at Sheardown Lake NW water quality monitoring stations in winter^a, Mary River Project CREMP, 2016.

Station DD-Hab 9-Stn 1 ^{b,c}					Station DLO-01-5 ^{b,c}					Station DLO-01-1 ^{b,c}					Station DLO-01-4 ^{b,c}					Station DLO-01-2 ^{b,c}					Station DLO-01-7 ^{b,c}				
Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (uS/cm)
2.90	1.0	101.5	7.61	146	2.90	1.3	95.9	7.83	151	3.00	1.6	98.7	8.13	152	3.15	1.7	100.2	7.92	154	3.15	1.6	98.4	7.87	151	3.20	1.4	102.0	7.7	150
3.90	1.4	101.1	7.60	150	3.90	1.5	97.2	7.79	151	4.00	1.6	99.0	7.95	151	4.15	1.7	100.5	7.83	152	4.15	1.6	98.7	7.79	151	4.20	1.5	101.4	7.6	150
4.90	1.5	100.9	7.62	150	4.90	1.5	97.9	7.74	151	5.00	1.6	99.0	7.88	151	5.15	1.6	100.6	7.77	152	5.15	1.5	99.1	7.74	151	5.20	1.5	101.2	7.6	150
5.90	1.5	100.7	7.63	149	5.90	1.5	98.2	7.70	151	6.00	1.5	99.1	7.81	151	6.15	1.6	101.1	7.74	152	6.15	1.5	99.3	7.72	151	6.20	1.5	101.0	7.6	150
6.90	1.6	100.2	7.61	149	6.90	1.5	98.3	7.66	151	7.00	1.5	99.0	7.75	151						7.15	1.6	99.3	7.69	151	7.20	1.6	100.9	7.6	150
7.90	1.6	99.9	7.62	149	7.90	1.5	98.5	7.63	151	8.00	1.5	99.2	7.69	151						8.15	1.5	99.2	7.67	151	8.20	1.6	100.5	7.6	150
8.90	1.6	99.1	7.62	149	8.90	1.5	98.3	7.61	151	9.00	1.5	99.2	7.67	151						9.15	1.6	99.2	7.66	151	9.20	1.6	100.4	7.6	150
9.90	1.6	99.1	7.6	149	9.90	1.5	97.5	7.59	151	10.00	1.5	99.1	7.64	151						10.15	1.6	99.2	7.65	151	10.20	1.6	100.0	7.6	150
					10.90	1.5	97.1	7.57	151	11.00	1.5	99.0	7.63	151						11.15	1.6	99.2	7.63	151					
					11.90	1.5	98.1	7.55	151	12.00	1.6	98.2	7.62	151						12.15	1.6	99.2	7.62	151					
					12.90	1.5	98.8	7.55	151	13.00	1.6	96.7	7.54	151						13.15	1.6	99.2	7.62	151					
					13.90	1.5	98.9	7.54	151	14.00	1.6	95.7	7.58	150						14.15	1.6	99.3	7.62	151					
					14.90	1.6	98.8	7.54	151	15.00	1.6	95.0	7.57	150						15.15	1.6	99.4	7.62	151					
					15.90	1.6	98.4	7.53	151	16.00	1.6	94.2	7.55	150						16.15	1.6	99.8	7.61	151					
					16.90	1.7	93.6	7.51	150	17.00	1.7	91.6	7.54	150						17.15	1.6	97.7	7.60	151					
					17.90	1.7	89.0	7.49	149	18.00	1.7	89.2	7.51	148						18.15	1.7	98.9	7.59	150.8					
					18.90	1.8	85.9	7.45	148	19.00	1.7	86.7	7.49	148															
					19.90	1.8	83.8	7.43	148	20.00	1.8	81.8	7.47	146.8															
					20.90	1.8	78.6	7.41	147																				
					21.90	1.9	71.7	7.34	147																				
					22.90	2.2	20.2	7.18	155																				

^a Sampling conducted on 26-Apr and 30-Apr, 2016.

^b Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 were 10, 23.05, 20.4, 6.4, 19.15, and 11.4, respectively, at the time of winter sampling.

^c Ice thickness at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 were 1.98, 1.89, 2.13, 2.14, and 2.18 m, respectively, at the time of winter sampling.

Table C.34: *In-situ* water quality profile data collected at Sheardown Lake NW water quality monitoring stations in summer^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)						Dissolved Oxygen (% Saturation)						pH (pH units)						Specific Conductance (µS/cm)					
	DD Hab9 ^b	DLO-01-5 ^b	DLO-01-1 ^b	DLO-01-4 ^b	DLO-01-2 ^b	DLO-01-7 ^b	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
1.0	10.0	9.0	9.5	8.8	9.1	7.9	102.2	99.8	101.2	99.3	101.6	99.2	6.77	7.00	7.57	7.64	7.73	7.65	122	128	122	137	122	137
2.0	10.0	9.0	9.4	8.7	9.1	7.5	102.2	99.8	101.4	99.0	101.8	99.1	7.14	7.10	7.60	7.67	7.74	7.65	122	128	122	137	122	137
3.0	10.0	8.9	9.4	8.4	9.1	7.8	102.1	99.6	101.6	98.9	101.8	99.0	7.22	7.18	7.66	7.68	7.75	7.67	122	128	122	137	122	137
4.0	10.0	8.8	9.4	8.4	9.1	7.8	102.1	99.6	101.5	98.7	101.9	99.1	7.31	7.26	7.69	7.69	7.78	7.68	122	128	123	137	122	137
5.0	10.0	8.7	9.3	8.3	9.1	7.7	102.1	99.4	101.5	98.9	101.7	98.4	7.36	7.31	7.73	7.70	7.80	7.70	122	128	123	137	122	137
6.0	10.0	8.6	9.3	8.2	9.1	7.4	101.6	99.3	101.7	98.4	101.6	98.1	7.40	7.38	7.75	7.70	7.84	7.70	123	129	123	137	122	137
7.0	10.0	8.6	9.3		9.0	7.3	101.8	99.1	101.4		101.5	97.9	7.43	7.43	7.77		7.84	7.69	124	129	123		122	137
8.0	10.0	8.5	9.3		9.0	7.2	101.8	99.2	101.3		101.4	97.7	7.48	7.47	7.79		7.85	7.69	124	129	123		123	137
9.0	10.0	8.4	9.1		8.8	6.9	101.7	99.1	101.0		100.6	97.0	7.50	7.51	7.79		7.87	7.67	123	129	123		123	137
10.0	10.0*	8.3	9.1		8.0		101.5*	98.8	100.9		99.4		7.53*	7.52	7.79		7.87		124*	129	123		123	
11.0		8.2	9.9		7.7			98.6	100.5		99.4			7.56	7.79		7.83			129	123		122	
12.0		8.1	7.8		7.7			98.8	100.7		98.6			7.57	7.76		7.81			128	123		122	
13.0		7.9	7.4		7.7			98.2	97.8		98.5			7.59	7.71		7.80			129	123		122	
14.0		7.6	7.3		7.7			97.7	97.1		98.4			7.57	7.64		7.80			128	122		122	
15.0		7.5	7.1		7.5			97.4	96.6		97.5			7.57	7.57		7.77			128	122		122	
16.0		7.3	7.1		7.3			97.2	96.3		97.1			7.57	7.50		7.76			129	122		122	
17.0		7.2	6.5		7.3			97.0	95.5		96.8			7.56	7.44		7.74			129	122		122	
18.0		7.1	6.7					96.6	95.3					7.56	7.40					129	122			
19.0		7.1	6.5					96.3	94.4					7.55	7.31					129	122			
20.0		7.0						96.2						7.54						129				
21.0		6.8						95.7						7.54						129				
22.0		6.5						96.1						7.54						129				

^a Sampling conducted on 24-July to 26-July, 2016.
^b Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 were 10.3, 24.1, 20.5, 6.0, 18.7, and 10.9 m, respectively, at the time of summer sampling.
* The deepest *in situ* water quality reading at station DD Hab9 was taken at 9.3 m at the time of fall sampling.

Table C.35: *In-situ* water quality profile data collected at Sheardown Lake NW water quality monitoring stations in fall^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)						Dissolved Oxygen (% Saturation)						pH (pH units)						Specific Conductance (µS/cm)					
	DD Hab9 ^b	DLO-01-5 ^b	DLO-01-1 ^b	DLO-01-4 ^b	DLO-01-2 ^b	DLO-01-7 ^b	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
1.0	10.0	10.5	10.4	10.6	10.7	10.8	97.6	96.1	97.2	97.4	96.1	96.0	7.08	7.24	7.46	8.12	8.15	8.10	190	192	190	210	220	210
2.0	10.8	10.5	10.4	10.5	10.5	10.8	98.3	96.9	97.6	97.7	96.9	97.3	7.42	7.38	7.65	8.10	8.12	8.07	192	192	190	210	220	210
3.0	10.7	10.5	10.4	10.5	10.4	10.5	98.3	97.4	97.8	97.8	97.3	96.0	7.53	7.51	7.74	8.08	8.10	8.07	192	192	191	220	220	220
4.0	10.7	10.5	10.4	10.4	10.4	10.4	98.4	97.6	97.8	97.8	97.4	97.0	7.61	7.61	7.79	8.07	8.09	8.06	192	192	192	210	220	220
5.0	10.7	10.4	10.3	10.4	10.3	10.4	98.3	97.6	97.6	97.7	97.2	97.6	7.68	7.68	7.84	8.05	8.07	8.04	192	192	192	220	220	220
6.0	10.7	10.4	10.2	10.3	10.3	10.3	98.3	97.6	97.3	98.1	97.2	97.6	7.73	7.74	7.87	8.04	8.07	8.04	193	192	192	220	220	220
7.0	10.6	10.4	10.2		10.2	10.3	98.2	97.6	97.0		97.1	97.5	7.77	7.78	7.90		8.06	8.04	193	192	192		220	220
8.0	10.6	10.4	10.1		10.2	10.3	98.0	97.4	96.8		97.0	97.4	7.80	7.80	7.91		8.05	8.04	193	192	191		220	220
9.0	10.1	10.3	10.1		10.2	10.0	97.3	97.0	96.5		96.7	96.5	7.84	7.83	7.92		8.02	8.04	202	192	192		220	220
10.0		10.2	10.1		10.1	9.7		96.9	96.2		96.0	95.7		7.85	7.93		7.99	8.01		192	192		220	210
11.0		10.1	9.9		9.8			96.6	95.7		95.4			7.87	7.93		7.95			192	192		210	
12.0		10.1	8.6		8.9			96.4	93.1		93.2			7.89	7.87		7.90			192	186		210	
13.0		7.8	7.8		8.6			91.8	91.5		92.8			7.83	7.82		7.80			184	184		210	
14.0		6.9	7.2		8.0			89.3	90.2		91.4			7.71	7.77		7.76			183	183		210	
15.0		6.7	6.9		7.4			88.2	89.1		89.6			7.66	7.73		7.69			182	183		210	
16.0		6.5	6.6		6.8			87.4	87.9		87.4			7.61	7.69		7.61			182	182		210	
17.0		6.5	6.5		6.6			86.7	87.2		86.8			7.59	7.65		7.54			182	182		210	
18.0		6.4	6.5					86.3	87.4					7.55	7.62					182	182			
19.0		6.4	6.4					85.9	86.0					7.53	7.60					182	182			
20.0		6.3						85.2						7.51						183				
21.0		6.3						84.7						7.49						183				
22.0		6.2						84.1						7.47						183				

^a Sampling conducted on 21-August and 22-August, 2016.

^b Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 were 9.7, 24.4, 20.8, 6.1, 18.6, and 12.3 m, respectively, at the time of fall sampling.

Table C.36: 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 2016.

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.)		
DD HAB9 STN2	13-Aug-16	10.3	4.8	-	surface	11.88	10.71	99.2	8.09	129
					bottom	9.99	10.34	94.9	7.72	126
DLO-01-08	13-Aug-16	11.4	5.2	clear, slight blue-green colouration	surface	12.49	10.94	102.7	8.07	128
					bottom	10.40	11.19	100.1	7.91	125
DLO-01-09	13-Aug-16	7.5	5.1	clear, slight blue-green colouration	surface	12.76	10.75	101.4	8.05	130
					bottom	10.76	11.00	99.1	7.93	125
DLO-01-03	13-Aug-16	8.6	5.0	clear, slight blue-green colouration	surface	12.35	10.92	102.2	7.96	128
					bottom	10.95	11.18	101.3	7.93	126
DLO-01-10	13-Aug-16	9.0	5.1	clear, slight blue-green colouration	surface	12.28	10.79	100.7	7.74	128
					bottom	10.67	11.16	100.5	7.51	126

Table C.37: Statistical comparison of bottom *in-situ* water quality between Sheardown Lake NW and Reference Lake 3 littoral stations, Mary River Project CREMP, August 2016.

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Areas?	p-value	Statistical Analysis ^a	Lake	n	Mean (n = 5)	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	Yes	<0.001	α , δ , γ	Reference	5	8.88	0.71	0.32	8.10	10.00
				Sheardown NW	5	5.03	0.16	0.07	4.78	5.24
Temperature (°C)	Yes	0.032	α , δ , γ	Reference	5	9.92	0.37	0.17	9.50	10.40
				Sheardown NW	5	10.55	0.37	0.17	9.99	10.95
Dissolved Oxygen (mg/L)	No	0.156	α , δ , γ	Reference	5	10.3	0.8	0.4	9.3	11.3
				Sheardown NW	5	11.0	0.4	0.2	10.3	11.2
Dissolved Oxygen (% saturation)	Yes	0.040	α , δ , γ	Reference	5	91.3	6.7	3.0	82.6	99.1
				Sheardown NW	5	99.2	2.5	1.1	94.9	101.3
pH (units)	No	0.270	α , δ , γ	Reference	5	7.64	0.23	0.10	7.28	7.86
				Sheardown NW	5	7.80	0.18	0.08	7.51	7.93
Specific Conductance (umho/cm)	Yes	<0.001	γ	Reference	5	74.0	0.0	0.0	74.0	74.0
				Sheardown NW	5	125.6	0.5	0.2	125.0	126.0

^a Data analysis included: α - data untransformed; β - data logit transformed; ι - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ε - t-test assuming unequal variance;

γ - ANOVA test validated using Mann Whitney U-test.

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

Table C.38: Water chemistry at Sheardown Lake NW (DLO-01) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Winter Sampling Event											
					DD-HAB9-STN1-S	DD-HAB9-STN1-B	DL0-01-5(S)	DL0-01-5(B)	DL0-01-1	DL0-01-1(B)	DL0-01-4(S)	DL0-01-4(B)	DL0-01-2(S)	DL0-01-2(B)	DL0-01-7-S	DL0-01-7-B
					surface 30-Apr-2016	bottom 30-Apr-2016	surface 26-Apr-2016	bottom 26-Apr-2016	surface 26-Apr-2016	bottom 26-Apr-2016	surface 26-Apr-2016	bottom 26-Apr-2016	surface 26-Apr-2016	bottom 26-Apr-2016	surface 30-Apr-2016	bottom 30-Apr-2016
Conventionals	Conductivity (lab)	umho/cm	-	-	153	152	150	147	151	148	157	151	154	158	154	153
	pH (lab)	pH	6.5 - 9.0	-	8.03	8.04	7.68	7.64	7.76	7.67	7.73	7.81	7.74	7.77	8.02	8.00
	Hardness (as CaCO ₃)	mg/L	-	-	74	73	70	68	72	71	74	72	73	72	73	74
	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	77	76	53	88	87	91	87	90	91	81	74
	Turbidity	NTU	-	-	0.13	0.49	0.38	0.33	0.26	0.24	0.17	0.31	0.22	0.58	0.47	0.17
	Alkalinity (as CaCO ₃)	mg/L	-	-	76	76	68	65	70	68	72	69	70	70	69	77
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	0.029	0.021	0.020	<0.020	0.043	<0.020	0.035	0.023	0.038	0.022	<0.020	<0.020
	Nitrate	mg/L	13	13	0.032	0.033	0.033	0.103	0.0335	0.051	0.030	0.033	0.032	0.030	0.033	0.033
	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	0.20	0.16	0.175	0.16	0.16	0.16	0.18	0.17	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	3.7	3.4	2.9	2.5	2.7	3.2	3.0	2.7	2.8	3.4	3.6	3.6
	Total Organic Carbon	mg/L	-	-	2.0	2.1	2.2	1.9	2.1	2.0	2.1	2.0	2.1	2.3	2.0	2.0
	Total Phosphorus	mg/L	0.020 ^d	-	<0.0030	<0.0030	0.0035	0.0031	0.0031	<0.0030	0.0033	0.0032	<0.0030	<0.0030	<0.0030	<0.0030
	Phenols	mg/L	0.004 ^d	-	0.0013	0.0014	0.0021	0.0015	<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	3.52	3.50	3.59	3.50	3.51	3.46	3.88	3.52	3.54	3.51	3.54	3.49
	Sulphate (SO ₄)	mg/L	218 ^β	218	3.99	3.96	3.98	3.83	3.96	3.89	4.24	3.97	3.98	3.95	4.01	3.97
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173 ^c	<0.0030	<0.0030	0.0052	<0.0030	0.00745	<0.0030	0.0033	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Antimony (Sb)	mg/L	0.020 ^d	-	<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	-	-	0.00716	0.00681	0.00650	0.00661	0.00657	0.00641	0.00658	0.00658	0.00659	0.00641	0.00695	0.00709
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<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	-	-	14.9	14.1	14.5	14.0	14.5	14.4	14.9	14.6	14.6	14.6	14.5	14.5
	Chromium (Cr)	mg/L	0.0089	0.0089	<0.00050	<0.00050	0.00106	<0.00050	0.00068	<0.00050	0.00108	0.00065	0.00127	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	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	0.00098	0.00086	0.00096	0.00081	0.00095	0.00089	0.00096	0.00089	0.00091	0.00090	0.00094	0.00103
	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	0.0011	0.0010	0.0010	0.0011	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	9.17	9.14	8.74	8.69	8.86	8.87	8.92	8.92	8.85	9.00	9.18	9.27
	Manganese (Mn)	mg/L	0.935 ^β	-	0.000821	0.00107	0.00175	0.0117	0.00175	0.00178	0.00128	0.00131	0.00141	0.00136	0.000890	0.00111
	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	-	0.000904	0.000898	0.000996	0.000867	0.000945	0.000915	0.000984	0.000932	0.000950	0.000945	0.000920	0.000888
	Nickel (Ni)	mg/L	0.025	0.025	0.00070	0.00068	0.00340	0.00137	0.00189	0.00137	0.00258	0.00201	0.00231	0.00115	0.00069	0.00073
	Potassium (K)	mg/L	-	-	1.21	1.20	1.20	1.18	1.21	1.21	1.22	1.24	1.21	1.24	1.24	1.21
	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	-	-	0.65	0.64	0.64	0.98	0.65	0.71	0.65	0.63	0.65	0.63	0.62	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	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.55	1.54	1.52	1.51	1.54	1.51	1.54	1.52	1.52	1.53	1.55	1.56
	Strontium (Sr)	mg/L	-	-	0.00959	0.00945	0.00990	0.00948	0.0098	0.00975	0.0101	0.00979	0.00987	0.00973	0.00960	0.00946
	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	0.00012	<0.00010	0.000295	<0.00010	<0.00010	<0.00010	0.00043	<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	-	0.00114	0.00112	0.00114	0.000983	0.001145	0.00109	0.00117	0.00113	0.00115	0.00115	0.00115	0.00110
	Vanadium (V)	mg/L	0.006 ^d	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	0.0132	<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.38: Water chemistry at Sheardown Lake NW (DLO-01) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Summer Sampling Event											
					DD-HAB-9-STN1-S	DD-HAB-9-STN1-B	DL0-01-5-S	DL0-01-5-B	DL0-01-1-S	DL0-01-1-B	DL0-01-4-S	DL0-01-4-B	DL0-01-2-S	DL0-01-2-B	DL0-01-7-S	DL0-01-7-B
					surface 24-Jul-2016	bottom 24-Jul-2016	surface 26-Jul-2016	bottom 26-Jul-2016	surface 24-Jul-2016	bottom 24-Jul-2016	surface 25-Jul-2016	bottom 25-Jul-2016	surface 24-Jul-2016	bottom 24-Jul-2016	surface 25-Jul-2016	bottom 25-Jul-2016
Conventionals	Conductivity (lab)	umho/cm	-	-	125	125	125	124	124	124	124	124	124	124	122	122
	pH (lab)	pH	6.5 - 9.0	-	7.97	8.00	8.00	7.84	8.00	7.80	7.90	7.98	7.92	7.90	7.88	7.96
	Hardness (as CaCO ₃)	mg/L	-	-	59	57	59	60	57	58	57	58	58	56	57	57
	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	-	-	62	57	67	67	45	52	61	62	55	50	64	58
	Turbidity	NTU	-	-	0.85	0.86	0.54	0.46	0.96	0.84	1.24	1.22	0.92	0.90	0.82	0.80
	Alkalinity (as CaCO ₃)	mg/L	-	-	54	58	57	58	44	56	56	54	54	55	54	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	<0.020	0.053	<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	-	-	<0.15	<0.15	1.04	0.16	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.4	1.3	1.4	1.4	1.5	1.5	1.3	1.4	1.4	1.4	1.4	1.4
	Total Organic Carbon	mg/L	-	-	1.5	1.6	1.7	1.6	1.7	2.9	1.7	1.7	1.6	1.8	1.6	1.6
	Total Phosphorus	mg/L	0.020 ^d	-	0.0038	0.0069	0.0037	0.0039	0.0035	0.0033	0.0047	0.0193	0.0066	0.0046	0.0055	0.0041
	Phenols	mg/L	0.004 ^d	-	<0.0010	<0.0010	0.0020	0.0018	0.0011	<0.0010	<0.0010	0.0042	<0.0010	<0.0010	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	2.89	2.95	2.85	2.82	2.86	2.83	2.88	2.90	2.86	2.84	2.88	2.83
	Sulphate (SO ₄)	mg/L	218 ^β	218	3.48	3.53	3.30	3.16	3.33	3.21	3.31	3.34	3.30	3.25	3.27	3.21
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173 ^c	0.0079	0.0067	0.0177	0.0074	0.0067	0.0076	0.0093	0.0064	0.0067	0.0121	0.0074	0.0068
	Antimony (Sb)	mg/L	0.020 ^d	-	<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	-	-	0.00552	0.00549	0.00594	0.00593	0.00554	0.00549	0.00545	0.00567	0.00547	0.00569	0.00569	0.00579
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<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	-	-	11.2	11.3	12.1	12.0	11.2	11.2	11.1	11.0	11.3	11.3	11.0	11.1
	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 ^d	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	0.00079	0.00088	0.00144	0.00086	0.00080	0.00072	0.00174	0.00135	0.00073	0.00081	0.00124	0.00098
	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	0.0011	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	-	-	7.32	7.20	7.80	7.67	7.27	7.19	7.30	7.16	7.15	7.19	7.33	7.20
	Manganese (Mn)	mg/L	0.935 ^β	-	0.00362	0.00372	0.00395	0.00405	0.00378	0.00389	0.00378	0.00374	0.00384	0.00532	0.00377	0.00389
	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	-	0.000680	0.000680	0.000733	0.000705	0.000670	0.000671	0.000679	0.000662	0.000683	0.000650	0.000667	0.000652
	Nickel (Ni)	mg/L	0.025	0.025	0.00060	0.00056	0.00066	0.00060	0.00060	0.00058	0.00061	0.00059	0.00060	0.00062	0.00062	0.00059
	Potassium (K)	mg/L	-	-	1.04	1.03	1.03	1.03	1.04	1.02	1.03	1.03	1.02	1.03	1.08	1.04
	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	-	-	0.47	0.46	0.49	0.55	0.47	0.53	0.45	0.45	0.46	0.50	0.48	0.49
	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	-	-	1.26	1.25	1.33	1.34	1.27	1.24	1.26	1.24	1.25	1.24	1.29	1.26
	Strontium (Sr)	mg/L	-	-	0.00774	0.00775	0.00797	0.00787	0.00751	0.00766	0.00758	0.00758	0.00757	0.00761	0.00754	0.00765
	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	-	0.000853	0.000833	0.000834	0.000802	0.000823	0.000818	0.000833	0.000806	0.000851	0.000836	0.000807	0.000814
	Vanadium (V)	mg/L	0.006 ^d	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.38: Water chemistry at Sheardown Lake NW (DLO-01) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Fall Sampling Event											
					DD-HAB-9-STN-1-S	DD-HAB-9-STN-1-B	DL0-01-05-S	DL0-01-05-B	DL0-01-01-S	DL0-01-01-B	DL0-01-4-S	DL0-01-4-B	DL0-01-2-S	DL0-01-2-B	DL0-01-07-S	DL0-01-07-B
					surface 21-Aug-2016	bottom 21-Aug-2016	surface 21-Aug-2016	bottom 21-Aug-2016	surface 21-Aug-2016	bottom 21-Aug-2016	surface 22-Aug-2016	bottom 22-Aug-2016	surface 22-Aug-2016	bottom 22-Aug-2016	surface 22-Aug-2016	bottom 22-Aug-2016
Conventionals	Conductivity (lab)	umho/cm	-	-	133	135	133	126	133	127	133	132	132	126	132	133
	pH (lab)	pH	6.5 - 9.0	-	8.14	8.14	8.03	7.74	8.13	7.83	8.11	8.13	8.07	7.78	8.11	8.12
	Hardness (as CaCO ₃)	mg/L	-	-	63	64	64	61	65	61	62	63	62	61	61	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	-	-	64	66	62	62	68	65	65	68	61	57	67	59
	Turbidity	NTU	-	-	0.95	0.87	0.87	0.74	0.85	0.79	0.91	0.76	0.95	0.81	0.82	0.76
	Alkalinity (as CaCO ₃)	mg/L	-	-	60	61	62	59	59	59	59	60	60	58	58	59
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	0.033	<0.020	0.031	<0.020	<0.020	0.060	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Nitrate	mg/L	13	13	0.024	0.031	0.021	0.024	0.022	0.022	0.032	0.022	0.024	0.026	0.023	0.023
	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	0.18	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.7	1.5	1.6	1.9	1.7	2.0	1.8	1.8	1.8	1.6	1.7	1.7
	Total Organic Carbon	mg/L	-	-	1.9	2.0	2.2	1.6	1.9	2.0	1.9	1.8	1.9	1.7	1.7	1.8
	Total Phosphorus	mg/L	0.020 ^d	-	0.0044	0.0051	0.0236	0.0073	0.0072	0.0061	0.0045	<0.0030	0.0043	0.0079	0.0157	0.0043
	Phenols	mg/L	0.004 ^d	-	0.0018	0.0024	0.0297	0.0020	0.0140	0.0047	0.0051	0.0019	0.0021	0.0024	0.0048	0.0034
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	3.00	3.09	3.04	2.87	3.05	2.89	3.11	3.08	3.07	2.88	3.08	3.13
	Sulphate (SO ₄)	mg/L	218 ^β	218	4.18	4.39	4.10	3.17	4.14	3.41	4.23	4.12	4.22	3.29	4.14	4.04
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173 ^c	0.0122	0.0129	0.0132	0.0096	0.0152	0.0102	0.0188	0.0151	0.0116	0.0113	0.0132	0.0200
	Antimony (Sb)	mg/L	0.020 ^d	-	<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	-	-	0.00613	0.00623	0.00623	0.00591	0.00642	0.00587	0.00609	0.00624	0.00620	0.00581	0.00645	0.00641
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<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	-	-	12.2	12.2	12.7	11.9	12.9	12.4	12.4	12.8	12.8	11.6	12.8	12.7
	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 ^d	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	0.00089	0.00105	0.00089	0.00084	0.00089	0.00082	0.0099*	0.0335*	0.00388*	0.0344*	0.00299*	0.0256*
	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	0.0013	0.0012	<0.0010	0.0013	0.0013
	Magnesium (Mg)	mg/L	-	-	7.86	7.94	7.62	7.41	7.62	7.59	7.81	7.74	7.70	7.41	8.09	7.78
	Manganese (Mn)	mg/L	0.935 ^β	-	0.00201	0.00200	0.00190	0.00289	0.00197	0.00217	0.00194	0.00207	0.00196	0.00231	0.00207	0.00226
	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	-	0.000760	0.000746	0.000799	0.000715	0.000790	0.000748	0.000748	0.000764	0.000757	0.000681	0.000765	0.000772
	Nickel (Ni)	mg/L	0.025	0.025	0.00065	0.00064	0.00062	0.00060	0.00065	0.00063	0.00060	0.00061	0.00064	0.00061	0.00065	0.00065
	Potassium (K)	mg/L	-	-	1.09	1.09	1.08	1.06	1.08	1.03	1.08	1.08	1.06	1.06	1.10	1.09
	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	-	-	0.45	0.47	0.46	0.56	0.45	0.51	0.48	0.47	0.47	0.55	0.48	0.48
	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	-	-	1.38	1.41	1.36	1.33	1.36	1.29	1.40	1.40	1.36	1.34	1.40	1.37
	Strontium (Sr)	mg/L	-	-	0.00833	0.00813	0.00858	0.00800	0.00868	0.00835	0.00829	0.00854	0.00855	0.00773	0.00842	0.00847
	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	-	0.00102	0.00103	0.00101	0.000875	0.00100	0.000874	0.00102	0.00101	0.000994	0.000882	0.000970	0.000995
	Vanadium (V)	mg/L	0.006 ^d	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.

 Indicates parameter concentration above the AEMP benchmark.

Table C.39: Dissolved metals concentrations at Sheardown Lake NW water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Winter Sampling Event												Summer Sampling Event					
			DD-HAB 9-STN1 surface	DD-HAB 9-STN1 bottom	DL0-01-5 surface	DL0-01-5 bottom	DL0-01-1 surface	DL0-01-1 bottom	DL0-01-4 surface	DL0-01-4 bottom	DL0-01-2 surface	DL0-01-2 bottom	DL0-01-7 surface	DL0-01-7 bottom	DD-HAB9-STN1 surface	DD-HAB9-STN1 bottom	DL0-01-5- surface	DL0-01-5- bottom	DL0-01-1- surface	DL0-01-1- bottom
			30-Apr-2016	30-Apr-2016	26-Apr-2016	26-Apr-2016	26-Apr-2016	26-Apr-2016	26-Apr-2016	26-Apr-2016	26-Apr-2016	26-Apr-2016	30-Apr-2016	30-Apr-2016	24-Jul-2016	24-Jul-2016	26-Jul-2016	26-Jul-2016	24-Jul-2016	24-Jul-2016
Dissolved Metals	Aluminum (Al)	mg/L	0.00147	0.00111	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.00179	0.00106	<0.0030	<0.0030	<0.0030	<0.0030	0.0040	<0.0030
	Antimony (Sb)	mg/L	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.000055	0.000061	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.000059	0.000065	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00736	0.00676	0.00657	0.00654	0.00669	0.00664	0.00666	0.00661	0.00665	0.00661	0.00773	0.00722	0.00551	0.00552	0.00557	0.00579	0.00537	0.00542
	Beryllium (Be)	mg/L	<0.000010	<0.000010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.000010	<0.000010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	0.0059	0.0058	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0059	0.0058	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	14.7	14.2	13.8	13.0	14.1	14.2	15.3	14.2	14.2	14.0	14.6	14.5	11.4	11.3	11.6	11.8	11.1	11.1
	Chromium (Cr)	mg/L	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0000123	0.0000113	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0000100	0.0000135	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00088	0.00085	0.00089	0.00080	0.00084	0.00080	0.00082	0.00081	0.00086	0.00085	0.00094	0.00094	0.00162	0.00078	0.00093	0.00083	0.00074	0.00078
	Iron (Fe)	mg/L	0.0022	0.0012	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.0016	0.0017	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.0000090	<0.0000090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0000105	<0.0000090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.00097	0.00093	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.00088	0.00092	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	9.00	9.03	8.61	8.57	8.90	8.58	8.81	8.79	9.07	8.90	9.00	9.15	7.30	7.04	7.37	7.30	7.14	7.22
	Manganese (Mn)	mg/L	0.000388	0.000087	0.000293	0.0112	0.00026	0.000162	0.000438	0.000371	0.000293	0.000273	0.000207	0.000117	0.000417	0.000487	0.000301	0.000117	0.000336	0.000108
	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
	Molybdenum (Mo)	mg/L	0.000911	0.000925	0.000981	0.000894	0.000910	0.000926	0.000974	0.000925	0.000940	0.000916	0.000933	0.000891	0.000693	0.000681	0.000659	0.000683	0.000668	0.000690
	Nickel (Ni)	mg/L	0.000682	0.000682	0.00114	0.00114	0.00093	0.00098	0.00083	0.00085	0.00096	0.00089	0.000685	0.000752	0.00061	0.00053	0.00059	0.00060	0.00060	0.00058
	Potassium (K)	mg/L	1.20	1.19	1.08	1.05	1.10	1.07	1.10	1.10	1.11	1.08	1.20	1.22	1.03	1.00	1.05	1.03	1.02	1.03
	Selenium (Se)	mg/L	<0.000040	<0.000040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000040	<0.000040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.630	0.622	0.62	0.93	0.61	0.70	0.61	0.61	0.61	0.61	0.629	0.627	0.46	0.46	0.46	0.53	0.45	0.50
	Silver (Ag)	mg/L	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.53	1.52	1.48	1.46	1.46	1.46	1.48	1.48	1.51	1.48	1.52	1.54	1.27	1.21	1.28	1.27	1.24	1.25
	Strontium (Sr)	mg/L	0.00956	0.00934	0.00936	0.00908	0.0093	0.00940	0.00977	0.00931	0.00936	0.00935	0.00949	0.00940	0.00772	0.00764	0.00790	0.00781	0.00767	0.00787
	Thallium (Tl)	mg/L	0.0000034	0.0000031	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0000032	0.0000035	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.000030	<0.000030	0.00013	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000030	<0.000030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.00114	0.00115	0.00111	0.000956	0.00111	0.00106	0.00111	0.00110	0.00111	0.00111	0.00118	0.00113	0.000860	0.000845	0.000834	0.000846	0.000841	0.000792
	Vanadium (V)	mg/L	<0.000050	0.000052	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	0.00126	0.00112	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.00075	0.00098	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.39: Dissolved metals concentrations at Sheardown Lake NW water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Summer Sampling Event						Fall Sampling Event											
			DL0-01-4-S1 surface	DL0-01-4-B1 bottom	DL0-01-2-S1 surface	DL0-01-2-B1 bottom	DL0-01-7S1 surface	DL0-01-7B1 bottom	DD-HAB9-STN1-S1 surface	DD-HAB9-STN1-B1 bottom	DL0-01-5-S1 surface	DL0-01-5-B1 bottom	DL0-01-1-S1 surface	DL0-01-1-B1 bottom	DL0-01-4-S1 surface	DL0-01-4-B1 bottom	DL0-01-2-S1 surface	DL0-01-2-B1 bottom	DL0-01-7-S1 surface	DL0-01-7-B1 bottom
			25-Jul-2016	25-Jul-2016	24-Jul-2016	24-Jul-2016	25-Jul-2016	25-Jul-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	22-Aug-2016	22-Aug-2016	22-Aug-2016	22-Aug-2016	22-Aug-2016	22-Aug-2016
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0040	0.0032	<0.0030	0.0032	0.0040	0.0034	0.0044	0.0037	0.0034	<0.0030	0.0032	<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	<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	0.00544	0.00575	0.00554	0.00567	0.00540	0.00581	0.00616	0.00619	0.00644	0.00584	0.00620	0.00595	0.00614	0.00614	0.00609	0.00586	0.00634	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	<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	11.2	11.3	11.4	11.1	11.2	11.0	12.6	12.6	12.5	12.1	12.6	12.3	12.4	12.3	12.3	12.1	12.2	12.4
	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	<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	0.00165	0.00145	0.00073	0.00079	0.00131	0.00098	0.00081	0.00091	0.00084	0.00082	0.00081	0.00078	0.00959	0.0310	0.00310	0.0340	0.00322	0.0242
	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	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0010	<0.0010	0.0011	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	7.14	7.25	7.27	6.98	7.14	7.15	7.79	7.87	7.84	7.58	8.06	7.36	7.54	7.72	7.60	7.41	7.43	7.80
	Manganese (Mn)	mg/L	0.000333	0.000299	0.000288	0.000141	0.000174	0.000143	0.000576	0.000483	0.000418	0.000152	0.000396	0.000180	0.000508	0.000454	0.000513	0.000150	0.000493	0.000409
	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
	Molybdenum (Mo)	mg/L	0.000656	0.000669	0.000694	0.000653	0.000670	0.000671	0.000760	0.000774	0.000728	0.000706	0.000773	0.000743	0.000747	0.000757	0.000746	0.000706	0.000748	0.000753
	Nickel (Ni)	mg/L	0.00056	0.00059	0.00058	0.00060	0.00056	0.00059	0.00062	0.00071	0.00060	0.00063	0.00061	0.00059	0.00058	0.00062	0.00062	0.00063	0.00061	0.00057
	Potassium (K)	mg/L	1.03	1.03	1.05	1.00	1.03	1.03	1.08	1.09	1.09	1.06	1.08	1.06	1.08	1.08	1.05	1.04	1.07	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	<0.0010
	Silicon (Si)	mg/L	0.45	0.44	0.45	0.46	0.47	0.49	0.43	0.45	0.43	0.54	0.44	0.49	0.43	0.45	0.43	0.52	0.44	0.43
	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	1.24	1.27	1.28	1.21	1.26	1.25	1.39	1.41	1.41	1.34	1.39	1.31	1.36	1.41	1.41	1.29	1.37	1.40
	Strontium (Sr)	mg/L	0.00756	0.00759	0.00774	0.00764	0.00765	0.00749	0.00843	0.00842	0.00841	0.00808	0.00836	0.00822	0.00834	0.00831	0.00835	0.00812	0.00824	0.00840
	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	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<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	0.000837	0.000837	0.000861	0.000828	0.000828	0.000807	0.00100	0.00104	0.000989	0.000861	0.000997	0.000891	0.00102	0.00102	0.00103	0.000882	0.000997	0.00101
	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.40: Summary of the magnitude of difference in aqueous metal concentrations between the Sheardown Lake basins and Reference Lake 3 in 2016, and at the Sheardown Lake basins between 2016 and the baseline period for winter, summer, and fall sampling events, Mary River Project CREMP. No reference lake data were collected in winter 2016.

Variable	Sheardown Lake NW					Sheardown Lake SE				
	2016 vs Reference Lake 3		2016 vs Baseline			2016 vs Reference Lake 3		2016 vs Baseline		
	Summer	Fall	Winter	Summer	Fall	Summer	Fall	Winter	Summer	Fall
Conductivity (lab)	1.6	1.6	1.1	1.1	1.1	1.2	1.4	1.0	0.9	1.0
Hardness (as CaCO ₃)	1.6	1.8	1.1	1.0	1.0	1.2	1.6	1.0	0.9	1.0
Total Suspended Solids (TSS)	0.9	1.0	1.0	0.5	0.8	1.7	1.1	0.9	1.4	0.9
Total Dissolved Solids (TDS)	1.3	1.7	0.9	0.8	0.8	1.1	1.6	0.8	0.8	0.8
Turbidity	3.9	2.5	1.3	1.1	1.6	8.5	7.0	0.8	1.1	1.3
Alkalinity (as CaCO ₃)	1.6	1.8	1.0	1.0	1.0	1.2	1.6	0.9	0.9	1.0
Total Ammonia	1.1	0.6	0.2	0.5	0.6	1.2	0.7	0.2	0.9	0.9
Nitrate	1.0	1.2	0.4	0.2	0.2	1.2	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)	1.2	1.0	0.7	1.4	1.0	0.8	1.0	0.7	1.1	0.7
Dissolved Organic Carbon	0.5	0.6	1.7	0.8	1.0	0.4	0.6	1.9	0.7	1.0
Total Organic Carbon	0.7	0.7	1.1	0.9	1.0	0.5	0.6	1.1	0.9	1.0
Total Phosphorus	1.1	0.8	0.8	0.9	1.5	1.7	1.0	1.0	1.3	1.8
Phenols	0.6	2.0	1.2	1.5	6.2	1.6	3.3	1.3	4.3	10
Bromide (Br)	1.0	1.0	0.6	0.4	0.4	1.0	1.0	0.7	0.4	0.4
Chloride (Cl)	2.1	2.4	1.1	1.2	1.1	1.3	1.8	1.0	0.7	0.7
Sulphate (SO ₄)	0.8	1.0	1.2	1.2	1.3	0.4	0.6	1.0	0.8	1.1
Aluminum (Al)	2.0	3.2	1.2	0.6	0.7	14	13	0.6	0.8	0.8
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	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Barium (Ba)	0.8	0.9	1.1	1.1	1.2	0.8	1.0	1.1	0.9	1.1
Beryllium (Be)	1.0	1.0	2.0	1.4	1.5	1.0	0.2	1.5	1.2	0.3
Cadmium (Cd)	1.0	1.0	0.8	0.9	0.9	1.0	1.0	0.8	0.8	0.8
Calcium (Ca)	1.6	1.8	1.0	1.0	1.0	1.2	1.6	1.0	0.9	1.0
Chromium (Cr)	1.0	1.0				1.0	1.0			
Cobalt (Co)	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	0.9	0.9
Copper (Cu)	1.3	1.1	0.9	1.0	0.7	0.9	1.3	0.8	0.6	1.1
Iron (Fe)	1.0	1.0	1.2	1.1	0.8	2.2	2.1	0.6	0.6	0.8
Lead (Pb)	1.0	1.0	0.9	0.9	0.1	1.8	2.0	0.5	0.8	1.2
Lithium (Li)	1.0	1.1	0.4	0.3	0.0	1.0	1.0	0.3	0.2	0.3
Magnesium (Mg)	1.7	1.8	1.0	1.0	1.1	1.2	1.5	1.0	1.0	1.0
Manganese (Mn)	5.3	3.4	3.4	2.2	1.0	5.8	6.9	0.3	0.8	1.3
Mercury (Hg)	1.0	1.0	1.0	0.9	0.3	1.0	1.0	1.0	1.0	1.0
Molybdenum (Mo)	5.4	5.5	1.1	1.0	1.1	2.6	3.6	1.1	1.0	1.1
Nickel (Ni)	1.2	1.3	2.0	0.9	0.9	1.0	1.4	0.9	0.8	1.1
Potassium (K)	1.2	1.2	1.2	1.3	1.3	0.8	1.0	1.1	1.2	1.2
Selenium (Se)	1.0	1.0				1.0	0.1			0.6
Silicon (Si)	1.1	1.2	0.8	0.8	0.8	1.1	1.6	0.7	0.7	0.9
Silver (Ag)	1.0	1.0	2.5	1.0	1.3	1.0	5.0	1.6	1.4	
Sodium (Na)	1.5	1.6	1.1	1.1	1.2	1.1	1.3	1.1	1.4	1.2
Strontium (Sr)	1.0	1.0	1.0	1.0	1.1	0.7	1.0	0.8	0.7	0.9
Thallium (Tl)	1.0	1.0	2.3	1.6	0.4	1.0	0.1	1.6	1.2	0.1
Tin (Sn)	1.0	1.0	0.2	0.2	0.2	1.0	1.0	0.1	0.1	0.1
Titanium (Ti)	1.0	1.0	1.0	1.0	1.0	1.0	0.3	1.0	0.9	0.2
Uranium (U)	3.3	3.6	1.2	1.1	1.2	2.1	2.9	1.0	1.0	1.1
Vanadium (V)	1.0	1.0	1.0	1.0	1.0	1.0	0.5	1.0	1.0	0.5
Zinc (Zn)	1.0	1.0	1.5	1.5	1.2	1.0	1.0	1.0	1.8	1.9



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

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

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

Table C.41: *In-situ* water quality profile data collected at Sheardown Lake SE water quality monitoring stations in winter^a, Mary River Project CREMP, 2016.

Station DLO-02-6 ^{b,c}					Station DLO-02-7 ^{b,c}					Station DLO-02-4 ^{b,c}					Station DLO-02-8 ^{b,c}					Station DLO-02-3 ^{b,c}				
Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)
2.80	0.9	90.1	7.48	166	2.90	1.0	99.4	7.32	153	3.40	1.2	98.6	7.34	148	2.80	1.1	99.2	7.46	180	2.90	1.1	102.0	7.37	149
3.80	0.9	90.4	7.42	164	3.50	1.1	99.7	7.32	151	4.40	1.3	99.3	7.34	148	3.80	1.2	100.1	7.38	149	3.90	1.2	101.9	7.35	149
4.80	1.0	98.7	7.39	166						5.40	1.3	100.2	7.34	148	4.80	1.2	100.5	7.34	148	4.90	1.2	101.8	7.35	149
5.80	1.0	86.5	7.37	166						6.40	1.3	100.6	7.34	149	5.80	1.2	100.7	7.33	149	5.90	1.3	101.4	7.35	148
6.80	1.1	84.0	7.35	167						7.40	1.3	101.0	7.34	149	6.80	1.2	101.0	7.32	149	6.90	1.3	101.0	7.34	149
										8.40	1.3	101.6	7.34	149	7.80	1.2	101.9	7.32	149	7.90	1.3	101.0	7.34	149
															8.80	1.2	102.0	7.32	149	8.90	1.3	101.3	7.33	149
															9.80	1.2	101.7	7.31	149	9.90	1.3	100.5	7.33	148
															10.80	1.2	100.9	7.31	149	10.90	1.4	92.6	7.33	148
															11.80	1.4	96.5	7.29	147	11.90	1.5	75.4	7.24	148
																				12.90	1.6	46.7	7.13	149
																				13.90	1.9	25.2	6.94	163

^a Sampling conducted 29 - 30-April 2016.

^b Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 were 6.90, 3.90, 9.10, 13.10, and 14.70 m, respectively, at the time of winter sampling.

^c Ice thickness at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 were 1.80, 1.97, 2.40, 1.83, and 1.93 m, respectively, at the time of winter sampling

Table C.42: *In-situ* water quality profile data collected at Sheardown Lake SE water quality monitoring stations in summer^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	DLO-02-6 ^b	DLO-02-7 ^b	DLO-02-4 ^b	DLO-02-8 ^b	DLO-02-3 ^b	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
1.0	9.9	10.3	9.7	9.9	9.8	98.6	99.1	100.2	98.4	98.8	7.78	7.88	7.57	7.79	7.71	91.0	90.0	89.0	90.0	90.0
2.0	9.8	10.0	9.6	9.8	9.7	98.3	98.5	99.0	98.3	98.3	7.76	7.83	7.64	7.78	7.68	91.0	90.0	89.0	90.0	90.0
3.0	9.7	9.8	9.6	9.7	9.7	98.3	98.2	98.3	98.0	98.1	7.77	7.82	7.67	7.80	7.70	92.0	90.0	89.0	90.0	90.0
4.0	9.7	9.5	9.6	9.5	9.6	98.5	98.5	98.1	97.6	97.8	7.79	7.84	7.68	7.81	7.72	92.0	91.0	90.0	90.0	90.0
5.0	9.6		9.5	9.4	9.5	98.0		97.6	97.3	97.2	7.83		7.69	7.81	7.74	92.0		90.0	90.0	90.0
6.0	9.5		9.4	9.2	9.4	97.4		97.1	97.6	96.6	7.81		7.71	7.81	7.73	92.0		90.0	90.0	90.0
7.0	9.5*		9.2	9.1	9.2	97.2*		96.6	96.6	96.6	7.81*		7.71	7.79	7.74	92.0*		91.0	91.0	90.0
8.0			8.8	9.0	9.1			96.0	96.6	96.7			7.72	7.80	7.72			92.0	91.0	90.0
9.0			8.7*	9.0	9.0			96.3*	96.5	96.7			7.70*	7.79	7.71			92.0*	91.0	91.0
10.0				8.8	8.9				96.3	96.5				7.79	7.73				91.0	91.0
11.0				8.7	8.9				96.4	96.6				7.79	7.73				91.0	91.0
12.0				8.6	8.8				96.4	96.5				7.80	7.74				91.0	91.0
13.0				8.6*	8.7				96.4*	96.3				7.79*	7.74				91.0*	91.0
13.9					8.7					96.3					7.75					91.0

^a Sampling conducted on 26-July, 2016.

^b Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 were 7.1, 5, 9.3, 13.8, and 14.9 m, respectively, at the time of summer sampling.

* The deepest *in situ* water quality reading at stations DLO-02-6, DLO-02-4, and DLO-02-8 were taken at 6.1, 8.3, and 12.8 m at the time of summer sampling.

Table C.43: *In-situ* water quality profile data collected at Sheardown Lake SE water quality monitoring stations in fall ^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)					Dissolved Oxygen (% Saturation)					pH (pH units)					Specific Conductance (µS/cm)				
	DLO-02-6 ^b	DLO-02-7 ^b	DLO-02-4 ^b	DLO-02-8 ^b	DLO-02-3 ^b	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
1.0	10.8	10.7	10.1	11.4	10.5	97.7	96.8	93.5	95.7	96.6	7.02	6.90	6.60	6.96	6.93	169	167	166	166	166
2.0	10.6	10.7	10.1	10.3	10.4	98.4	97.4	94.0	96.0	96.8	7.38	7.08	6.76	7.14	7.13	169	167	166	167	167
3.0	10.4	10.5	10.0	10.2	10.4	98.7	97.2	94.2	95.4	96.7	7.49	7.24	6.96	7.28	7.24	169	167	166	166	167
4.0	10.0		10.0	10.2	10.3	97.1		94.0	95.2	96.8	7.62		7.08	7.37	7.40	171		166	166	167
5.0	9.9		10.0	10.1	10.2	96.3		93.8	94.9	96.5	7.67		7.17	7.44	7.52	171		167	166	167
6.0	9.7		10.0	10.1	10.2	95.5		93.3	94.7	96.0	7.70		7.27	7.47	7.58	172		167	166	167
7.0			9.9	10.1	10.1			93.4	94.4	95.2			7.31	7.51	7.52			167	166	167
8.0			9.8	10.0	10.1			93.2	94.0	94.7			7.35	7.54	7.65			167	166	166
9.0				10.0	10.0				93.8	94.5				7.59	7.66				166	166
10.0				10.0	10.0				92.6	94.6				7.59	7.66				166	166
11.0				9.7	9.9				88.5	91.3				7.57	7.64				NA ^c	165
12.0				9.2	9.6				81.2	88.2				7.53	7.60				161	164
13.0					9.1					80.6					7.56					161
14.0					8.9					73.6					7.47					162

^a Sampling conducted on 21-August, 2016.

^b Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 were 6.8, 3.9, 8.9, 13.2, and 14.4 m, respectively, at the time of fall sampling.

^c Not Available

Table C.44: 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 2016.

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.)		
DLO-02-1	14-Aug-16	11.3	2.0	slightly turbid, beige-green colouration	surface	12.22	10.43	97.3	7.72	111
					bottom	10.02	9.34	83.1	7.51	115
DLO-02-11	14-Aug-16	6.7	2.2	slightly turbid, beige-green colouration	surface	12.62	10.59	99.7	7.95	111
					bottom	11.36	10.39	95.3	7.82	110
DLO-02-9	14-Aug-16	8.2	2.1	slightly turbid, beige-green colouration	surface	12.53	10.56	99.3	7.94	111
					bottom	11.08	10.42	94.8	7.80	108
DLO-02-13	14-Aug-16	12.0	2.2	slightly turbid, beige-green colouration	surface	12.57	10.55	99.1	7.92	113
					bottom	10.09	9.75	86.5	7.68	105
DLO-02-3	14-Aug-16	13.9	2.2	slightly turbid, beige-green colouration	surface	12.25	10.53	92.8	7.87	110
					bottom	9.91	9.15	80.9	7.45	106

Table C.45: Statistical comparison of bottom *in-situ* water quality between littoral stations of Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2016.

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Areas?	p-value	Statistical Analysis ^a	Lake	n	Mean (n = 5)	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	Yes	0.000	η , δ , γ	Reference	5	8.88	0.71	0.32	8.10	10.00
				Sheardown SE	5	2.15	0.08	0.04	2.03	2.24
Temperature (°C)	No	0.144	η , δ , γ	Reference	5	9.92	0.37	0.17	9.50	10.40
				Sheardown SE	5	10.49	0.67	0.30	9.91	11.36
Dissolved Oxygen (mg/L)	No	0.268	α , δ , γ	Reference	5	10.3	0.8	0.4	9.3	11.3
				Sheardown SE	5	9.8	0.6	0.3	9.2	10.4
Dissolved Oxygen (% saturation)	No	0.470	α , δ , γ	Reference	5	91.3	6.7	3.0	82.6	99.1
				Sheardown SE	5	88.1	6.6	3.0	80.9	95.3
pH (units)	No	0.951	α , δ , γ	Reference	5	7.64	0.23	0.10	7.28	7.86
				Sheardown SE	5	7.65	0.17	0.07	7.45	7.82
Specific Conductance (umho/cm)	Yes	0.008	γ	Reference	5	74.0	0.0	0.0	74.0	74.0
				Sheardown SE	5	108.8	4.0	1.8	105.0	115.0

^a Data analysis included: α - data untransformed; β - data logit transformed; η - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ϵ - t-test assuming unequal variance; γ - ANOVA test validated using Mann Whitney U-test.

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

Table C.46: Water chemistry at Sheardown Lake SE (DLO-02) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Winter Sampling Event								
					DL0-02-6-S surface 30-Apr-16	DL0-02-6-B bottom 30-Apr-16	DL0-02-7 surface 29-Apr-16	DL0-02-4-S surface 29-Apr-16	DL0-02-4-B bottom 29-Apr-16	DL0-02-8-S surface 29-Apr-16	DL0-02-8-B bottom 29-Apr-16	DL0-02-3-S surface 29-Apr-16	DL0-02-3-B bottom 29-Apr-16
Conventional	Conductivity (lab)	umho/cm	-	-	171	167	157	154	150	152	151	156	150
	pH (lab)	pH	6.5 - 9.0	-	7.87	7.84	7.95	7.97	7.98	7.92	7.98	8.00	7.81
	Hardness (as CaCO ₃)	mg/L	-	-	81	82	77	74	73	75	74	75	74
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	85	85	89	83	81	76	76	79	83
	Turbidity	NTU	-	-	0.30	0.50	0.21	0.24	0.30	0.25	0.49	0.31	0.32
	Alkalinity (as CaCO ₃)	mg/L	-	-	80	76	76	81	71	14	74	74	70
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	0.056	0.059	0.028	0.022	<0.020	<0.020	0.021	<0.020	0.057
	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	-	-	3.3	3.6	3.4	3.5	3.9	3.9	3.3	3.6	2.9
	Total Organic Carbon	mg/L	-	-	3.4	2.1	2.2	2.1	1.8	2.0	1.9	2.1	1.7
	Total Phosphorus	mg/L	0.020 ^a	-	0.0034	0.0042	0.0044	0.0037	0.0040	0.0047	0.0049	0.0045	0.0092
	Phenols	mg/L	0.004 ^a	-	0.0022	0.0011	<0.0010	0.0019	<0.0010	<0.0010	0.0012	<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	3.43	3.40	3.14	3.11	3.59	3.09	3.02	3.06	3.17
	Sulphate (SO ₄)	mg/L	218 ^b	218	3.07	3.01	2.80	2.78	2.72	2.74	2.67	2.74	2.39
	Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173 ^c	<0.0030	0.0033	<0.0030	0.0066	<0.0030	<0.0030	<0.0030	<0.0030
Antimony (Sb)		mg/L	0.020 ^a	-	<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	-	-	0.00812	0.00840	0.00754	0.00748	0.00705	0.00712	0.00721	0.00721	0.00690
Beryllium (Be)		mg/L	0.011 ^a	-	<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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (Ca)		mg/L	-	-	16.3	16.4	15.0	14.7	14.5	14.7	14.5	14.9	14.1
Chromium (Cr)		mg/L	0.0089	0.0089	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00183
Cobalt (Co)		mg/L	0.0009 ^a	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	0.00087	0.00081	0.00084	0.00091	0.00086	0.00087	0.00080	0.00078	0.00080
Iron (Fe)		mg/L	0.30	0.300	0.032	0.045	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.040
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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)		mg/L	-	-	9.96	10.3	9.19	9.24	8.86	9.04	8.95	9.05	8.96
Manganese (Mn)		mg/L	0.935 ^b	-	0.00412	0.00591	0.00211	0.00179	0.00165	0.00166	0.00177	0.00143	0.00482
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	-	0.000656	0.000588	0.000592	0.000589	0.000595	0.000604	0.000600	0.000621	0.000438
Nickel (Ni)		mg/L	0.025	0.025	0.00077	0.00079	0.00068	0.00067	0.00068	0.00064	0.00064	0.00061	0.00062
Potassium (K)		mg/L	-	-	1.27	1.31	1.18	1.19	1.13	1.15	1.14	1.17	1.08
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	-	-	0.73	0.73	0.61	0.56	0.53	0.57	0.56	0.56	0.99
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	-	-	1.58	1.62	1.48	1.50	1.41	1.44	1.43	1.45	1.46
Strontium (Sr)		mg/L	-	-	0.0109	0.0109	0.00982	0.00996	0.00964	0.00974	0.00963	0.00986	0.00952
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	-	0.000953	0.000929	0.000887	0.000875	0.000893	0.000877	0.000880	0.000888	0.000665
Vanadium (V)		mg/L	0.006 ^a	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	0.0040	<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.

 Indicates parameter concentration above the AEMP benchmark.

Table C.46: Water chemistry at Sheardown Lake SE (DLO-02) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Summer Sampling Event									
					DL0-02-6-S surface 26-Jul-16	DL0-02-6-B bottom 26-Jul-16	DL0-02-7-S surface 26-Jul-16	DL0-02-7-B bottom 26-Jul-16	DL0-02-4-S surface 26-Jul-16	DL0-02-4-B bottom 26-Jul-16	DL0-02-8-S surface 26-Jul-16	DL0-02-8-B bottom 26-Jul-16	DL0-02-3-S surface 26-Jul-16	DL0-02-3-B bottom 26-Jul-16
Conventionals	Conductivity (lab)	umho/cm	-	-	89.3	89.3	87.4	87.9	87.9	88.7	87.1	88	88.0	88.5
	pH (lab)	pH	6.5 - 9.0	-	7.90	7.85	7.87	7.81	7.89	7.81	7.87	7.82	7.87	7.83
	Hardness (as CaCO ₃)	mg/L	-	-	41	42	42	42	41	41	41	42	42	41
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	2.8	<2.0	9.4	<2.0	9.6
	Total Dissolved Solids (TDS)	mg/L	-	-	56	56	54	54	51	50	49	51	45	46
	Turbidity	NTU	-	-	1.13	1.31	1.08	0.88	0.81	1.74	0.89	6.02	0.91	4.46
	Alkalinity (as CaCO ₃)	mg/L	-	-	40	40	42	39	41	40	40	43	40	41
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	0.034	0.040	<0.020
	Nitrate	mg/L	13	13	0.067	<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	0.17	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.1	1.2	1.1	1.1	1.2	1.1	1.1	1.2	1.2	1.1
	Total Organic Carbon	mg/L	-	-	1.4	1.3	1.4	1.2	1.3	1.4	1.3	1.5	1.4	1.4
	Total Phosphorus	mg/L	0.020 ^d	-	0.0053	0.0052	0.0049	0.0082	0.0051	0.0081	0.0049	0.0174	0.0164	0.0165
	Phenols	mg/L	0.001 ^d	-	0.0018	0.0051	0.0034	0.0022	0.0034	0.0024	0.0017	0.0016	0.0197	0.0013
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	1.83	1.83	1.79	1.80	1.81	1.75	1.81	1.70	1.79	1.68
	Sulphate (SO ₄)	mg/L	218 ^g	218	1.81	1.79	1.70	1.69	1.70	1.70	1.72	1.64	1.69	1.64
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173 ^c	0.0461	0.0255	0.0312	0.0514	0.0268	0.0503	0.0173	0.149	0.0245	0.169
	Antimony (Sb)	mg/L	0.020 ^d	-	<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	-	-	0.00466	0.00484	0.00443	0.00502	0.00458	0.00515	0.00437	0.00634	0.00446	0.00632
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	-	8.07	8.46	8.23	8.55	8.10	8.49	8.06	8.6	8.23	8.59
	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
	Cobalt (Co)	mg/L	0.0009 ^d	0.004	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.00069	0.00064	0.00060	0.00064	0.00081	0.00068	0.00063	0.00089	0.00063	0.00093
	Iron (Fe)	mg/L	0.30	0.300	0.040	0.030	<0.030	0.054	0.031	0.060	<0.030	0.174	<0.030	0.180
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	0.000067	<0.000050	0.000080	<0.000050	0.000238	<0.000050	0.000218
	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	-	-	5.47	5.27	5.18	5.40	5.23	5.18	5.25	5.33	5.22	5.22
	Manganese (Mn)	mg/L	0.935 ^g	-	0.00363	0.00346	0.00321	0.00414	0.00382	0.00509	0.00328	0.006595	0.00335	0.00644
	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
	Molybdenum (Mo)	mg/L	0.073	-	0.000334	0.000356	0.000372	0.000340	0.000356	0.000347	0.000363	0.000222	0.000359	0.000238
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.74	0.72	0.72	0.73	0.73	0.72	0.71	0.77	0.72	0.77
	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
	Silicon (Si)	mg/L	-	-	0.45	0.40	0.41	0.50	0.40	0.46	0.38	0.68	0.40	0.70
	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	-	-	0.922	0.909	0.888	0.921	0.893	0.892	0.871	0.95	0.891	0.943
	Strontium (Sr)	mg/L	-	-	0.00577	0.00597	0.00574	0.00609	0.00562	0.00609	0.00557	0.0065	0.00576	0.00649
	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	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.015	-	0.000514	0.000514	0.000478	0.000531	0.000459	0.000526	0.000477	0.000681	0.000473	0.000656
	Vanadium (V)	mg/L	0.006 ^d	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.46: Water chemistry at Sheardown Lake SE (DLO-02) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Fall Sampling Event									
					DL0-02-06-S surface 21-Aug-16	DL0-02-06-B bottom 21-Aug-16	DL0-02-07-S surface 21-Aug-16	DL0-02-07 bottom 21-Aug-16	DL0-02-04-S surface 21-Aug-16	DL0-02-04-B bottom 21-Aug-16	DL0-02-08-S surface 21-Aug-16	DL0-02-08-B bottom 21-Aug-16	DL0-02-03-S surface 21-Aug-16	DL0-02-03-B bottom 21-Aug-16
Conventionals	Conductivity (lab)	umho/cm	-	-	117	119	116	116	117	115	115	115	115	111
	pH (lab)	pH	6.5 - 9.0	-	8.11	8.09	8.08	8.12	8.03	7.99	8.07	8.02	8.09	7.73
	Hardness (as CaCO ₃)	mg/L	-	-	55	56	55	54.5	54	54	54	54	54	53
	Total Suspended Solids (TSS)	mg/L	-	-	3.4	<2.0	<2.0	2.3	2.4	<2.0	<2.0	<2.0	<2.0	<2.0
	Total Dissolved Solids (TDS)	mg/L	-	-	58	55	62	57	63	60	61	62	63	62
	Turbidity	NTU	-	-	2.03	2.07	2.27	2.16	2.33	2.56	2.47	2.33	2.28	2.95
	Alkalinity (as CaCO ₃)	mg/L	-	-	52	52	51	54	50	54	56	50	50	53
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	<0.020	<0.020	<0.020	0.029	<0.020	<0.020	0.044	<0.020	<0.020	0.051
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.024
	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	0.16	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.4	1.5	1.5	1.5	1.5	1.9	1.8	1.3	1.3	1.3
	Total Organic Carbon	mg/L	-	-	2.0	1.8	1.6	2.0	1.6	1.5	1.6	1.7	1.6	1.5
	Total Phosphorus	mg/L	0.020 ^d	-	0.0062	0.0065	0.0058	0.0171	0.0060	0.0060	0.0179	0.0059	0.0062	0.0214
	Phenols	mg/L	0.001 ^d	-	0.0019	0.0024	0.0026	0.0025	0.0018	0.0021	0.0574	0.0023	<0.0010	0.0291
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	2.23	2.35	2.32	2.21	2.22	2.24	2.24	2.20	2.26	2.23
	Sulphate (SO ₄)	mg/L	218 ^g	218	2.67	2.75	2.67	2.64	2.59	2.59	2.63	2.61	2.58	2.56
Total Metals	Aluminum (Al)	mg/L	0.100	0.179, 0.173 ^c	0.052	0.052	0.049	0.053	0.078	0.061	0.046	0.057	0.047	0.071
	Antimony (Sb)	mg/L	0.020 ^d	-	<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	-	-	0.00609	0.00627	0.00649	0.00626	0.00671	0.00647	0.00625	0.00634	0.00624	0.00619
	Beryllium (Be)	mg/L	0.011 ^d	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)	mg/L	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<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
	Cadmium (Cd)	mg/L	0.00012	0.00009	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	-	10.8	11.3	11.2	11.1	11.1	10.8	11.1	11.1	10.9	10.4
	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
	Cobalt (Co)	mg/L	0.0009 ^d	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	<0.0010	0.0010	<0.0010	0.0013	0.0010	0.0011	0.0011	0.0011	0.0010	<0.0010
	Iron (Fe)	mg/L	0.30	0.300	0.055	0.060	0.052	0.053	0.085	0.068	<0.050	0.063	0.051	0.081
	Lead (Pb)	mg/L	0.001	0.001	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011
	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	-	-	6.30	6.59	6.43	6.35	6.41	6.20	6.35	6.32	6.29	5.92
	Manganese (Mn)	mg/L	0.935 ^g	-	0.00339	0.00406	0.00360	0.00370	0.00473	0.00429	0.00363	0.00408	0.00350	0.00772
	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
	Molybdenum (Mo)	mg/L	0.073	-	0.000479	0.000515	0.000507	0.000506	0.000500	0.000485	0.000501	0.000490	0.000490	0.000428
	Nickel (Ni)	mg/L	0.025	0.025	0.00065	0.00068	0.00066	0.00074	0.00068	0.00073	0.00070	0.00070	0.00075	0.00063
	Potassium (K)	mg/L	-	-	0.919	0.944	0.918	0.92	0.952	0.903	0.917	0.914	0.906	0.891
	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
	Silicon (Si)	mg/L	-	-	0.596	0.777	0.616	0.61	0.697	0.636	0.592	0.641	0.608	0.761
	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
	Sodium (Na)	mg/L	-	-	1.12	1.16	1.14	1.13	1.14	1.10	1.12	1.13	1.12	1.10
	Strontium (Sr)	mg/L	-	-	0.0081	0.0085	0.0084	0.0085	0.0085	0.0083	0.0084	0.0085	0.0081	0.0082
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<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
	Titanium (Ti)	mg/L	-	-	0.00195	0.00273	0.00195	0.00213	0.00395	0.00258	0.00202	0.00237	0.00224	0.00326
	Uranium (U)	mg/L	0.015	-	0.000784	0.000812	0.000819	0.000803	0.000806	0.000789	0.000795	0.000800	0.000796	0.000700
	Vanadium (V)	mg/L	0.006 ^d	0.006	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)	mg/L	0.030	0.030	<0.0030	<0.0030	<0.0030	0.0037	<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.

 Indicates parameter concentration above the AEMP benchmark.

Table C.47: Dissolved metals concentrations at Sheardown Lake SE water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Winter Sampling Event									Summer Sampling Event					
			DL0-02-6-S surface 30-Apr-16	DL0-02-6-B bottom 30-Apr-16	DL0-02-7 surface 29-Apr-16	DL0-02-4-S surface 29-Apr-16	DL0-02-4-B bottom 29-Apr-16	DL0-02-8-S surface 29-Apr-16	DL0-02-8-B bottom 29-Apr-16	DL0-02-3-S surface 29-Apr-16	DL0-02-3-B bottom 29-Apr-16	DL0-02-6-S surface 26-Jul-16	DL0-02-6-B bottom 26-Jul-16	DL0-02-7-S surface 26-Jul-16	DL0-02-7-B bottom 26-Jul-16	DL0-02-4-S surface 26-Jul-16	DL0-02-4-B bottom 26-Jul-16
Dissolved Metals	Aluminum (Al)	mg/L	0.00109	0.00142	0.00111	0.00121	0.00106	0.00097	0.00127	0.00118	0.00108	0.0058	0.0046	0.0051	0.0061	0.0042	0.0059
	Antimony (Sb)	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)	mg/L	0.000073	0.000068	0.000059	0.000096	0.000070	0.000057	0.000061	0.000073	0.000064	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	0.00813	0.00791	0.00733	0.00711	0.00698	0.00723	0.00711	0.00724	0.00697	0.00431	0.00463	0.00418	0.00455	0.00416	0.00455
	Beryllium (Be)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)	mg/L	0.0059	0.0058	0.0056	0.0055	0.0053	0.0054	0.0054	0.0055	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	16.2	16.0	15.3	14.9	14.5	14.9	14.7	14.7	14.5	8.25	8.33	8.23	8.32	8.02	8.08
	Chromium (Cr)	mg/L	<0.00010	<0.00010	0.00041	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0000122	0.0000110	0.0000099	0.0000139	0.0000095	0.0000120	0.0000086	0.0000091	0.0000091	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.00086	0.00090	0.00084	0.00090	0.00081	0.00084	0.00080	0.00080	0.00078	0.00063	0.00059	0.00057	0.00056	0.00059	0.00064
	Iron (Fe)	mg/L	0.0061	0.0068	0.0061	0.0030	0.0024	0.0025	0.0025	0.0023	0.0034	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)	mg/L	<0.0000090	<0.0000090	<0.0000090	<0.0000090	<0.0000090	<0.0000090	<0.0000090	<0.0000090	<0.0000090	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)	mg/L	0.00105	0.00091	0.00106	0.00078	0.00095	0.00086	0.00100	0.00099	0.00093	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	9.96	10.1	9.45	9.00	8.98	9.21	9.12	9.41	9.08	5.07	5.13	5.1	5.16	5.11	4.99
	Manganese (Mn)	mg/L	0.00115	0.000712	0.000480	0.000390	0.000201	0.000390	0.000296	0.000333	0.00234	0.000347	0.000217	0.000298	0.000254	0.000206	0.000503
	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
	Molybdenum (Mo)	mg/L	0.000649	0.000608	0.000623	0.000616	0.000594	0.000600	0.000615	0.000617	0.000459	0.000447	0.000347	0.000348	0.000347	0.000365	0.000334
	Nickel (Ni)	mg/L	0.000749	0.000749	0.000657	0.000660	0.000598	0.000648	0.000633	0.000652	0.000551	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	1.28	1.29	1.20	1.14	1.13	1.17	1.16	1.18	1.10	0.72	0.73	0.72	0.74	0.73	0.72
	Selenium (Se)	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.746	0.725	0.579	0.560	0.548	0.566	0.552	0.565	0.986	0.36	0.36	0.37	0.39	0.35	0.39
	Silver (Ag)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	1.58	1.61	1.48	1.43	1.42	1.47	1.45	1.49	1.49	0.917	0.929	0.91	0.941	0.904	0.915
	Strontium (Sr)	mg/L	0.0107	0.0107	0.0100	0.00985	0.00966	0.00964	0.00964	0.00973	0.00950	0.0058	0.00594	0.0058	0.00613	0.00583	0.00604
	Thallium (Tl)	mg/L	0.0000023	0.0000027	<0.0000020	0.0000028	0.0000028	0.0000026	0.0000024	<0.0000020	<0.0000020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)	mg/L	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000952	0.000919	0.000899	0.000900	0.000856	0.000911	0.000887	0.000891	0.000710	0.000516	0.000502	0.000467	0.000504	0.000453	0.000468
	Vanadium (V)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	mg/L	<0.00050	0.00088	0.00069	0.00107	0.00132	0.00084	0.00099	0.00117	0.00096	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.003

Table C.47: Dissolved metals concentrations at Sheardown Lake SE water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Summer Sampling Event				Fall Sampling Event									
			DL0-02-8-S surface	DL0-02-8-B bottom	DL0-02-3-S surface	DL0-02-3-B bottom	DL0-02-06-S surface	DL0-02-06-B bottom	DL0-02-07-S surface	DL0-02-07 bottom	DL0-02-04-S surface	DL0-02-04-B bottom	DL0-02-08-S surface	DL0-02-08-B bottom	DL0-02-03-S surface	DL0-02-03-B bottom
			26/Jul/2016	26/Jul/2016	26/Jul/2016	26/Jul/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016	21/Aug/2016
Dissolved Metals	Aluminum (Al)	mg/L	0.0052	0.009	0.0046	0.0064	0.0093	0.0170	0.0081	0.0090	0.0091	0.0077	0.0072	0.0082	0.0081	0.0079
	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	0.00426	0.004825	0.0042	0.00467	0.00597	0.00643	0.00601	0.00596	0.00600	0.00601	0.00595	0.00607	0.00593	0.00596
	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	8.22	8.425	8.23	8.24	11.0	11.7	11.2	11.1	11.1	10.9	11.0	10.9	10.8	10.8
	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	0.0006	0.00057	0.00058	0.00058	0.00076	0.00105	0.00094	0.00080	0.00069	0.00081	0.00084	0.00081	0.00076	0.00079
	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	0.000072	<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	5.01	5.07	5.15	5.02	6.76	6.42	6.49	6.56	6.33	6.42	6.51	6.45	6.62	6.44
	Manganese (Mn)	mg/L	0.000286	0.000375	0.000196	0.000411	0.000561	0.00115	0.000440	0.00039	0.000283	0.000272	0.000414	0.000188	0.000376	0.000392
	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
	Molybdenum (Mo)	mg/L	0.000354	0.000311	0.00037	0.000326	0.000489	0.000507	0.000511	0.000471	0.000492	0.000480	0.000473	0.000489	0.000465	0.000447
	Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00071	<0.00050	<0.00050	0.00051	0.00051	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.73	0.72	0.74	0.7	0.90	0.92	0.91	0.91	0.90	0.89	0.89	0.89	0.90	0.89
	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	0.455	0.36	0.44	0.56	0.54	0.56	0.55	0.55	0.55	0.56	0.55	0.55	0.63
	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	0.9	0.9555	0.915	0.938	1.23	1.24	1.19	1.18	1.20	1.19	1.16	1.14	1.20	1.22
	Strontium (Sr)	mg/L	0.00574	0.00631	0.00574	0.00621	0.00807	0.00864	0.00835	0.00817	0.00833	0.00824	0.00812	0.00814	0.00807	0.00812
	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	<0.00010	<0.00010	<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
	Uranium (U)	mg/L	0.000493	0.0005795	0.000487	0.00056	0.000836	0.000810	0.000821	0.000820	0.000801	0.000810	0.000819	0.000814	0.000821	0.000765
	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	0.003	<0.0030	<0.0030	<0.0030	0.0057	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.48: *In-situ* water quality measurements collected at Mary River benthic invertebrate community stations, Mary River Project CREMP, August 2016.

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	9.9	10.98	97.0	7.98	134
	GO-09 B2	9.2	11.25	97.8	7.97	133
	GO-09 B3	8.6	11.36	97.3	7.99	132
	GO-09 B4	8.0	11.55	97.6	7.94	132
	GO-09 B5	7.0	11.81	97.4	7.90	132
Mary River Upstream (GO-03)	GO-03 B1	12.7	10.22	96.5	8.00	122
	GO-03 B2	12.6	10.36	97.4	7.99	122
	GO-03 B3	12.3	10.44	97.7	7.99	122
	GO-03 B4	12.1	10.52	97.8	7.97	122
	GO-03 B5	11.8	10.55	97.5	7.97	121
Mary River Downstream (EO-01)	EO-01 B1	10.6	11.13	99.8	7.98	135
	EO-01 B2	9.9	11.27	99.6	7.96	136
	EO-01 B3	9.6	11.33	99.4	7.93	136
	EO-01 B4	9.3	11.49	100.3	7.95	137
	EO-01 B5	9.0	11.50	99.5	7.94	137
Mary River Downstream (EO-20)	EO-20 B1	8.6	11.70	100.2	7.94	138
	EO-20 B2	8.4	11.63	99.1	7.94	138
	EO-20 B3	8.0	11.87	100.3	7.93	138
	EO-20 B4	7.7	11.84	99.3	7.94	138
	EO-20 B5	7.7	11.79	98.9	7.85	139
Mary River Downstream (CO-05)	CO-05 B1	8.7	11.33	97.3	7.79	138
	CO-05 B2	8.9	11.41	98.4	7.81	138
	CO-05 B3	8.9	11.45	98.6	7.83	138
	CO-05 B4	9.0	11.50	99.4	7.83	138
	CO-05 B5	9.2	11.54	100.4	7.86	138

Table C.49: *In-situ* water quality summary for Mary River benthic invertebrate community study areas, Mary River Project CREMP, August 2016.

Metric	Station	Sample Size	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
						Lower Bound	Upper Bound		
Temperature (°C)	GO-09	5	8.54	1.11	0.50	7.16	9.92	7.00	9.90
	GO-03	5	12.30	0.37	0.16	11.84	12.76	11.80	12.70
	EO-01	5	9.68	0.61	0.27	8.92	10.44	9.00	10.60
	EO-20	5	8.08	0.41	0.18	7.57	8.59	7.70	8.60
	CO-05	5	8.94	0.18	0.08	8.71	9.17	8.70	9.20
Dissolved Oxygen (mg/L)	GO-09	5	11.4	0.3	0.1	11.0	11.8	11.0	11.8
	GO-03	5	10.4	0.1	0.1	10.3	10.6	10.2	10.6
	EO-01	5	11.3	0.2	0.1	11.2	11.5	11.1	11.5
	EO-20	5	11.8	0.1	0.0	11.6	11.9	11.6	11.9
	CO-05	5	11.4	0.1	0.0	11.3	11.5	11.3	11.5
Dissolved Oxygen (% saturation)	GO-09	5	97.4	0.3	0.1	97.0	97.8	97.0	97.8
	GO-03	5	97.4	0.5	0.2	96.7	98.0	96.5	97.8
	EO-01	5	99.7	0.4	0.2	99.3	100.2	99.4	100.3
	EO-20	5	99.6	0.6	0.3	98.8	100.4	98.9	100.3
	CO-05	5	98.8	1.2	0.5	97.4	100.3	97.3	100.4
pH (pH units)	GO-09	5	7.96	0.04	0.02	7.91	8.00	7.90	7.99
	GO-03	5	7.98	0.01	0.01	7.97	8.00	7.97	8.00
	EO-01	5	7.95	0.02	0.01	7.93	7.98	7.93	7.98
	EO-20	5	7.92	0.04	0.02	7.87	7.97	7.85	7.94
	CO-05	5	7.82	0.03	0.01	7.79	7.86	7.79	7.86
Specific Conductance (uS/cm)	GO-09	5	132.7	1.0	0.5	131.4	134.0	131.7	134.2
	GO-03	5	122.0	0.5	0.2	121.3	122.6	121.3	122.4
	EO-01	5	136.0	0.5	0.2	135.4	136.6	135.4	136.5
	EO-20	5	138.1	0.3	0.1	137.7	138.4	137.8	138.5
	CO-05	5	137.8	0.2	0.1	137.5	138.0	137.5	138.1

Table C.50: Statistical comparison of *in-situ* water quality variables among Mary River benthic invertebrate community study areas, Mary River Project CREMP, August 2016.

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 2 Areas?	p-value	Statistical Test
Temperature (°C)	YES	0.00000	α , δ	GO-09	GO-3	YES	0.0092	Tamhane's
				GO-09	EO-01	NO	0.6103	
				GO-09	EO-20	NO	0.9960	
				GO-09	CO-05	NO	0.9982	
				GO-03	EO-01	YES	0.0011	
				GO-03	EO-20	YES	0.0000	
				GO-03	CO-05	YES	0.0000	
				EO-01	EO-20	YES	0.0187	
Dissolved Oxygen (% Saturation)	YES	0.00001	α , δ	EO-01	CO-05	NO	0.4152	Tukey's HSD
				EO-20	CO-05	YES	0.0599	
				GO-09	GO-3	NO	1.0000	
				GO-09	EO-01	YES	0.0002	
				GO-09	EO-20	YES	0.0005	
				GO-09	CO-05	YES	0.0261	
				GO-03	EO-01	YES	0.0002	
				GO-03	EO-20	YES	0.0004	
pH (pH units)	YES	0.00000	α , δ	GO-03	CO-05	YES	0.0213	Tukey's HSD
				EO-01	EO-20	NO	0.9953	
				EO-01	CO-05	NO	0.2492	
				EO-20	CO-05	NO	0.4304	
				GO-09	GO-3	NO	0.5485	
				GO-09	EO-01	NO	0.9994	
				GO-09	EO-20	NO	0.3092	
				GO-09	CO-05	YES	0.0000	
Specific Conductance (umho/cm)	YES	0.00000	α , δ	GO-03	EO-01	NO	0.4209	Tukey's HSD
				GO-03	EO-20	YES	0.0161	
				GO-03	CO-05	YES	0.0000	
				EO-01	EO-20	NO	0.4209	
				EO-01	CO-05	YES	0.0000	
				EO-20	CO-05	YES	0.0003	
				GO-09	GO-3	YES	0.0000	Tamhane's
				GO-09	EO-01	YES	0.0086	
				GO-09	EO-20	YES	0.0018	
				GO-09	CO-05	YES	0.0029	
				GO-03	EO-01	YES	0.0000	
				GO-03	EO-20	YES	0.0000	
				GO-03	CO-05	YES	0.0000	
				EO-01	EO-20	YES	0.0016	
				EO-01	CO-05	YES	0.0057	
				EO-20	CO-05	NO	0.5632	

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

^b Data analysis included: α - data untransformed; β - data logit transformed; η - $\log_0$ transformed; δ - single factor ANOVA test conducted; γ - ANOVA test validated using Kruskal Wallis H-test or Mann Whitney U-test, as appropriate

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

Table C.51: Water chemistry at Mary River water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Spring Sampling Event										
					G0-09-A	G0-09	G0-09-B	G0-03	G0-01	E0-03	E0-20	E0-21	C0-10	C0-05	C0-01
					26-Jun-2016	26-Jun-2016	26-Jun-2016	25-Jun-2016	26-Jun-2016	26-Jun-2016	25-Jun-2016	25-Jun-2016	25-Jun-2016	25-Jun-2016	25-Jun-2016
Conventional	Conductivity (lab)	umho/cm	-	-	18.2	19	23	19.7	19.8	20.8	19.5	18.4	19.95	28.9	26.9
	pH (lab)	pH	6.5 - 9.0	-	7.08	7.09	7.17	7.22	7.15	7.18	7.2	7.08	7.21	7.31	7.33
	Hardness (as CaCO ₃)	mg/L	-	-	<10	<10	10	<10	<10	<10	<10	<10	<10	13	12
	Total Suspended Solids (TSS)	mg/L	-	-	15.6	8.8	6.4	5.2	4	4.8	4.4	8.8	2.8	2.8	6.9
	Total Dissolved Solids (TDS)	mg/L	-	-	<10	13	13	<10	<10	10	<10	<10	<10	<10	<10
	Turbidity	NTU	-	-	12	8.82	5.54	5.57	4.33	4.07	4.67	5.27	3.945	4.34	4.85
	Alkalinity (as CaCO ₃)	mg/L	-	-	<10	11	13	<10	<10	13	10	<10	11.5	18	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	<0.020
	Nitrate	mg/L	13	13	0.031	0.024	<0.020	<0.020	<0.020	<0.020	0.021	<0.020	0.0405	<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
	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
	Dissolved Organic Carbon	mg/L	-	-	<1.0	1	1.1	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Organic Carbon	mg/L	-	-	<1.0	1	1.2	1.2	1.1	1.3	1.1	1.1	1.05	1.2	1.5
	Total Phosphorus	mg/L	0.020 ^d	-	0.0192	0.0146	0.0097	0.009	0.0078	0.0114	0.0065	0.0119	0.0073	0.0077	0.0088
	Phenols	mg/L	0.004 ^d	-	0.0024	0.0033	0.0029	0.0025	0.0031	0.0026	0.0015	0.0014	0.0014	0.002	0.0018
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
	Chloride (Cl)	mg/L	120	120	0.76	0.66	0.7	0.58	0.59	0.58	0.59	0.59	0.67	0.77	0.71
	Sulphate (SO ₄)	mg/L	218 ^β	218	0.32	<0.30	0.31	<0.30	<0.30	<0.30	0.37	0.35	0.44	0.54	0.44
Total Metals	Aluminum (Al)	mg/L	0.100	0.966	0.250	0.185	0.158	0.113	0.080	0.079	0.088	0.095	0.087	0.070	0.090
	Antimony (Sb)	mg/L	0.020 ^d	-	<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
	Barium (Ba)	mg/L	-	-	0.00372	0.00284	0.00291	0.00248	0.00209	0.00201	0.00208	0.00216	0.001975	0.00233	0.00247
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Calcium (Ca)	mg/L	-	-	1.9	1.8	2.14	1.92	1.8	1.93	1.77	1.36	1.85	2.67	2.47
	Chromium (Cr)	mg/L	0.0089	0.0089	0.00057	<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 ^d	0.004	0.00018	<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	0.00076	0.00059	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)	mg/L	0.30	0.874	0.322	0.142	0.117	0.124	0.073	0.069	0.085	0.091	0.0835	0.062	0.087
	Lead (Pb)	mg/L	0.001	0.001	0.000359	0.000207	0.000145	0.000135	0.000096	0.000102	0.000119	0.000109	0.0001045	0.000094	0.000131
	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
	Magnesium (Mg)	mg/L	-	-	1.15	1.03	1.24	1.12	1.01	1.13	0.998	0.952	1.09	1.59	1.49
	Manganese (Mn)	mg/L	0.935 ^β	-	0.00763	0.00399	0.00301	0.00334	0.002	0.00228	0.00266	0.00297	0.00242	0.00275	0.00328
	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
	Molybdenum (Mo)	mg/L	0.073	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000071	0.000061
	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
	Potassium (K)	mg/L	-	-	0.32	0.29	0.32	0.25	0.24	0.25	0.23	0.22	0.225	0.29	0.28
	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
	Silicon (Si)	mg/L	-	-	0.68	0.54	0.6	0.43	0.37	0.34	0.34	0.34	0.35	0.31	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
	Sodium (Na)	mg/L	-	-	0.425	0.377	0.463	0.353	0.349	0.341	0.333	0.315	0.359	0.418	0.401
	Strontium (Sr)	mg/L	-	-	0.00219	0.00204	0.00243	0.00176	0.0018	0.00185	0.00172	0.00131	0.00172	0.00222	0.00215
	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
	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	-	-	0.018	<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	-	0.000197	0.000146	0.000149	0.000115	0.00011	0.000103	0.000099	0.000087	0.0000965	0.000152	0.000139
	Vanadium (V)	mg/L	0.006 ^d	0.006	<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

^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.51: Water chemistry at Mary River water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Summer Sampling Event												
					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
					18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016
Conventional	Conductivity (lab)	umho/cm	-	-	54.2	62.3	58.7	59.1	60.7	149	76.3	61.6	63.9	61.45	66.5	62.5	68.3
	pH (lab)	pH	6.5 - 9.0	-	7.75	7.82	7.79	7.81	7.84	8.13	7.88	7.79	7.76	7.775	7.62	7.82	7.89
	Hardness (as CaCO ₃)	mg/L	-	-	23	27	26	26	27	71	34	27	28	27	27	28	30
	Total Suspended Solids (TSS)	mg/L	-	-	2	<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	-	-	30	33	30	31	32	83	40	26	33	30	35	38	38
	Turbidity	NTU	-	-	12.1	9.24	9.47	7.35	6.93	3.96	6.51	7.43	7.3	7.465	7.95	8.42	5.26
	Alkalinity (as CaCO ₃)	mg/L	-	-	29	38	36	36	31	75	42	34	32	37	35	34	35
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	0.077	<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	0.35000	<0.15	<0.15	<0.15
	Dissolved 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	<1.0	<1.0
	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	<1.0	<1.0
	Total Phosphorus	mg/L	0.020 ^d	-	0.0086	0.0063	0.0067	0.0048	0.007	0.0046	0.012	0.0079	0.0055	0.0062	0.0059	0.0066	0.0043
	Phenols	mg/L	0.004 ^d	-	0.0013	0.0016	0.0017	0.0018	0.0017	0.0014	0.0015	0.0019	<0.0010	0.00145	0.0011	0.0015	<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	1.23	1.25	1.19	1.08	1.07	1.39	1.13	1.05	1.04	1.03	1.04	1.08	1.10
	Sulphate (SO ₄)	mg/L	218 ^β	218	0.8	0.8	0.8	0.7	0.8	5.1	1.5	0.9	0.9	0.9	0.9	1.0	1.0
Total Metals	Aluminum (Al)	mg/L	0.100	0.966	0.3030	0.230	0.178	0.171	0.245	0.1010	0.213	0.234	0.249	0.252	0.239	0.228	0.224
	Antimony (Sb)	mg/L	0.020 ^d	-	<0.00010	<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	-	-	0.0056	0.0054	0.0051	0.0051	0.0054	0.0076	0.0058	0.0056	0.0058	0.0057	0.0055	0.0055	0.0058
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<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	6	5	6	6	15	7	6	6	6	6	6	6
	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	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	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	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	Iron (Fe)	mg/L	0.30	0.874	0.208	0.158	0.127	0.115	0.147	0.069	0.128	0.145	0.152	0.160	0.152	0.148	0.127
	Lead (Pb)	mg/L	0.001	0.001	0.00025	0.00019	0.00017	0.00013	0.00016	0.00010	0.00015	0.00017	0.00017	0.00018	0.00018	0.00018	0.00013
	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	-	-	2.72	3.18	3	3.07	3.16	8.3	4.1	3.13	3.39	3.225	3.29	3.28	3.63
	Manganese (Mn)	mg/L	0.935 ^β	-	0.00244	0.00181	0.00170	0.00131	0.00158	0.00102	0.00140	0.00159	0.00170	0.00175	0.00177	0.00213	0.00179
	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	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.00015	0.00014	0.00012	0.00014	0.00015	0.00019	0.00015	0.00017	0.00018	0.00018	0.00017	0.00017	0.00019
	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	-	-	0.68	0.68	0.64	0.63	0.66	0.83	0.69	0.64	0.69	0.67	0.67	0.67	0.72
	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	<0.0010
	Silicon (Si)	mg/L	-	-	1.07	0.99	0.79	0.80	0.99	0.79	0.93	0.99	0.95	1.01	0.98	0.89	0.95
	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	-	-	0.948	1.010	0.973	0.928	0.929	0.828	0.902	0.861	0.914	0.879	0.906	0.877	0.976
	Strontium (Sr)	mg/L	-	-	0.006	0.006	0.006	0.006	0.006	0.009	0.007	0.006	0.006	0.006	0.006	0.006	0.006
	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	-	-	0.0120	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0100	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.015	-	0.0006	0.0006	0.0006	0.0005	0.0005	0.0013	0.0006	0.0005	0.0004	0.0004	0.0004	0.0004	0.0005
	Vanadium (V)	mg/L	0.006 ^d	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.51: Water chemistry at Mary River water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Fall Sampling Event												
					G0-09-A	G0-09	G0-09-B	G0-03	G0-01	F0-01	E0-10	E0-03	E0-21	E0-20	C0-10	C0-05	CO-01
					20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016
Conventional	Conductivity (lab)	umho/cm	-	-	191	189	188	168.5	174	261	186	174	172	173	170	171	170
	pH (lab)	pH	6.5 - 9.0	-	8.23	8.24	8.21	8.135	8.14	8.28	8.14	8.12	8.17	8.16	8.13	8.15	8.15
	Hardness (as CaCO ₃)	mg/L	-	-	80	84	82	75.5	79	131	84	80	80	79	79	79	79
	Total Suspended Solids (TSS)	mg/L	-	-	5.4	2.9	2.9	2.95	2.5	3	2.9	<2.0	3.4	3.5	5.6	6.9	2.5
	Total Dissolved Solids (TDS)	mg/L	-	-	107	98	98	94.5	69	141	102	90	86	90	94	99	89
	Turbidity	NTU	-	-	16.3	9.7	11	12.25	16.1	11	16.5	12.9	16	14.6	32.7	41.5	15.5
	Alkalinity (as CaCO ₃)	mg/L	-	-	73	79	79	73.5	75	118	82	70	68	72	76	76	72
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	0.032	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.026	0.039	0.065	0.022	0.022
	Nitrate	mg/L	13	13	0.023	<0.020	<0.020	<0.020	<0.020	0.096	<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	0.16	0.25	0.15	<0.15	0.21	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.2	1.3	1.1	1.25	1.3	1.2	1.2	1.2	1.8	1.2	1.6	1.9	1.5
	Total Organic Carbon	mg/L	-	-	1.5	1.4	1.4	1.5	1.5	1.4	2.3	1.3	1.5	1.4	1.6	1.8	1.6
	Total Phosphorus	mg/L	0.020 ^d	-	0.0125	0.009	0.0107	0.00885	0.0098	0.0112	0.0117	0.0097	0.0157	0.0097	0.0358	0.0206	0.0102
	Phenols	mg/L	0.004 ^d	-	0.0056	0.0063	0.0086	0.0048	0.0037	0.0057	0.0058	0.0039	0.016	0.0042	0.0552	0.0039	0.004
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	11.5	9	9.29	6.995	6.92	5.57	6.74	6.56	6.08	6.55	6.09	6.08	6.1
	Sulphate (SO ₄)	mg/L	218 ^β	218	5.58	4.52	4.64	3.77	4.59	14.3	5.01	4.38	4.19	4.36	5.03	5.15	4.03
Total Metals	Aluminum (Al)	mg/L	0.100	0.966	0.395	0.217	0.258	0.291	0.484	0.251	0.418	0.301	0.431	0.382	1.04	1.39	0.32
	Antimony (Sb)	mg/L	0.020 ^d	-	<0.00010	<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	0.00013	<0.00010	<0.00010	0.00011	0.00013	0.00015	0.00014	0.00012	0.00014	0.00012	0.0002	0.00026	0.00013
	Barium (Ba)	mg/L	-	-	0.0147	0.013	0.0131	0.0126	0.0142	0.0148	0.0143	0.0133	0.0143	0.0133	0.0174	0.0196	0.0129
	Beryllium (Be)	mg/L	0.011 ^d	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.000010	0.000011	<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	17.8	18	15.7	16.9	27	17.5	17.1	16.9	16.7	16.5	16.5	15.8
	Chromium (Cr)	mg/L	0.0089	0.0089	0.00096	0.0006	0.00065	0.00073	0.0011	0.00108	0.00112	0.00076	0.00108	0.00096	0.00237	0.00319	0.00086
	Cobalt (Co)	mg/L	0.0009 ^d	0.004	0.0002	0.00012	0.00014	0.00015	0.00023	0.00024	0.00022	0.00016	0.00022	0.00018	0.00048	0.00065	0.00018
	Copper (Cu)	mg/L	0.002	0.0024	0.0017	0.0017	0.0015	0.0015	0.0016	0.0019	0.0016	0.0016	0.0016	0.0015	0.0024	0.0027	0.0017
	Iron (Fe)	mg/L	0.30	0.874	0.41	0.227	0.278	0.298	0.471	0.325	0.437	0.308	0.442	0.383	1.07	1.42	0.356
	Lead (Pb)	mg/L	0.001	0.001	0.00036	0.00025	0.00024	0.00029	0.00041	0.00042	0.0004	0.00031	0.00039	0.00034	0.00083	0.00108	0.00033
	Lithium (Li)	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	0.0011	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	0.0017	0.0024	<0.0010
	Magnesium (Mg)	mg/L	-	-	9.32	9.46	9.21	8.855	9.18	15.9	10.2	9.58	9.4	9.18	9.66	9.72	9.17
	Manganese (Mn)	mg/L	0.935 ^β	-	0.0056	0.0030	0.0036	0.0036	0.0055	0.0050	0.0053	0.0040	0.0054	0.0047	0.0121	0.0167	0.0053
	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	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.00063	0.00051	0.00053	0.00043	0.00046	0.00034	0.00043	0.00052	0.00053	0.00053	0.00053	0.00057	0.00046
	Nickel (Ni)	mg/L	0.025	0.025	0.00079	0.00067	0.00059	0.00073	0.00102	0.00148	0.00111	0.00092	0.00117	0.00103	0.00241	0.00259	0.00114
	Potassium (K)	mg/L	-	-	1.68	1.45	1.45	1.34	1.42	1.46	1.44	1.43	1.4	1.41	1.7	1.88	1.38
	Selenium (Se)	mg/L	0.001	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	1.55	1.27	1.34	1.33	1.73	1.25	1.56	1.35	1.66	1.5	2.74	3.62	1.41
	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
	Sodium (Na)	mg/L	-	-	5.67	4.57	4.56	3.71	3.69	2.2	3.54	3.59	3.35	3.46	3.42	3.4	3.33
	Strontium (Sr)	mg/L	-	-	0.0234	0.0211	0.0216	0.0179	0.0184	0.0197	0.0188	0.0184	0.0179	0.0182	0.0187	0.0188	0.0165
	Thallium (Tl)	mg/L	0.0008	0.0008	0.000014	0.000011	0.000012	0.0000105	0.000014	0.000013	0.000015	0.000011	0.000015	0.000014	0.000027	0.000036	0.000013
	Tin (Sn)	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)	mg/L	-	-	0.0233	0.0124	0.0156	0.01615	0.0271	0.0156	0.0245	0.0164	0.0248	0.0212	0.0611	0.0822	0.0185
	Uranium (U)	mg/L	0.015	-	0.00657	0.00577	0.0058	0.004605	0.00468	0.00353	0.0043	0.00453	0.00406	0.00441	0.00406	0.00407	0.00364
	Vanadium (V)	mg/L	0.006 ^d	0.006	0.00099	0.00063	0.00074	0.000735	0.00104	0.00078	0.00101	0.00075	0.00098	0.00092	0.00208	0.00274	0.00082
	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	0.0031	0.005	<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.52: Dissolved metal concentrations at Mary River water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Spring Sampling Event													Summer Sampling Event						
			G0-09A	G0-09	G0-09B	G0-03	G0-01	F0-01	E0-10	E0-03	E0-20	E0-21	C0-10	C0-05	C0-01	GO-09-A	GO-09	GO-09-B	GO-03	GO-01	FO-01	EO-10
			26-Jun-2016	26-Jun-2016	26-Jun-2016	25-Jun-2016	26-Jun-2016	26-Jun-2016	26-Jun-2016	26-Jun-2016	25-Jun-2016	25-Jun-2016	25-Jun-2016	25-Jun-2016	25-Jun-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016
Dissolved Metals	Aluminum (Al)	mg/L	0.0215	0.0214	0.0159	0.0118	0.0126	0.0082	0.0096	0.0099	0.0092	0.0111	0.011	0.0106	0.0122	0.0380	0.0271	0.0308	0.0223	0.0246	0.0045	0.0193
	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	0.00139	0.00142	0.00182	0.00149	0.00149	0.00166	0.00153	0.00146	0.00141	0.00132	0.00144	0.00177	0.00174	0.00358	0.00390	0.00383	0.00391	0.00402	0.00683	0.00446
	Beryllium (Be)	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	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)	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	<0.00050	<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	1.44	1.64	2.09	1.74	1.77	3.55	2.30	1.87	1.76	1.59	1.7	2.63	2.34	4.89	5.80	5.37	5.49	5.65	14.6	7.11
	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	0.00031	0.00034	0.00031	0.00033	0.00032	0.00021	0.00070	0.00031	0.00028	0.00029	0.00027	0.00035	0.00033	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	0.00051	0.00051
	Iron (Fe)	mg/L	0.013	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.011	<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
	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	0.896	1.01	1.25	1.04	1.03	2.28	1.35	1.11	1.01	0.975	1.06	1.62	1.45	2.66	3.12	2.96	3.03	3.16	8.46	3.95
	Manganese (Mn)	mg/L	0.00164	0.00134	0.00108	0.00125	0.00085	0.00057	0.00080	0.00082	0.00097	0.00103	0.00096	0.00142	0.00132	0.000219	0.000181	0.000174	0.000140	0.000151	0.000094	0.000128
	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	<0.000050	<0.000050	<0.000050	<0.000050	0.000075	0.000065	0.000186	0.000162	0.000156	0.000161	0.000157	0.000183	0.000162
	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	0.224	0.237	0.279	0.219	0.219	0.238	0.221	0.224	0.196	0.206	0.21	0.284	0.263	0.57	0.59	0.58	0.57	0.58	0.80	0.60
	Selenium (Se)	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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)	mg/L	0.250	0.270	0.308	0.261	0.253	0.213	0.238	0.246	0.217	0.205	0.23	0.242	0.246	0.50	0.52	0.51	0.49	0.50	0.58	0.51
	Silver (Ag)	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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.942	0.995	0.979	0.913	0.920	0.839	0.881
	Strontium (Sr)	mg/L	0.0016	0.0017	0.0022	0.0016	0.0017	0.0021	0.0018	0.0017	0.0015	0.0015	0.0016	0.0022	0.0020	0.00587	0.00618	0.00590	0.00561	0.00573	0.00919	0.00634
	Thallium (Tl)	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	<0.00010	<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	0.00060	0.00062	0.00049	<0.00030	0.00042	<0.00030	<0.00030	<0.00030	<0.00030	0.00034	<0.00030	<0.00030	0.00034	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)	mg/L	0.000085	0.000079	0.000102	0.000070	0.000079	0.000064	0.000077	0.000073	0.000072	0.000066	0.000067	0.000116	0.000102	0.000507	0.000564	0.000525	0.000439	0.000446	0.00125	0.000559
	Vanadium (V)	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	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)	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	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

Table C.52: Dissolved metal concentrations at Mary River water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units							Fall Sampling Event												
			EO-03	E0-20	E0-21	C0-10	C0-05	C0-01	G0-09-A	G0-09	G0-09-B	G0-03	G0-01	F0-01	E0-10	E0-03	E0-20	E0-21	C010	C0-05	C0-01
			18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	18-Jul-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	20-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016	19-Aug-2016
Dissolved Metals	Aluminum (Al)	mg/L	0.0242	0.0232	0.0243	0.0222	0.0227	0.0195	0.0116	0.0079	0.0092	0.0080	0.0093	0.0037	0.0085	0.0071	0.0091	0.0097	0.0088	0.0096	0.0085
	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
	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
	Barium (Ba)	mg/L	0.00407	0.00421	0.00416	0.00417	0.00428	0.00450	0.0119	0.0113	0.0112	0.0105	0.0112	0.0132	0.0112	0.0107	0.0107	0.0108	0.0108	0.0110	0.0110
	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
	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
	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
	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
	Calcium (Ca)	mg/L	5.69	5.87	5.7	5.74	5.78	6.35	16.9	17.6	17.6	15.8	16.4	26.6	17.6	16.8	16.5	16.6	16.4	16.3	16.4
	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	<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
	Copper (Cu)	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	0.00052	0.00103	0.00091	0.00096	0.00091	0.00086	0.00079	0.00086	0.00088	0.00093	0.00089	0.00092	0.00095	0.00097
	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
	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
	Lithium (Li)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010	0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)	mg/L	3.15	3.32	3.14	3.19	3.21	3.50	9.21	9.79	9.28	8.81	9.34	15.6	9.80	9.20	9.30	9.02	9.28	9.29	9.32
	Manganese (Mn)	mg/L	0.000121	0.000155	0.00014	0.000241	0.000723	0.000430	0.000372	0.000193	0.000226	0.00013	0.000137	0.000417	0.000159	0.000162	0.000360	0.000139	0.000310	0.00109	0.000726
	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
	Molybdenum (Mo)	mg/L	0.000180	0.000192	0.000182	0.000184	0.000187	0.000197	0.000620	0.000489	0.000516	0.000416	0.000427	0.000342	0.000419	0.000505	0.000506	0.000534	0.000528	0.000529	0.000502
	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	0.00051	0.00057	0.00057
	Potassium (K)	mg/L	0.57	0.58	0.57	0.57	0.60	0.61	1.51	1.35	1.35	1.21	1.23	1.33	1.25	1.27	1.24	1.23	1.24	1.27	1.26
	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
	Silicon (Si)	mg/L	0.48	0.49	0.49	0.49	0.48	0.50	0.89	0.90	0.91	0.87	0.89	0.81	0.86	0.90	0.91	0.89	0.90	0.94	0.93
	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
	Sodium (Na)	mg/L	0.874	0.893	0.86	0.872	0.874	0.947	5.69	4.82	4.77	3.70	3.75	2.21	3.55	3.61	3.43	3.43	3.36	3.34	3.46
	Strontium (Sr)	mg/L	0.00576	0.00576	0.0057	0.00560	0.00574	0.00622	0.0213	0.0198	0.0211	0.0167	0.0170	0.0186	0.0171	0.0173	0.0166	0.0173	0.0166	0.0162	0.0162
	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
	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	0.00011
	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
	Uranium (U)	mg/L	0.000375	0.000375	0.000375	0.000349	0.000337	0.000417	0.00631	0.00559	0.00564	0.004280	0.00417	0.00318	0.00407	0.00390	0.00355	0.00394	0.00349	0.00332	0.00341
	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
	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

Table C.53: *In-situ* water quality profile data collected at Mary Lake water quality monitoring stations in winter^a, Mary River Project CREMP, 2016.

Station BLO-05-B (South Basin) ^{b,c}					Station BLO-03 (South Basin) ^{b,c}					Station BLO-04 (South Basin) ^{b,c}					Station BLO-09 (South Basin) ^{b,c}					Station BLO-06 (South Basin) ^{b,c}				
Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)	Depth (m)	Temp. (°C)	DO (% Sat.)	pH	Sp. Cond. (µS/cm)
2.50	1.0	104.0	7.8	95.6	2.65	0.8	98.9	7.7	88.4	2.50	1.1	101.5	7.7	92.5	3.00	1.1	98.7	7.8	88.0	2.60	1.8	100.8	7.9	93.0
3.50	1.2	105.6	7.7	93.4	3.65	1.2	99.7	7.6	86.7	3.50	1.2	100.5	7.7	88.3	4.00	1.1	99.1	7.8	87.2	3.60	1.0	102.1	7.8	90.8
4.50	1.2	106.1	7.7	93.1	4.65	1.3	99.9	7.6	86.4	4.50	1.3	100.1	7.6	86.2	5.00	1.4	99.1	7.7	86.0	4.60	1.2	101.9	7.8	90.0
5.50	1.3	105.9	7.7	92.7	5.65	1.4	99.7	7.6	85.7	5.50	1.4	99.7	7.6	85.4	6.00	1.4	98.8	7.7	85.0	5.60	1.4	101.5	7.7	88.7
6.50	1.3	106.0	7.7	93.9	6.65	1.5	99.2	7.6	85.1	6.50	1.5	99.1	7.6	84.6	7.00	1.5	98.3	7.7	84.4	6.60	1.5	100.8	7.7	88.3
					7.65	1.5	98.7	7.6	84.4	7.50	1.6	98.5	7.6	84.1	8.00	1.5	98.0	7.7	84.3					
					8.65	1.6	97.9	7.6	83.6	8.50	1.6	97.8	7.6	83.3	9.00	1.6	97.3	7.6	83.6					
					9.65	1.6	96.9	7.5	83.2	9.50	1.6	96.8	7.6	82.9	10.00	1.6	97.0	7.6	83.4					
					10.65	1.6	96.8	7.5	82.9	10.50	1.6	96.7	7.6	82.8	11.00	1.6	96.8	7.6	83.3					
					11.65	1.7	96.1	7.5	82.3	11.50	1.6	96.3	7.6	82.5	12.00	1.6	96.4	7.6	82.8					
					12.65	1.7	95.7	7.5	82.3	12.50	1.6	95.8	7.6	82.2	13.00	1.6	96.9	7.6	82.5					
					13.65	1.7	95.5	7.5	81.9	13.50	1.7	94.9	7.6	81.9	14.00	1.6	95.4	7.6	82.2					
										14.50	1.7	94.5	7.6	81.6	15.00	1.7	94.7	7.6	82.0					
										15.50	1.7	93.6	7.5	81.3	16.00	1.7	93.6	7.6	81.4					
										16.50	1.8	93.0	7.5	81.0	17.00	1.8	93.0	7.5	81.2					
										17.50	1.8	92.0	7.5	80.9	18.00	1.8	92.9	7.5	81.1					
										18.50	1.8	91.1	7.5	81.2	19.00	1.8	90.5	7.5	80.9					
										19.50	1.8	90.7	7.5	81.5	20.00	1.8	88.6	7.5	80.7					
										20.50	1.8	90.3	7.5	82.0	21.00	1.9	87.8	7.5	80.6					
															22.00	1.9	85.9	7.5	80.6					
															23.00	2.0	84.3	7.4	81.0					
															24.00	2.0	83.6	7.4	81.3					
															25.00	2.0	81.7	7.4	81.7					
															26.00	2.1	78.2	7.4	81.9					
															27.00	2.2	75.8	7.3	82.5					
															28.00	2.2	68.8	7.3	84.0					
															29.00	2.3	65.0	7.2	84.8					

^a Sampling conducted on 25-April, 6-May and 16-May, 2016.

^b 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 15.7, 10.1, 5, 12.4, 21.3, 7.3, 17.8, 21.8, 30, and 7.8 m, respectively, at the time of winter sampling.

^c 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 were 1.65, 1.90, 1.50, 1.48, 1.33, 1.50, 1.32, 1.40, 1.46, and 1.65 m, respectively, at the time of winter sampling.

Table C.54: *In-situ* water quality profile data collected at Mary Lake water quality monitoring stations in summer^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)										Dissolved Oxygen (% Saturation)									
	BLO-01-A ^b	BLO-01 ^b	BLO-01-B ^b	BLO-05-A ^b	BLO-05 ^b	BLO-05-B ^b	BLO-03 ^b	BLO-04 ^b	BLO-09 ^b	BLO-06 ^b	BLO-01-A	BLO-01	BLO-01-B	BLO-05-A	BLO-05	BLO-05-B	BLO-03	BLO-04	BLO-09	BLO-06
1.0	9.8	10.1	9.8	10.8	11.1	9.1	10.9	10.5	10.0	8.1	100.1	100.2	100.3	99.5	100.3	98.1	102.4	103.4	102.4	99.4
2.0	9.5	10.1	9.8	10.7	10.5	8.9	10.9	10.5	9.8	8.1	100.1	100.3	100.3	101.1	100.7	99.0	104.0	103.5	102.8	99.5
3.0	9.4	10.0	9.5	10.7	10.3	8.8	10.9	10.4	9.6	8.0	99.9	100.2	100.5	101.6	101.2	99.2	104.3	103.4	102.9	99.4
4.0	9.4	9.8	9.4	10.7	10.3	8.8	10.9	9.9	9.6	8.0	99.8	99.6	100.4	101.9	101.4	99.4	104.2	102.9	102.7	99.4
5.0	9.3	9.6	9.3	10.7	10.1	8.7	10.9	9.8	9.2	8.0	99.7	99.7	100.1	102.1	101.1	99.2	104.2	102.7	101.6	99.1
6.0	9.1	9.6		10.6	9.8	8.6	10.9	9.8	8.8	7.5	100.0	99.8		102.1	100.2	99.1	104.2	102.5	101.0	98.0
7.0	9.1	9.5		10.0	9.3	8.6	10.9	9.6	8.7		100.0	99.7		100.8	99.7	99.1	104.1	101.6	100.7	
8.0	9.1	9.5		9.6	9.0	8.6*	10.9	9.4	8.7		100.1	99.7		99.8	99.2	98.7*	103.9	101.5	100.5	
9.0	9.1	9.3		9.4	9.0		9.2	9.2	8.6		100.0	99.3		99.5	99.2		101.0	100.0	99.9	
10.0	9.0			9.2	9.0		8.8	8.6	8.4		99.9			99.1	99.3		100.3	99.4	99.6	
11.0	9.0			8.2	8.0		8.8	8.3	8.4		99.8			97.3	97.1		100.4	99.0	99.4	
12.0	9.0				7.8		8.7	8.1	8.3		99.8				96.8		100.2	98.7	99.2	
13.0	9.0				7.6		8.6	8.0	8.2		99.7				96.2		100.0	98.4	99.0	
14.0	8.8				7.5		8.6	7.9	8.1		99.7				96.0		99.6	98.0	98.5	
15.0	8.7				7.3		8.4	7.5	7.9		99.8				95.5		99.3	97.0	98.1	
16.0					7.1		8.4	7.5	7.9						95.1		99.2	96.5	97.7	
17.0					7.1			7.4	7.6						94.6			96.1	97.0	
18.0					7.0			7.3	7.4						94.4			95.9	96.7	
19.0					7.0			7.2	7.3						94.3			96.0	96.4	
20.0					7.0			7.2	7.1						94.2			95.8	96.1	
21.0					6.9*				7.1						93.5*				96.0	
22.0									6.6										94.7	
23.0									6.6										94.6	
24.0									6.5										94.4	
25.0									6.5										94.3	
26.0									6.5										94.1	
27.0									6.5										94.0	
28.0									6.4										93.8	
29.0									6.4										93.5	
30.0									6.3										93.1	

^a Sampling conducted on 26-July, 29-July and 30-July, 2016.

^b 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 16.9, 9.95, 5.14, 11, 21.7, 8.5, 19.9, 21, 30.5, 8.2 m, respectively, at the time of summer sampling.

* The deepest *in situ* water quality reading at stations BL0-05 and BL0-05-B were taken at 21.7 m and 7.5 m, respectively, at the time of summer sampling.

Table C.54: *In-situ* water quality profile data collected at Mary Lake water quality monitoring stations in summer^a, Mary River Project CREMP, 2016.

Depth (m)	pH (pH units)										Specific Conductance (µS/cm)									
	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
1.0	7.63	7.83	7.68	7.71	7.63	7.27	7.65	7.75	7.82	7.70	185.5	180.1	189.5	69.0	82.0	57.0	57.2	61.3	57.9	54.3
2.0	7.66	7.80	7.72	7.76	7.60	7.03	7.64	7.71	7.77	7.59	191.0	179.8	191.2	69.0	69.0	58.0	57.2	61.1	57.9	54.4
3.0	7.69	7.81	7.74	7.68	7.59	6.86	7.65	7.69	7.71	7.54	191.7	182.2	191.2	70.0	64.0	58.0	57.2	58.0	57.8	54.4
4.0	7.69	7.80	7.76	7.68	7.58	6.41	7.64	7.67	7.71	7.50	192.7	187.6	192.3	70.0	66.0	59.0	57.3	57.4	57.4	54.5
5.0	7.71	7.80	7.77	7.70	7.57	6.38	7.65	7.63	7.67	7.48	195.1	187.8	193.2	70.0	72.0	59.0	57.3	57.4	56.4	54.5
6.0	7.71	7.80		7.70	7.57	6.38	7.65	7.62	7.64	7.46	195.4	188.0		71.0	67.0	59.0	57.3	57.4	56.2	54.2
7.0	7.72	7.81		7.69	7.57	6.39	7.66	7.61	7.61		195.6	188.7		69.0	62.0	59.0	57.3	57.7	56.2	
8.0	7.73	7.81		7.67	7.56	6.40*	7.66	7.59	7.60		195.9	189.2		73.0	62.0	59.0*	57.3	57.5	56.2	
9.0	7.74	7.80		7.66	7.54		7.66	7.58	7.59		196.8	192.7		70.0	61.0		56.2	57.4	55.8	
10.0	7.75			7.63	7.51		7.60	7.54	7.57		198.1			66.0	62.0		56.1	56.4	55.7	
11.0	7.75			7.61	7.50		7.56	7.51	7.55		198.3			60.0	58.0		56.0	56.5	55.7	
12.0	7.76				7.45		7.54	7.50	7.55		198.3				58.0		56.0	56.5	55.5	
13.0	7.76				7.41		7.53	7.49	7.53		199.6				57.0		56.0	56.6	55.4	
14.0	7.76				7.38		7.51	7.48	7.51		203.6				58.0		56.0	56.7	55.6	
15.0	7.76				7.36		7.51	7.44	7.50		205.3				57.0		56.1	57.9	55.4	
16.0					7.32		7.51	7.42	7.48						57.0		56.1	58.3	54.9	
17.0					7.12			7.42	7.47						57.0			57.5	54.7	
18.0					6.89			7.41	7.45						57.0			57.0	54.6	
19.0					6.83			7.39	7.43						57.0			56.9	54.4	
20.0					6.80			7.39	7.42						57.0			57.2	54.2	
21.0					6.77*				7.41						58.0*				54.1	
22.0									7.40										53.7	
23.0									7.39										53.7	
24.0									7.37										53.9	
25.0									7.36										53.7	
26.0									7.35										53.7	
27.0									7.35										53.7	
28.0									7.34										53.7	
29.0									7.33										53.8	
30.0									7.33										53.8	

^a Sampling conducted on 26-July, 29-July and 30-July, 2016.

^b 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 16.9, 9.95, 5.14, 11, 21.7, 8.5, 19.9, 21, 30.5, 8.2 m, respectively, at the time of summer sampling.

* The deepest *in situ* water quality reading at stations BL0-05 and BL0-05-B were taken at 21.7 m and 7.5 m, respectively, at the time of summer sampling.

Table C.55: *In-situ* water quality profile data collected at Mary Lake water quality monitoring stations in fall^a, Mary River Project CREMP, 2016.

Depth (m)	Temperature (°C)										Dissolved Oxygen (% Saturation)									
	BLO-01-A ^b	BLO-01 ^b	BLO-01-B ^b	BLO-05-A ^b	BLO-05 ^b	BLO-05-B ^b	BLO-03 ^b	BLO-04 ^b	BLO-09 ^b	BLO-06 ^b	BLO-01-A ^b	BLO-01 ^b	BLO-01-B ^b	BLO-05-A ^b	BLO-05 ^b	BLO-05-B ^b	BLO-03 ^b	BLO-04 ^b	BLO-09 ^b	BLO-06 ^b
1.0	10.4	10.1	10.2	11.1	11.3	11.2	11.0	10.5	10.5	9.9	99.8	98.9	100.1	98.1	99.0	98.5	99.3	97.1	98.9	93.5
2.0	10.0	10.0	10.1	11.1	11.3	11.2	10.9	10.5	10.5	10.8	100.1	99.6	99.8	98.8	99.2	99.3	99.8	98.0	99.2	95.8
3.0	9.9	9.9	9.9	11.1	11.2	11.2	10.9	10.4	10.5	9.7	99.7	99.6	99.8	98.9	99.2	99.5	99.8	98.7	99.2	96.7
4.0	9.7	9.9	9.8	11.0	11.1	11.1	10.9	10.4	10.3	9.7	99.4	99.5	99.4	98.9	99.1	99.4	99.7	99.0	99.1	97.0
5.0	9.5	9.8		11.0	11.0	11.0	10.7	10.4	10.2	9.6	99.0	99.3		98.7	98.8	98.8	99.4	99.2	98.8	97.1
6.0	9.4	9.7		10.9	10.8	10.7	10.6	10.4	10.2	9.6	98.8	99.1		98.6	98.3	98.5	99.0	99.1	98.7	97.1
7.0	9.3	9.6		10.9	10.7	10.6	10.6	10.2	10.1	9.5	98.5	98.6		98.6	97.8	98.3	98.9	98.8	98.6	96.7
8.0	9.3	9.5		10.9	10.5		10.5	9.9	10.1	9.4	98.4	98.1		98.5	98.0		98.7	98.1	98.4	96.3
9.0	9.2	9.4*		10.9	10.5		10.4	9.5	10.0		97.8	97.8*		98.5	97.8		98.5	97.1	98.4	
10.0	9.2			10.7	10.2		10.4	9.3	10.0		97.7			97.9	97.0		98.5	96.6	98.3	
11.0	9.2			10.3*	9.6		10.3	9.1	10.0		97.4			96.7*	95.8		97.8	96.1	98.2	
12.0	9.1				9.3		10.0	9.1	9.1		97.5				95.1		97.0	96.0	96.1	
13.0	9.1				9.2		8.8	9.0	8.9		97.6				93.7		95.4	96.0	95.8	
14.0	9.1				8.4		8.8	8.8	9.0		97.6				91.5		94.3	95.1	95.8	
15.0					7.9		8.7	8.7	8.9						90.1		94.2	94.9	96.0	
16.0					7.5		8.5	8.2	7.7						89.5		93.9	93.5	93.4	
17.0					7.4		8.4	7.7	7.5						89.7		93.6	92.2	92.8	
18.0					7.3			7.1	7.3						89.5			91.9	92.3	
19.0					7.2			7.4	7.2						89.0			91.1	92.0	
20.0					7.2			7.0	7.0						88.5			90.3	91.6	
21.0									6.7										90.7	
22.0									6.6										90.3	
23.0									6.4										90.1	
24.0									6.4										89.7	
25.0									6.3										89.6	
26.0									6.2										89.5	
27.0									6.2										89.3	
28.0									6.1										88.8	
29.0									6.1										88.5	
30.0									6.1										88.2	

^a Sampling conducted on 21-August to 24-August, 2016.

^b 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 14.9, 9.2, 4.7, 11.5, 20.6, 7.6, 19.5, 21.1, 30.2, and 9.7 m, respectively, at the time of fall sampling.

* The deepest *in situ* water quality reading at stations BLO-1 and BLO-05A were taken at 8.2 and 10.5 m, respectively, at the time of fall sampling.

Table C.55: *In-situ* water quality profile data collected at Mary Lake water quality monitoring stations in fall^a, Mary River Project CREMP, 2016.

Depth (m)	pH (pH units)										Specific Conductance (µS/cm)									
	BLO-01-A ^b	BLO-01 ^b	BLO-01-B ^b	BLO-05-A ^b	BLO-05 ^b	BLO-05-B ^b	BLO-03 ^b	BLO-04 ^b	BLO-09 ^b	BLO-06 ^b	BLO-01-A ^b	BLO-01 ^b	BLO-01-B ^b	BLO-05-A ^b	BLO-05 ^b	BLO-05-B ^b	BLO-03 ^b	BLO-04 ^b	BLO-09 ^b	BLO-06 ^b
1.0	8.11	8.06	8.05	8.08	8.00	8.04	7.72	7.90	7.78	8.01	149	150	149	78	73	75	72		73	
2.0	8.01	7.96	7.99	7.95	7.93	7.92	7.70	7.83	7.74	7.89	149	149	148	78	75	75	71		73	
3.0	8.00	7.95	8.00	7.91	7.88	7.87	7.69	7.76	7.73	7.81	149	148	146	79	76	75	71		73	
4.0	7.98	7.94	8.00	7.87	7.88	7.84	7.68	7.72	7.70	7.75	150	148	146	80	77	74	71		73	
5.0	7.96	7.93		7.84	7.82	7.80	7.66	7.68	7.68	7.67	153	147		80	76	74	71		73	
6.0	7.95	7.92		7.81	7.79	7.77	7.65	7.64	7.67	7.66	154	150		81	75	74	71		73	
7.0	7.94	7.91		7.77	7.75	7.74	7.63	7.60	7.66	7.64	154	151		81	81	73	70		72	
8.0	7.92	7.90		7.77	7.71		7.63	7.56	7.64	7.61	154	151		81	84		70		72	
9.0	7.91	7.89*		7.76	7.70		7.62	7.50	7.63		154	151		81	88		70		73	
10.0	7.92			7.73	7.70		7.60	7.45	7.62		153			81	85		69		71	
11.0	7.91			7.70*	7.67		7.58	7.38	7.62		153			80	81		69		72	
12.0	7.90				7.63		7.57	7.36	7.62		153				79		67		71	
13.0	7.96				7.62		7.45	7.35	7.58		154				69		63		67	
14.0	7.91				7.60		7.44	7.35	7.54		154				61		62		65	
15.0					7.54		7.42	7.32	7.52						57		61		62	
16.0					7.50		7.40	7.33	7.50						55		60		60	
17.0					7.45		7.38	7.30	7.46						54		60		57	
18.0					7.43			7.26	7.44						53				56	
19.0					7.41			7.23	7.41						53				55	
20.0					7.39			7.20	7.39						53				54	
21.0									7.37										53	
22.0									7.35										53	
23.0									7.33										53	
24.0									7.31										53	
25.0									7.28										53	
26.0									7.26										53	
27.0									7.22										53	
28.0									7.15										53	
29.0									7.08										55	
30.0									7.03										56	

^a Sampling conducted on 21-August to 24-August, 2016.

^b 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 14.9, 9.2, 4.7, 11.5, 20.6, 7.6, 19.5, 21.1, 30.2, and 9.7 m, respectively, at the time of fall sampling.

* The deepest *in situ* water quality reading at stations BLO-1 and BLO-05A were taken at 8.2 and 10.5 m, respectively, at the time of fall sampling.

Table C.56: 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 2016.

Replicate ID	Date Sampled	Station Depth (m)	Secchi Depth (m)	Colour/ Clarity	Depth sampled	Temperature (°C)	Dissolved Oxygen		pH (units)	Specific Conductance (µS/cm)
							(mg/L)	(% sat.)		
BLO-01	15-Aug-16	9.6	3.99	-	surface	12.07	10.75	99.9	8.13	132
					bottom	9.82	10.63	93.8	7.94	120
BLO-20	15-Aug-16	11.3	2.86	slight blue-green colouration	surface	12.32	11.18	104.4	7.72	73
					bottom	10.07	11.02	97.8	7.72	73
BLO-11	15-Aug-16	11.6	3.06	-	surface	12.64	11.76	108.4	7.86	73
					bottom	9.94	11.69	102.5	7.82	80
BLO-21	15-Aug-16	11.2	3.26	slight blue-green colouration	surface	13.42	10.31	98.7	7.50	74
					bottom	9.23	7.79	63.7	7.27	71
BLO-22	15-Aug-16	11.3	3.72	slight blue-green colouration	surface	12.92	10.65	100.8	6.87	75
					bottom	9.35	11.11	97.4	7.19	69
BLO-06	15-Aug-16	9.1	3.85	slight blue-green colouration	surface	13.23	10.95	104.3	7.77	71
					bottom	12.63	8.39	77.4	7.44	71

Table C.57: Statistical comparison of bottom *in-situ* water quality between littoral stations of Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

Habitat Variable	Statistical Test Results			Summary Statistics						
	Significant Difference Between Areas?	p -value	Statistical Analysis ^a	Lake	N	Mean (n = 5)	Standard Deviation	Standard Error	Minimum	Maximum
Secchi Depth (m)	Yes	0.001	α , δ , γ	Reference	5	8.88	0.71	0.32	8.10	10.00
				Mary	6	3.46	0.46	0.19	2.86	3.99
Temperature (°C)	No	0.931	γ	Reference	5	9.92	0.37	0.17	9.50	10.40
				Mary	6	10.17	1.25	0.51	9.23	12.63
Dissolved Oxygen (mg/L)	No	0.769	α , δ , γ	Reference	5	10.3	0.8	0.4	9.3	11.3
				Mary	6	10.1	1.6	0.7	7.8	11.7
Dissolved Oxygen (% saturation)	No	0.734	α , δ , γ	Reference	5	91.3	6.7	3.0	82.6	99.1
				Mary	6	88.8	15.0	6.1	63.7	102.5
pH (units)	No	0.640	α , δ , γ	Reference	5	7.64	0.23	0.10	7.28	7.86
				Mary	6	7.56	0.31	0.13	7.19	7.94
Specific Conductance (umho/cm)	No	0.429	γ	Reference	5	74.0	0.0	0.0	74.0	74.0
				Mary	6	80.7	19.6	8.0	69.0	120.0

^a Data analysis included: α - data untransformed; β - data logit transformed; η - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ϵ - t-test assuming unequal variance; γ - ANOVA test validated using Kruskal Wallis H-test or Mann Whitney U-test, as appropriate.

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

Table C.58: Water chemistry at Mary Lake north basin (BLO-01) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Winter Sampling Event					Spring	Summer Sampling Event						Fall Sampling Event							
					BL0-01-A(S)	BL0-01-A(B)	BL0-01 (S)	BL0-01 (B)	BL0-01-B	I0-01	I0-01	BL0-01-A-S	BL0-01-A-B	BL0-01-S	BL0-01-B	BL0-01-B-S	BL0-01-B-B	I0-01	BL0-01A-S	BL0-01A-B	BL0-01-S	BL0-01-B	BL0-01B-S	BL0-01B-B
					surface	bottom	surface	bottom	surface	river	river	surface	bottom	surface	bottom	surface	bottom	river	surface	bottom	surface	bottom	surface	bottom
					25-Apr-2016	25-Apr-2016	1-May-2016	1-May-2016	25-Apr-2016	25-Jun-2016	20-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	19-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016
Conventional	Conductivity (lab)	umho/cm	-	-	222	220	231	227	231	27.9	85.4	90.4	96.2	86.9	90.7	91.0	93	194	158	166	160	164	159	156
	pH (lab)	pH	6.5 - 9.0	-	7.85	7.31	8.08	8.13	7.86	7.45	7.86	7.89	7.93	7.88	7.91	7.94	7.89	8.24	8.17	8.12	8.12	8.13	8.14	8.17
	Hardness (as CaCO ₃)	mg/L	-	-	110	107	116	109	113	13	43	43	46	41	44	44	45	95	76	81	76	79	77	73
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	2.8	<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	-	-	147	147	130	131	152	13	47700	49	52	45	49	47	48	98	86	93	85	83	82	80
	Turbidity	NTU	-	-	0.22	0.81	0.48	0.34	0.27	3.88	1.70	0.94	0.94	0.99	1.00	0.88	5.06	0.44	1.48	1.12	1.24	1.19	1.31	1.71
	Alkalinity (as CaCO ₃)	mg/L	-	-	112	109	112	106	110	12	42	46	46	45	49	44	50	94	77	79	77	82	79	78
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	0.064	<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	<0.020	0.043	0.071	<0.020	<0.020
	Nitrate	mg/L	13	13	0.071	0.164	0.070	0.068	0.068	<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	<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	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	3.7	3.2	4.1	4.0	4.0	1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.7	1.8	1.7	1.8	1.7	1.8	1.9
	Total Organic Carbon	mg/L	-	-	2.5	2.4	2.6	2.5	2.6	1.1	1.5	1.0	<1.0	<1.0	1.0	1.0	1.1	1.8	2.1	1.9	1.8	1.8	1.9	1.8
	Total Phosphorus	mg/L	0.020 ^d	-	0.0039	0.0050	0.0033	<0.0030	0.0041	0.0062	<0.0030	0.0061	0.0050	0.0046	0.0044	0.0052	0.0055	<0.0030	<0.0030	0.0035	0.0035	0.0041	0.0030	0.0037
Phenols	mg/L	0.004 ^d	-	0.0013	<0.0010	0.0018	0.0019	0.0018	0.0027	0.0016	0.0010	0.0044	0.0019	0.0023	0.0016	0.0034	0.0041	0.0028	0.0028	0.0018	0.0018	0.0023	0.0024	
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
	Chloride (Cl)	mg/L	120	120	5.84	5.61	5.97	5.78	5.93	0.69	1.08	1.17	1.13	1.16	1.16	1.17	1.20	5.51	3.18	3.76	3.24	3.54	3.21	3.06
	Sulphate (SO ₄)	mg/L	218 [ⓑ]	218	2.74	2.14	2.82	2.71	2.77	<0.30	0.52	0.55	0.59	0.54	0.56	0.58	0.63	1.95	1.36	1.50	1.39	1.45	1.37	1.32
Total Metals	Aluminum (Al)	mg/L	0.100	0.13	0.0036	0.0036	<0.0030	<0.0030	0.0041	0.0923	0.0629	0.0321	0.0395	0.0330	0.0403	0.0387	0.0323	0.0104	0.028	0.024	0.030	0.029	0.024	0.028
	Antimony (Sb)	mg/L	0.020 ^d	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00020	<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	<0.00010	<0.00010	<0.00010
	Barium (Ba)	mg/L	-	-	0.0103	0.00990	0.0113	0.0108	0.0107	0.00240	0.00487	0.00475	0.00530	0.00462	0.00522	0.00493	0.00529	0.00976	0.00764	0.00811	0.00774	0.00791	0.00817	0.00816
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000050	<0.000050	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)	mg/L	0.00012	0.00006	<0.000010	<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	-	-	21.4	21.5	22.8	22.2	23.0	2.71	8.62	9.05	9.59	8.24	9.19	9.19	9.3	18.9	15.1	16.0	15.3	15.5	16.0	14.9
	Chromium (Cr)	mg/L	0.0089	0.0089	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	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	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	<0.00010	<0.00010	<0.00010
	Copper (Cu)	mg/L	0.002	0.0024	0.00126	0.00082	0.00118	0.00117	0.00118	<0.00050	0.00053	0.00060	0.00063	0.00056	0.00065	0.00058	0.00059	0.00099	<0.0010	<0.0010	0.0011	0.0010	0.0011	0.0010
	Iron (Fe)	mg/L	0.30	0.326	<0.030	0.076	<0.030	<0.030	<0.030	0.096	0.038	0.030	0.041	0.032	0.033	0.031	0.033	<0.030	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Lead (Pb)	mg/L	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000130	<0.000050	<0.000050	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Lithium (Li)	mg/L	-	-	<0.0010	<0.0010	0.0012	0.0012	0.0011	<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	<0.0010
	Magnesium (Mg)	mg/L	-	-	13.4	12.8	13.7	13.2	13.8	1.61	5.15	5.38	6.00	5.13	5.38	5.66	5.62	11.4	8.51	8.92	8.57	8.73	8.66	8.39
	Manganese (Mn)	mg/L	0.935 [ⓑ]	-	0.00134	0.0293	0.00187	0.00219	0.00223	0.00363	0.000636	0.00306	0.00264	0.00260	0.00263	0.00242	0.002315	0.000319	0.00452	0.00561	0.00465	0.00574	0.00482	0.00470
	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	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.000345	0.000250	0.000329	0.000309	0.000344	<0.000050	0.000091	0.000097	0.000098	0.000088	0.000109	0.000107	0.000098	0.000238	0.000219	0.000217	0.000209	0.000227	0.000217	0.000205
	Nickel (Ni)	mg/L	0.025	0.025	0.00204	0.00139	0.00064	0.00061	0.00153	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00053	<0.00050	0.00052	0.00055	0.00056	0.00054
	Potassium (K)	mg/L	-	-	1.25	1.16	1.27	1.21	1.30	0.29	0.55	0.56	0.58	0.54	0.59	0.59	0.57	1.04	0.862	0.898	0.882	0.886	0.887	0.857
	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	<0.0010	<0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Silicon (Si)	mg/L	-	-	1.01	1.80	1.13	1.13	1.09	0.42	0.74	0.62	0.66	0.59	0.64	0.63	0.65	0.86	0.812	0.805	0.822	0.800	0.843	0.831
	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	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)	mg/L	-	-	3.26	3.05	3.26	3.14	3.30	0.405	0.933	0.954	0.962	0.921	0.970	0.973	0.96	3.20	1.93	2.12	1.97	2.03	1.97	1.90
	Strontium (Sr)	mg/L	-	-	0.0149	0.0141	0.0152	0.0146	0.0156	0.00200	0.00559	0.00595	0.00623	0.00552	0.00603	0.00604	0.0061	0.0130	0.0109	0.0112	0.0109	0.0112	0.0112	0.0108
	Thallium (Tl)	mg/L	0.0008	0.0008	<0.00010	<0.00010	<0.00010	<0.00010	<															

^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.59: Water chemistry at Mary Lake south basin (BLO) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Summer Sampling Event													
					BL0-05-A-S surface	BL0-05-A-B bottom	BL0-05-S surface	BL0-05-B bottom	BL0-05-B-S surface	BL0-05-B-B bottom	BL0-03-S surface	BL0-03-B bottom	BL0-04-S surface	BL0-04-B bottom	BL0-09-S surface	BL0-09-B bottom	BL0-06-S surface	BL0-06-B bottom
					30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	29-Jul-2016	29-Jul-2016
Conventionals	Conductivity (lab)	umho/cm	-	-	68.1	55.8	61.8	56.5	55.9	55.3	55.4	54.1	60.5	55.1	56.1	51.5	53.5	52.4
	pH (lab)	pH	6.5 - 9.0	-	7.82	7.75	7.74	7.58	7.71	7.73	7.74	7.70	7.69	7.68	7.74	7.64	7.80	7.73
	Hardness (as CaCO ₃)	mg/L	-	-	31	27	29	25	26	26	25	25	27	25	25	24	24	24
	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
	Total Dissolved Solids (TDS)	mg/L	-	-	41	35	44	34	40	37	32	33	40	29	37	37	49	37
	Turbidity	NTU	-	-	2.09	2.01	1.30	1.55	1.32	1.22	0.94	0.97	1.33	2.07	1.12	1.76	1.86	1.78
	Alkalinity (as CaCO ₃)	mg/L	-	-	29	22	25	23	18	24	23	26	28	24	24	22	20	25
Nutrients and Organics	Total Ammonia	mg/L	variable ^c	0.855	<0.020	0.033	<0.020	<0.020	0.034	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.044	0.021
	Nitrate	mg/L	13	13	<0.020	<0.020	<0.020	<0.020	0.024	<0.020	<0.020	0.023	<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	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.1	1.7	1.8	1.9	1.8	1.7	1.9	1.8	1.1	1.1	1.0	1.9	1.2	1.8
	Total Organic Carbon	mg/L	-	-	2.4	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.9	1.5	1.4	1.5	1.2	1.2
	Total Phosphorus	mg/L	0.020 ^d	-	0.0060	0.0055	0.0045	0.0056	0.0257	0.0082	0.0079	0.0044	0.0064	0.0059	0.0118	0.0068	0.0056	0.0055
Anions	Phenols	mg/L	0.004 ^d	-	0.0015	0.0017	0.0020	0.0026	0.0050	0.0032	0.0012	0.0016	0.0013	0.0013	0.0062	0.0018	0.0014	0.0016
	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	1.35	1.18	1.26	1.20	1.19	1.19	1.11	1.35	1.24	1.19	1.22	1.26	1.25	1.19
	Sulphate (SO ₄)	mg/L	218 ^β	218	0.95	0.66	0.79	0.64	0.67	0.65	0.50	0.58	0.75	0.66	0.67	0.60	0.67	0.63
Total Metals	Aluminum (Al)	mg/L	0.100	0.13	0.0482	0.0531	0.0369	0.0468	0.0390	0.0521	0.0123	0.149	0.0388	0.0533	0.0413	0.0417	0.0419	0.0387
	Antimony (Sb)	mg/L	0.020 ^d	-	<0.00010	<0.00010	<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	-	-	0.00444	0.00379	0.00401	0.00366	0.00356	0.00377	0.00306	0.00348	0.00374	0.00397	0.00345	0.00350	0.00327	0.00362
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<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	-	-	6.48	5.47	6.01	5.24	5.31	5.40	5.34	5.45	5.73	5.23	5.40	4.97	4.98	5.00
	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	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	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
	Copper (Cu)	mg/L	0.002	0.0024	0.00067	0.00069	0.00063	0.00058	0.00052	0.00061	<0.00050	0.00097	0.00057	0.00054	0.00052	0.00051	0.00051	0.00053
	Iron (Fe)	mg/L	0.30	0.326	0.044	0.046	0.037	0.046	0.041	0.043	<0.030	<0.030	0.038	0.058	0.040	0.044	0.042	0.043
	Lead (Pb)	mg/L	0.001	0.001	0.000066	0.000060	0.000052	0.000067	0.000052	0.000054	<0.000050	0.000070	0.000051	0.000077	0.000051	0.000060	0.000054	0.000065
	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	-	-	3.81	3.09	3.42	2.90	3.03	3.02	3.08	2.99	3.25	3.09	3.05	2.87	2.88	2.90
	Manganese (Mn)	mg/L	0.935 ^β	-	0.00230	0.00277	0.00222	0.00266	0.00228	0.00239	0.00195	0.00283	0.00224	0.00308	0.00214	0.00306	0.00258	0.00267
	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	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.000123	0.000096	0.000113	0.000081	0.000094	0.000093	0.000077	0.000086	0.000098	0.000082	0.000093	0.000079	0.000090	0.000081
	Nickel (Ni)	mg/L	0.025	0.025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00067	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	-	-	0.60	0.49	0.53	0.45	0.48	0.47	0.44	0.44	0.50	0.49	0.47	0.45	0.46	0.46
	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	<0.0010	<0.0010
	Silicon (Si)	mg/L	-	-	0.51	0.44	0.45	0.45	0.44	0.42	0.33	0.38	0.47	0.47	0.43	0.44	0.40	0.40
	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	-	-	0.954	0.800	0.861	0.747	0.778	0.776	0.728	0.763	0.810	0.786	0.770	0.764	0.747	0.753
	Strontium (Sr)	mg/L	-	-	0.00565	0.00462	0.00497	0.00427	0.00439	0.00428	0.00401	0.00413	0.00475	0.00427	0.00440	0.00402	0.00409	0.00398
	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	-	-	<0.010	<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	0.015	-	0.000557	0.000368	0.000444	0.000313	0.000341	0.000337	0.000270	0.000284	0.000390	0.000330	0.000338	0.000285	0.000292	0.000287
	Vanadium (V)	mg/L	0.006 ^d	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.

 Indicates parameter concentration above the AEMP benchmark.

Table C.59: Water chemistry at Mary Lake south basin (BLO) water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Water Quality Guideline (WQG) ^a	AEMP Benchmark ^b	Fall Sampling Event													
					BL0-05-A-S surface	BL0-05-A-B bottom	BL0-05-S surface	BL0-05-B bottom	BL0-05-B-S surface	BL0-05-B-B bottom	BL0-03-S surface	BL0-03-B bottom	BL0-04 surface	BL0-04-B bottom	BL0-09-S surface	BL0-09-B bottom	BL0-06-S surface	BL0-06-B bottom
					23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	24-Aug-2016	24-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016
Conventionals	Conductivity (lab)	umho/cm	-	-	84.0	87.2	79.6	56.4	81.7	78.3	76.4	64.1	76	82.7	75.8	54.8	77.1	76.7
	pH (lab)	pH	6.5 - 9.0	-	7.79	7.85	7.85	7.68	7.65	7.77	7.83	7.72	7.87	7.84	7.84	7.60	7.83	7.82
	Hardness (as CaCO ₃)	mg/L	-	-	39	41	37	26	37	37	36	30	35	37	35	26	36	36
	Total Suspended Solids (TSS)	mg/L	-	-	<2.0	2.5	<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	-	-	46	43	41	25	41	39	42	35	41	43	36	25	39	36
	Turbidity	NTU	-	-	1.69	1.80	1.55	1.67	1.71	1.88	0.79	0.52	1.65	3.12	1.41	1.23	1.70	2.27
	Alkalinity (as CaCO ₃)	mg/L	-	-	38	38	33	24	39	37	32	34	33	37	35	21	33	35
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	0.021	<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	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
	Dissolved Organic Carbon	mg/L	-	-	1.2	1.2	1.3	<1.0	1.2	1.2	1.4	1.2	1.3	1.2	1.2	1.1	1.2	1.2
	Total Organic Carbon	mg/L	-	-	1.3	1.4	1.4	1.1	1.3	1.3	1.5	1.2	1.3	1.6	1.4	1.2	1.4	1.3
	Total Phosphorus	mg/L	0.020 ^d	-	0.0062	0.0072	0.0067	0.0080	0.0155	0.0054	0.0063	0.0065	0.0066	0.0061	0.0092	0.0061	0.0049	0.0059
	Phenols	mg/L	0.004 ^d	-	0.0030	0.0187	0.0036	0.0038	0.0089	0.0075	0.0045	0.0014	0.0034	0.0088	0.0165	0.0021	0.0134	0.0024
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	1.85	1.97	1.58	1.25	1.61	1.58	1.30	1.27	1.41	1.80	1.42	1.29	1.48	1.52
	Sulphate (SO ₄)	mg/L	218 ^β	218	1.29	1.37	1.12	0.68	1.12	1.12	0.94	0.74	1.01	1.37	0.96	0.66	1.08	1.14
Total Metals	Aluminum (Al)	mg/L	0.100	0.13	0.0763	0.0801	0.0663	0.0496	0.0670	0.0621	0.0264	0.0200	0.0513	0.0599	0.0552	0.0440	0.0627	0.0560
	Antimony (Sb)	mg/L	0.020 ^d	-	<0.00010	<0.00010	<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	-	-	0.00571	0.00553	0.00499	0.00395	0.00525	0.00540	0.00416	0.00342	0.00463	0.00527	0.00448	0.00353	0.00473	0.00483
	Beryllium (Be)	mg/L	0.011 ^d	-	<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	<0.000010	<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	-	-	8.17	8.31	7.58	5.37	7.70	7.56	7.29	6.07	7.2	7.79	7.27	5.25	7.34	7.18
	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	<0.00050	<0.00050
	Cobalt (Co)	mg/L	0.0009 ^d	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
	Copper (Cu)	mg/L	0.002	0.0024	0.00067	0.00069	0.00075	0.00053	0.00065	0.00076	0.00056	<0.00050	0.00150	0.0438*	0.00398*	0.0271*	0.00284*	0.0115*
	Iron (Fe)	mg/L	0.30	0.326	0.053	0.058	0.049	0.047	0.048	0.055	<0.030	<0.030	0.042	0.058	0.039	0.039	0.048	0.055
	Lead (Pb)	mg/L	0.001	0.001	0.000068	0.000066	0.000053	0.000067	0.000057	0.000067	<0.000050	<0.000050	0.000051	0.000084	<0.000050	0.000061	0.000060	0.000075
	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	-	-	4.73	4.89	4.52	3.17	4.49	4.40	4.26	3.64	4.33	4.51	4.30	3.08	4.31	4.35
	Manganese (Mn)	mg/L	0.935 ^β	-	0.00158	0.00157	0.00126	0.00445	0.00125	0.00155	0.00105	0.00125	0.00113	0.00213	0.00110	0.00167	0.00129	0.00180
	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	<0.000010	<0.000010
	Molybdenum (Mo)	mg/L	0.073	-	0.000164	0.000165	0.000137	0.000093	0.000137	0.000141	0.000104	0.000083	0.000137	0.000148	0.000131	0.000087	0.000141	0.000126
	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	<0.00050
	Potassium (K)	mg/L	-	-	0.67	0.68	0.64	0.50	0.63	0.63	0.53	0.49	0.60	0.66	0.59	0.49	0.61	0.62
	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	<0.0010	<0.0010
	Silicon (Si)	mg/L	-	-	0.67	0.68	0.62	0.52	0.64	0.63	0.61	0.47	0.60	0.65	0.57	0.48	0.61	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	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)	mg/L	-	-	1.21	1.27	1.11	0.819	1.09	1.13	0.927	0.844	1.02	1.17	0.999	0.806	1.03	1.07
	Strontium (Sr)	mg/L	-	-	0.00697	0.00721	0.00644	0.00442	0.00640	0.00632	0.00545	0.00456	0.0059	0.00676	0.00587	0.00436	0.00612	0.00609
	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	-	-	<0.010	<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	0.015	-	0.000815	0.000882	0.000695	0.000305	0.000699	0.000674	0.000505	0.000357	0.000579	0.000783	0.000570	0.000315	0.000608	0.000657
	Vanadium (V)	mg/L	0.006 ^d	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.60: Dissolved metal concentrations at Mary Lake north basin water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Winter Sampling Event					Spring Sampling	Summer Sampling Event								Fall Sampling Event						
			BL0-01-A (S) surface	BL0-01-A (B) bottom	BL0-01 (S) surface	BL0-01 (B) bottom	BL0-01-B surface	I0-01 river	I0-01 river	BL0-01-A-S surface	BL0-01-A-B bottom	BL0-01-S surface	BL0-01-B bottom	BL0-01-B-S surface	BL0-01-B-B bottom	I0-01 river	BL0-01A-S surface	BL0-01A-B bottom	BL0-01-S surface	BL0-01-B bottom	BL0-01B-S surface	BL0-01B-B bottom	
			25-Apr-2016	25-Apr-2016	1-May-2016	1-May-2016	25-Apr-2016	25-Jun-2016	20-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	26-Jul-2016	19-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016	21-Aug-2016
Dissolved Metals	Aluminum (Al)	mg/L	<0.0030	<0.0030	0.00218	0.00208	<0.0030	0.0075	0.0068	0.0045	0.0054	0.0055	0.0053	0.0046	0.00505	0.0035	0.0048	0.0047	0.0045	0.0047	0.0052	0.0055	
	Antimony (Sb)	mg/L	<0.00010	<0.00010	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<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	0.000080	0.000071	<0.00010	<0.00010	<0.00010	<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	0.0103	0.00947	0.0119	0.0109	0.0105	0.00166	0.00459	0.00454	0.00495	0.00434	0.00473	0.00462	0.00495	0.00976	0.00785	0.00809	0.00801	0.00824	0.00833	0.00803	
	Beryllium (Be)	mg/L	<0.00050	<0.00050	<0.000010	<0.000010	<0.00050	<0.00010	<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	<0.0000050	<0.0000050	<0.00050	<0.000050	<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	<0.0050	<0.0050	<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	<0.0000050	<0.0000050	<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	22.2	21.7	23.1	21.9	22.7	2.54	8.66	8.73	9.42	8.39	8.88	8.99	9.1	19.7	15.4	16.9	15.4	16.3	15.6	14.7	
	Chromium (Cr)	mg/L	<0.00050	<0.00050	<0.00010	<0.00010	<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	0.0000156	0.0000129	<0.00010	<0.00010	<0.00010	<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	0.00122	0.00081	0.00118	0.00079	0.00116	0.00043	<0.00050	0.00056	0.00055	0.00053	0.00057	0.00057	0.00056	0.00097	0.00090	0.00091	0.00102	0.00100	0.00090	0.00097	
	Iron (Fe)	mg/L	<0.030	<0.030	0.0083	0.0067	<0.030	<0.010	<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	<0.0000090	<0.0000090	<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	<0.0010	0.00108	0.00103	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0013	0.0011	0.0011	0.0011		
	Magnesium (Mg)	mg/L	13.2	12.8	14.1	13.3	13.6	1.55	5.08	5.26	5.49	4.99	5.28	5.34	5.40	11.2	9.13	9.50	9.13	9.30	9.16	8.78	
	Manganese (Mn)	mg/L	0.000765	0.000630	0.00114	0.00119	0.00143	0.00092	0.000201	0.00120	0.00109	0.00110	0.00112	0.00112	0.00114	0.000394	0.00223	0.00300	0.00228	0.00255	0.00254	0.00233	
	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		
	Molybdenum (Mo)	mg/L	0.000395	0.000254	0.000314	0.000306	0.000345	<0.000050	0.000090	0.000101	0.000094	0.000099	0.000100	0.000100	0.000102	0.000241	0.000195	0.000215	0.000200	0.000202	0.000202	0.000201	
	Nickel (Ni)	mg/L	0.00125	0.00110	0.000716	0.000604	0.00106	<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	1.23	1.14	1.30	1.22	1.28	0.24	0.51	0.58	0.56	0.56	0.57	0.57	0.57	1.04	0.90	0.92	0.89	0.91	0.90	0.88	
	Selenium (Se)	mg/L	<0.0010	<0.0010	<0.000040	<0.000040	<0.0010	<0.000050	<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	1.03	1.79	1.12	1.10	1.10	0.233	0.62	0.55	0.59	0.52	0.57	0.56	0.57	0.86	0.85	0.86	0.86	0.85	0.87	0.83	
	Silver (Ag)	mg/L	<0.000010	<0.000010	<0.0000050	<0.0000050	<0.000010	<0.000050	<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	3.23	3.06	3.41	3.18	3.26	<0.50	0.921	0.963	0.939	0.930	0.952	0.960	0.97	3.02	2.16	2.27	2.07	2.24	2.09	2.09	
	Strontium (Sr)	mg/L	0.0150	0.0142	0.0155	0.0148	0.0155	0.0017	0.00552	0.00577	0.00627	0.00573	0.00601	0.00597	0.0060	0.0130	0.0108	0.0117	0.0109	0.0112	0.0109	0.0104	
	Thallium (Tl)	mg/L	<0.00010	<0.00010	0.0000038	0.0000034	<0.00010	<0.000010	<0.00010	<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	0.00012	<0.00010	<0.000030	<0.000030	<0.00010	<0.00010	<0.00010	<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	<0.00050	<0.00050	<0.010	<0.00030	<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	0.00267	0.00192	0.00268	0.00258	0.00265	0.000056	0.000499	0.000500	0.000623	0.000433	0.000512	0.000543	0.000553	0.00245	0.00157	0.00176	0.00156	0.00169	0.00153	0.00154		
Vanadium (V)	mg/L	<0.0010	<0.0010	0.000095	0.000086	<0.0010	<0.00050	<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	0.00112	0.00198	<0.0030	<0.0010	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0033	<0.0030		

Table C.61: Dissolved metal concentrations at Mary Lake south basin water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Winter Sampling Event														Summer Sampling Event						
			BL0-05-A-S surface 1-May-2016	BL0-05-A-B bottom 1-May-2016	BL0-05-S surface 1-May-2016	BL0-05-B bottom 1-May-2016	BL0-05-B-S surface 1-May-2016	BL0-05-B-B bottom 1-May-2016	BL0-03-S surface 6-May-2016	BL0-03-B bottom 6-May-2016	BL0-04-S surface 6-May-2016	BL0-04-B bottom 6-May-2016	BL0-09-S surface 6-May-2016	BL0-09-B bottom 6-May-2016	BL0-06-S surface 6-May-2016	BL0-06-B bottom 6-May-2016	BL0-05-A-S surface 30-Jul-2016	BL0-05-A-B bottom 30-Jul-2016	BL0-05-S surface 30-Jul-2016	BL0-05-B bottom 30-Jul-2016	BL0-05-B-S surface 30-Jul-2016	BL0-05-B-B bottom 30-Jul-2016	BL0-03-S surface 30-Jul-2016
Dissolved Metals	Aluminum (Al)	mg/L	0.00243	0.00197	0.00216	0.00230	0.00276	0.00241	<0.0030	<0.0030	0.0119	<0.0030	<0.0030	0.0033	<0.0030	0.0032	0.0081	0.0070	0.0086	0.0064	0.0066	0.0064	0.0051
	Antimony (Sb)	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00010	<0.00010	<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	0.000045	0.000039	0.000043	0.000047	0.000051	0.000045	<0.00010	<0.00010	<0.00010	<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	0.00493	0.00452	0.00509	0.00499	0.00552	0.00541	0.00494	0.00412	0.00543	0.00450	0.00495	0.00476	0.00510	0.00498	0.00408	0.00371	0.00372	0.00341	0.00322	0.00350	0.00294
	Beryllium (Be)	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<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	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<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	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<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	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000010	<0.000010	0.000014	<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	8.77	8.34	9.05	8.11	9.56	9.36	9.30	8.00	10.2	8.18	8.99	8.5	9.19	8.88	6.30	5.64	5.95	5.17	5.31	5.27	5.27
	Chromium (Cr)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<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	<0.0000050	0.0000055	0.0000065	0.0000085	0.0000072	0.0000064	<0.00010	<0.00010	<0.00010	<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	0.00064	0.00068	0.00067	0.00084	0.00066	0.00075	0.00087	0.00054	0.00202	0.00065	0.00067	0.00071	0.00069	0.00066	0.00058	0.00053	0.00060	<0.00050	0.00051	<0.00050	<0.00050
	Iron (Fe)	mg/L	0.0028	0.0022	0.0025	0.0029	0.0038	0.0038	<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	<0.0000090	<0.0000090	<0.0000090	0.0000135	<0.0000090	0.0000090	<0.000050	<0.000050	0.000063	<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	0.00061	0.00059	0.00057	<0.00050	0.00056	0.00058	<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	5.29	4.92	5.29	4.80	5.65	5.47	5.23	4.73	5.24	4.75	5.28	4.96	5.47	5.13	3.71	3.08	3.41	2.90	3.01	3.00	2.99
	Manganese (Mn)	mg/L	0.000216	0.000169	0.000207	0.000364	0.000294	0.000481	0.000355	0.000187	0.00125	0.000190	0.000189	0.00022	0.000247	0.000214	0.000478	0.000551	0.000480	0.000809	0.000524	0.000489	0.000333
	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	0.000173	0.000167	0.000163	0.000151	0.000188	0.000179	0.000154	0.000137	0.000195	0.000145	0.000159	0.000151	0.000175	0.000160	0.000147	0.000114	0.000123	0.000094	0.000106	0.000097	0.000081
	Nickel (Ni)	mg/L	0.000372	0.000382	0.000397	0.000368	0.000424	0.000591	<0.00050	<0.00050	0.00067	<0.00050	<0.00050	0.00056	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Potassium (K)	mg/L	0.691	0.623	0.680	0.608	0.731	0.702	0.69	0.61	0.76	0.63	0.69	0.65	0.72	0.67	0.56	0.47	0.52	0.44	0.46	0.44	0.42
	Selenium (Se)	mg/L	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<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	0.345	0.344	0.383	0.394	0.373	0.37	0.35	0.36	0.34	0.36	0.49	0.37	0.35	0.44	0.36	0.40	0.36	0.36	0.36	0.31
	Silver (Ag)	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<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	1.25	1.14	1.26	1.15	1.34	1.29	1.24	1.09	1.47	1.13	1.23	1.20	1.27	1.21	0.949	0.802	0.886	0.758	0.775	0.766	0.710
	Strontium (Sr)	mg/L	0.00698	0.00653	0.00718	0.00641	0.00758	0.00718	0.00706	0.00618	0.00784	0.00644	0.00706	0.0066	0.00732	0.00699	0.00552	0.00447	0.00495	0.00424	0.00433	0.00432	0.00388
	Thallium (Tl)	mg/L	0.0000023	<0.0000020	0.0000023	<0.0000020	0.0000021	0.0000024	<0.00010	<0.00010	<0.00010	<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	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.00010	<0.00010	0.00035	<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	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<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	0.000731	0.000699	0.000743	0.000612	0.000768	0.000742	0.000647	0.000612	0.000677	0.000610	0.000707	0.000607	0.000716	0.000690	0.000541	0.000359	0.000428	0.000287	0.000321	0.000315	0.000273
	Vanadium (V)	mg/L	0.000080	0.000074	0.000062	0.000064	0.000088	0.000077	<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	0.00055	0.00064	0.00098	0.00091	0.00101	0.00095	<0.0030	<0.0030	0.0081	<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.61: Dissolved metal concentrations at Mary Lake south basin water quality monitoring stations, Mary River Project CREMP, 2016.

Parameters		Units	Summer Sampling Event							Fall Sampling Event															
			BL0-03-B	BL0-04-S	BL0-04-B	BL0-09-S	BL0-09-B	BL0-06-S	BL0-06-B	BL0-05-A-S	BL0-05-A-B	BL0-05-S	BL0-05-B	BL0-05-B-S	BL0-05-B-B	BL0-03-S	BL0-03-B	BL0-04	BL0-04-B	BL0-09-S	BL0-09-B	BL0-06-S	BL0-06-B		
			bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom	surface	bottom
			30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	30-Jul-2016	29-Jul-2016	29-Jul-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	24-Aug-2016	24-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	23-Aug-2016	
Dissolved Metals	Aluminum (Al)	mg/L	0.0056	0.0083	0.0084	0.0081	0.0065	0.0062	0.0057	0.0763	0.0801	0.0663	0.0496	0.0670	0.0621	0.0264	0.0200	0.0513	0.0599	0.0552	0.0440	0.0627	0.0560		
	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	0.00322	0.00341	0.00376	0.00323	0.00313	0.00329	0.00337	0.00571	0.00553	0.00499	0.00395	0.00525	0.00540	0.00416	0.00342	0.00463	0.00527	0.00448	0.00353	0.00473	0.00483		
	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	5.11	5.53	5.21	5.12	4.94	4.98	5.01	8.17	8.31	7.58	5.37	7.70	7.56	7.29	6.07	7.2	7.79	7.27	5.25	7.34	7.18		
	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	<0.00050	<0.00050	0.00084	<0.00050	<0.00050	<0.00050	<0.00050	0.00067	0.00069	0.00075	0.00053	0.00065	0.00076	0.00056	<0.00050	0.00150	0.0438	0.00398	0.0271	0.00284	0.0115		
	Iron (Fe)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.053	0.058	0.049	0.047	0.048	0.055	<0.030	<0.030	0.042	0.058	0.039	0.039	0.048	0.055		
	Lead (Pb)	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000068	0.000066	0.000053	0.000067	0.000057	0.000067	<0.000050	<0.000050	0.000051	0.000084	<0.000050	0.000061	0.000060	0.000075		
	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	2.94	3.20	2.88	3.00	2.82	2.83	2.81	4.73	4.89	4.52	3.17	4.49	4.40	4.26	3.64	4.33	4.51	4.30	3.08	4.31	4.35		
	Manganese (Mn)	mg/L	0.000507	0.000420	0.00117	0.000480	0.000938	0.000738	0.000743	0.00158	0.00157	0.00126	0.00445	0.00125	0.00155	0.00105	0.00125	0.00113	0.00213	0.00110	0.00167	0.00129	0.00180		
	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	0.000078	0.000091	0.000103	0.000100	0.000080	0.000087	0.000087	0.000164	0.000165	0.000137	0.000093	0.000137	0.000141	0.000104	0.000083	0.000137	0.000148	0.000131	0.000087	0.000141	0.000126		
	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	0.42	0.48	0.46	0.46	0.43	0.43	0.43	0.67	0.68	0.64	0.50	0.63	0.63	0.53	0.49	0.60	0.66	0.59	0.49	0.61	0.62		
	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	0.34	0.39	0.37	0.36	0.35	0.34	0.34	0.67	0.68	0.62	0.52	0.64	0.63	0.61	0.47	0.60	0.65	0.57	0.48	0.61	0.62		
	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	0.758	0.804	0.763	0.770	0.762	0.741	0.728	1.21	1.27	1.11	0.819	1.09	1.13	0.927	0.844	1.02	1.17	0.999	0.806	1.03	1.07		
	Strontium (Sr)	mg/L	0.00382	0.00469	0.00424	0.00427	0.00400	0.00408	0.00398	0.00697	0.00721	0.00644	0.00442	0.00640	0.00632	0.00545	0.00456	0.0059	0.00676	0.00587	0.00436	0.00612	0.00609		
	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	0.000271	0.000345	0.000294	0.000320	0.000257	0.000272	0.000272	0.000815	0.000882	0.000695	0.000305	0.000699	0.000674	0.000505	0.000357	0.000579	0.000783	0.000570	0.000315	0.000608	0.000657		
	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	0.0040	<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	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030		

Table C.62: Summary of the magnitude of difference in aqueous metal concentrations between Mary Lake and Reference Lake 3 in 2016, and at Mary Lake between 2016 and the baseline period for winter, summer, and fall sampling events, Mary River Project CREMP. No reference lake data were collected in winter 2016.

Variable	Mary Lake North Basin					Mary Lake South Basin				
	2016 vs Reference Lake 3		2016 vs Baseline			2016 vs Reference Lake 3		2016 vs Baseline		
	Summer	Fall	Winter	Summer	Fall	Summer	Fall	Winter	Summer	Fall
Conductivity (lab)	1.2	1.9	0.9	0.9	1.0	0.7	0.9	0.9	0.8	0.9
Hardness (as CaCO ₃)	1.2	2.2	0.9	0.8	0.9	0.7	1.0	1.0	0.8	0.9
Total Suspended Solids (TSS)	0.9	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.6	1.0
Total Dissolved Solids (TDS)	1.0	2.2	0.9	0.7	0.8	0.8	1.0	0.7	0.9	0.7
Turbidity	7.3	4.0	2.0	0.6	1.6	6.8	4.9	0.3	0.8	1.4
Alkalinity (as CaCO ₃)	1.4	2.4	1.0	0.9	1.0	0.7	1.0	0.9	0.7	0.9
Total Ammonia	1.0	0.8	0.3	0.2	0.2	1.2	0.5	0.2	0.3	0.3
Nitrate	1.0	1.0	0.8	0.2	0.2	1.0	1.0	0.3	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	0.7	0.5	0.6	0.8	1.0	1.1	0.9	0.9
Dissolved Organic Carbon	0.4	0.7	1.8	0.7	1.0	0.6	0.4	1.4	1.1	0.9
Total Organic Carbon	0.4	0.7	1.2	0.6	1.1	0.6	0.5	1.1	1.0	0.9
Total Phosphorus	0.9	0.4	0.5	0.6	0.5	1.5	0.7	1.0	1.4	1.2
Phenols	0.9	0.7	1.6	2.4	2.3	0.9	2.3	1.2	2.3	7.0
Bromide (Br)	1.0	1.0	0.5	0.5	0.7	1.0	1.0	0.9	0.4	0.4
Chloride (Cl)	0.9	2.6	0.7	0.7	0.8	0.9	1.2	0.6	0.5	0.5
Sulphate (SO ₄)	0.1	0.3	0.5	0.3	0.3	0.2	0.3	0.6	0.3	0.4
Aluminum (Al)	8.4	6.4	0.6	0.5	0.3	12	13	0.4	0.7	1.7
Antimony (Sb)	1.0	1.2	1.0	1.0	1.2	1.0	1.0	1.0	1.0	1.0
Arsenic (As)	1.0	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0	0.9
Barium (Ba)	0.8	1.2	0.9	0.7	0.9	0.6	0.7	1.0	0.8	0.9
Beryllium (Be)	1.0	0.2	1.5	1.5	0.2	1.0	1.0	1.1	1.5	2.0
Bismuth (Bi)	1.0	0.1	1.0	1.0	0.1	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	0.9	0.7	1.0	1.0	0.2	0.9	0.8
Calcium (Ca)	1.3	2.2	0.9	0.8	0.9	0.8	1.0	0.9	0.8	0.9
Chromium (Cr)	1.0	1.0	1.6	0.9	0.7	1.0	1.0	1.2	1.1	1.1
Cobalt (Co)	1.0	1.0	1.0	0.8	0.7	1.0	1.0	1.0	0.9	0.9
Copper (Cu)	0.8	1.3	0.9	0.6	0.4	0.8	0.9	0.9	0.7	0.9
Iron (Fe)	1.1	1.7	1.4	0.3	0.5	1.4	1.6	1.0	0.6	1.0
Lead (Pb)	1.0	2.0	0.9	0.7	1.4	1.2	1.2	0.9	0.7	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)	1.3	2.0	0.9	0.9	0.9	0.7	1.0	1.0	0.8	1.0
Manganese (Mn)	3.5	8.1	1.2	0.7	0.5	3.4	2.7	0.5	1.2	1.4
Mercury (Hg)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0
Molybdenum (Mo)	0.8	1.6	1.0	0.7	0.9	0.7	0.9	1.1	0.9	0.9
Nickel (Ni)	1.0	1.1	1.5	0.9	0.9	1.0	1.0	1.0	1.0	1.0
Potassium (K)	0.7	1.0	1.0	1.0	1.1	0.5	0.7	1.0	1.0	1.2
Selenium (Se)	1.0	0.1	2.8	2.4	0.1	1.0	1.0	1.2	1.4	1.9
Silicon (Si)	1.4	1.9	1.0	0.9	0.9	1.0	1.4	0.8	0.8	1.3
Silver (Ag)	1.0	5.0	1.6	1.8		1.0	1.0	1.2	1.9	2.3
Sodium (Na)	1.1	2.4	0.7	1.1	0.9	0.9	1.2	0.9	1.0	1.0
Strontium (Sr)	0.7	1.4	0.9	0.8	0.9	0.6	0.7	0.7	0.7	0.8
Thallium (Tl)	1.0	0.1	1.6	1.5	0.1	1.0	1.0	1.1	1.5	2.1
Tin (Sn)	1.0	1.0	0.1	0.0	0.0	1.0	1.0	0.2	0.1	0.1
Titanium (Ti)	1.0	0.1	1.0	1.0	0.1	1.0	1.0	1.0	1.0	1.0
Uranium (U)	2.2	5.8	0.8	0.7	0.7	1.4	2.2	0.9	0.7	0.9
Vanadium (V)	1.0	0.5	1.0	1.0	0.3	1.0	1.0	1.0	1.0	1.0
Zinc (Zn)	1.0	1.0	1.6	1.6	3.0	1.0	1.0	1.7	1.4	1.4

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

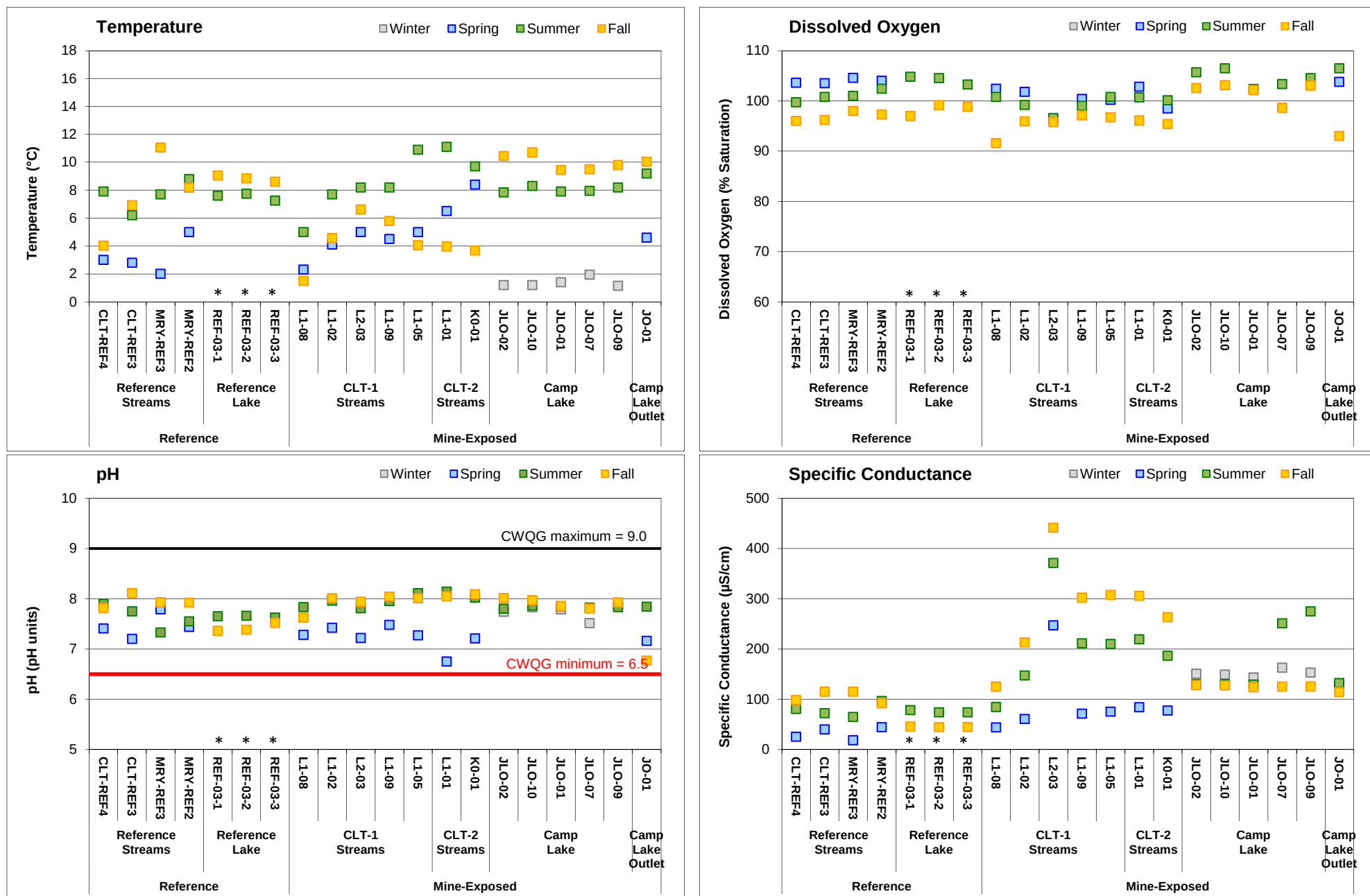


Figure C.1: Comparison of *in-situ* water quality variables measured at Camp Lake system water quality monitoring stations in winter, spring, summer, and fall 2016, Mary River Project CREMP. Lake values represent mean of surface and bottom *in-situ* water quality measurements. * Reference Lake 3 (REF-03) was not sampled in winter.



Figure C.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, 2016) periods in the fall. Values represent mean $\pm$ SD. Creek reference includes the CLT-REF and MRY-REF series stations (mean $\pm$ 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.

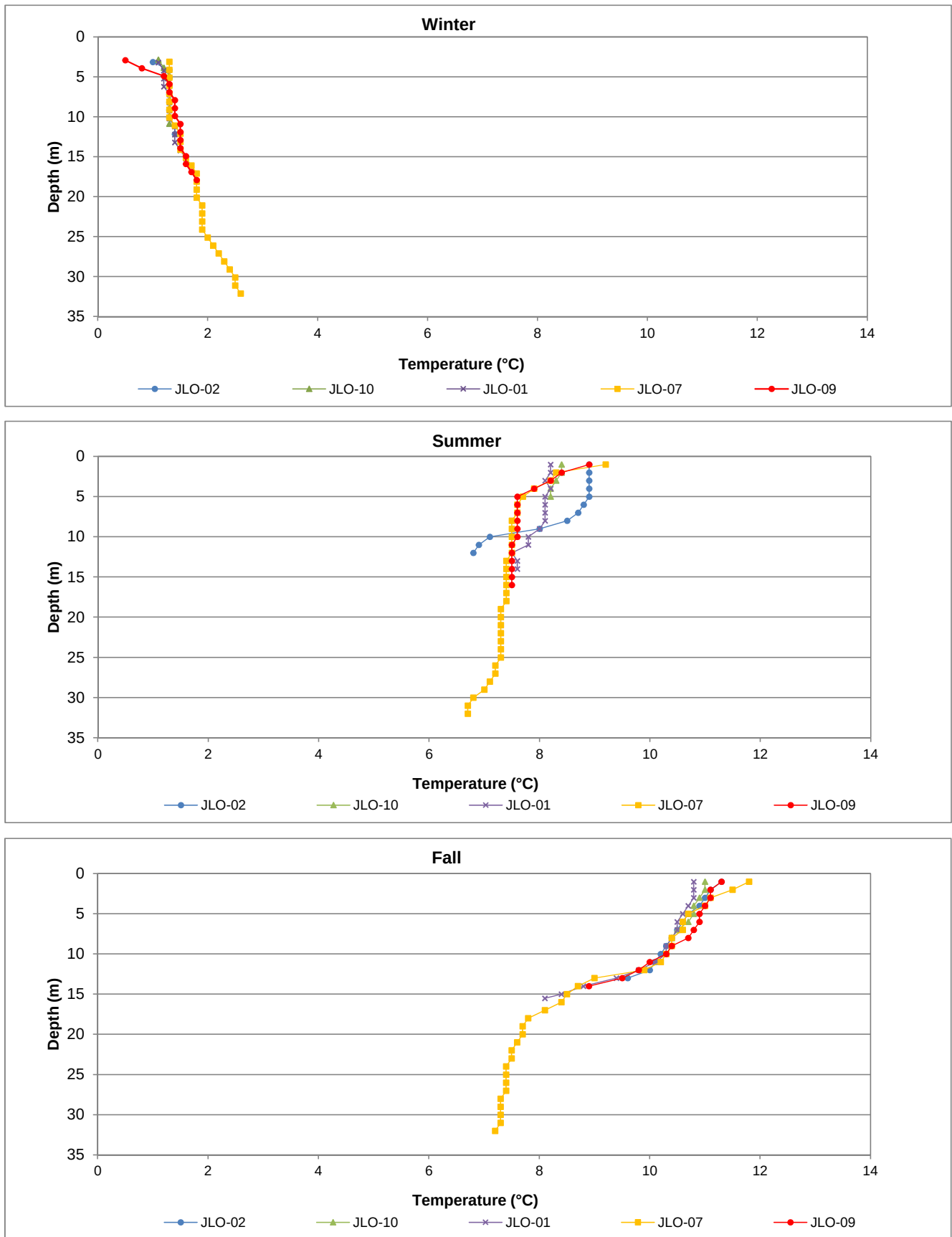


Figure C.3: Vertical profiles of temperature measured at Camp Lake in winter, summer and fall, 2016.

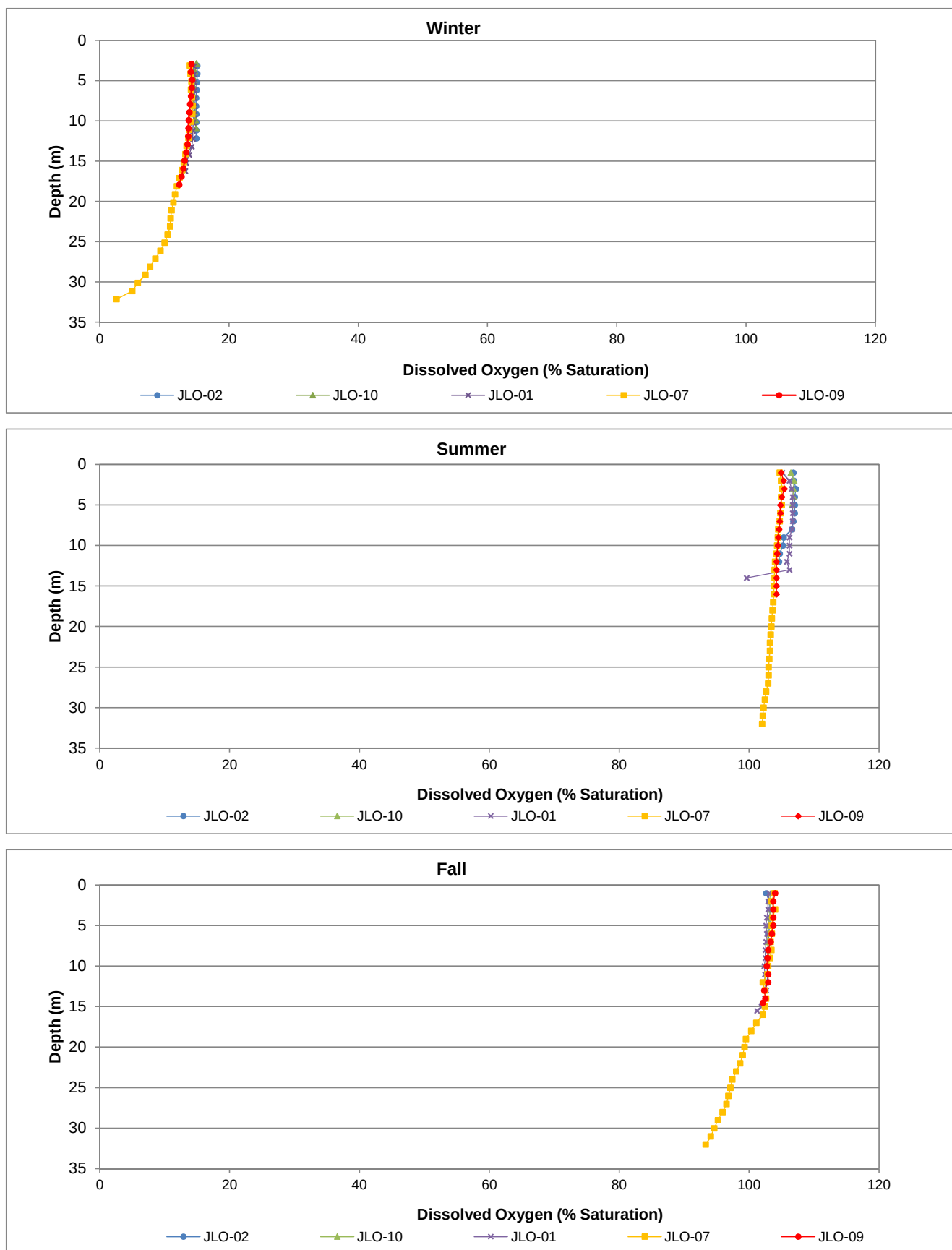


Figure C.4: Vertical profiles of dissolved oxygen measured at Camp Lake in winter, summer, and fall, 2016.

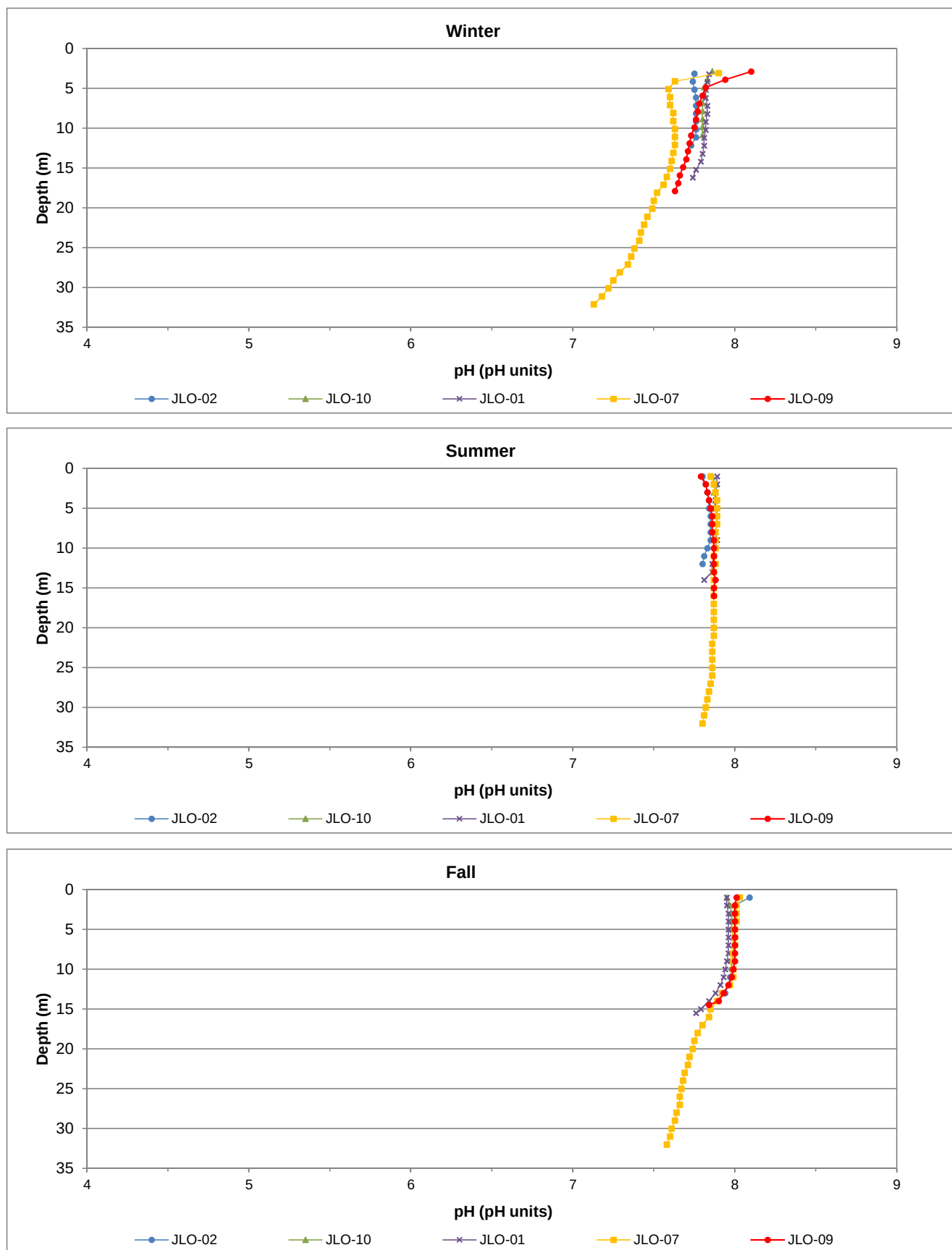


Figure C.5: Vertical profiles of pH measured at Camp Lake in winter, summer and fall, 2016.

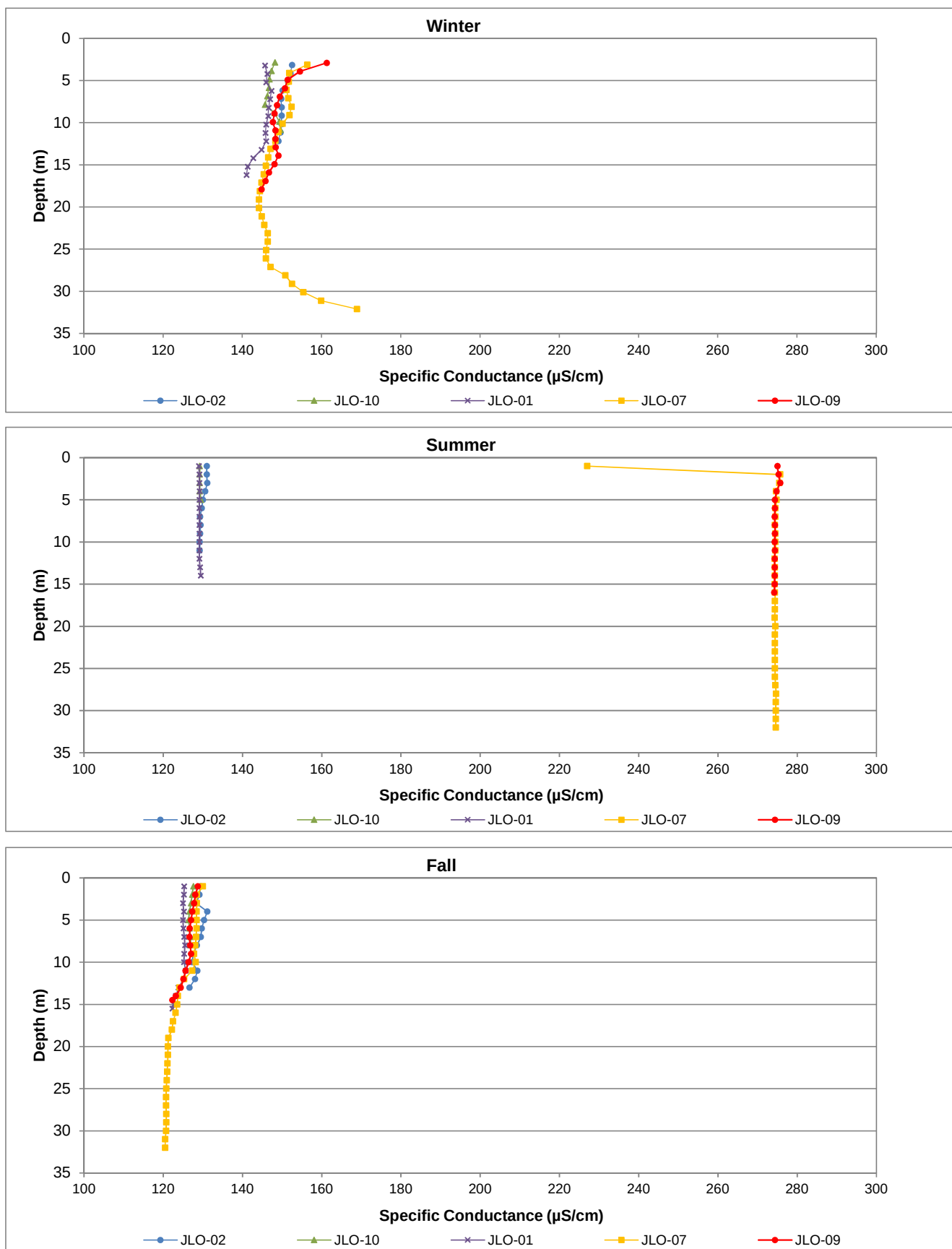


Figure C.6: Vertical profiles of conductivity measured at Camp Lake in winter, summer, and fall, 2016.

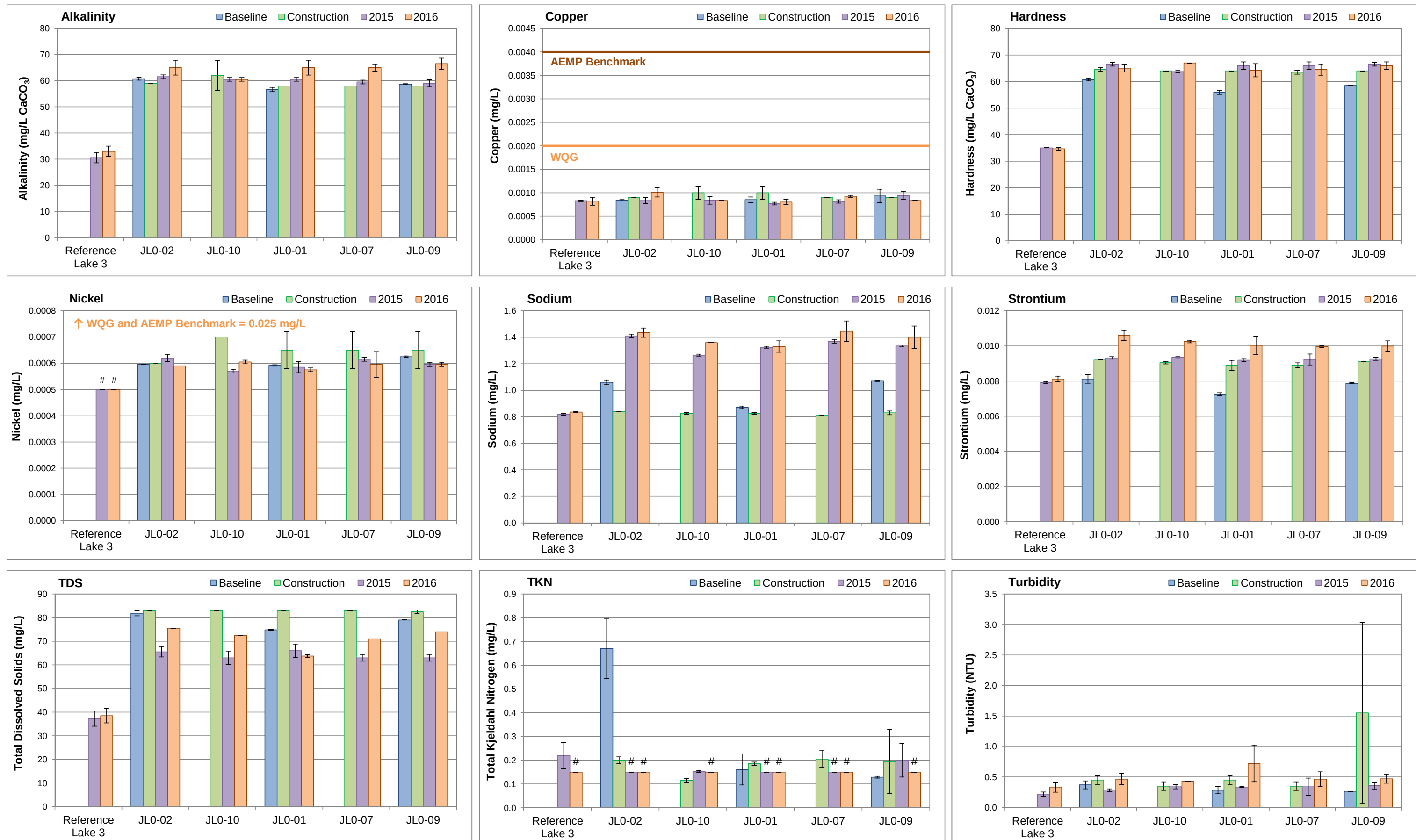


Figure C.7: Temporal comparison of water chemistry at Camp Lake (JLO) for mine baseline (2005 - 2013), construction (2014) and operational (2015, 2016) periods during fall. Values represent mean $\pm$ SD. Pound symbol (#) indicates parameter concentration is below the laboratory method detection limit. See Table 2.2 for information regarding Water Quality Guideline (WQG) criteria. AEMP Benchmarks are specific to Camp Lake.



Figure C.8: Comparison of *in-situ* water quality variables measured at Sheardown Lake system water quality monitoring stations in winter, spring, summer, and fall 2016, Mary River Project CREMP. Lake values represent mean of surface and bottom *in-situ* water quality measurements. * Reference Lake 3 (REF-03) was not sampled in winter.

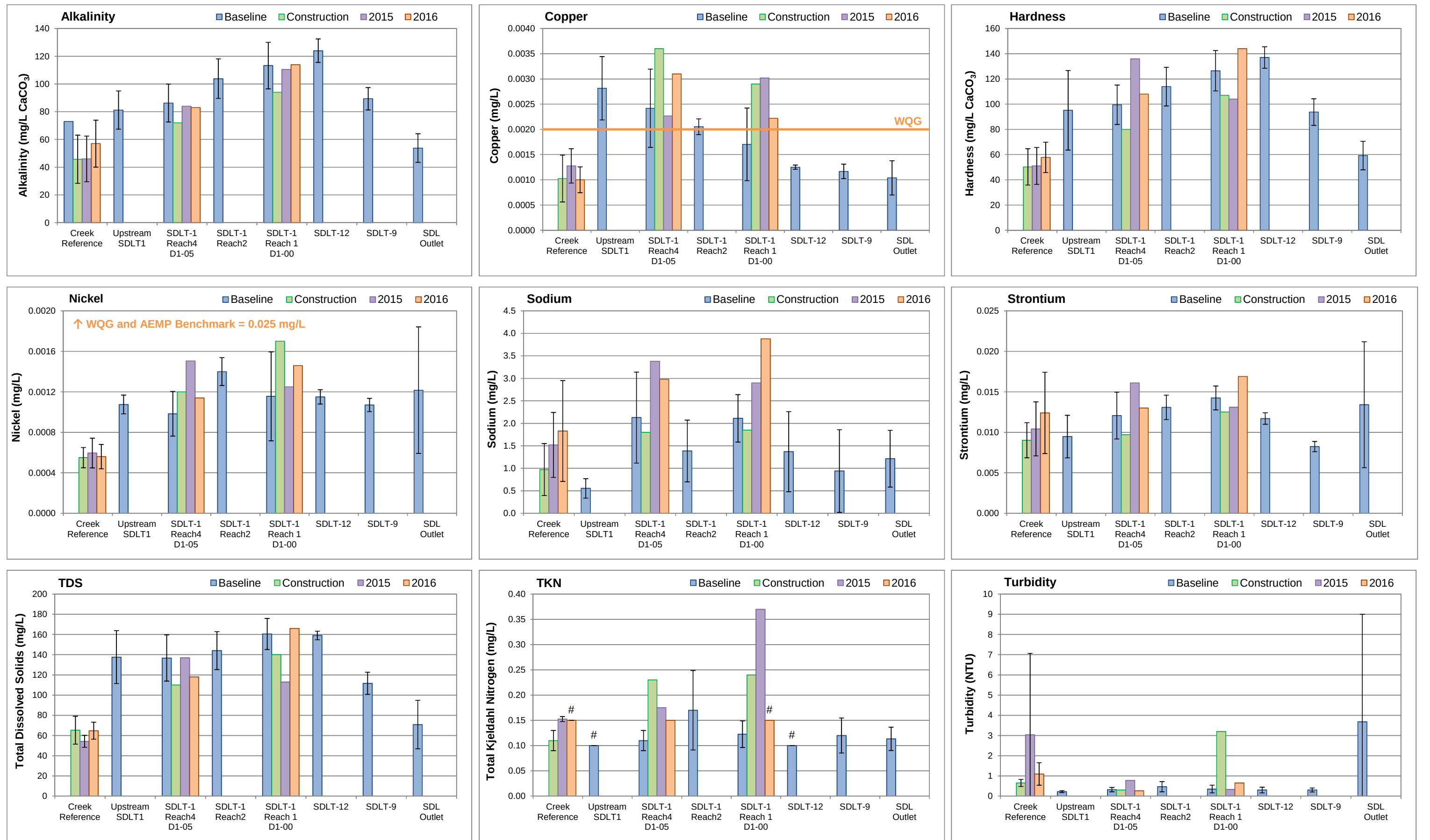


Figure C.9: Temporal comparison of water chemistry at Sheardown Lake Tributaries (SDLT) for mine baseline (2005 - 2013), construction (2014) and operational (2015, 2016) periods during fall. Values represent mean $\pm$ SD. Creek reference includes the CLT-REF and MRY-REF series stations (mean $\pm$ SD; 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.

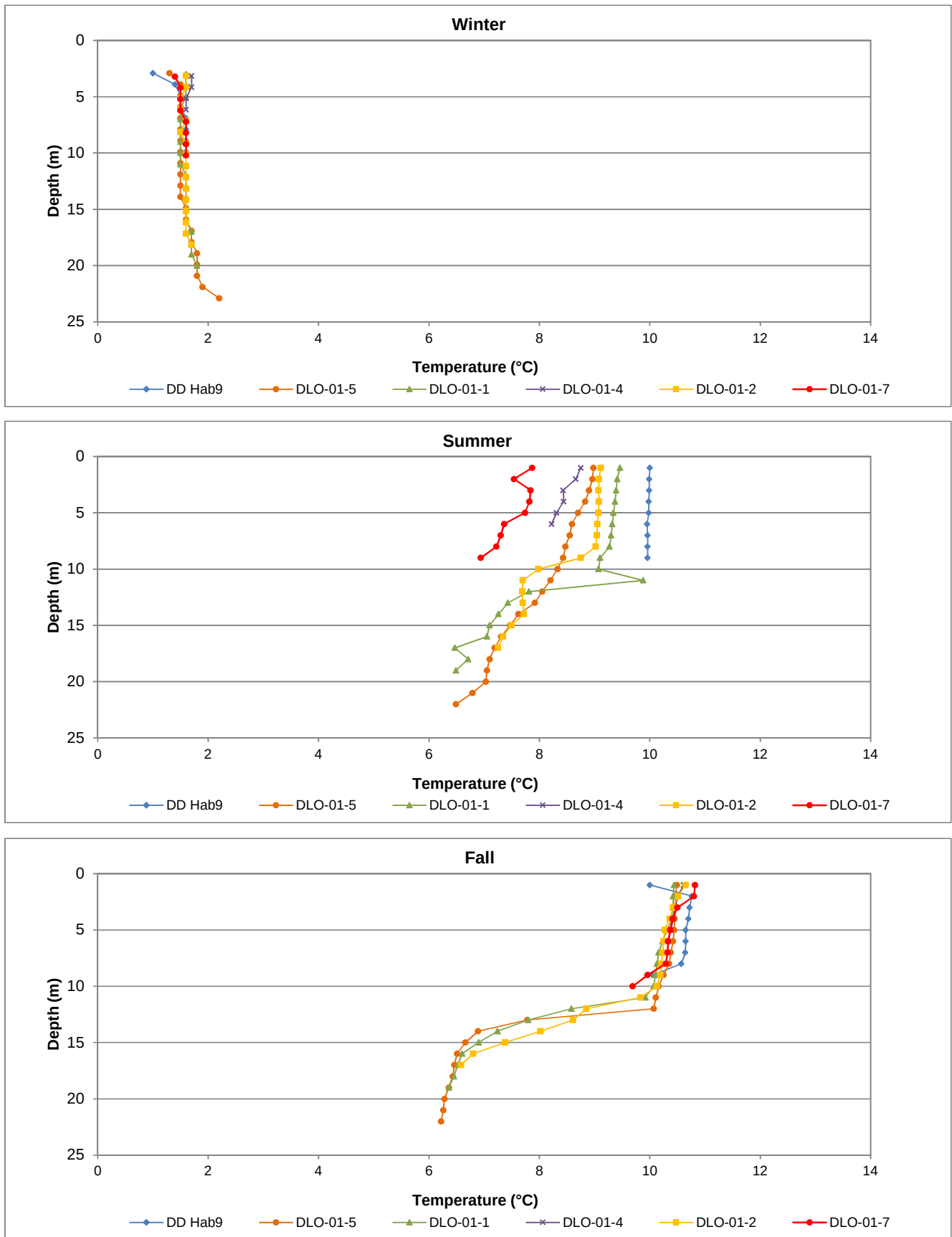


Figure C.10: Vertical profiles of temperature measured at Sheardown Lake NW in winter, summer, and fall, 2016.

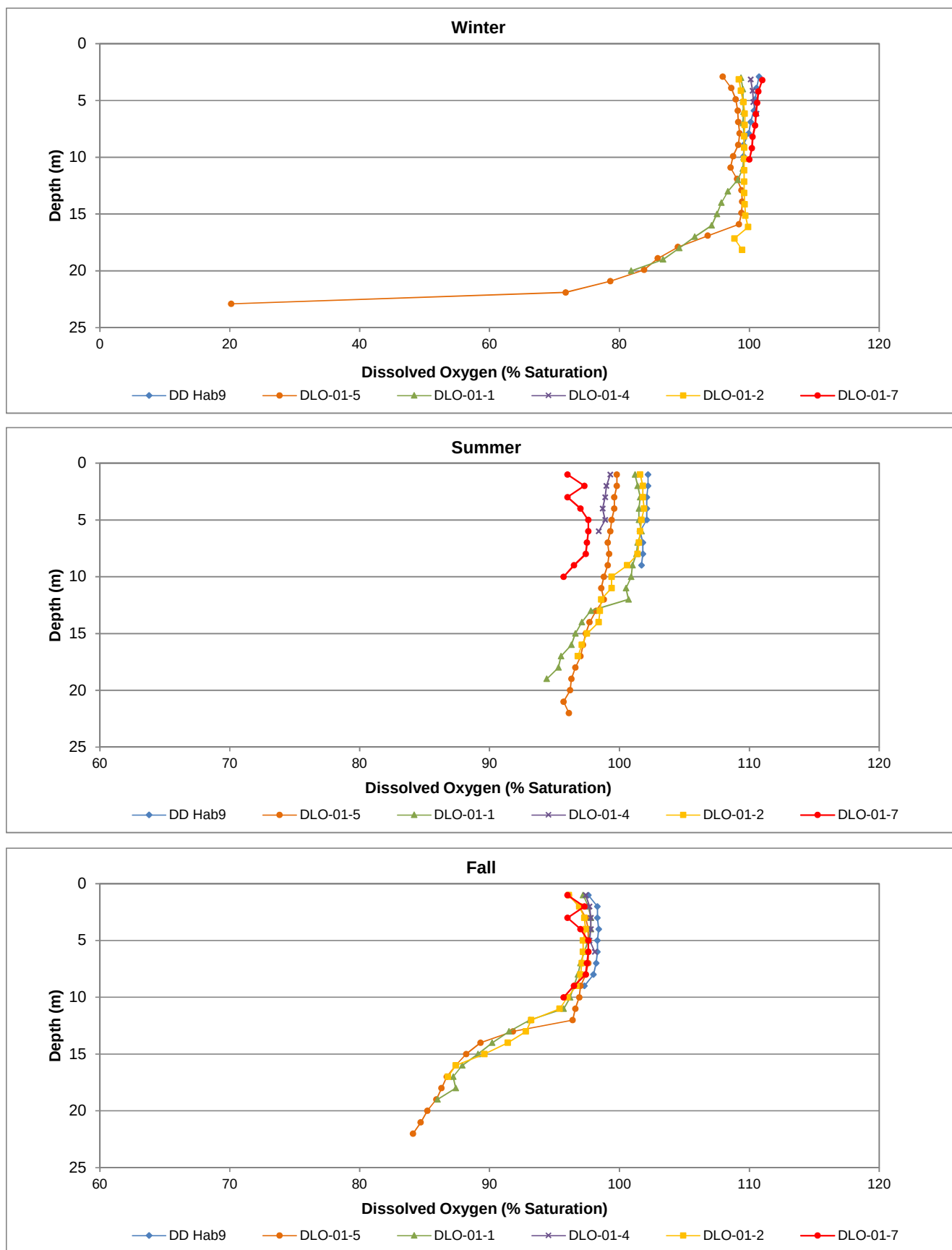


Figure C.11: Vertical profiles of dissolved oxygen measured at Sheardown Lake NW in winter, summer, and fall, 2016.

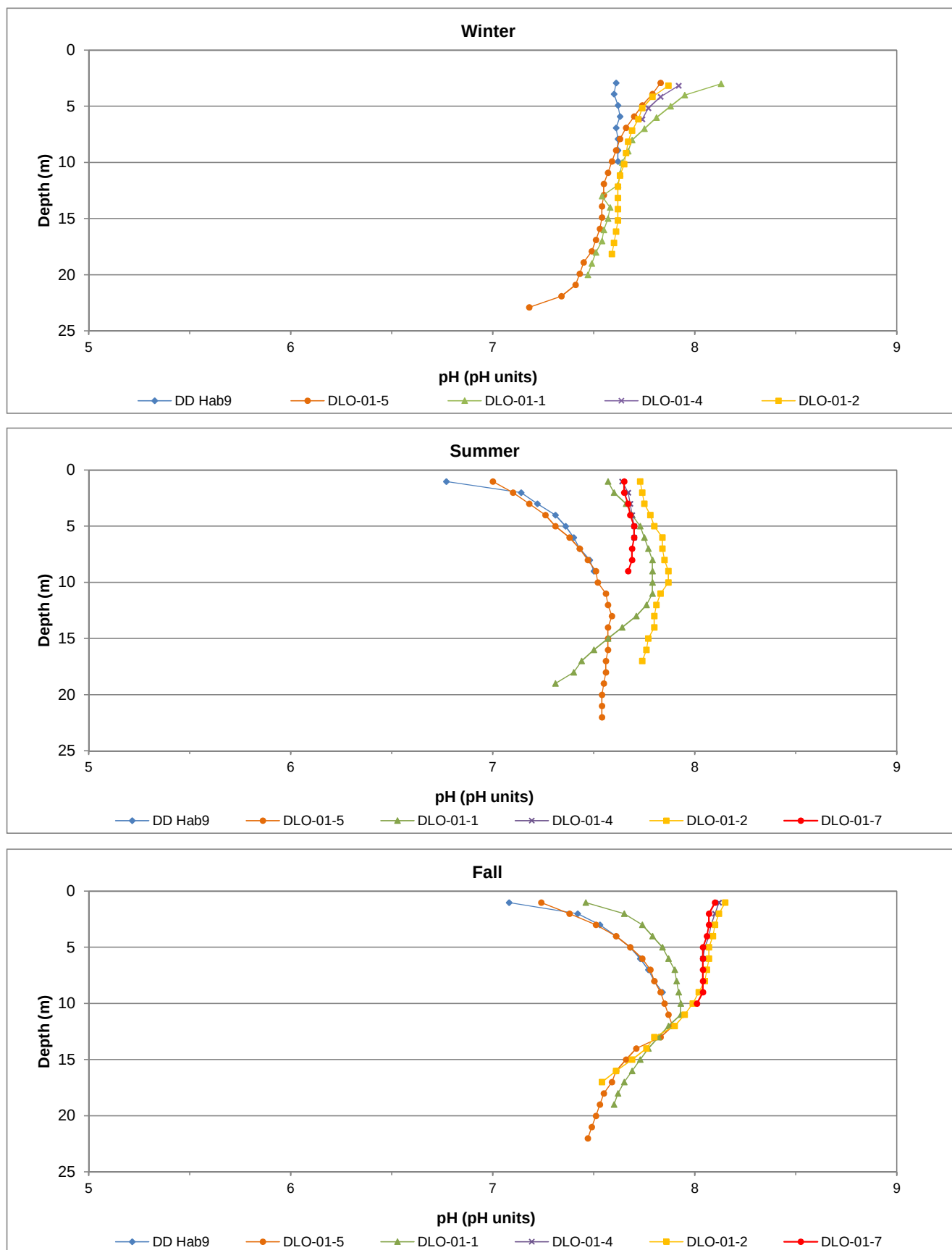


Figure C.12: Vertical profiles of pH measured at Sheardown Lake NW in winter, summer, and fall, 2016.

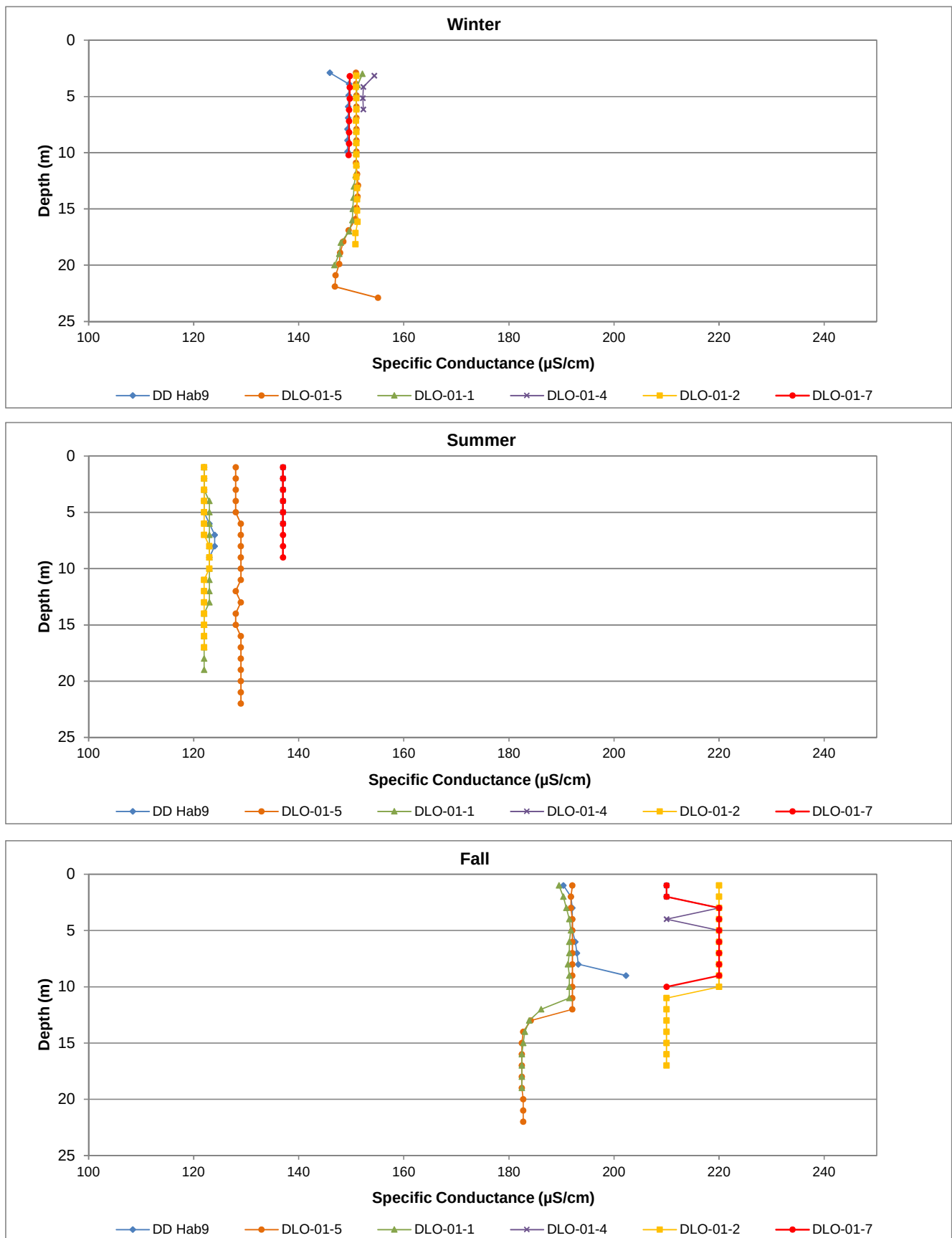


Figure C.13: Vertical profiles of conductivity measured at Sheardown Lake NW in winter, summer, and fall, 2016.

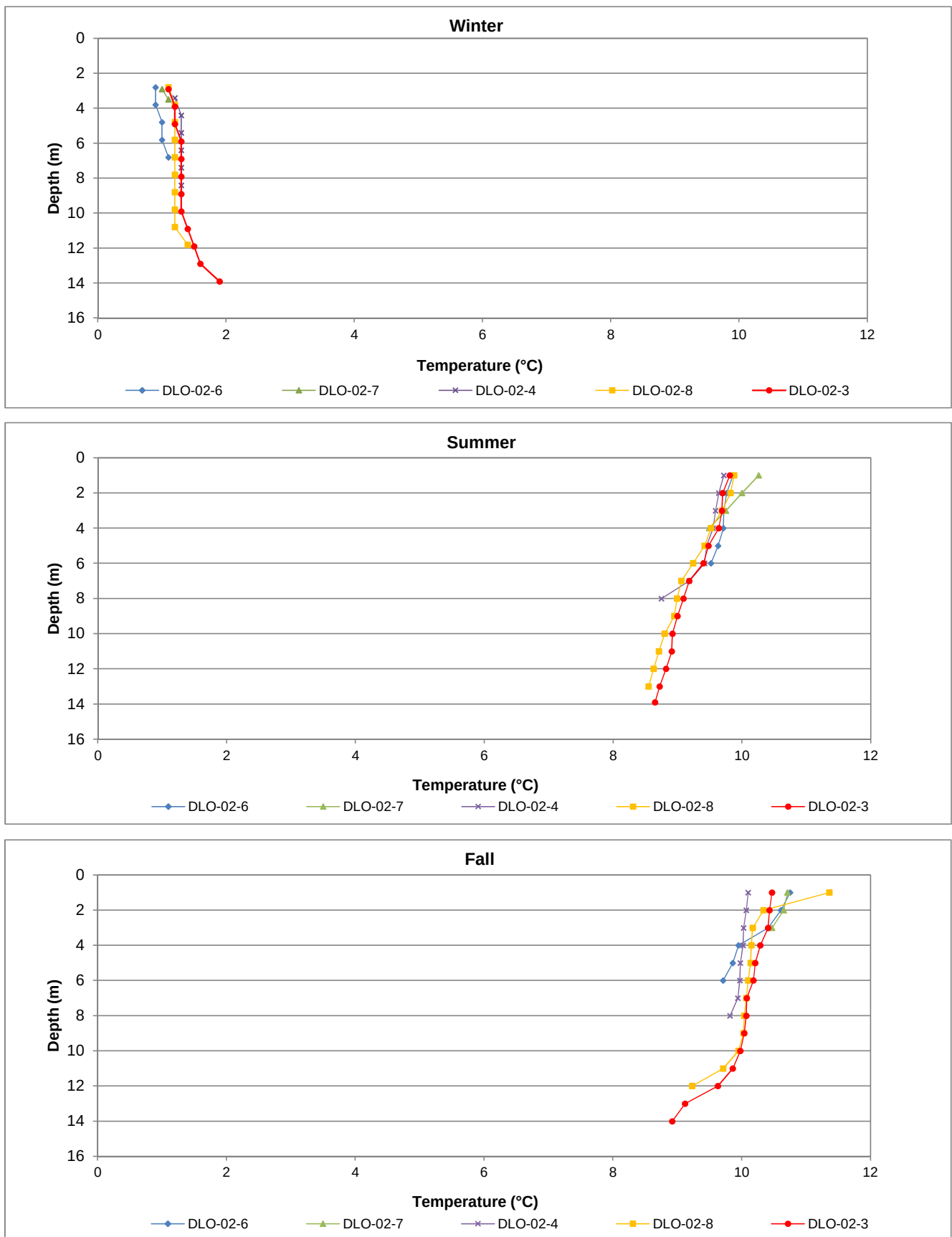


Figure C.14: Vertical profiles of temperature measured at Sheardown Lake SE in winter, summer, and fall, 2016.

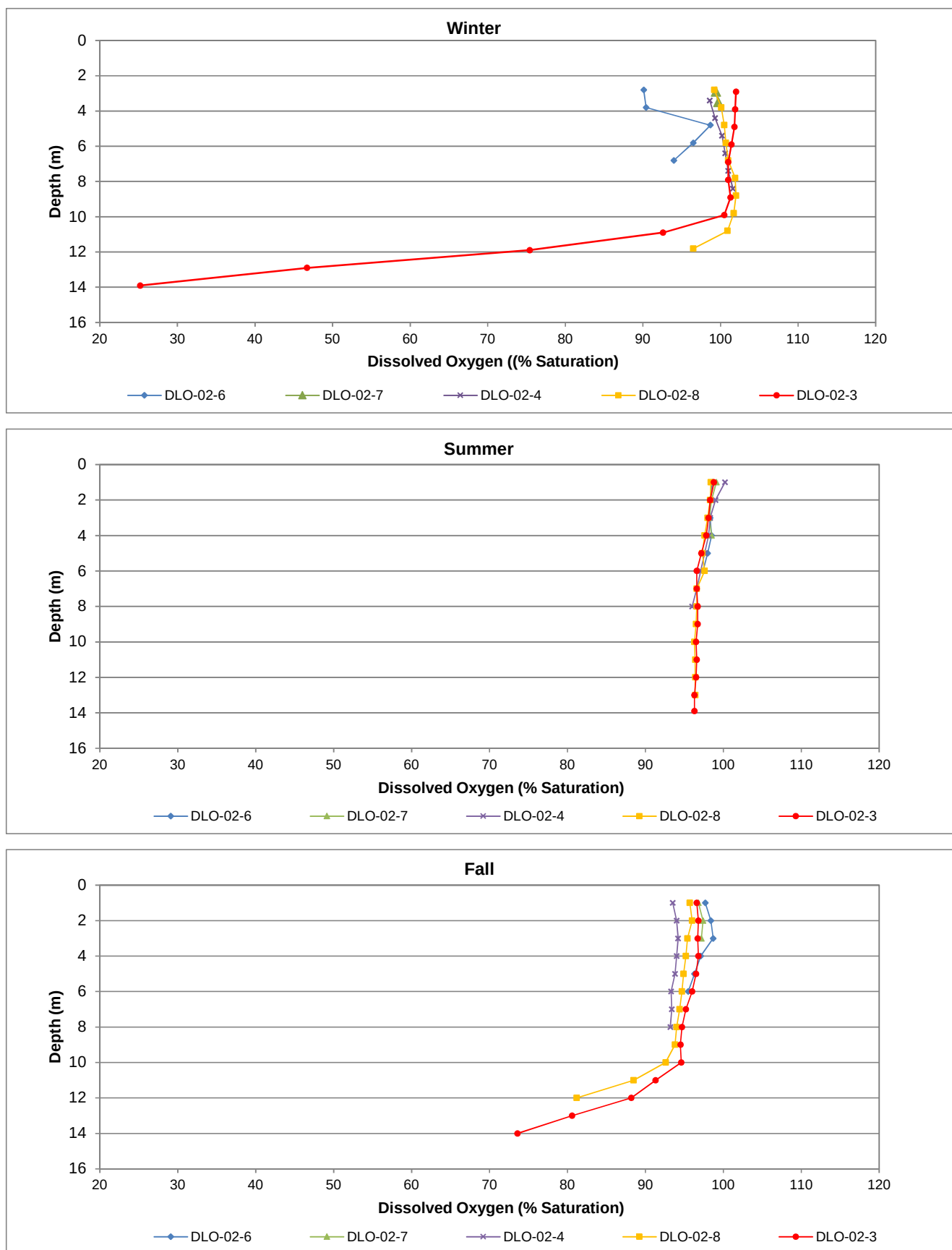


Figure C.15: Vertical profiles of dissolved oxygen measured at Sheardown Lake SE in winter, summer, and fall, 2016.

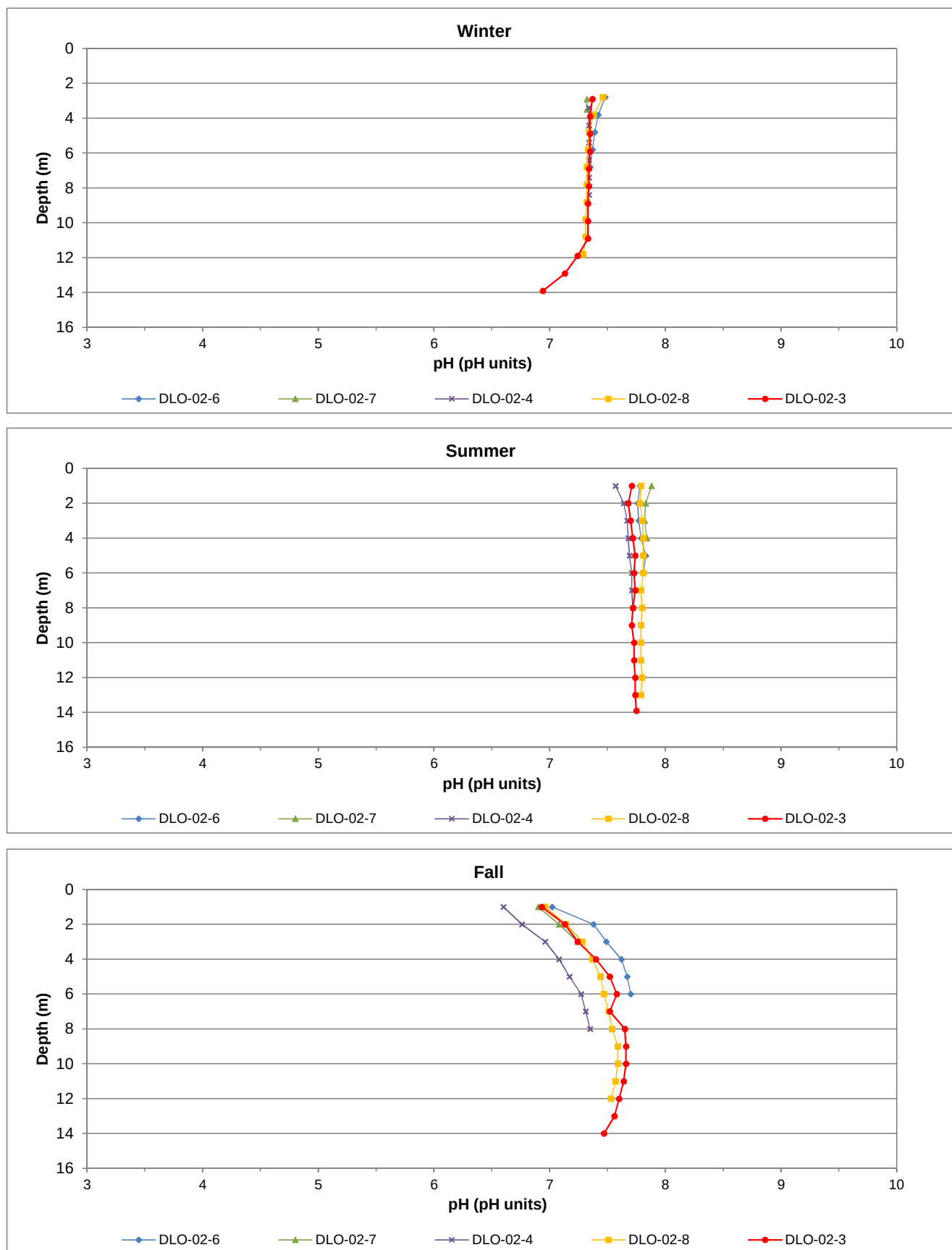


Figure C.16: Vertical profiles of pH measured at Sheardown Lake SE in winter, summer, and fall, 2016.

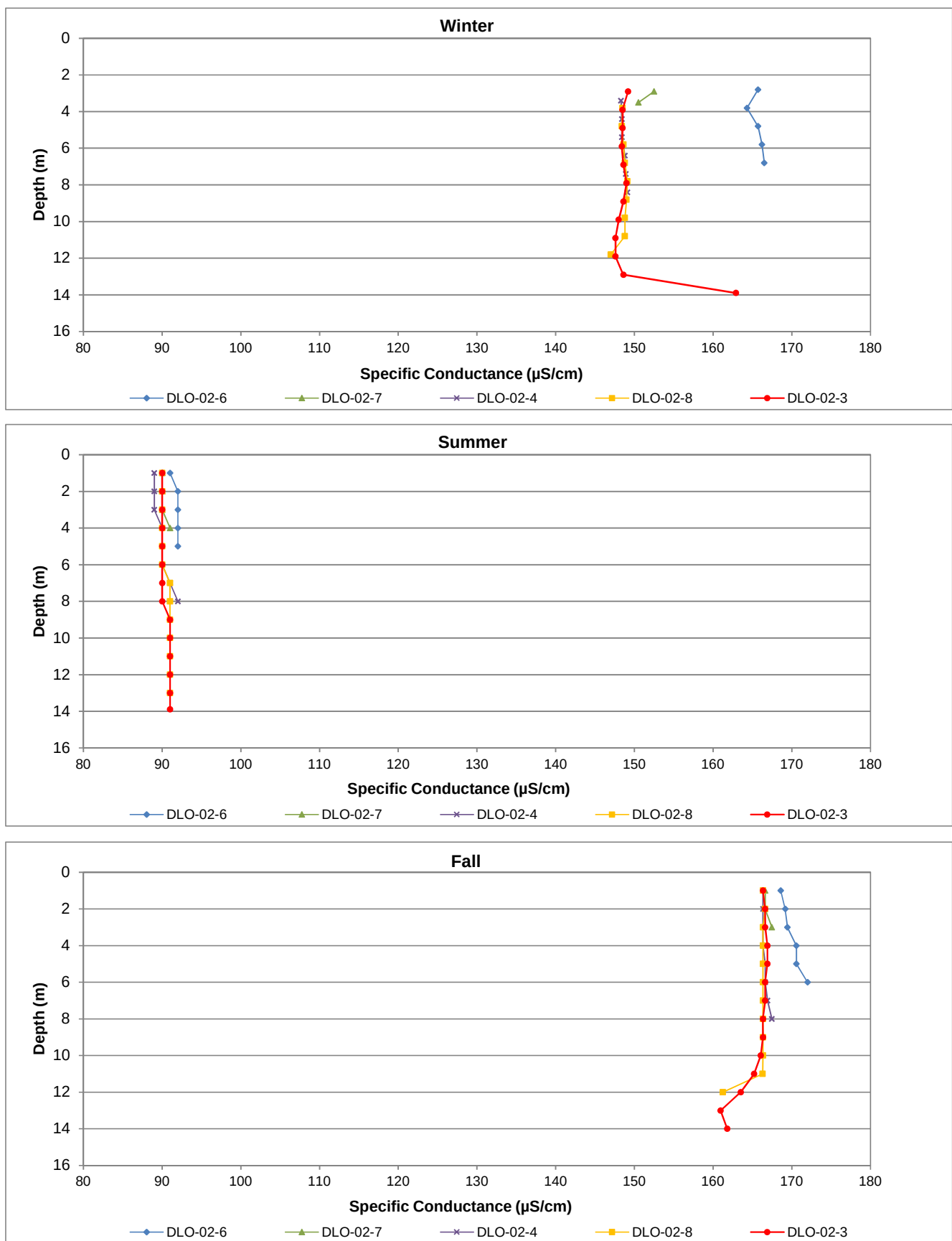


Figure C.17: Vertical profiles of conductivity measured at Sheardown Lake SE in winter, summer, and fall, 2016.

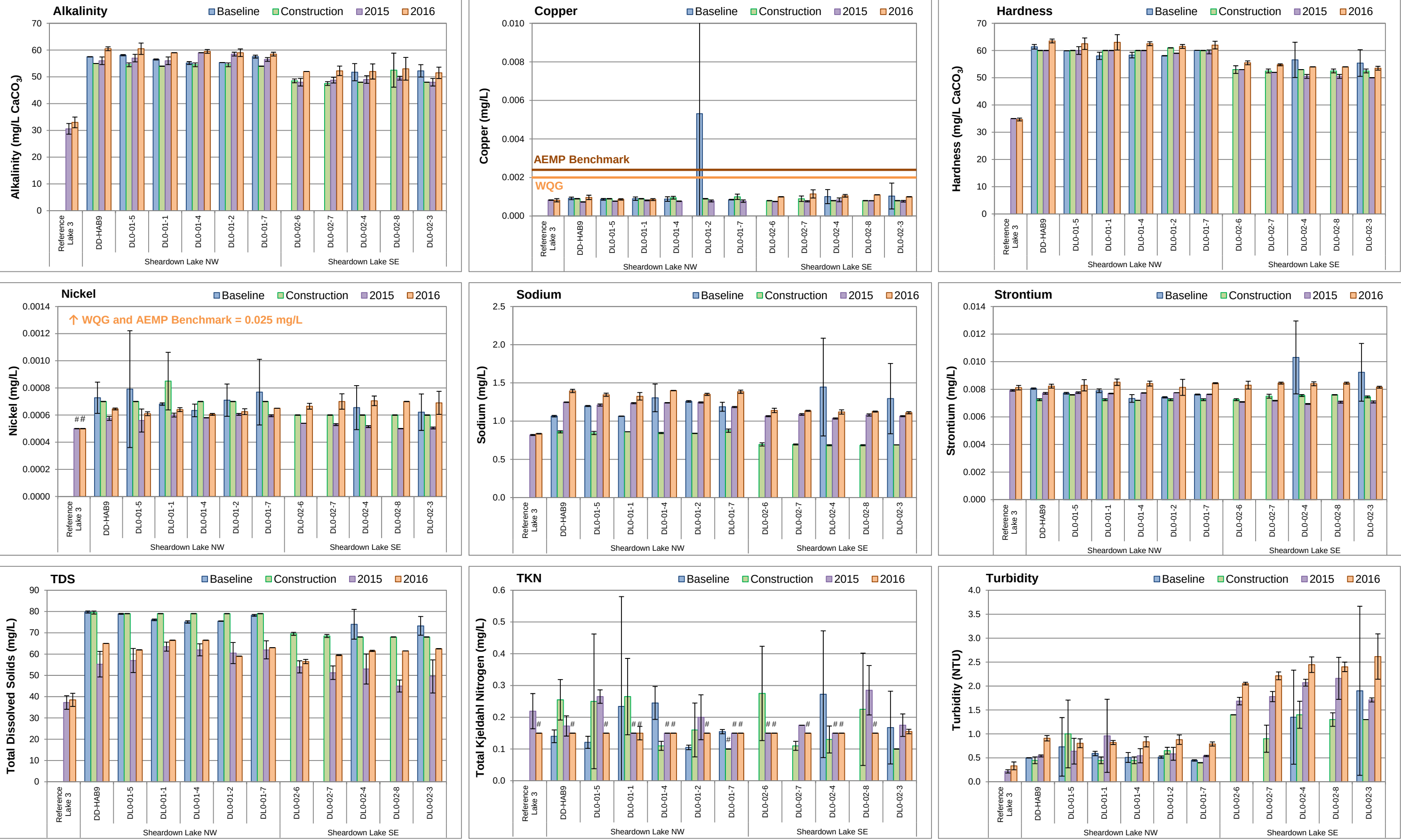


Figure C.18: Temporal comparison of water chemistry at Sheardown Lake Northwest (DLO-01) and Sheardown Lake Southeast (DLO-02) for mine baseline (2005 - 2013), construction (2014), and operational (2015, 2016) periods during fall. Values represent mean ± SD. Pound symbol (#) indicates parameter concentration 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).



Figure C.19: Comparison of in-situ water quality variables measured at Mary River water quality monitoring stations in spring, summer, and fall 2016, Mary River Project CREMP.



Figure C.20: Temporal comparison of water chemistry at Mary River stations for mine baseline (2005 - 2013), construction (2014) and operational (2015, 2016) periods in the fall. 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.

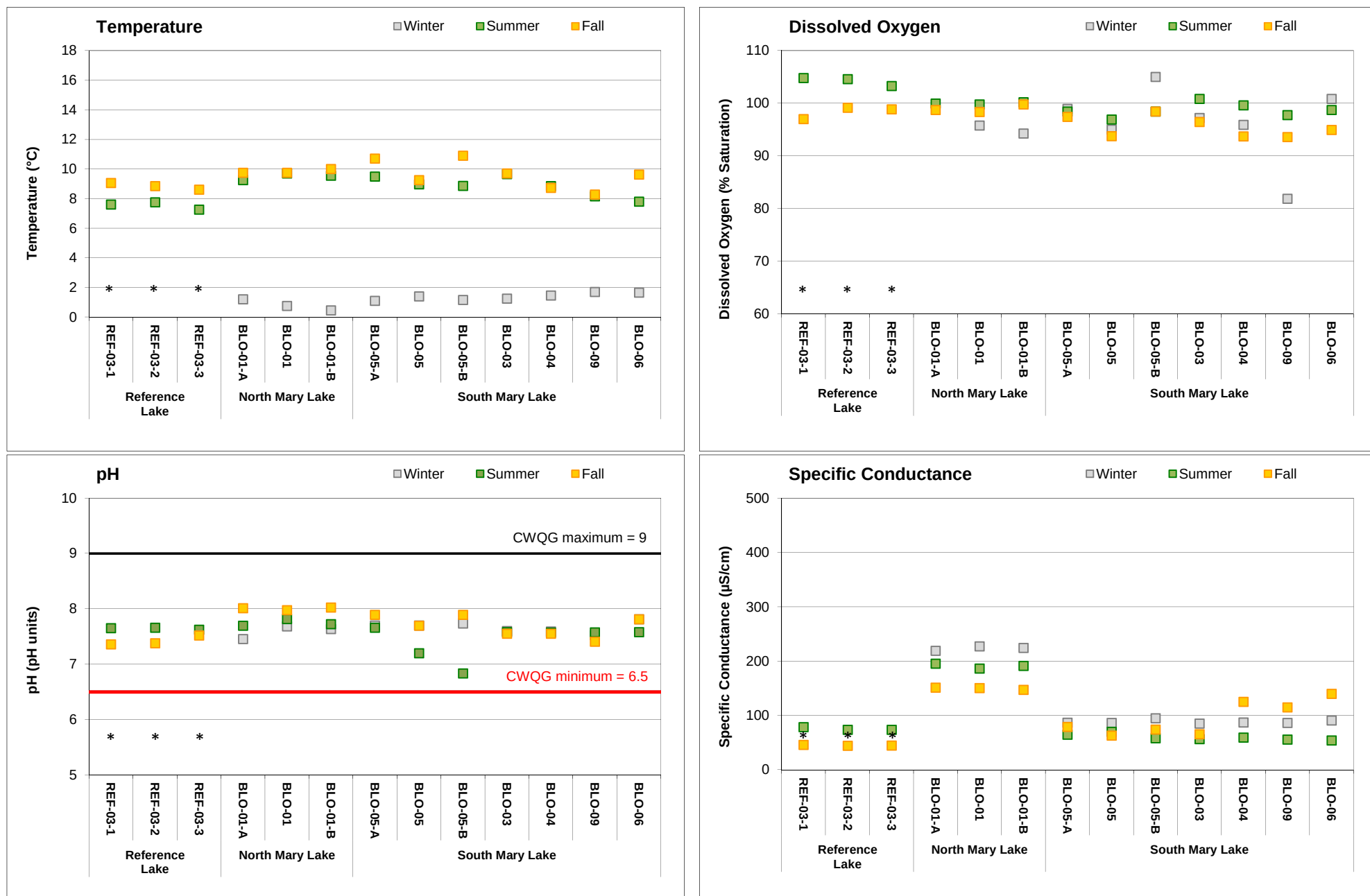


Figure C.21: Comparison of *in-situ* water quality variables measured at Mary Lake water quality monitoring stations in winter, summer, and fall 2016, Mary River Project CREMP. Lake values represent mean of surface and bottom *in-situ* water quality measurements. *Reference Lake 3 (REF-03) was not sampled in winter.

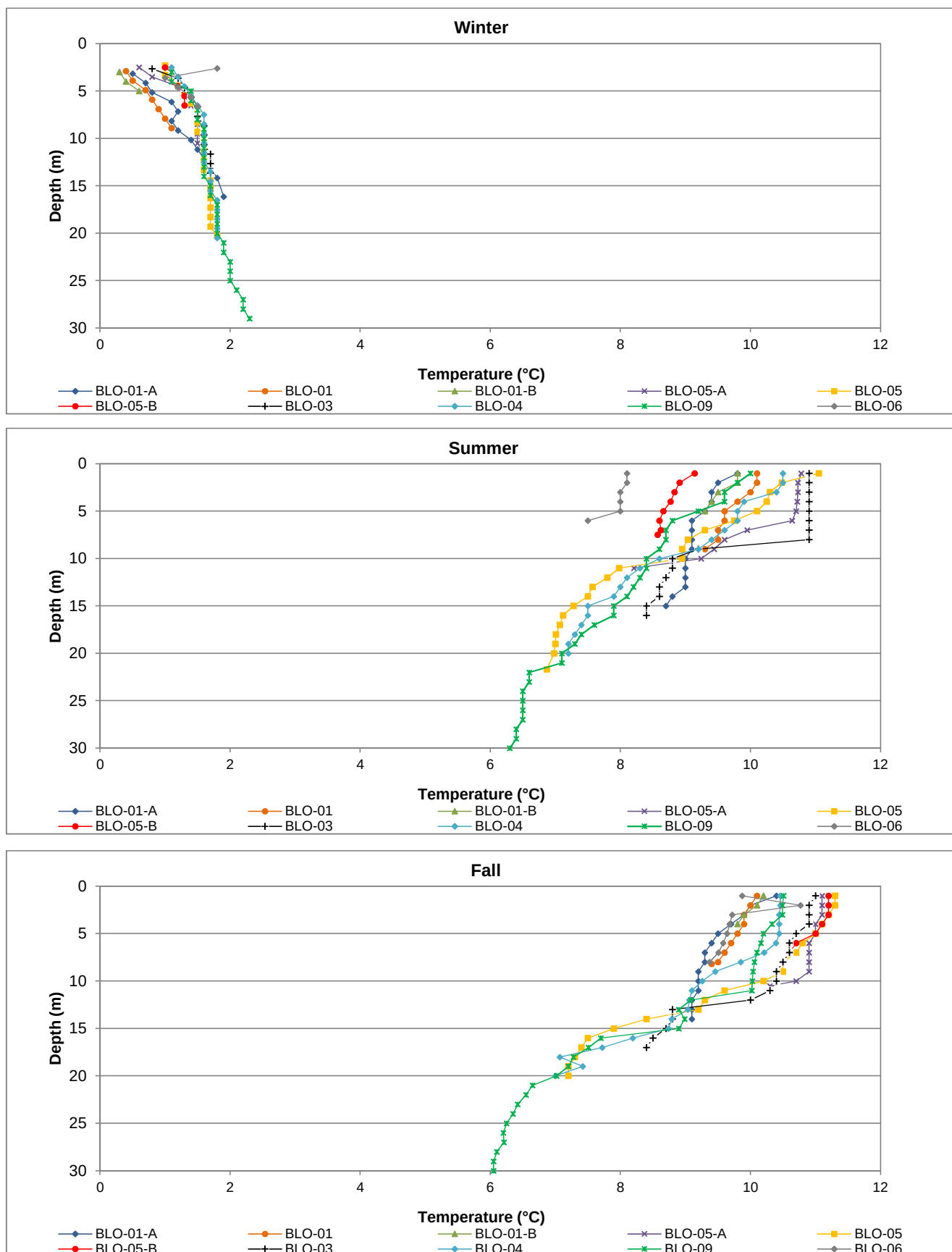


Figure C.22: Vertical profiles of temperature measured at Mary Lake in winter, summer, and fall, 2016.

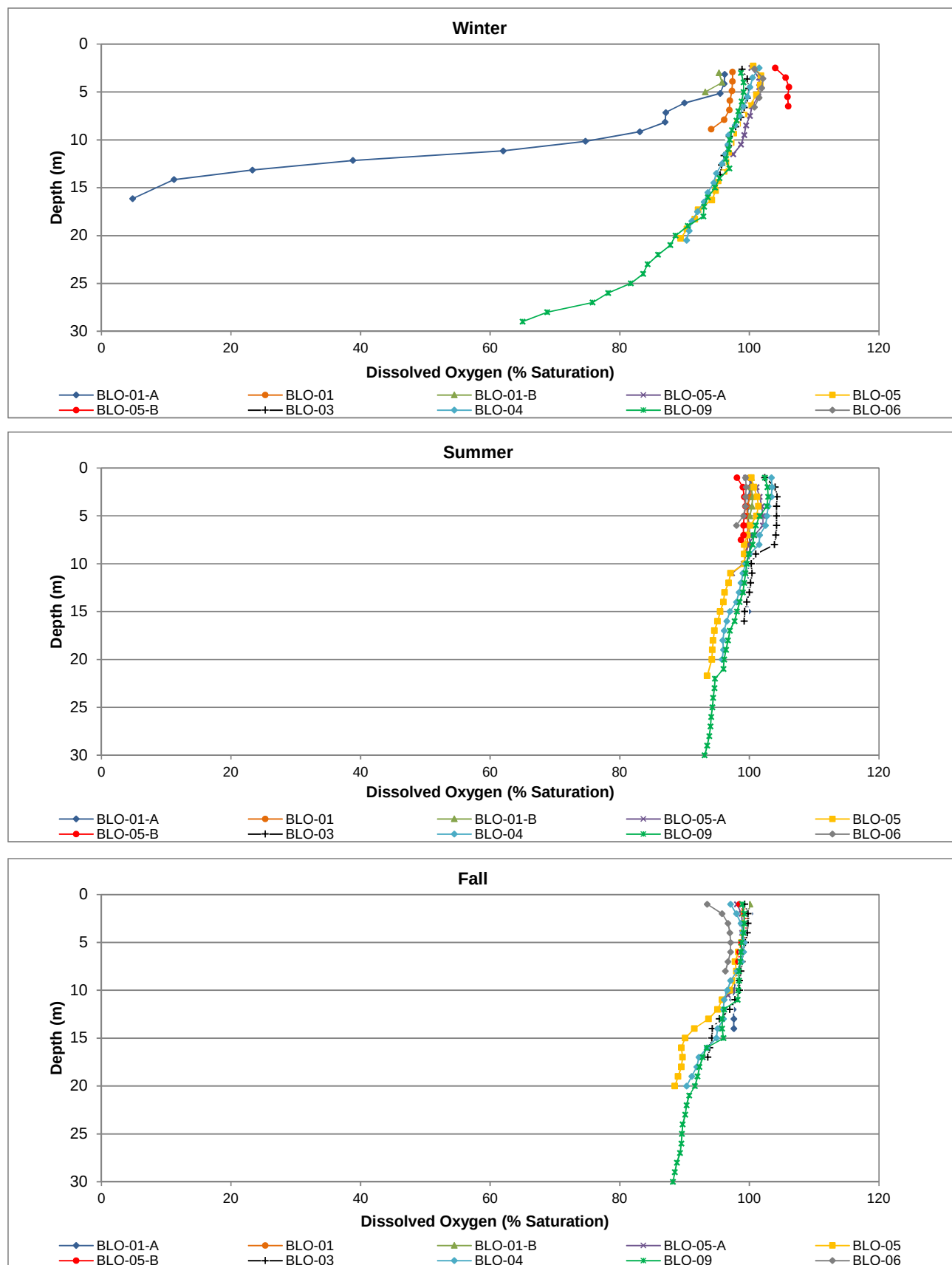


Figure C.23: Vertical profiles of dissolved oxygen measured at Mary Lake in winter, summer, and fall, 2016.

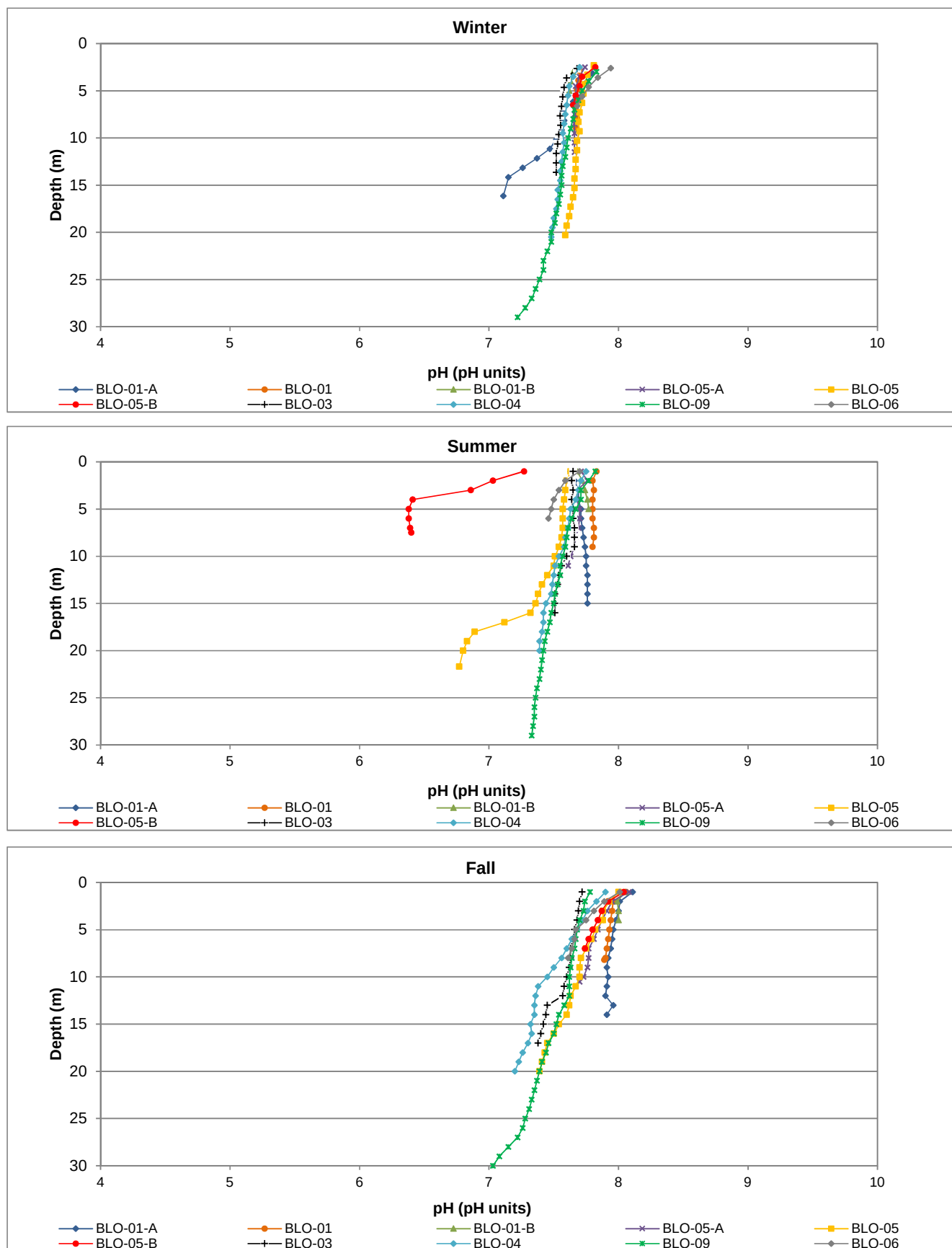


Figure C.24: Vertical profiles of pH measured at Mary Lake in winter, summer, and fall, 2016.

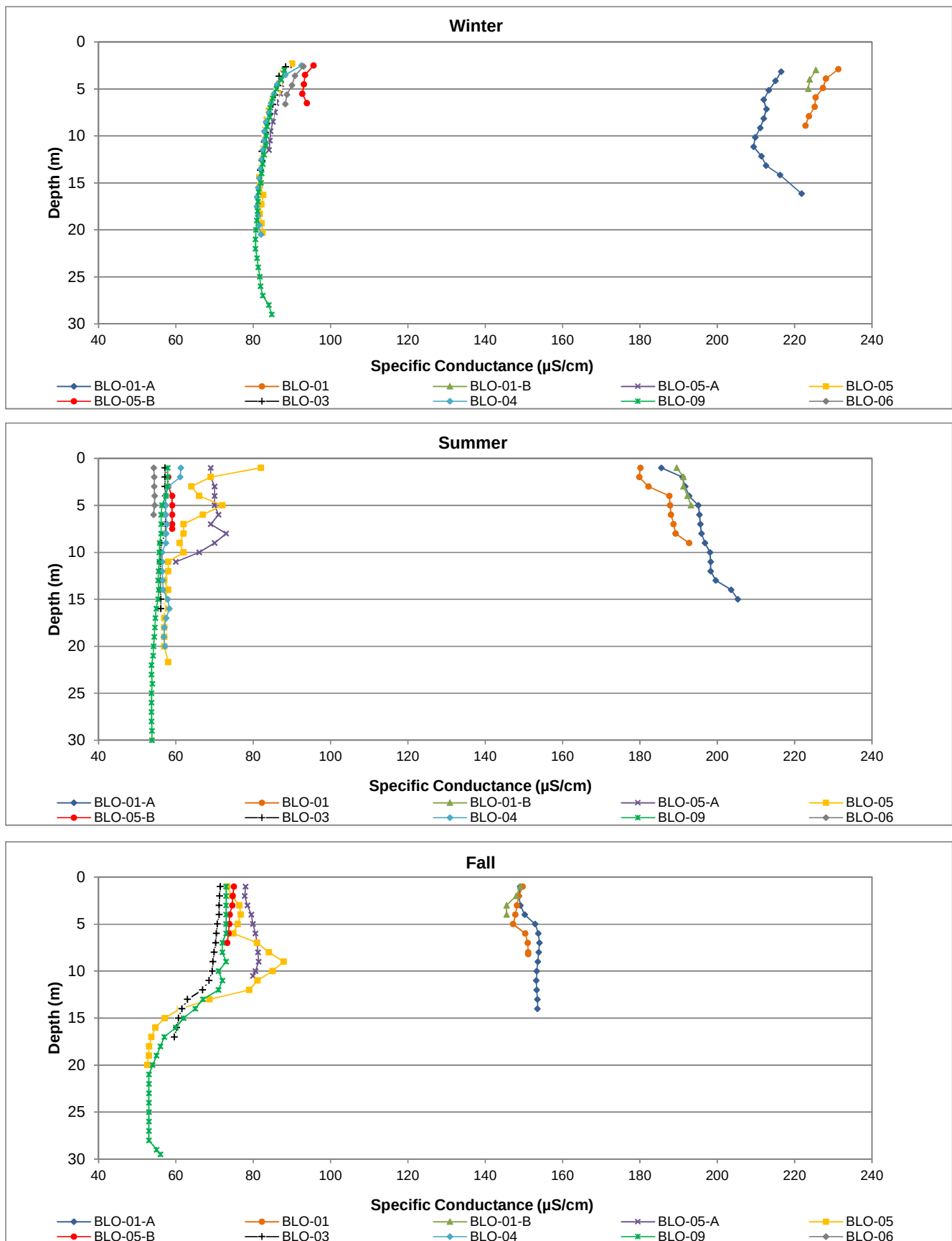


Figure C.25: Vertical profiles of conductivity measured at Mary Lake in winter, summer, and fall, 2016.



Figure C.26: Temporal comparison of water chemistry at Mary Lake (BLO) for mine baseline (2005 - 2013), construction (2014), and operational (2015, 2016) periods during fall. Values represent mean $\pm$ 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.

APPENDIX D

SEDIMENT QUALITY DATA

Table D.1: Field observations at Reference Lake 3 (REF-03) benthic invertebrate community stations^a, Mary River Project CREMP, August 2016.

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia ^b	Plant or Algal Presence
REF-03-1	9.0	gray brown silt with some fine sand; no precipitate layer observed	none detected	sparse moss growth
REF-03-2	8.1	thin orange-brown precipitate layer over brown-gray silt	none detected	sparse moss growth
REF-03-3	10.0	thin orange-brown precipitate layer over medium red-brown sandy-silt	none detected	none observed
REF-03-4	8.8	medium brown coloured silt over gray-brown silt; no precipitate layer	none detected	none observed
REF-03-5	10.7	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	22.9	medium orange-brown coloured silt; no precipitate layer observed	none detected	none observed
REF-03-8	18.6	orange-brown coloured silt with some fine sand, no precipitate layer observed	none detected	none observed
REF-03-9	21.6	thin orange-brown precipitate layer over medium brown silt	none detected	none observed
REF-03-10	19.8	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.2: Sediment core observations from cores collected at littoral stations of Reference Lake 3 (REF-03), Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
REF-03-1	9.0	1	25.0	0 to 10	brown grey silt
				10 to 25	medium grey silt, some black streaking
		2	29.0	0 to 8	brown grey silt
				8 to 29	medium grey silt, some black streaking
		3	28.5	0 to 10	brown grey silt
				10 to 28.5	medium grey silt, some black streaking
REF-03-2	8.1	1	48.5	0 to 1	orange brown floc-like silt
				1 to 43	beige silt, sparse organics
				43 to 48.5	medium to dark brown-grey silt
		2	18.0	0 to 1	orange brown floc-like silt
				1 to 18	beige silt, sparse organics
		3	38.0	0 to 2	orange brown floc-like silt
				2 to 38	beige silt, sparse organics
REF-03-3	10.0	1	13.0	0 to 5	medium beige silt
				5 to 13	light beige silt
		2	10.0	0 to 4	medium beige silt
				4 to 10	light beige silt
		3	18.0	0 to 3	orange brown floc-like silt
				3 to 4	medium beige silt
				5 to 18	light beige silt
REF-03-4	8.8	1	18.5	0 to 8	orange brown floc-like silt
				8 to 18.5	grey beige silt, some black streaking
		2	19.0	0 to 7	orange brown floc-like silt
				7 to 19	grey beige silt, some black streaking
		3	12.0	0 to 8	orange brown floc-like silt
				8 to 12	grey beige silt, some black streaking
REF-03-5	10.7	1	12.5	0 to 1	orange brown silt
				1 to 12.5	medium grey fines with some black streaking
		2	26.0	0 to 3	orange brown silt
				3 to 18	medium grey fines with some black streaking
				18 to 26	medium-dark grey fines with some black streaking
		3	29.0	0 to 2	orange brown silt
				2 to 19	medium grey fines with some black streaking
19 to 29	medium-dark grey fines with some black streaking				

Table D.3: Sediment core observations from cores collected at profundal stations of Reference Lake 3 (REF-03), Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
REF-03-6	19.5	1	30.0	0 to 27	orange brown silt
				27 to 30	medium grey silt, some black streaking
		2	30.5	0 to 27	orange brown silt
				27 to 30.5	medium grey silt, some black streaking
		3	28.0	0 to 20	orange brown silt
				20 to 24	medium grey silt, some black streaking
				24 to 28	medium-dark grey silt, some black streaking
REF-03-7	22.9	1	16.0	0 to 4	medium orange brown, floc-like silt
				4 to 14	light orange brown silt
				14 to 16	light grey brown silt
		2	25.0	0 to 4	medium orange brown, floc-like silt
				4 to 20	light orange brown silt
				20 to 25	light grey brown silt
		3	21.0	0 to 5	medium orange brown floc-like silt
				5 to 15	light orange brown silt
				15 to 21	light grey brown silt
REF-03-8	18.6	1	8.0	0 to 8	orange brown silt, black layer on top mm
		2	13.0	0 to 15	orange brown silt, black layer on top mm
		3	16.5	0 to 7	orange brown silt, black layer on top mm
				7 to 16	medium grey brown silt with black streaking
REF-03-9	21.6	1	30.0	0 to 20	orange brown silt
				20 to 30	medium grey brown silt
		2	20.0	0 to 18	orange brown silt
				18 to 20	medium grey brown silt
		3	27.0	0 to 24	orange brown silt
				24 to 27	medium grey brown silt
REF-03-DUP (Duplicate of REF-03-9)	21.6	1	19.0	0 to 10	orange brown silt, some black streaking
				10 to 19	grey brown silt, some black streaking
		2	27.0	0 to 10	orange brown silt, some black streaking
				10 to 27	grey brown silt, some black streaking
		3	26.0	0 to 14	orange brown silt, some black streaking
				14 to 26	grey brown silt, some black streaking
REF-03-10	19.8	1	22.0	0 to 8	light brown to orange brown silt
				8 to 18.5	orange brown silt (with black layer at ~ 8mm and very orange below for ~ 1mm)
				18 to 22	grey brown silt
		2	15.0	0 to 12	light brown to orange brown silt
				12 to 15	orange brown silt
		3	21.5	0 to 7	light brown to orange brown silt
				7 to 11	orange brown silt
				11 to 21	grey brown silt

Table D.4: Sediment particle size, total organic carbon, and metal concentrations at Reference Lake 3 (REF-03) sediment stations, Mary River Project CREMP, August 2016.

Analyte		Units	Sediment Quality Guideline (SQG) ^a	Reference Lake 3 Stations										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	%	-	66.6	20.5	32.9	13.0	39.8	15.2	53.5	14.5	19.9	20.2	29.6	18.4	5.81
	Silt	%	-	31.1	72.3	59.8	78.3	56.5	78.4	43.9	78.3	74.0	73.1	64.6	16.42	5.19
	Clay	%	-	2.30	7.2	7.4	8.7	3.70	6.3	2.70	7.3	6.10	6.7	5.8	2.17	0.69
	Moisture	%	-	95.4	72.9	99.0	70.5	89.8	93.2	97.7	83.3	66.6	97.6	87	12.42	3.93
	Total Organic Carbon	%	10 ^α	5.39	4.31	8.04	4.82	3.30	5.03	4.09	4.41	3.42	4.65	4.75	1.33	0.421
Metals	Aluminum (Al)	mg/kg	-	15,200	23,700	17,700	30,300	16,600	25,500	16,400	21,850	16,500	24,400	20,815	5,069	1,603
	Antimony (Sb)	mg/kg	-	<0.10	0.19	<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	2.74	5.96	3.87	7.24	4.23	6.98	3.67	5.94	4.04	6.25	5.09	1.56	0.493
	Barium (Ba)	mg/kg	-	115	144	153	187	96.4	167	96.6	164	98.4	147	137	32.9	10.41
	Beryllium (Be)	mg/kg	-	0.61	0.96	0.70	1.20	0.70	1.04	0.69	0.91	0.67	0.99	0.85	0.20	0.063
	Bismuth (Bi)	mg/kg	-	<0.20	<0.20	<0.20	0.22	<0.20	0.21	<0.20	<0.20	<0.20	<0.20	0.20	0.0067	0.0021
	Boron (B)	mg/kg	-	11.4	17.8	16.4	22.4	12.1	20.3	12.4	17.2	12.9	18.1	16.1	3.76	1.19
	Cadmium (Cd)	mg/kg	3.5	0.135	0.165	0.284	0.200	0.095	0.205	0.096	0.178	0.121	0.153	0.16	0.057	0.018
	Calcium (Ca)	mg/kg	-	6,190	6,000	6,310	6,630	4,230	6,040	4,150	5,675	4,760	6,210	5,620	902	285.3
	Chromium (Cr)	mg/kg	90	57.2	74.3	57.7	93.8	52.6	84.2	51.8	71.4	55.5	76.1	67.5	14.6	4.62
	Cobalt (Co)	mg/kg	-	8.87	16.9	8.86	20.9	11.6	18.6	11.2	17.4	10.2	17.0	14.1	4.45	1.41
	Copper (Cu)	mg/kg	197	55.3	94.6	95.5	121	60.3	105	63.6	88.2	57.7	98.1	83.9	23.0	7.28
	Iron (Fe)	mg/kg	40,000 ^α	21,400	49,200	21,400	60,700	34,900	55,200	37,400	53,900	34,100	48,900	41,710	13,932	4,406
	Lead (Pb)	mg/kg	91.3	15.2	25.5	95.9	26.7	79.9	48.8	24.2	27.4	15.0	19.2	37.8	28.31	8.95
	Lithium (Li)	mg/kg	-	27.4	37.4	28.3	49.4	27.9	42.8	26.9	38.3	26.1	40.8	34.5	8.26	2.61
	Magnesium (Mg)	mg/kg	-	11,600	15,300	11,200	19,000	10,700	16,700	9,960	14,200	10,800	15,600	13,506	3,077	973
	Manganese (Mn)	mg/kg	1,100 ^{α,β}	286	1,170	297	1,420	686	2,020	767	3,550	442	1,170	1,181	995.5	314.8
	Mercury (Hg)	mg/kg	0.486	0.0475	0.0633	0.0515	0.0699	0.0199	0.0738	0.0234	0.0737	0.0353	0.0687	0.0527	0.0206	0.00651
	Molybdenum (Mo)	mg/kg	-	0.72	2.75	1.36	3.20	3.18	3.35	2.72	4.49	2.97	2.56	2.73	1.05	0.332
	Nickel (Ni)	mg/kg	75 ^{α,β}	40.1	53.3	44.4	65.1	35.8	59.1	35.7	50.9	37.1	53.0	47.4	10.37	3.28
	Phosphorus (P)	mg/kg	2,000 ^α	781	1,050	760	1,320	827	1,180	810	1,016	1,020	1,040	980	184.8	58.4
	Potassium (K)	mg/kg	-	3,280	5,460	4,260	6,870	4,170	6,040	3,820	5,255	3,940	5,830	4,893	1,161	367.3
	Selenium (Se)	mg/kg	-	0.45	0.67	0.69	0.93	0.36	1.00	0.39	0.87	0.55	0.78	0.67	0.23	0.072
	Silver (Ag)	mg/kg	-	0.11	0.24	0.16	0.32	<0.10	0.28	<0.10	0.24	0.11	0.26	0.19	0.085	0.027
	Sodium (Na)	mg/kg	-	254	412	403	527	260	491	250	406	313	437	375	100	31.8
	Strontium (Sr)	mg/kg	-	12.1	14.7	12.9	17.8	10.3	16.3	10.0	14.8	11.5	15.5	13.6	2.63	0.83
	Sulphur (S)	mg/kg	-	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	0	0
	Thallium (Tl)	mg/kg	-	0.325	0.723	0.389	0.916	0.418	0.845	0.362	0.772	0.445	0.748	0.594	0.226	0.0715
	Tin (Sn)	mg/kg	-	5.9	9.9	137	7.9	116	46.4	17.9	15.2	4.8	2.3	36.3	49.39	15.619
	Titanium (Ti)	mg/kg	-	1,050	1,280	1,060	1,580	1,010	1,370	1,030	1,205	1,210	1,220	1,202	179	56.5
	Uranium (U)	mg/kg	-	8.73	26.4	10.9	31.6	17.5	29.5	9.95	22.8	12.4	26.0	19.6	8.71	2.75
	Vanadium (V)	mg/kg	-	45.0	68.6	50.7	84.0	51.6	75.4	52.5	63.4	50.1	68.8	61.0	12.9	4.09
	Zinc (Zn)	mg/kg	315	67.3	101	82.2	122	70.0	109	77.0	91.2	72.0	101	89	18.5	5.86
	Zirconium (Zr)	mg/kg	-	5.0	3.6	6.5	4.6	3.3	4.2	3.2	3.7	3.7	3.9	4.2	1.0	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 paramter concentration above Sediment Quality Guideline (SQG).

Table D.5: Field observations at Camp Lake (JLO) benthic invertebrate community stations^a, Mary River Project CREMP, August 2016.

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia ^b	Plant or Algal Presence
JLO-2	10.6	medium to light brown silt, some reddish oxidized material to ~ 0.5cm surficial depth	none detected	root-like organics (sparse), globular algae (sparse)
JLO-21	11.1	medium brown grey silt with some fine sand; 0.5cm layer of red oxidized material at surface	none detected	globular algae (common)
JLO-32	9.9	loose' medium brown silt with thin layer of oxidized material at surface	none detected	(dead) moss leaves; globular algae (common)
JLO-31	11.7	medium brown silt; 0.5cm layer of red oxidized material at surface	none detected	globular algae (common)
JLO-30	10.6	light brown grey silt / fine sand mix; 0.5cm layer of red oxidized material at surface	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.6: Sediment core observations from cores collected at littoral stations of Camp Lake (JLO), Mary Rive Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
JLO-02	10.6	1	14.0	0 to 2	orange to black coloured organic silt
				2 to 6	dark orangish-brown silt with black streaking
				6 to 14	medium brown silt
		2	12.0	0 to 2	orange black organic silt
				2 to 6	dark orangish-brown silt with black streaking
				6 to 12	medium brown silt
		3	15.5	0 to 2.5	orange black organic silt
				2.5 to 5	dark orangish-brown silt with black streaking
				5 to 15.5	medium brown silt
JLO-30	10.6	1	8.0	0 to 1.5	orange-coloured (iron oxide) sand
				1.5 to 8	light brown grey sand
		2	5.0	0 to 0.5	orange-coloured (iron oxide) sand
				0.5 to 5	light brown grey sand; evidence of anoxia at 2 cm
		3	4.5	0 to 0.5	orange-coloured (iron oxide) sand
				0.5 to 4.5	light brown grey sand
JLO-31	11.7	1	21.0	0 to 2	orange-coloured (iron oxide) organic silt
				2 to 13	light brown grey silt
				13 to 21	medium brown grey silt
		2	13.5	0 to 1.5	orange coloured (iron oxide) organic silt
				1.5 to 13.5	medium brown grey silt
		3	11.0	0 to 2	orange coloured (iron oxide) organic silt
				2 to 11	medium brown grey silt
JLO-32	9.9	1	19.0	0 to 2	orangish-coloured (iron oxide) silt
				2 to 4	bright orange (iron oxide) smear
				4 to 11	medium light brown grey silt
				11 to 19	medium brown grey silt
		2	18.0	0 to 3	silty organics, globular algae
				3 to 7	olive brown organic silt
				7 to 18	medium light brown silt / sand
		3	13.5	0 to 3	orangish-coloured (iron oxide) silt
				3 to 13.5	medium light brown grey silt
JLO-21	11.1	1	13.5	0 to 1.5	orangish-coloured (iron oxide) silt
				1.5 to 13.5	light brown silt
		2	16.5	0 to 1.5	orangish-coloured (iron oxide) silt
				1.5 to 16.5	light brown silt
		3	11.5	0 to 2	orangish-coloured (iron oxide) silt
				2 to 11.5	light brown silt

Table D.7: Sediment core observations from cores collected at profundal stations of Camp Lake (JLO) Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
JLO-14	26.5	1	12.5	0 to 3	reddish brown oxidized silt
				3 to 10	light brown grey silt
				10 to 12.5	medium brown grey silt
		2	13.0	0 to 3	reddish brown oxidized silt
				3 to 8	light brown grey silt
				8 to 13	medium brown grey silt; possible anoxia
		3	22.5	0 to 4	reddish brown oxidized silt
				4 to 9.5	light brown grey silt
				9.5 to 22	medium brown grey silt; possible anoxia
JLO-07	33.2	1	19.5	0 to 2	reddish-orange oxidized silt
				2 to 10	light brown grey; reduced streaks
				10 to 19.5	medium brown grey
		2	7.5	0 to 4	reddish-orange oxidized silt
				4 to 7.5	light brown grey
		3	10.0	0 to 2	reddish-orange oxidized silt
				2 to 7	light brown grey; reduced streaks
				7 to 10	medium brown grey
JLO-11	28.8	1	14.5	0 to 1.5	reddish-orange oxidized silt
				1.5 to 7	light brown grey silt
				7	redox boundary (band of anoxia)
				7 to 14.5	medium light brown grey silt
		2	17.5	0 to 1.5	reddish-orange oxidized silt
				1 to 6.5	light brown grey silt
				6.5	redox boundary (band of anoxia)
				6.5 to 17.5	medium light brown grey silt
		3	21.5	0 to 2	reddish-orange oxidized silt
				2 to 13	light brown grey silt
				13 to 21.5	medium brown grey silt

Table D.8: Statistical comparison of substrate physical properties at littoral depth stations between Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

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
Sand (% by weight)	No	0.783	α, δ, γ	Reference	5	42.5	18.1	8.1	19.9	66.6
				Camp	5	45.8	17.8	8.0	32.7	76.8
Silt (% by weight)	No	0.816	α, δ, γ	Reference	5	53.1	16.3	7.3	31.1	74.0
				Camp	5	50.6	16.5	7.4	22.0	61.5
Clay (% by weight)	No	0.574	α, δ, γ	Reference	5	4.4	2.2	1.0	2.3	7.4
				Camp	5	3.7	2.0	0.9	1.2	5.9
Moisture (%)	Yes	0.095	γ	Reference	5	89.7	13.4	6.0	66.6	99.0
				Camp	5	73.5	9.3	4.2	59.4	82.8
TOC (%)	Yes	0.071	α, δ, γ	Reference	5	4.8	2.0	0.9	3.3	8.0
				Camp	5	2.9	0.8	0.4	1.5	3.5

^a Data analysis included: α - data untransformed; β - data logit transformed; η - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ϵ - t-test assuming unequal variance; γ - ANOVA test validated using Mann Whitney U-test.

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

Table D.9: Sediment particle size, total organic carbon, and metal concentrations at Camp Lake (JLO) sediment stations, Mary River Project CREMP, August 2016.

Analyte		Units	Sediment Quality Guideline (SQG) ^a	AEMP Benchmark ^b	Camp Lake Stations								Study Area Summary Statistics		
					JLO-02 (littoral)	JLO-21 (littoral)	JLO-32 (littoral)	JLO-14 (profundal)	JLO-31 (littoral)	JLO-07 (profundal)	JLO-11 (profundal)	JLO-30 (littoral)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	32.7	43.1	35.7	35.8	40.6	48.8	53.6	76.8	46	14	5.1
	Silt	%	-	-	61.5	51.5	60.9	55.6	57.0	43.6	41.8	22.0	49	13	4.7
	Clay	%	-	-	5.9	5.4	3.4	8.6	2.4	7.6	4.6	1.2	4.9	2.5	0.9
	Moisture	%	-	-	69.3	78.9	77.2	76.6	82.8	63.6	66.3	59.4	72	8	2.93
	Total Organic Carbon	%	10 ^α	-	3.36	3.17	3.49	2.39	2.85	2.50	2.59	1.49	2.73	0.64	0.23
Metals	Aluminum (Al)	mg/kg	-	-	17,000	14,700	14,800	19,500	14,100	19,700	17,500	6,700	15,500	4,148	1,466
	Antimony (Sb)	mg/kg	-	-	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.011	0.0038
	Arsenic (As)	mg/kg	17	5.9	9.6	5.82	13.8	8.01	11.4	5.31	13.5	2.86	8.79	3.99	1.41
	Barium (Ba)	mg/kg	-	-	170	78.7	171	190	176	83.3	105	43.3	127	55.9	19.8
	Beryllium (Be)	mg/kg	-	-	0.89	0.90	0.86	1.05	0.81	1.10	0.96	0.38	0.87	0.22	0.078
	Bismuth (Bi)	mg/kg	-	-	0.29	0.42	0.35	0.30	0.26	0.36	0.31	<0.20	0.31	0.067	0.024
	Boron (B)	mg/kg	-	-	22.5	23.8	23.9	28.5	23.9	30.1	25.1	10.5	23.5	5.87	2.08
	Cadmium (Cd)	mg/kg	3.5	1.5	0.267	0.180	0.319	0.223	0.178	0.129	0.177	0.061	0.19	0.080	0.028
	Calcium (Ca)	mg/kg	-	-	4,900	4,600	5,880	4,680	4,470	4,560	4,380	2,170	4,455	1,038	367
	Chromium (Cr)	mg/kg	90	98	72.3	61.8	63.2	77.4	58.8	78.9	72.3	31.3	64.5	15.3	5.41
	Cobalt (Co)	mg/kg	-	-	20.9	16.3	20.0	24.7	20.1	17.7	18.5	7.76	18.2	4.91	1.74
	Copper (Cu)	mg/kg	197	50	48.4	38.7	50.4	49.5	37.6	50.8	49.1	16.1	42.6	11.9	4.21
	Iron (Fe)	mg/kg	40,000 ^α	52,400	49,050	38,700	57,600	66,400	73,500	44,700	73,800	21,900	53,206	18,164	6,422
	Lead (Pb)	mg/kg	91.3	35	20.6	23.8	22.4	24.0	19.7	25.8	22.4	13.4	21.5	3.81	1.35
	Lithium (Li)	mg/kg	-	-	28.9	32.2	26.9	35.5	26.7	37.0	31.4	12.9	28.9	7.48	2.64
	Magnesium (Mg)	mg/kg	-	-	14,050	11,800	11,900	13,700	10,400	13,900	13,100	5,810	11,833	2,742	969
	Manganese (Mn)	mg/kg	1,100 ^{α,β}	4,370	2,540	526	4,690	5,470	3,770	815	635	1,390	2,480	1,952	690.2
	Mercury (Hg)	mg/kg	0.486	0.17	0.0458	0.0411	0.0470	0.0512	0.0379	0.0536	0.0618	0.0120	0.0438	0.0148	0.00525
	Molybdenum (Mo)	mg/kg	-	-	2.02	1.01	4.10	3.00	5.07	0.93	1.42	1.00	2.32	1.58	0.559
	Nickel (Ni)	mg/kg	75 ^{α,β}	72	80.7	61.4	80.3	75.3	69.1	66.3	67.5	31.9	66.6	15.6	5.51
	Phosphorus (P)	mg/kg	2,000 ^α	1,580	1,580	1,360	1,690	2,170	2,280	1,380	2,860	697	1,752	668	236
	Potassium (K)	mg/kg	-	-	4,055	3,710	3,780	4,910	3,680	5,040	4,370	1,690	3,904	1,038	367
	Selenium (Se)	mg/kg	-	-	0.43	0.44	0.48	0.53	0.41	0.47	0.62	<0.20	0.45	0.12	0.043
	Silver (Ag)	mg/kg	-	-	0.11	0.11	0.12	0.15	<0.10	0.17	0.14	<0.10	0.13	0.026	0.009
	Sodium (Na)	mg/kg	-	-	190	169	167	249	157	320	253	78	198	74	26
	Strontium (Sr)	mg/kg	-	-	9.46	9.31	10.6	14.9	10.1	19.5	11.7	5.24	11.4	4.25	1.50
	Sulphur (S)	mg/kg	-	-	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5000	0	0
	Thallium (Tl)	mg/kg	-	-	0.554	0.478	0.619	0.641	0.532	0.447	0.423	0.190	0.485	0.142	0.0503
	Tin (Sn)	mg/kg	-	-	3.0	5.9	7.1	2.8	2.2	5.1	<2.0	10.2	4.8	2.9	1.0
	Titanium (Ti)	mg/kg	-	-	935	866	743	870	705	972	789	418	787	175	61.8
	Uranium (U)	mg/kg	-	-	6.98	5.45	6.64	7.39	4.52	6.92	7.29	1.66	5.86	1.96	0.694
	Vanadium (V)	mg/kg	-	-	59.8	51.7	53.7	64.3	49.9	62.5	61.0	24.5	53.4	12.8	4.53
	Zinc (Zn)	mg/kg	315	135	60.7	49.9	54.6	64.1	48.2	63.1	58.4	23.7	52.8	13.1	4.64
	Zirconium (Zr)	mg/kg	-	-	6.2	6.5	3.9	4.0	2.7	6.7	4.8	1.3	4.5	1.9	0.68

^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 [BCWSQG], probable effects level (PEL; BCMOE 2015)).

^b AEMP Sediment Quality Benchmarks developed by Intrinsik (2013, 2014) using sediment quality guidelines, baseline sediment quality data, and method detection limits. The indicated values are specific to Camp Lake.

Indicates parameter concentration above Sediment Quality Guideline (SQG).

BOLD Indicates parameter concentration above the AEMP Benchmark.

Table D.10: Magnitude of difference in sediment metal concentrations between 2016 Camp Lake and Reference Lake 3 data, at Camp Lake between 2016 and baseline, and at Camp Lake between 2016 and 2015 for littoral and profundal substrates, Mary River Project CREMP, 2016.

Variable	Camp Lake versus Reference Lake 3 2016				Camp Lake 2016 versus Baseline Period				Camp Lake 2016 versus Initial Year of Mine Operation (2015)			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Reference Lake Concentration (mg/kg)	Magnitude of Difference	Reference Lake Concentration (mg/kg)	Magnitude of Difference	Camp Lake Baseline Concentration (mg/kg)	Magnitude of Difference	Camp Lake Baseline Concentration (mg/kg)	Magnitude of Difference	Camp Lake 2015 Concentration (mg/kg)	Magnitude of Difference	Camp Lake 2015 Concentration (mg/kg)	Magnitude of Difference
Aluminum (Al)	16,480	0.8	25,150	0.8	18,267	0.7	15,175	1.2	15,900	0.8	15,430	1.2
Antimony (Sb)	<0.10	1.1	0.12	0.8	1.0	0.1	1.0	0.1	0.1	1.1	0.1	1.0
Arsenic (As)	3.7	2.3	6.5	1.4	2.8	3.1	3.5	2.6	14.6	0.6	6.6	1.4
Barium (Ba)	112	1.1	162	0.8	105	1.2	68	1.9	174	0.7	99	1.3
Beryllium (Be)	0.7	1.1	1.0	1.0	1.0	0.8	1.0	1.0	0.8	0.9	0.9	1.2
Bismuth (Bi)	<0.20	1.5	0.21	1.6	-	-	-	-	0.3	1.0	0.3	1.1
Boron (B)	13.0	1.6	19.2	1.5	1	28.5	2	15.2	24	0.9	23	1.2
Cadmium (Cd)	0.1	1.4	0.2	1.0	0.5	0.4	0.5	0.4	0.4	0.6	0.2	1.1
Calcium (Ca)	5,128	0.9	6,111	0.7	3,130	1.4	2,857	1.6	6,310	0.7	5,759	0.8
Chromium (Cr)	55	1.0	80	1.0	81	0.7	71	1.1	73	0.8	67	1.1
Cobalt (Co)	10	1.7	18	1.1	18	0.9	17	1.2	22	0.8	17	1.2
Copper (Cu)	66	0.6	101	0.5	45	0.8	40	1.3	57	0.7	39	1.3
Iron (Fe)	29,840	1.6	53,580	1.2	36,133	1.3	33,206	1.9	62,300	0.8	44,161	1.4
Lead (Pb)	46	0.4	30	0.8	18	1.1	19	1.3	21	0.9	20	1.2
Lithium (Li)	27	0.9	42	0.8	-	-	-	-	28.1	0.9	28.4	1.2
Magnesium (Mg)	10,852	1.0	16,160	0.8	13,967	0.8	10,113	1.3	13,600	0.8	12,638	1.1
Manganese (Mn)	496	5.2	1,866	1.2	699	3.7	942	2.4	1,900	1.4	2,476	0.9
Mercury (Hg)	0.0355	1.0	0.0699	0.8	0.100	0.4	0.100	0.6	0.058	0.6	0.036	1.6
Molybdenum (Mo)	2.190	1.2	3.270	0.5	1.0	2.6	1.0	1.8	2.6	1.0	1.8	1.0
Nickel (Ni)	39	1.7	56	1.2	67	1.0	63	1.1	84	0.8	62	1.1
Phosphorus (P)	840	1.8	1,121	1.9	800	1.9	1,125	1.9	1750.0	0.9	1,471	1.5
Potassium (K)	3,894	0.9	5,891	0.8	3,450	1.0	3,771	1.3	4,090	0.8	4,010	1.2
Selenium (Se)	0.5	0.8	0.9	0.6	1.0	0.4	1.0	0.5	0.6	0.7	0.4	1.5
Silver (Ag)	0.1	0.9	0.3	0.6	0.3	0.4	0.3	0.4	0.2	0.7	0.1	1.1
Sodium (Na)	296	0.5	455	0.6	279	0.5	254	1.1	184	0.8	193	1.4
Strontium (Sr)	11.4	0.8	15.8	1.0	9.3	1.0	12.0	1.3	11.1	0.8	13.4	1.1
Sulphur (S)	<5,000	1.0	<5,000	1.0	-	-	-	-	5000.0	1.0	5000.0	1.0
Thallium (Tl)	0.388	1.2	0.801	0.6	1.0	0.5	1.0	0.5	0.7	0.7	0.5	1.0
Tin (Sn)	56	0.1	16	0.2	-	-	-	-	2.0	2.8	2.0	1.7
Titanium (Ti)	1,072	0.7	1,331	0.7	-	-	-	-	893.0	0.8	759.9	1.2
Uranium (U)	12	0.4	27	0.3	-	-	-	-	9.7	0.5	5.7	1.3
Vanadium (V)	50	1.0	72	0.9	69	0.7	57	1.1	61	0.8	53	1.2
Zinc (Zn)	74	0.6	105	0.6	67	0.7	57	1.1	61	0.8	52	1.2
Zirconium (Zr)	4.3	0.9	4.0	1.3	-	-	-	-	8	0.5	5	1.0

Denotes slight elevation (mean variable concentration 2 to 5 times higher than respective mean reference, baseline period 0r 2015 value).

Denotes moderate elevation (mean variable concentration 5 to 10 times higher than respective mean reference, baseline period, or 2015 value).

Denotes highly elevated concentration (mean variable concentration greater than 10 times higher than respective mean reference, baseline period or 2015 value).

Table D.11: Field observations at Sheardown Lake Northwest (DLO-01) benthic invertebrate community stations^a, Mary River Project CREMP, August 2016.

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia ^b	Plant or Algal Presence
DD-HAB-9-STN2	10.3	thin "rust" layer at surface (~0.3cm thick) over medium brown silt	none detected	moss or <i>Chara</i> sp. (common); globular algae (sparse)
DLO-01-8	11.4	very thin oxidized layer at surface (<0.2cm thick) over medium brown silt	none detected	none observed
DLO-01-9	7.5	thin layer of oxidized material (0.25cm thick) over dark brown silt	Yes (slight sulphur odour)	globular algae (sparse)
DLO-01-3	8.6	thin layer of oxidized material (0.25cm thick) over dark brown silt	Yes (slight sulphur odour, blackened substrate)	globular algae (sparse)
DLO-01-10	9.0	reddish-orange coloured oxidized material (~0.5cm thick) over medium brown silt	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.12: Sediment core observations from cores collected at littoral stations in Sheardown Lake Northwest (DLO-01), Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
DD-HAB 9-STN2	10.3	1	17.0	0 to 3	dark orange-brown to black organic-silt flocc mixture
				3 to 17	dark to medium brown silt
		2	19.5	0 to 2.5	dark orange brown oxidized flocc
				2.5 to 9	dark orange brown to black organic silt flocc mix
				9 to 19.5	dark to medium brown silt
		3	16.0	0 to 1	orange brown oxidized flocc
				1 to 7	dark orange brown to black organic silt flocc mix
				7 to 16	dark to medium brown silt
DLO-01-08	11.4	1	14.5	0 to 2.5	orange-brown (iron oxide) silt
				2.5 to 10	medium beige-coloured silt
				10 to 11	green coloured silt
				11 to 14.5	medium beige-coloured silt
		2	16.0	0 to 2	orange-brown (iron oxide) silt
				2 to 12	medium beige-coloured silt
				12 to 13	green coloured silt
				13 to 16	medium beige-coloured silt
		3	14.5	0 to 3	orange-brown (iron oxide) silt
				3 to 10	medium beige-coloured silt
				10 to 11	green coloured silt
				11 to 14.5	medium beige-coloured silt
DLO-01-3	7.8	1	13.5	0 to 0.5	orange brown (iron oxide) silt, moss present
				0.5 to 6	gray black reducing zone, silt
				6 to 13.5	medium brown silt
		2	16.0	0 to 0.5	orange brown (iron oxide) silt, moss present
				0.5 to 6.5	gray black reducing zone, silt
				6.5 to 16	medium brown silt
		3	14.0	0 to 2	orange brown (iron oxide) silt, moss present
				2 to 14	medium brown silt
DLO-01-9	7.5	1	21.0	0 to 2	iron oxide / macrophyte (moss) mix
				2 to 10	medium brown organic silt
				10 to 21	medium brown silt
		2	18.0	0 to 1	iron oxide / macrophyte (moss) mix
				1 to 7	medium brown organic silt
				7 to 18	medium brown silt
		3	22.0	0 to 2.5	iron oxide / macrophyte (moss) mix
				2.5 to 7	medium brown organic silt
				7 to 22	medium brown silt
DLO-01-10	9.4	1	15.0	0 to 1	orange brown oxidized silt
				1 to 4	medium brown organic silt
				4 to 15	medium brown silt
		2	15.0	0 to 2	orange brown oxidized silt
				2 to 15	medium brown silt
		3	14.5	0 to 2	orange brown oxidized silt
				2 to 14.5	medium brown silt

Table D.13: Sediment core observations from cores collected at profundal stations in Sheardown Lake Northwest (DLO-01), Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
DLO-01-05	23.1	1	13.0	0 to 0.5	orange brown oxidized silt
				0.5 to 4.5	dark brown silt with black streaking
				4.5 to 13	medium brown silt
		2	13.0	0 to 0.5	orange brown oxidized silt
				0.5 to 5	dark brown silt with black streaking
				5 to 13	medium brown silt
		3	22.0	0 to 0.5	orange brown oxidized silt
				0.5 to 4.5	dark brown silt with black streaking
				4 to 22	medium brown silt
DLO-01	20.3	1	14.0	0 to 0.5	oxidized orange brown silt
				0.5 to 14	uniform orange brown silt
		2	15.0	0 to 0.5	oxidized orange brown silt
				0.5 to 15	uniform orange brown silt
		3	11.5	0 to 11.5	uniform orange brown silt, some oxidation at surface
DLO-01-2	18.6	1	18.0	0 to 18	uniform orange brown silt
		2	14.5	0 to 14.5	uniform orange brown silt
		3	13.5	0 to 13.5	uniform orange brown silt
DLO-DUP (replicate of DLO-01-2)	-	1	14.5	0 to 3	orange brown oxidized silt
				3 to 5	black to orange colour orange oxidized silt
				5 to 14.5	light brown silt
		2	14.0	0 to 14.5	orange brown oxidized silt
		3	16.5	0 to 16.5	orange brown oxidized silt

Table D.14: Statistical comparison of littoral station substrate physical properties between Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2016.

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
Sand (% by weight)	No	0.601	α , δ , γ	Reference	5	42.5	18.1	8.1	19.9	66.6
				Sheardown NW	5	36.4	17.6	7.9	12.7	53.4
Silt (% by weight)	No	0.769	α , δ , γ	Reference	5	53.1	16.3	7.3	31.1	74.0
				Sheardown NW	5	56.3	17.2	7.7	39.1	79.0
Clay (% by weight)	Yes	0.041	ϵ , δ , γ	Reference	5	4.4	2.2	1.0	2.3	7.4
				Sheardown NW	5	7.3	0.6	0.3	6.6	8.3
Moisture (%)	Yes	0.039	α , δ , γ	Reference	5	89.7	13.4	6.0	66.6	99.0
				Sheardown NW	5	70.4	11.3	5.0	58.1	86.6
TOC (%)	Yes	0.056	γ	Reference	5	4.8	2.0	0.9	3.3	8.0
				Sheardown NW	5	2.9	1.3	0.6	2.0	5.1

^a Data analysis included: α - data untransformed; β - data logit transformed; η - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ϵ - t-test assuming unequal variance; γ - ANOVA test validated using Mann Whitney U-test.

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

Table D.15: Sediment particle size, total organic carbon, metal concentrations at Sheardown Lake Northwest (DLO-01) sediment stations, Mary River Project CREMP, August 2016.

Analyte		Units	Sediment Quality Guideline (SQG) ^a	AEMP Benchmark ^b	Sheardown Lake Northwest Stations								Study Area Summary Statistics		
					DLO-01-5 (profundal)	DD-HAB 9-STN2 (littoral)	DLO-01-8 (littoral)	DLO-01 (profundal)	DLO-01-9 (littoral)	DLO-01-2 (profundal)	DLO-01-3 (littoral)	DLO-01-10 (littoral)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	16.2	12.7	22.9	11.5	48.7	23.4	44.2	53.4	29	17	6.0
	Silt	%	-	-	69.8	79.0	69.8	68.7	44.3	69.4	49.2	39.1	61	15	5.2
	Clay	%	-	-	14.0	8.3	7.3	19.8	7.0	7.3	6.6	7.5	10	4.7	1.7
	Moisture	%	-	-	56.1	69.4	86.6	55.3	75.6	63.7	58.1	62.2	66	11	3.8
	Total Organic Carbon	%	10 ^α	-	2.19	2.90	2.04	1.70	5.12	1.92	2.23	2.03	2.52	1.11	0.392
Metals	Aluminum (Al)	mg/kg	-	-	21,300	13,600	18,100	23,800	19,500	18,550	12,900	14,000	17,719	3,925	1,388
	Antimony (Sb)	mg/kg	-	-	<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	6.2	3.74	13.8	6.13	4.93	7.54	4.23	2.52	9.77	6.58	3.71	1.31
	Barium (Ba)	mg/kg	-	-	91.2	621	92.6	103	110	108.2	61.8	93.6	160	186.8	66.0
	Beryllium (Be)	mg/kg	-	-	1.14	0.72	0.97	1.24	1.03	0.95	0.67	0.73	0.931	0.208	0.074
	Bismuth (Bi)	mg/kg	-	-	0.32	0.27	0.21	0.27	0.28	0.23	<0.20	<0.20	0.25	0.044	0.016
	Boron (B)	mg/kg	-	-	31.2	20.2	28.4	33.9	31.9	27.0	19.5	20.2	26.5	5.83	2.06
	Cadmium (Cd)	mg/kg	3.5	1.5	0.259	0.306	0.172	0.271	0.481	0.241	0.208	0.166	0.263	0.100	0.0355
	Calcium (Ca)	mg/kg	-	-	4,130	4,360	3,960	4,630	6,180	4,445	3,920	4,050	4,459	738	261.0
	Chromium (Cr)	mg/kg	90	97	79.8	52.4	67.3	83.8	77.2	70.7	54.4	58.2	68.0	12.0	4.24
	Cobalt (Co)	mg/kg	-	-	14.9	12.6	14.3	17.2	14.5	15.4	9.90	12.2	13.9	2.24	0.79
	Copper (Cu)	mg/kg	197	58	49.8	38.6	38.9	50.1	71.0	40.1	34.9	31.1	44.3	12.64	4.47
	Iron (Fe)	mg/kg	40,000 ^α	52,200	43,400	83,000	60,700	41,200	65,400	36,400	24,700	59,900	51,838	18,738	6,625
	Lead (Pb)	mg/kg	91.3	35	25.3	20.2	24.0	29.8	22.5	37.8	16.0	16.2	24.0	7.23	2.56
	Lithium (Li)	mg/kg	-	-	41.9	22.8	30.1	41.3	35.8	34.0	23.9	25.1	31.9	7.6	2.69
	Magnesium (Mg)	mg/kg	-	-	14,100	9,480	11,200	14,400	13,800	12,050	10,100	9,900	11,879	2,011	711
	Manganese (Mn)	mg/kg	1,100 ^{α,β}	4,530	376	10,300	873	1,120	437	2,810	244	663	2,103	3,411	1,206
	Mercury (Hg)	mg/kg	0.486	0.17	0.0587	0.0418	0.0315	0.0367	0.0592	0.0342	0.0277	0.0322	0.0402	0.0123	0.00433
	Molybdenum (Mo)	mg/kg	-	-	1.40	19.7	8.87	1.82	7.49	5.76	2.29	5.67	6.62	5.95	2.10
	Nickel (Ni)	mg/kg	75 ^{α,β}	77	66.0	66.3	60.6	68.5	90.5	69.0	55.5	56.3	66.6	11.0	3.89
	Phosphorus (P)	mg/kg	2,000 ^α	1,958	909	2,310	1,050	929	1,030	835	780	1,880	1,215	562	199
	Potassium (K)	mg/kg	-	-	5,380	3,340	4,380	5,750	4,720	4,635	3,170	3,420	4,349	965	341
	Selenium (Se)	mg/kg	-	-	0.50	0.41	0.39	0.34	0.68	0.35	0.27	0.35	0.41	0.13	0.045
	Silver (Ag)	mg/kg	-	-	0.22	0.12	0.12	0.19	0.18	0.13	<0.10	<0.10	0.15	0.045	0.016
	Sodium (Na)	mg/kg	-	-	316	186	250	316	297	272	224	196	257	51.6	18.3
	Strontium (Sr)	mg/kg	-	-	12.3	9.17	10.1	13.2	12.1	11.1	9.43	9.24	10.8	1.57	0.55
	Sulphur (S)	mg/kg	-	-	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	5000	0	0
	Thallium (Tl)	mg/kg	-	-	0.546	0.446	0.456	0.633	0.610	0.569	0.375	0.351	0.498	0.106	0.0376
	Tin (Sn)	mg/kg	-	-	2.4	4.7	9.3	10.8	2.1	26.2	3.5	3.2	7.8	8.1	2.9
	Titanium (Ti)	mg/kg	-	-	1,280	773	1,050	1,350	1,160	1,140	973	884	1,076	196	69
	Uranium (U)	mg/kg	-	-	9.35	7.88	5.29	9.23	15.0	6.29	6.82	5.82	8.21	3.13	1.11
	Vanadium (V)	mg/kg	-	-	59.2	39.8	52.3	65.3	59.0	54.2	39.2	42.4	51.4	9.9	3.50
	Zinc (Zn)	mg/kg	315	123	75.1	51.8	61.8	78.8	72.7	65.2	47.2	49.4	62.7	12.3	4.34
	Zirconium (Zr)	mg/kg	-	-	14.9	5.9	6.7	8.3	20.7	4.9	8.7	6.4	9.6	5.45	1.93

^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 Intransik (2013, 2014) using sediment quality guidelines, baseline sediment quality data, and method detection limits. The indicated values are specific to Sheardown Lake Northwest.

Indicates paramter concentration above Sediment Quality Guideline (SQG).

BOLD

 Indicates parameter concentration above the AEMP Benchmark.

Table D.16: Magnitude of difference in sediment metal concentrations between Sheardown Lake NW and Reference Lake 3 in 2016, at Sheardown Lake NW between 2016 and the baseline period, and at Sheardown Lake NW between 2015 and 2016 mine operation years for littoral and profundal stations, Mary River Project CREMP, 2016.

Variable	Sheardown Lake NW versus Reference Lake 3 in 2016				Sheardown Lake NW 2016 versus Baseline Period				Sheardown Lake NW 2016 versus Initial Year of Mine Operation (2015)			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Reference Lake Concentration (mg/kg)	Magnitude of Difference	Reference Lake Concentration (mg/kg)	Magnitude of Difference	Sheardown Lake NW Baseline Concentration (mg/kg)	Magnitude of Difference	Sheardown Lake NW Baseline Concentration (mg/kg)	Magnitude of Difference	Sheardown Lake NW 2015 Concentration (mg/kg)	Magnitude of Difference	Sheardown Lake NW 2015 Concentration (mg/kg)	Magnitude of Difference
Aluminum (Al)	16,480	0.9	25,150	0.8	11,792	1.3	17,745	1.2	15,205	1.0	21,000	1.0
Antimony (Sb)	<0.10	1.0	0.12	0.8	1.0	0.1	1.0	0.1	0.1	1.0	0.1	1.0
Arsenic (As)	3.7	2.1	6.5	0.7	3.0	2.7	3.2	1.3	6.9	1.2	5.1	0.8
Barium (Ba)	112	1.8	162	0.6	78	2.5	93	1.1	140	1.4	100	1.0
Beryllium (Be)	0.7	1.2	1.0	1.1	1.0	0.8	1.0	1.1	0.8	1.0	1.1	1.0
Bismuth (Bi)	<0.20	1.2	0.21	1.3	-	-	-	-	0.3	-	0.3	-
Boron (B)	13.0	1.8	19.2	1.6	3	8.4	3	9.9	25	0.9	32	1.0
Cadmium (Cd)	0.1	1.8	0.2	1.4	0.5	0.5	0.5	0.5	0.4	0.8	0.3	1.0
Calcium (Ca)	5,128	0.9	6,111	0.7	2,697	1.7	3,558	1.2	4,411	1.0	4,595	1.0
Chromium (Cr)	55	1.1	80	1.0	53	1.2	81	1.0	60	1.0	81	1.0
Cobalt (Co)	10	1.3	18	0.9	10	1.2	15	1.0	14	0.9	17	0.9
Copper (Cu)	66	0.6	101	0.5	33	1.3	48	1.0	45	1.0	47	1.0
Iron (Fe)	29,840	2.0	53,580	0.8	28,120	2.1	40,382	1.0	57,810	1.0	43,375	0.9
Lead (Pb)	46	0.4	30	1.0	13	1.6	20	1.5	19	1.1	24	1.3
Lithium (Li)	27	1.0	42	0.9	-	-	-	-	26.6	-	36.2	-
Magnesium (Mg)	10,852	1.0	16,160	0.8	7,448	1.5	11,498	1.2	10,250	1.1	13,750	1.0
Manganese (Mn)	496	5.1	1,866	0.8	756	3.3	2,164	0.7	1,496	1.7	2,707	0.5
Mercury (Hg)	0.0355	1.1	0.0699	0.6	0.100	0.4	0.100	0.4	0.039	1.0	0.041	1.1
Molybdenum (Mo)	2.190	4.0	3.270	0.9	3.4	2.6	3.5	0.8	9.6	0.9	3.8	0.8
Nickel (Ni)	39	1.7	56	1.2	49	1.3	69	1.0	70	0.9	70	1.0
Phosphorus (P)	840	1.7	1,121	0.8	863	1.6	1,400	0.6	1020.3	-	1006.8	-
Potassium (K)	3,894	1.0	5,891	0.9	2,681	1.4	4,612	1.1	3,889	1.0	5,458	1.0
Selenium (Se)	0.5	0.9	0.9	0.5	1.0	0.4	1.0	0.4	0.5	0.8	0.4	1.0
Silver (Ag)	0.1	1.1	0.3	0.7	0.3	0.5	0.3	0.6	0.2	0.7	0.2	0.9
Sodium (Na)	296	0.8	455	0.7	249	0.9	342	0.9	233	1.0	306	1.0
Strontium (Sr)	11.4	0.9	15.8	0.8	7.2	1.4	11.4	1.1	10.7	0.9	13.0	0.9
Sulphur (S)	<5,000	1.0	<5,000	1.0	-	-	-	-	5000.0	-	5000.0	-
Thallium (Tl)	0.388	1.2	0.801	0.7	1.0	0.4	1.0	0.6	0.5	0.8	0.7	0.9
Tin (Sn)	56	0.1	16	0.8	-	-	-	-	2.0	-	2.0	-
Titanium (Ti)	1,072	0.9	1,331	0.9	-	-	-	-	889.3	-	1235.0	-
Uranium (U)	12	0.7	27	0.3	-	-	-	-	8.9	-	9.2	-
Vanadium (V)	50	0.9	72	0.8	37	1.2	58	1.0	47	1.0	61	1.0
Zinc (Zn)	74	0.8	105	0.7	51	1.1	76	1.0	59	1.0	76	1.0
Zirconium (Zr)	4.3	2.2	4.0	2.3	-	-	-	-	10.9875	-	9.675	-

- Denotes slight elevation (mean variable concentration 2 to 5 times higher than respective mean reference, baseline, or 2015 value).
- Denotes moderate elevation (mean variable concentration 5 to 10 times higher than respective mean reference, baseline period, or 2015 value).
- Denotes highly elevated concentration (mean variable concentration greater than 10 times higher than respective mean reference, baseline period or 2015 value).

Table D.17: Field observations at Sheardown Lake Southeast (DLO-02) benthic invertebrate community stations^a, Mary River Project CREMP, August 2016.

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia ^b	Plant or Algal Presence
DLO-02-1	11.3	dark brown silt (compact)	none detected	globular algae (sparse)
DLO-02-11	6.7	moderately loose silt / organic silt, dark brown to black, some iron oxide flecking on surface	Yes (slight sulphur/chemical odour)	moss (very sparse), globular algae (common)
DLO-02-9	8.2	dark to medium brown compact silt, possible 0.1cm oxidized layer (reddish 6mm)	none detected	moss (sparse), globular algae (sparse)
DLO-02-13	12.0	dark brown compact to semi-compact silt	none detected	none observed
DLO-02-3	13.9	dark brown, compact silt	none detected	moss (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.18: Sediment core observations from cores collected in Sheardown Lake Southeast basin (DLO-02), Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
DLO-02-1	11.3	1	26.0	0 to 2	orange brown oxidized silt
				2 to 7	medium brown silt
				7 to 22	medium brown-coloured silt sand mix
				22 to 26	medium brown silt
		2	9.5	0 to 1.5	orange brown oxidized silt
				1.5 to 9.5	medium brown silt
		3	7.0	0 to 2	orange brown oxidized silt
				2 to 7	medium brown silt
DLO-02-11	6.7	1	10.0	0 to 1	orange brown oxidized material over silt
				1 to 10	medium brown silt, some black streaking
		2	9.5	0 to 1	orange brown oxidized material over silt
				1 to 3	green, black, and/or brown organic silt floc-like material, possibly anoxic
				3 to 10	medium brown silt with some black streaking
		3	11.0	0 to 1	orange brown oxidized material over silt
				1 to 11	medium brown silt, some black streaking
DLO-02-9	8.2	1	10.5	0 to 1	orange brown oxidized material
				1 to 10.5	dark brown silt with black streaking
		2	8.0	0 to 2	orange brown oxidized material
				2 to 8	dark brown silt with black streaking
		3	9.5	0 to 1.5	orange brown oxidized material
				1.5 to 9.5	dark brown silt with black streaking
DLO-02-13	12	1	10.0	0 to 1.5	orange brown silt
				1.5 to 10	medium brown silt, some black streaking
		2	12.0	0 to 2	orange brown silt
				2 to 12	medium brown silt, some black streaking
		3	14.0	0 to 2	orange brown silt
				2 to 14	medium brown silt, some black streaking
DLO-02-3	13.9	1	15.5	0 to 2	orange brown silt
				2 to 15.5	medium brown silt with black streaking throughout
		2	12.5	0 to 2	orange brown silt
				2 to 12.4	medium brown silt with black streaking throughout
		3	7.0	0 to 7	orange brown and medium brown silt, some black streaking

Table D.19: Statistical comparison of substrate physical properties between littoral depth stations at Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2016.

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
Sand (% by weight)	Yes	0.003	β , δ , γ	Reference	5	42.5	18.1	8.1	19.9	66.6
				Sheardown SE	5	12.0	4.3	1.9	7.3	16.6
Silt (% by weight)	Yes	0.051	α , ϵ , γ	Reference	5	53.1	16.3	7.3	31.1	74.0
				Sheardown SE	5	73.0	3.2	1.4	70.4	78.1
Clay (% by weight)	Yes	0.000	α , δ , γ	Reference	5	4.4	2.2	1.0	2.3	7.4
				Sheardown SE	5	14.9	3.2	1.4	11.6	18.7
Moisture (%)	Yes	0.008	γ	Reference	5	89.7	13.4	6.0	66.6	99.0
				Sheardown SE	5	41.4	5.7	2.5	36.9	51.2
TOC (%)	Yes	0.015	α , ϵ , γ	Reference	5	4.8	2.0	0.9	3.3	8.0
				Sheardown SE	5	1.3	0.3	0.1	1.1	1.9

^a Data analysis included: α - data untransformed; β - data logit transformed; η - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ϵ - t-test assuming unequal variance; γ - ANOVA test validated using Mann Whitney U-test.

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

Table D.20: Sediment particle size, total organic carbon, and metal concentrations at Sheardown Lake Southeast (DLO-02) sediment stations, Mary River Project CREMP, August 2016.

Analyte		Units	Sediment Quality Guideline (SQG) ^a	AEMP Benchmark ^b	Sheardown Lake Southeast Stations					Study Area Summary Statistics		
					DLO-02-1 (littoral)	DLO-02-11 (littoral)	DLO-02-9 (littoral)	DLO-02-13 (littoral)	DLO-02-3 (littoral)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	16.3	11.4	8.4	7.3	16.6	12	4.3	1.9
	Silt	%	-	-	72.1	70.6	78.1	74.0	70.4	73	3.2	1.4
	Clay	%	-	-	11.6	18.0	13.5	18.7	12.9	15	3.2	1.4
	Moisture	%	-	-	36.9	51.2	41.3	38.6	39.0	41	5.7	2.5
	Total Organic Carbon	%	10 ^α	-	1.22	1.86	1.05	1.07	1.32	1.30	0.33	0.15
Metals	Aluminum (Al)	mg/kg	-	-	14,300	18,200	15,300	18,800	15,600	16,440	1,953	873
	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	2.86	5.14	4.49	5.89	3.63	4.40	1.20	0.54
	Barium (Ba)	mg/kg	-	-	66.2	85.4	90.2	143	76.4	92.2	29.8	13.34
	Beryllium (Be)	mg/kg	-	-	0.70	0.85	0.68	0.86	0.70	0.76	0.09	0.04
	Bismuth (Bi)	mg/kg	-	-	0.60	0.23	0.21	0.21	<0.20	0.29	0.17	0.08
	Boron (B)	mg/kg	-	-	17.4	23.6	20.2	24.8	21.3	21.5	2.91	1.30
	Cadmium (Cd)	mg/kg	3.5	1.5	0.092	0.114	0.098	0.121	0.091	0.103	0.0136	0.0061
	Calcium (Ca)	mg/kg	-	-	5,770	3,800	6,480	4,290	5,220	5,112	1,085	485.4
	Chromium (Cr)	mg/kg	90	79	63.7	76.1	74.8	75.1	63.7	70.7	6.4	2.9
	Cobalt (Co)	mg/kg	-	-	12.3	12.8	12.8	15.4	12.1	13.1	1.33	0.60
	Copper (Cu)	mg/kg	110	56	24.2	29.0	24.1	28.1	23.4	25.8	2.59	1.16
	Iron (Fe)	mg/kg	40,000 ^α	34,400	33,100	49,100	38,500	45,600	35,400	40,340	6,794	3,038
	Lead (Pb)	mg/kg	91.3	35	16.6	34.6	18.3	20.9	18.1	21.7	7.4	3.3
	Lithium (Li)	mg/kg	-	-	26.5	34.8	28.4	34.6	27.8	30.4	4.0	1.8
	Magnesium (Mg)	mg/kg	-	-	12,100	12,800	13,500	13,100	12,100	12,720	618	276
	Manganese (Mn)	mg/kg	1,100 ^{α,β}	657	527	435	1,830	4,240	949	1,596	1,578	706
	Mercury (Hg)	mg/kg	0.486	0.17	0.0240	0.0296	0.0188	0.0305	0.0233	0.0252	0.0048	0.0022
	Molybdenum (Mo)	mg/kg	-	-	0.80	2.40	1.23	2.57	1.27	1.65	0.78	0.350
	Nickel (Ni)	mg/kg	75 ^{α,β}	66	52.0	57.0	61.6	60.2	48.4	55.8	5.6	2.5
	Phosphorus (P)	mg/kg	2,000 ^α	1,278	914	1020	1060	1170	966	1,026	98	44
	Potassium (K)	mg/kg	-	-	3,340	4,450	3,570	4,550	3,630	3,908	552	247
	Selenium (Se)	mg/kg	-	-	<0.20	0.20	<0.20	<0.20	<0.20	0.20	0	0
	Silver (Ag)	mg/kg	-	-	<0.10	0.13	<0.10	0.12	0.10	0.11	0.01	0.01
	Sodium (Na)	mg/kg	-	-	219	303	250	310	255	267	38.3	17.1
	Strontium (Sr)	mg/kg	-	-	9.62	10.3	10.5	11.6	10.3	10.5	0.7	0.3
	Sulphur (S)	mg/kg	-	-	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	0	0
	Thallium (Tl)	mg/kg	-	-	0.332	0.412	0.366	0.440	0.337	0.377	0.047	0.021
	Tin (Sn)	mg/kg	-	-	4.4	30.0	5.8	5.8	6.8	10.6	10.9	4.9
	Titanium (Ti)	mg/kg	-	-	1,120	1,270	1,110	1,250	1,190	1,188	73	33
	Uranium (U)	mg/kg	-	-	4.62	6.18	4.21	5.88	4.96	5.17	0.84	0.37
	Vanadium (V)	mg/kg	-	-	43.5	52.3	44.9	52.2	45.1	47.6	4.3	1.9
	Zinc (Zn)	mg/kg	315	135	51.3	55.2	45.5	56.9	48.4	51.5	4.7	2.1
	Zirconium (Zr)	mg/kg	-	-	17.3	18.5	12.1	13.5	14.5	15.2	2.7	1.2

^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)).

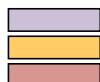
^b AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, baseline sediment quality data, and method detection limits. The indicated values are specific to Sheardown Lake Southeast.

Indicates paramter concentration above Sediment Quality Guideline (SQG).

BOLD Indicates parameter concentration above the AEMP Benchmark.

Table D.21: Magnitude of difference in sediment metal concentrations between Sheardown Lake SE and Reference Lake 3 in 2016, at Sheardown Lake SE between 2016 and the baseline period, and at Sheardown Lake SE between 2016 and 2015 mine operational years for littoral and profundal stations, Mary River Project CREMP, 2016

Variable	Sheardown Lake SE versus Reference Lake 3 in 2016		Sheardown Lake SE 2016 versus Baseline Period		Sheardown Lake SE 2016 versus Initial Year of Mine Operation (2015)	
	Reference Lake Concentration (mg/kg)	Magnitude of Difference	Sheardown Lake SE Baseline Concentration (mg/kg)	Magnitude of Difference	Sheardown Lake SE 2015 Concentration (mg/kg)	Magnitude of Difference
Aluminum (Al)	16,480	1.0	14,950	1.1	18,467	0.9
Antimony (Sb)	<0.10	1.0	1.0	0.1	0.1	1.0
Arsenic (As)	3.7	1.2	1.9	2.4	4.7	0.9
Barium (Ba)	112	0.8	81	1.1	95	1.0
Beryllium (Be)	0.7	1.1	1.0	0.8	0.9	0.9
Boron (B)	13.0	1.6	3	8.6	27	0.8
Cadmium (Cd)	0.1	0.7	0.5	0.2	0.1	0.9
Calcium (Ca)	5,128	1.0	6,310	0.8	5,933	0.9
Chromium (Cr)	55	1.3	78	0.9	84	0.8
Cobalt (Co)	10	1.3	13	1.0	15	0.9
Copper (Cu)	66	0.4	30	0.9	30	0.9
Iron (Fe)	29,840	1.4	32,284	1.2	44,300	0.9
Lead (Pb)	46	0.5	17	1.3	19	1.1
Lithium (Li)	27	1.1	-	-	32.7	0.9
Magnesium (Mg)	10,852	1.2	12,634	1.0	14,233	0.9
Manganese (Mn)	496	3.2	462	3.5	1,048	1.5
Mercury (Hg)	0.0355	0.7	0.100	0.3	0.025	1.0
Molybdenum (Mo)	2.190	0.8	1.5	1.1	1.7	1.0
Nickel (Ni)	39	1.4	62	0.9	68	0.8
Phosphorus (P)	840	1.2	1,150	0.9	1,076	1.0
Potassium (K)	3,894	1.0	3,947	1.0	4,647	0.8
Selenium (Se)	0.5	0.4	1.0	0.2	0.2	0.9
Silver (Ag)	0.1	0.9	0.4	0.3	0.1	0.8
Sodium (Na)	296	0.9	353	0.8	299	0.9
Strontium (Sr)	11.4	0.9	16.0	0.7	13.1	0.8
Thallium (Tl)	0.388	1.0	1.0	0.4	0.5	0.8
Tin (Sn)	56	0.2	-	-	2.0	5.3
Titanium (Ti)	1,072	1.1	-	-	1,380	0.9
Uranium (U)	12	0.4	-	-	6.3	0.8
Vanadium (V)	50	1.0	52	0.9	55	0.9
Zinc (Zn)	74	0.7	51	1.0	62	0.8



Denotes slight elevation (mean variable concentration 2 to 4 times higher than respective mean reference, baseline period or 2015 value).

Denotes moderate elevation (mean variable concentration 4 to 10 times higher than respective mean reference, baseline period or 2015 value).

Denotes highly elevated concentration (mean variable concentration greater than 10 times higher than respective mean reference, baseline period or 2015 value).

Table D.22: Field observations at Mary Lake (BLO) benthic invertebrate community stations^a, Mary River Project CREMP, August 2016.

Station	Station Depth (m)	Colour and Texture Observations	Evidence of Anoxia ^b	Plant or Algal Presence
BLO-01	9.6	medium brown clay silt	none detected	none observed
BLO-20	11.3	brown grey fine silt with some sand	none detected	none observed
BLO-11	11.6	medium brown silt with some sand	none detected	none observed
BLO-21	11.2	medium brown silt	none detected	none observed
BLO-22	11.3	medium brown silt	none detected	none observed
BLO-06	9.1	medium brown silt	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.23: Sediment observations from cores collected at littoral stations of Mary Lake (BLO), Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
BLO-01	9.6	1	17.0	0 to 2	orange brown silt
				2 to 11	medium beige silt with black streaking
				11 to 17	medium to dark brown silt
		2	27.5	0 to 2	orange brown silt
				2 to 27.5	gradient from medium beige with black streaking to dark brown silt
		3	19.0	0 to 2	orange brown silt
				2 to 19	gradient from medium beige with black streaking to dark brown silt
BLO-20	11.5	1	13.0	0 to 2	medium orange brown silt
				2 to 13	medium dark brown silt with some black streaking
		2	10.0	0 to 4	medium orange brown silt
				4 to 10	medium dark brown silt with some black streaking
		3	11.0	0 to 3	medium orange brown silt
				3 to 11	medium dark brown silt with some black streaking
BLO-11	10.9	1	15.0	0 to 1.5	orange brown silt
				1.5 to 15	orange brown silt with fine sand
		2	7.5	0 to 3	orange brown silt
				3 to 7.5	orange brown silt with fine sand
		3	13.5	0 to 2	orange brown silt
				2 to 7	orange brown silt with fine sand
BLO-21	10.9	1	10.5	0 to 4	light beige silt
				4 to 10.5	medium brown silt with black streaking/band at top of layer
		2	10.5	0 to 4.5	light beige silt
				4.5 to 10.5	medium brown silt with black streaking/band at top of layer
		3	10.5	0 to 5	light beige silt
				5 to 10.5	medium brown silt with black streaking/band at top of layer
BLO-22	11.4	1	19.0	0 to 1.5	light orange brown silt
				1.5 to 8	medium beige brown silt
				8 to 19	dark brown silt with some minor black streaking
		2	20.0	0 to 2	light orange brown silt
				2 to 6	medium beige brown silt
				6 to 20	dark brown silt with some minor black streaking
		3	20.0	0 to 2	light orange brown silt
				2 to 7	medium beige brown silt
				7 to 20	dark brown silt with some minor black streaking
BLO-06	9.1	1	9.0	0 to 6	medium brown silt
				6 to 9	medium brown silt with dark brown pockets
		2	9.0	0 to 6	medium brown silt
				6 to 9	medium brown silt with dark brown pockets
		3	10.5	0 to 6.5	medium brown silt
				6.5 to 10.5	medium brown silt with dark brown pockets

Table D.24: Sediment observations from cores collected at profundal stations of Mary Lake (BLO), Mary River Project CREMP, August 2016.

Sample Station	Station Depth (m)	Core #	Core Length (cm)	Core Horizon (cm)	Core Observation
BLO-12	20.0	1	7.0	0 to 7	medium brown silt
		2	14.5	0 to 2.5	medium brown silt wth some fine sand
				2.5 to 7.5	medium dark brown silt wth some fine sand
				7.5 to 14.5	compact medium to dark brown silt wth some fine sand
		3	25.0	0 to 7	medium brown silt
				7 to 25	compact medium to dark brown silt wth some fine sand
BLO-10	17.7	1	13.0	0 to 3.5	light brown silt
				3.5 to 7	medium brown silt, some black banding/streaking
				7 to 13.5	medium to dark brown silt
		2	10.0	0 to 3	light brown silt
				3 to 9	medium brown silt, some black banding/streaking
				9 to 10	medium dark brown silt
		3	8.0	0 to 3.5	light brown silt
				3.5 to 8	medium brown silt, some black banding/streaking
BLO-08	26.3	1	18.0	0 to 3	orange brown silt
				3 to 9	medium brown silt, top of layer marked by redox band ~0.5cm thick
				9 to 18	dark brown silt
		2	17.0	0 to 3	orange brown silt
				3 to 9	medium brown silt, top of layer marked by redox band ~0.5cm thick
				9 to 17	dark brown silt
		3	12.5	0 to 3	orange brown silt
				3 to 7.5	medium brown silt, top of layer marked by redox band ~0.5cm thick
				7 to 12.5	dark brown silt

Table D.25: Statistical comparison of littoral station substrate physical properties between Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

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
Sand (% by weight)	Yes	0.030	α , δ , γ	Reference	5	42.5	18.1	8.1	19.9	66.6
				Mary	6	17.7	13.9	5.7	5.1	40.4
Silt (% by weight)	No	0.228	α , δ , γ	Reference	5	53.1	16.3	7.3	31.1	74.0
				Mary	6	62.3	5.9	2.4	52.1	70.6
Clay (% by weight)	Yes	0.024	α , ϵ , γ	Reference	5	4.4	2.2	1.0	2.3	7.4
				Mary	6	20.0	12.1	4.9	7.5	33.4
Moisture (%)	Yes	0.001	γ	Reference	5	89.7	13.4	6.0	66.6	99.0
				Mary	6	51.0	7.8	3.2	42.0	59.7
TOC (%)	Yes	0.012	γ	Reference	5	4.8	2.0	0.9	3.3	8.0
				Mary	6	1.1	0.3	0.1	0.8	1.5

^a Data analysis included: α - data untransformed; β - data logit transformed; η - $\log_{10}$ transformed; δ - single factor ANOVA test conducted; ϵ - t-test assuming unequal variance; γ - ANOVA test validated using Mann Whitney U-test.

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

Table D.26: Sediment particle size, total organic carbon, and metal concentrations at Mary Lake (BLO) sediment stations, Mary River Project CREMP, August 2016.

Analyte		Units	Sediment Quality Guideline (SQG) ^a	AEMP Benchmark ^b	Mary Lake Stations									Study Area Summary Statistics		
					BLO-01 (littoral)	BLO-11 (littoral)	BLO-12 (profundal)	BLO-08 (profundal)	BLO-10 (profundal)	BLO-20 (littoral)	BLO-21 (littoral)	BLO-22 (littoral)	BLO-06 (littoral)	Mean	Standard Deviation	Standard Error
Non-metals	Sand	%	-	-	18.7	40.4	34.6	5.1	7.5	26.6	10.0	5.6	5.1	17	14	4.6
	Silt	%	-	-	70.6	52.1	52.7	61.7	54.0	63.8	63.3	62.1	61.6	60	6	2.0
	Clay	%	-	-	10.7	7.5	12.6	33.1	38.6	9.5	26.7	32.3	33.4	23	12	4.1
	Moisture	%	-	-	55.9	42.0	41.1	67.8	53.9	43.0	47.5	57.9	59.7	52	9.2	3.1
	Total Organic Carbon	%	10 ^α	-	1.54	0.78	0.78	1.12	1.00	1.03	0.88	1.16	1.15	1.05	0.24	0.079
Metals	Aluminum (Al)	mg/kg	-	-	14,700	14,800	14,700	26,100	23,800	14,300	22,100	24,600	25,500	20,067	5,281	1,760
	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	0
	Arsenic (As)	mg/kg	17	5.9	5.54	2.72	2.71	4.00	3.76	2.35	3.54	4.32	3.93	3.65	0.98	0.33
	Barium (Ba)	mg/kg	-	-	87.2	60.1	57.0	103	107	60.1	94.5	119	106	88.2	23.5	7.85
	Beryllium (Be)	mg/kg	-	-	0.76	0.70	0.69	1.27	1.24	0.70	1.10	1.26	1.36	1.01	0.289	0.0963
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	<0.20	0.27	0.25	<0.20	0.22	0.26	0.25	0.23	0.029	0.010
	Boron (B)	mg/kg	-	-	21.6	20.1	18.7	35.4	34.5	19.8	29.3	34.0	36.5	27.8	7.61	2.54
	Cadmium (Cd)	mg/kg	3.5	1.5	0.100	0.082	0.082	0.157	0.146	0.077	0.124	0.175	0.140	0.120	0.0364	0.01213
	Calcium (Ca)	mg/kg	-	-	9,700	4,280	4,300	4,900	4,610	7,750	4,380	4,720	4,750	5,488	1,911	636.9
	Chromium (Cr)	mg/kg	90	98	61.7	63.0	60.8	93.9	87.4	61.7	81.2	87.5	87.5	76.1	13.9	4.64
	Cobalt (Co)	mg/kg	-	-	13.9	11.6	11.5	17.7	16.8	11.1	15.8	18.1	17.2	14.9	2.86	0.955
	Copper (Cu)	mg/kg	110	50	27.5	21.5	20.7	35.7	33.5	21.1	31.4	34.3	34.1	28.9	6.27	2.09
	Iron (Fe)	mg/kg	40,000 ^α	52,400	34,400	28,600	27,800	41,700	39,700	28,600	37,600	42,000	41,950	35,817	6,115	2,038
	Lead (Pb)	mg/kg	91.3	35	16.3	15.5	17.3	27.6	29.1	14.5	24.5	25.0	36.2	22.9	7.46	2.49
	Lithium (Li)	mg/kg	-	-	29.9	27.7	27.2	45.7	45.9	27.3	43.2	46.3	51.5	38.3	10.0	3.34
	Magnesium (Mg)	mg/kg	-	-	14,600	11,100	11,000	16,700	16,200	12,900	15,200	16,400	16,900	14,556	2,344	781
	Manganese (Mn)	mg/kg	1,100 ^{α,β}	4,370	1,790	1,190	1,190	1,220	731	469	632	5,340	719	1,476	1,505	502
	Mercury (Hg)	mg/kg	0.486	0.17	0.0275	0.0264	0.0266	0.0665	0.0617	0.0185	0.0450	0.0598	0.0519	0.0427	0.0182	0.00607
	Molybdenum (Mo)	mg/kg	-	-	0.58	0.63	1.16	0.88	0.79	0.61	0.69	1.57	0.86	0.86	0.32	0.11
	Nickel (Ni)	mg/kg	75 ^{α,β}	72	53.2	47.7	49.5	67.4	62.7	47.7	56.5	65.6	60.1	56.7	7.6	2.55
	Phosphorus (P)	mg/kg	2,000 ^α	1,580	1,110	989	958	854	784	896	806	945	767	901	112	37
	Potassium (K)	mg/kg	-	-	3,400	3,430	3,400	6,440	5,790	3,270	5,350	6,190	6,365	4,848	1,435	478
	Selenium (Se)	mg/kg	-	-	<0.20	<0.20	<0.20	0.24	0.24	<0.20	<0.20	0.23	0.23	0.22	0.019	0.006
	Silver (Ag)	mg/kg	-	-	<0.10	<0.10	<0.10	0.15	0.15	<0.10	0.12	0.14	0.14	0.12	0.022	0.007
	Sodium (Na)	mg/kg	-	-	239	227	225	395	372	218	348	366	390	309	78.7	26.2
	Strontium (Sr)	mg/kg	-	-	13.8	10.3	10.0	16.1	14.5	10.9	13.4	15.2	15.3	13.3	2.31	0.769
	Sulphur (S)	mg/kg	-	-	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	0	0
	Thallium (Tl)	mg/kg	-	-	0.331	0.331	0.328	0.605	0.579	0.322	0.541	0.621	0.640	0.478	0.144	0.0481
	Tin (Sn)	mg/kg	-	-	4.1	4.1	7.3	7.1	10.6	3.1	5.0	2.0	20.4	7.1	5.630	1.877
	Titanium (Ti)	mg/kg	-	-	965	1,190	1,090	1,580	1,550	1,150	1,550	1,520	1,660	1,362	259	86
	Uranium (U)	mg/kg	-	-	3.78	5.02	5.05	10.4	10.3	5.04	8.36	9.64	10.1	7.52	2.74	0.915
	Vanadium (V)	mg/kg	-	-	46.8	44.0	42.3	68.7	65.5	42.1	63.3	66.0	69.8	56.5	12.3	4.08
	Zinc (Zn)	mg/kg	315	135	49.8	51.4	49.0	82.3	78.7	49.0	76.1	81.3	85.0	67.0	16.5	5.49
	Zirconium (Zr)	mg/kg	-	-	9.3	12.8	13.7	23.7	23.1	16.8	22.9	19.9	24.5	18.5	5.57	1.86

^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, baseline sediment quality data, and method detection limits. The indicated values are specific to Mary Lake.

Indicates paramter concentration above Sediment Quality Guideline (SQG).

BOLD

 Indicates parameter concentration above the AEMP Benchmark.

Table D.27: Magnitude of difference in sediment metal concentrations between Mary Lake and Reference Lake 3 in 2016, at Mary Lake between 2016 and the baseline period, and at Mary Lake between 2015 and 2016 for littoral and profundal stations, Mary River Project CREMP, 2016.

Variable	Mary Lake versus Reference Lake 3 in 2016				Mary Lake 2016 versus Baseline Period				Mary Lake 2016 versus Initial Year of Mine Operation (2015)			
	Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations		Littoral Stations		Profundal Stations	
	Reference Lake Concentration (mg/kg)	Magnitude of Difference	Reference Lake Concentration (mg/kg)	Magnitude of Difference	Mary Lake Baseline Concentration (mg/kg)	Magnitude of Difference	Mary Lake Baseline Concentration (mg/kg)	Magnitude of Difference	Mary Lake 2015 Concentration (mg/kg)	Magnitude of Difference	Mary Lake 2015 Concentration (mg/kg)	Magnitude of Difference
Aluminum (Al)	16,480	1.2	25,150	0.9	18,267	1.1	17,000	1.3	21,300	0.9	24,913	0.9
Antimony (Sb)	<0.10	1.0	0.12	0.8	1.0	0.1	1.0	0.1	0.1	1.0	0.1	1.0
Arsenic (As)	3.7	1.0	6.5	0.5	2.8	1.3	3.7	0.9	4.9	0.8	5.2	0.7
Barium (Ba)	112	0.8	162	0.6	105	0.8	76	1.2	94	0.9	98	0.9
Beryllium (Be)	0.7	1.5	1.0	1.0	1.0	1.0	1.0	1.1	1.1	0.9	1.2	0.9
Bismuth (Bi)	<0.20	1.1	0.21	1.2	-	-	-	-	0.2	0.9	0.3	0.8
Boron (B)	13.0	2.1	19.2	1.5	1	36.7	2	14.1	33	0.8	36	0.8
Cadmium (Cd)	0.1	0.8	0.2	0.7	0.5	0.2	0.5	0.3	0.1	1.0	0.1	0.9
Calcium (Ca)	5,128	1.2	6,111	0.8	3,130	1.9	2,934	1.6	6,995	0.8	4,583	1.0
Chromium (Cr)	55	1.3	80	1.0	81	0.9	76	1.1	79	0.9	92	0.9
Cobalt (Co)	10	1.4	18	0.8	18	0.8	18	0.9	16	0.9	18	0.9
Copper (Cu)	66	0.4	101	0.3	45	0.6	44	0.7	31	0.9	34	0.9
Iron (Fe)	29,840	1.2	53,580	0.7	36,133	1.0	35,654	1.0	38,750	0.9	43,019	0.8
Lead (Pb)	46	0.5	30	0.8	18	1.2	21	1.2	22	1.0	25	1.0
Lithium (Li)	27	1.4	42	0.9	-	-	-	-	42.3	0.9	47.0	0.8
Magnesium (Mg)	10,852	1.3	16,160	0.9	13,967	1.0	10,903	1.3	15,750	0.9	16,063	0.9
Manganese (Mn)	496	3.4	1,866	0.6	699	2.4	991	1.1	1,222	1.4	1,681	0.6
Mercury (Hg)	0.0355	1.1	0.0699	0.7	0.100	0.4	0.100	0.5	0.035	1.1	0.050	1.0
Molybdenum (Mo)	2.190	0.4	3.270	0.3	1.0	0.8	1.0	0.9	0.8	1.1	1.0	0.9
Nickel (Ni)	39	1.4	56	1.1	67	0.8	65	0.9	58	0.9	66	0.9
Phosphorus (P)	840	1.1	1,121	0.8	800	1.1	1,325	0.7	946.5	1.0	983.5	0.9
Potassium (K)	3,894	1.2	5,891	0.9	3,450	1.4	4,287	1.2	5,400	0.9	6,237	0.8
Selenium (Se)	0.5	0.4	0.9	0.3	1.0	0.2	1.0	0.2	0.2	0.9	0.2	1.0
Silver (Ag)	0.1	1.0	0.3	0.5	0.3	0.4	0.4	0.4	0.1	0.9	0.2	0.8
Sodium (Na)	296	1.0	455	0.7	279	1.1	284	1.2	331	0.9	382	0.9
Strontium (Sr)	11.4	1.2	15.8	0.9	9.3	1.4	13.3	1.0	15.3	0.9	16.4	0.8
Sulphur (S)	<5,000	1.0	<5,000	1.0	-	-	-	-	5,000	1.0	5,000	1.0
Thallium (Tl)	0.388	1.2	0.801	0.6	1.0	0.5	1.0	0.5	0.5	0.9	0.6	0.8
Tin (Sn)	56	0.1	16	0.5	-	-	-	-	2.0	3.2	2.0	4.1
Titanium (Ti)	1,072	1.2	1,331	1.1	-	-	-	-	1,401	1.0	1,565	0.9
Uranium (U)	12	0.6	27	0.3	-	-	-	-	7.4	0.9	9.7	0.9
Vanadium (V)	50	1.1	72	0.8	69	0.8	63	0.9	61	0.9	68	0.9
Zinc (Zn)	74	0.9	105	0.7	67	1.0	64	1.1	71	0.9	82	0.9
Zirconium (Zr)	4.3	4.1	4.0	5.0	-	-	-	-	18	1.0	23	0.9

Denotes slight elevation (mean variable concentration 2 to 5 times higher than respective mean reference, baseline period or 2015 value).

Denotes moderate elevation (mean variable concentration 5 to 10 times higher than respective mean reference, baseline period, or 2015 value).

Denotes highly elevated concentration (mean variable concentration greater than 10 times higher than respective mean reference, baseline period, or 2015 value).

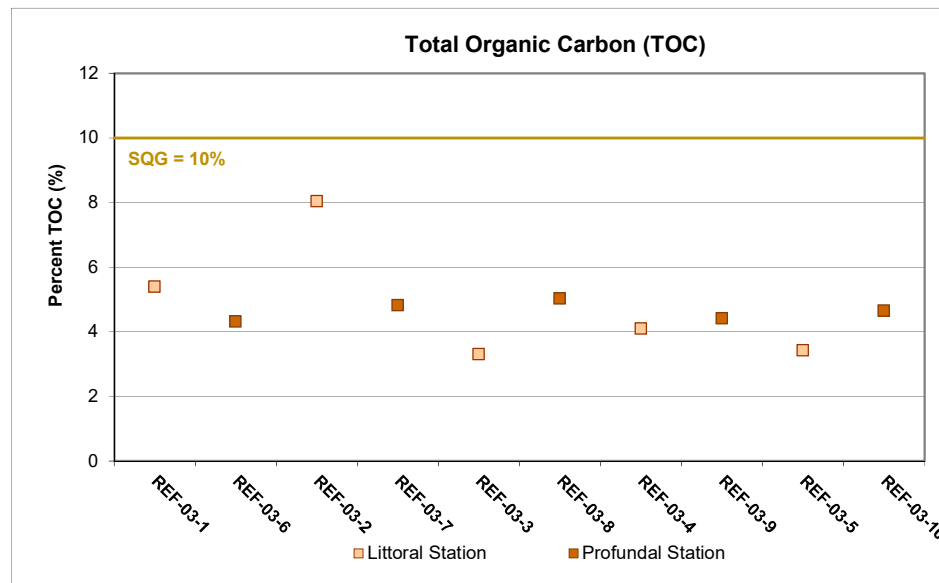
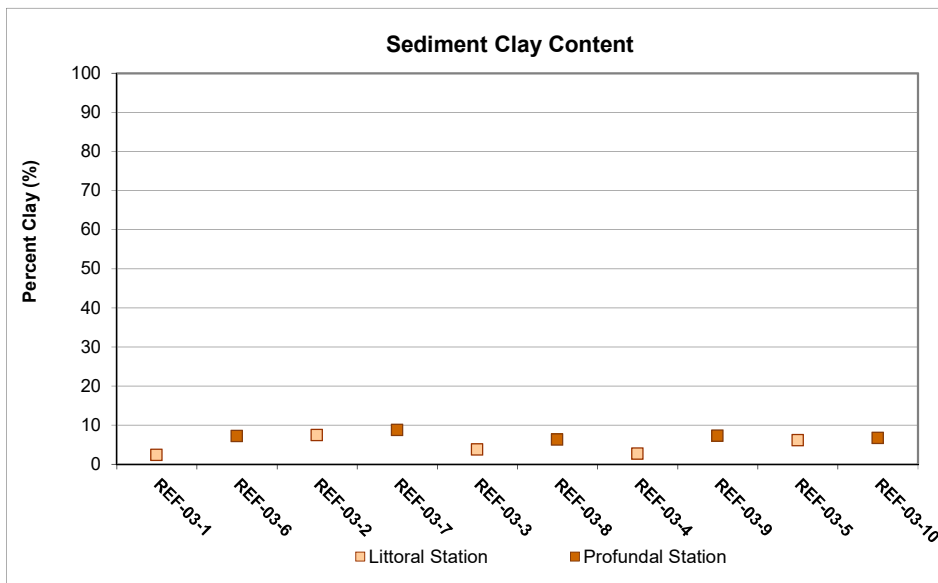
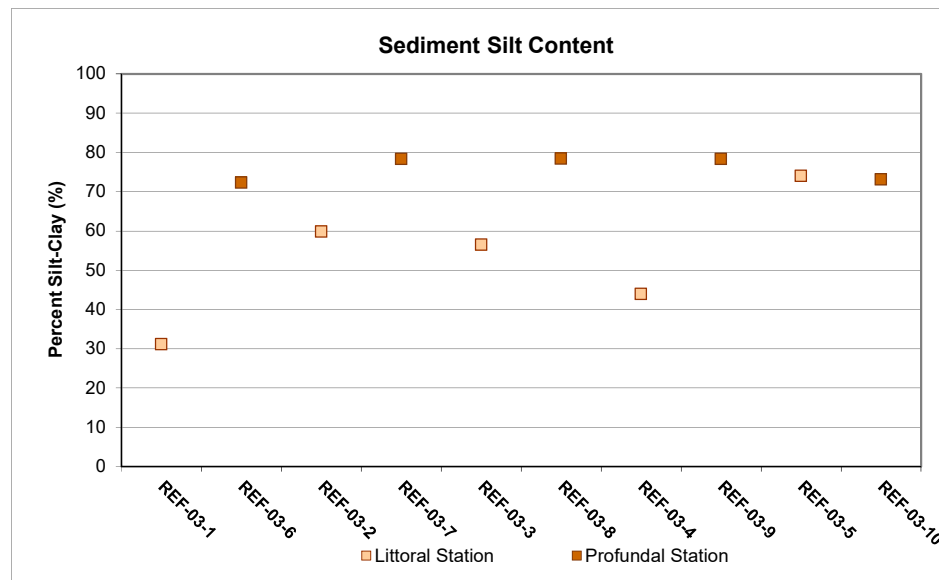
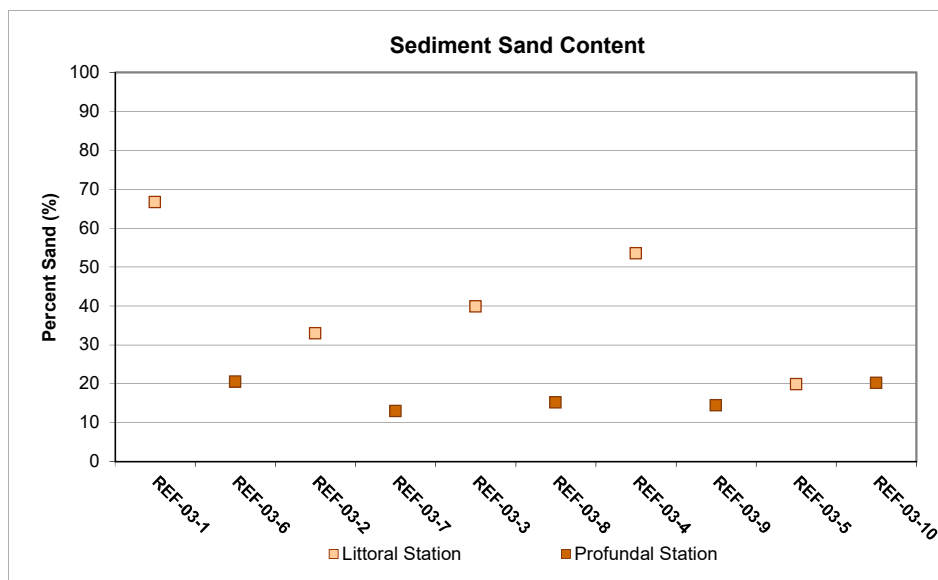


Figure D.1: Reference Lake 3 (REF-03) physical-chemical sediment quality at littoral and profundal sampling depths, Mary River Project CREMP, August 2016.

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, 2016.

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	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	27-Jun-16	25-Jun-16	26-Jun-16	27-Jun-16	27-Jun-16	25-Jun-16
	Summer	24-Jul-16	24-Jul-16	25-Jul-16	25-Jul-16	20-Jul-16	19-Jul-16	19-Jul-16	19-Jul-16	20-Jul-16	20-Jul-16	20-Jul-16	20-Jul-16	19-Jul-16	19-Jul-16	20-Jul-16
	Fall	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	20-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16
Chlorophyll a (µg/L)	Spring	0.18	0.17	0.14	0.45	0.13	0.24	0.53	0.24	0.25	0.25	0.19	0.97	0.31	0.43	0.21
	Summer	0.41	0.31	0.56	0.37	0.17	0.35	0.85	0.54	0.57	0.60	0.30	1.86	0.27	1.07	0.26
	Fall	0.41	0.28	0.18	0.35	0.13	0.21	1.20	0.36	0.36	0.37	0.19	0.66	0.26	0.22	0.19
	Average	0.33	0.25	0.29	0.39	0.14	0.27	0.86	0.38	0.39	0.41	0.23	1.16	0.28	0.57	0.22
	Standard Deviation	0.13	0.07	0.23	0.05	0.02	0.07	0.34	0.15	0.16	0.18	0.06	0.62	0.03	0.44	0.04
	Standard Error	0.08	0.04	0.13	0.03	0.01	0.04	0.19	0.09	0.09	0.10	0.04	0.36	0.02	0.26	0.02
Phaeophytin a (µg/L)	Spring	0.28	0.29	0.28	0.45	0.26	0.28	0.45	0.35	0.33	0.38	0.27	0.65	0.43	0.44	0.29
	Summer	0.43	0.37	0.54	0.39	0.29	0.39	0.59	0.48	0.46	0.44	0.30	0.79	0.32	0.60	0.32
	Fall	0.34	0.30	0.30	0.33	0.22	0.28	0.48	0.32	0.34	0.33	0.24	0.38	0.25	0.29	0.23
	Average	0.35	0.32	0.37	0.39	0.26	0.32	0.51	0.38	0.38	0.38	0.27	0.61	0.33	0.44	0.28
	Standard Deviation	0.08	0.04	0.14	0.06	0.04	0.06	0.07	0.09	0.07	0.06	0.03	0.21	0.09	0.16	0.05
	Standard Error	0.04	0.03	0.08	0.03	0.02	0.04	0.04	0.05	0.04	0.03	0.02	0.12	0.05	0.09	0.03

Table E.2: Phytoplankton monitoring data (i.e., chlorophyll a and phaeophytin a concentrations) collected at Reference Lake 3 (REF-03), Mary River Project CREMP, 2016.

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	16-Jul-16	28-Jul-16	28-Jul-16	-	-	-	16-Jul-16	28-Jul-16	28-Jul-16	-	-	-
	Fall	20-Aug-16	19-Aug-16	20-Aug-16	-	-	-	20-Aug-16	19-Aug-16	20-Aug-16	-	-	-
Summer	Surface	0.66	0.945	1.22	0.94	0.28	0.16	0.75	0.635	0.64	0.68	0.07	0.04
	Bottom	1.08	0.81	0.82	0.90	0.15	0.09	0.74	0.69	0.65	0.69	0.05	0.03
	Average	0.87	0.88	1.02	0.92	0.08	0.05	0.75	0.66	0.65	0.68	0.05	0.03
Fall	Surface	0.63	0.69	0.64	0.65	0.03	0.02	0.5	0.43	0.45	0.46	0.04	0.02
	Bottom	1.01	0.7	0.76	0.82	0.16	0.09	0.6	0.48	0.6	0.56	0.07	0.04
	Average	0.82	0.70	0.70	0.74	0.07	0.04	0.55	0.46	0.53	0.51	0.05	0.03

Table E.3: Phytoplankton monitoring data (i.e., chlorophyll a and phaeophytin a concentrations) collected at Camp Lake (JLO), Mary River Project CREMP, 2016.

Analyte		Chlorophyll a (µg/L)								Phaeophytin a (µg/L)							
Station		JL0-02	JL0-10	JL0-01	JL0-07	JL0-09	Average	Standard Deviation	Standard Error	JL0-02	JL0-10	JL0-01	JL0-07	JL0-09	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	23-Apr-16	23-Apr-16	23-Apr-16	25-Apr-16	25-Apr-16	-	-	-	23-Apr-16	23-Apr-16	23-Apr-16	25-Apr-16	25-Apr-16	-	-	-
	Summer	24-Jul-16	24-Jul-16	24-Jul-16	26-Jul-16	26-Jul-16	-	-	-	24-Jul-16	24-Jul-16	24-Jul-16	26-Jul-16	26-Jul-16	-	-	-
	Fall	22-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	-	-	-	22-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	-	-	-
Winter	Surface	0.63	0.56	1.01	1.21	0.55	0.79	0.30	0.13	<0.39	<0.39	<0.39	0.45	<0.39	0.40	0.03	0.01
	Bottom	0.83	0.86	0.26	0.22	0.33	0.50	0.32	0.14	<0.39	<0.39	<0.39	<0.39	<0.39	0.39	0	0
	Average	0.73	0.71	0.64	0.72	0.44	0.65	0.12	0.05	0.39	0.39	0.39	0.42	0.39	0.40	0.01	0.01
Summer	Surface	1.42	1.28	1.46	1.14	1.21	1.30	0.14	0.06	0.61	0.58	0.56	0.70	0.59	0.61	0.05	0.02
	Bottom	2.32	1.52	2.16	1.20	1.32	1.70	0.51	0.23	0.62	0.61	0.69	0.80	0.87	0.72	0.11	0.05
	Average	1.87	1.40	1.81	1.17	1.27	1.50	0.32	0.14	0.62	0.60	0.63	0.75	0.73	0.66	0.07	0.03
Fall	Surface	0.67	0.68	0.66	0.63	0.70	0.67	0.03	0.01	0.48	0.42	0.41	0.44	0.46	0.44	0.03	0.01
	Bottom	1.15	0.89	1.70	2.01	1.54	1.46	0.44	0.20	0.71	0.56	0.85	0.76	0.77	0.73	0.11	0.05
	Average	0.91	0.79	1.18	1.32	1.12	1.06	0.21	0.10	0.60	0.49	0.63	0.60	0.62	0.59	0.05	0.02

Table E.4: 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, 2016.

Study Lake	Overall 3-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Seasons?	p-value	Statistical Test ^b	(I) Area	(J) Area	Significant Difference Between 2 Seasons?	p-value	Statistical Test
Reference Creek Stations	NO	0.11231	ANOVA ^c	Spring	Summer	NO	0.0958	Tukey's ^c
				Spring	Fall	NO	0.4767	
				Summer	Fall	NO	0.5030	
Mary River GO-09 Reference Stations	NO	0.51119	ANOVA ^c	Spring	Summer	NO	0.9173	Tukey's ^c
				Spring	Fall	NO	0.7138	
				Summer	Fall	NO	0.4935	
Reference Lake 3	-	-	-	Winter	Summer	not applicable	-	ANOVA ^c
				Winter	Fall	not applicable	-	
				Summer	Fall	YES	0.0406	
Camp Lake	YES	0.00014	ANOVA ^{d,e}	Winter	Summer	YES	0.0001	Tukey's ^f
				Winter	Fall	YES	0.0074	
				Summer	Fall	YES	0.0571	
Sheardown Lake NW	YES	0.00001	ANOVA ^c	Winter	Summer	YES	0.0000	Tukey's ^c
				Winter	Fall	YES	0.0008	
				Summer	Fall	YES	0.0524	
Sheardown Lake SE	YES	0.00576	ANOVA ^c	Winter	Summer	NO	0.4522	Tukey's ^c
				Winter	Fall	YES	0.0464	
				Summer	Fall	YES	0.0050	
Mary Lake North Basin	YES	0.00001	ANOVA ^c	Winter	Summer	YES	0.0000	Tukey's ^c
				Winter	Fall	YES	0.0000	
				Summer	Fall	NO	0.2408	
Mary Lake South Basin	YES	0.00001	ANOVA	Winter	Summer	YES	0.0000	Tukey's
				Winter	Fall	YES	0.0017	
				Summer	Fall	YES	0.0195	

^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 Logged 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.

Table E.5: Summary data and statistical comparison of chlorophyll a concentrations (mg/L) between individual mine-exposed lakes and Reference Lake 3 for summer sampling, Mary River Project CREMP, July 2016.

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	0.92	0.08	0.05	0.71	1.13	0.87	1.02
Camp Lake	YES	0.0115	β	6.9	5	1.50	0.32	0.14	1.11	1.90	1.17	1.87
Sheardown Lake NW	YES	0.0002	β	14.3	6	2.13	0.39	0.16	1.73	2.54	1.58	2.65
Sheardown Lake SE	YES	0.0019	β	6.9	5	1.51	0.21	0.09	1.25	1.77	1.29	1.70
Mary Lake North	YES	0.0028	β	22.9	3	2.86	0.99	0.57	0.39	5.33	2.07	3.98
Mary Lake South	NO	0.2051	β	-	7	1.08	0.17	0.06	0.92	1.23	0.78	1.32

^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.6: Summary data and statistical comparison of chlorophyll a concentrations (mg/L) between individual mine-exposed lakes and Reference Lake 3 for fall sampling, Mary River Project CREMP, August 2016.

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	0.74	0.07	0.04	0.56	0.91	0.70	0.82
Camp Lake	YES	0.0367	β	4.6	5	1.06	0.21	0.10	0.80	1.33	0.79	1.32
Sheardown Lake NW	YES	0.0000	β	11.1	6	1.53	0.18	0.07	1.33	1.72	1.30	1.80
Sheardown Lake SE	YES	0.0001	β	30.1	5	2.87	0.74	0.33	1.95	3.78	2.07	3.98
Mary Lake North	YES	0.0170	β	3.7	3	1.00	0.09	0.05	0.77	1.22	0.90	1.07
Mary Lake South	NO	0.9080	β	-	7	0.75	0.23	0.09	0.54	0.97	0.40	1.06

^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.7: Statistical comparisons of chlorophyll a concentrations among years of mine construction (2014) and operation (2015, 2016) at mine-exposed Camp Lake for the Mary River Project CREMP.

Season	Overall 3-group Comparison			Summary		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Winter	YES	0.00061	β , γ	2014	0.28	2014	2015	YES	0.0012	Tukey's (β , γ)
				2015	0.74	2014	2016	YES	0.0061	
				2016	0.65	2015	2016	NO	0.5455	
Summer	NO	0.21920	β , γ	2014	1.05	2014	2015	NO	0.9540	Tamhane's (β , γ)
				2015	1.26	2014	2016	NO	0.9257	
				2016	1.50	2015	2016	NO	0.4502	
Fall	YES	0.01762	α , γ	2014	1.59	2014	2015	NO	0.1262	Tamhane's (β)
				2015	0.65	2014	2016	NO	0.4558	
				2016	1.06	2015	2016	YES	0.0299	
Annual	NO	0.25654	β , γ	2014	1.01	2014	2015	NO	0.8452	Tamhane's (β , γ)
				2015	0.88	2014	2016	NO	0.5511	
				2016	1.07	2015	2016	NO	0.5364	

^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.8: Phytoplankton monitoring data (i.e., chlorophyll a and phaeophytin a concentrations) collected at Sheardown Lake Northwest (DLO-01), Mary River Project CREMP, 2016.

Analyte		Chlorophyll a (µg/L)								
Station		DD-HAB 9-STN1	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	30-Apr-16	26-Apr-16	26-Apr-16	26-Apr-16	26-Apr-16	30-Apr-16	-	-	-
	Summer	24-Jul-16	26-Jul-16	24-Jul-16	25-Jul-16	24-Jul-16	25-Jul-16	-	-	-
	Fall	21-Aug-16	21-Aug-16	21-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	-	-	-
Winter	Surface	0.73	0.76	0.88	0.53	0.51	1.66	0.85	0.42	0.17
	Bottom	1.08	0.63	0.66	0.72	1.01	1.32	0.90	0.28	0.11
	Average	0.91	0.70	0.77	0.63	0.76	1.49	0.87	0.32	0.13
Summer	Surface	1.99	1.68	2.28	1.99	2.28	2.37	2.10	0.26	0.11
	Bottom	1.71	1.48	1.84	2.47	3.02	2.46	2.16	0.58	0.24
	Average	1.85	1.58	2.06	2.23	2.65	2.42	2.13	0.39	0.16
Fall	Surface	1.26	1.72	1.10	1.56	1.63	1.81	1.51	0.28	0.11
	Bottom	1.34	1.35	2.10	1.13	1.97	1.34	1.54	0.40	0.16
	Average	1.30	1.54	1.60	1.35	1.80	1.58	1.53	0.18	0.07

Analyte		Phaeophytin a (µg/L)								
Station		DD-HAB 9-STN1	DLO-01-5	DLO-01-1	DLO-01-4	DLO-01-2	DLO-01-7	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	30-Apr-16	26-Apr-16	26-Apr-16	26-Apr-16	26-Apr-16	30-Apr-16	-	-	-
	Summer	24-Jul-16	26-Jul-16	24-Jul-16	25-Jul-16	24-Jul-16	25-Jul-16	-	-	-
	Fall	21-Aug-16	21-Aug-16	21-Aug-16	22-Aug-16	22-Aug-16	22-Aug-16	-	-	-
Winter	Surface	0.43	0.58	0.72	0.37	0.44	0.65	0.53	0.14	0.06
	Bottom	0.57	0.39	0.48	0.38	0.56	0.64	0.50	0.10	0.04
	Average	0.50	0.49	0.60	0.38	0.50	0.65	0.52	0.09	0.04
Summer	Surface	0.59	0.77	0.65	1.09	0.61	1.01	0.79	0.21	0.09
	Bottom	0.57	1.02	0.67	0.94	0.67	0.92	0.80	0.18	0.08
	Average	0.58	0.90	0.66	1.02	0.64	0.97	0.79	0.19	0.08
Fall	Surface	0.52	0.54	0.65	0.52	0.52	0.49	0.54	0.06	0.02
	Bottom	0.52	1.06	0.88	0.49	0.84	0.48	0.71	0.25	0.10
	Average	0.52	0.80	0.77	0.51	0.68	0.49	0.63	0.14	0.06

Table E.9: Statistical comparisons of chlorophyll a concentrations among years of mine construction (2014) and operation (2015, 2016) at mine-exposed Sheardown Lake NW for the Mary River Project CREMP.

Season	Overall 3-group Comparison			Summary		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Winter	YES	0.01755	β	2014	2.55	2014	2015	YES	0.0982	Tukey's (β)
				2015	1.10	2014	2016	YES	0.0158	
				2016	0.87	2015	2016	NO	0.6123	
Summer	YES	0.04169	β	2014	2.43	2014	2015	YES	0.0449	Tukey's (β)
				2015	1.51	2014	2016	NO	0.8630	
				2016	2.13	2015	2016	NO	0.1163	
Fall	YES	0.00554	β	2014	0.80	2014	2015	YES	0.0100	Tukey's (β)
				2015	1.61	2014	2016	YES	0.0132	
				2016	1.53	2015	2016	NO	0.9889	
Annual	NO	0.88904	β	2014	1.93	2014	2015	NO	0.9694	Tamhane's (β)
				2015	1.41	2014	2016	NO	0.9834	
				2016	1.51	2015	2016	NO	0.9997	

^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 Southeast (DLO-02), Mary River Project CREMP, 2016.

Analyte		Chlorophyll a (µg/L)								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	DL0-02-06	DL0-02-07	DL0-02-4	DL0-02-8	DL0-02-03	Average	Standard Deviation	Standard Error
Sample Collection Date	Winter	30-Apr-16	29-Apr-16	29-Apr-16	29-Apr-16	29-Apr-16	-	-	-	30-Apr-16	29-Apr-16	29-Apr-16	29-Apr-16	29-Apr-16	-	-	-
	Summer	26-Jul-16	26-Jul-16	26-Jul-16	26-Jul-16	26-Jul-16	-	-	-	26-Jul-16	26-Jul-16	26-Jul-16	26-Jul-16	26-Jul-16	-	-	-
	Fall	21-Aug-16	21-Aug-16	21-Aug-16	21-Aug-16	21-Aug-16	-	-	-	21-Aug-16	21-Aug-16	21-Aug-16	21-Aug-16	21-Aug-16	-	-	-
Winter	Surface	1.67	3.13	-	2.39	2.43	2.41	0.60	0.30	0.60	1.11	0.50	0.76	0.67	0.73	0.23	0.10
	Bottom	1.05	2.67	1.35	1.91	1.08	1.61	0.68	0.31	0.64	0.87	-	0.72	0.55	0.70	0.14	0.07
	Average	1.36	2.90	1.35	2.15	1.76	1.90	0.65	0.29	0.62	0.99	0.50	0.74	0.61	0.69	0.19	0.08
Summer	Surface	1.27	1.27	1.17	1.79	1.49	1.40	0.25	0.11	0.77	0.63	0.91	0.84	0.85	0.80	0.11	0.05
	Bottom	1.30	1.93	1.40	1.61	1.86	1.62	0.28	0.12	0.77	0.73	0.78	0.70	0.89	0.77	0.07	0.03
	Average	1.29	1.60	1.29	1.70	1.68	1.51	0.21	0.09	0.77	0.68	0.85	0.77	0.87	0.79	0.07	0.03
Fall	Surface	3.19	4.37	2.01	4.10	4.18	3.57	0.98	0.44	0.84	1.24	0.89	0.98	0.70	0.93	0.20	0.09
	Bottom	1.89	3.58	2.12	2.29	0.96	2.17	0.94	0.42	0.83	0.90	0.74	0.96	0.82	0.85	0.08	0.04
	Average	2.54	3.98	2.07	3.20	2.57	2.87	0.74	0.33	0.84	1.07	0.82	0.97	0.76	0.89	0.13	0.06

Table E.11: Statistical comparisons of chlorophyll a concentrations among years of mine construction (2014) and operation (2015, 2016) at mine-exposed Sheardown Lake SE for the Mary River Project CREMP.

Season	Overall 3-group Comparison			Summary		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Winter	NO	0.11765	β	2014	2.67	2014	2015	NO	0.1040	Tukey's (β)
				2015	1.58	2014	2016	NO	0.3642	
				2016	1.90	2015	2016	NO	0.6942	
Summer	YES	0.00000	α	2014	0.20	2014	2015	YES	0.0001	Tamhane's (α)
				2015	0.91	2014	2016	YES	0.0004	
				2016	1.51	2015	2016	YES	0.0056	
Fall	YES	0.03835	α	2014	1.54	2014	2015	NO	0.8717	Tamhane's (α)
				2015	0.99	2014	2016	NO	0.3911	
				2016	2.87	2015	2016	YES	0.0130	
Annual	YES	0.00666	ϵ	2014	1.47	2014	2015	NO	0.6827	ϵ
				2015	1.16	2014	2016	NO	0.1261	
				2016	2.09	2015	2016	YES	0.0000	

^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; ϵ - transformed data non-normal, Kruskal-Wallis H-test (multiple group comparisons) or Mann-Whitney U-test (pair-wise comparisons) conducted, 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 the Mary River, Mary River Project CREMP, 2016.

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	26-Jun-16	26-Jun-16	26-Jun-16	25-Jun-16	26-Jun-16	26-Jun-16	26-Jun-16	26-Jun-16	25-Jun-16	25-Jun-16	25-Jun-16	25-Jun-16	25-Jun-16
	Summer	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16	18-Jul-16
	Fall	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16
Chlorophyll a (µg/L)	Spring	0.35	0.26	0.23	0.23	0.20	0.16	0.19	0.21	0.19	0.19	0.19	0.32	0.33
	Summer	0.29	0.24	0.22	0.22	0.22	0.68	0.28	0.26	0.28	0.26	0.27	0.26	0.23
	Fall	0.59	0.29	0.23	0.23	0.23	0.64	0.28	0.18	0.20	0.19	0.18	0.25	0.21
	Average	0.41	0.26	0.23	0.23	0.22	0.49	0.25	0.22	0.22	0.21	0.21	0.28	0.26
	Standard Deviation	0.16	0.03	0.01	0.01	0.02	0.29	0.05	0.04	0.05	0.04	0.05	0.04	0.06
	Standard Error	0.09	0.01	0.00	0.00	0.009	0.17	0.03	0.02	0.03	0.02	0.03	0.02	0.04
Phaeophytin a (µg/L)	Spring	0.39	0.35	0.31	0.30	0.29	0.27	0.27	0.30	0.28	0.28	0.27	0.30	0.29
	Summer	0.44	0.42	0.40	0.39	0.39	0.37	0.37	0.41	0.49	0.41	0.40	0.43	0.36
	Fall	0.46	0.40	0.33	0.39	0.44	0.36	0.36	0.34	0.36	0.38	0.35	0.38	0.29
	Average	0.43	0.39	0.35	0.36	0.37	0.33	0.33	0.35	0.38	0.36	0.34	0.37	0.31
	Standard Deviation	0.04	0.04	0.05	0.05	0.08	0.06	0.06	0.06	0.11	0.07	0.07	0.07	0.04
	Standard Error	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.032	0.06	0.04	0.04	0.04	0.02

Table E.13: Statistical comparisons of annual average chlorophyll a concentrations among Mary River phytoplankton monitoring stations, 2016.

Overall 10-group Comparison			Pair-wise, post-hoc comparisons ^a				
Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Area	(J) Area	Significant Difference Between 2 Years?	p-value	Statistical Test
NO	0.36058	β	GO-09 Ref	GO-03	NO	0.8716	Tukey's (β)
				GO-01	NO	0.7130	
				EO-10	NO	0.9910	
				EO-03	NO	0.6740	
				EO-20	NO	0.7761	
				EO-21	NO	0.6108	
				CO-10	NO	0.5881	
				CO-05	NO	1.0000	
				CO-01	NO	0.9973	
			GO-03	GO-01	NO	1.0000	
				EO-10	NO	1.0000	
				EO-03	NO	1.0000	
				EO-20	NO	1.0000	
				EO-21	NO	1.0000	
				CO-10	NO	1.0000	
				CO-05	NO	0.9864	
				CO-01	NO	0.9999	
			GO-01	EO-10	NO	0.9993	
				EO-03	NO	1.0000	
				EO-20	NO	1.0000	
				EO-21	NO	1.0000	
				CO-10	NO	1.0000	
				CO-05	NO	0.9470	
				CO-01	NO	0.9977	
			EO-10	EO-03	NO	0.9988	
				EO-20	NO	0.9998	
				EO-21	NO	0.9974	
				CO-10	NO	0.9966	
				CO-05	NO	0.9998	
				CO-01	NO	1.0000	
			EO-03	EO-20	NO	1.0000	
				EO-21	NO	1.0000	
				CO-10	NO	1.0000	
				CO-05	NO	0.9335	
				CO-01	NO	0.9963	
			EO-20	EO-21	NO	1.0000	
				CO-10	NO	1.0000	
				CO-05	NO	0.9656	
				CO-01	NO	0.9991	
			EO-21	CO-10	NO	1.0000	
				CO-05	NO	0.9079	
				CO-01	NO	0.9928	
			CO-10	CO-05	NO	0.8975	
				CO-01	NO	0.9911	
			CO-05	CO-01	NO	1.0000	

^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; ϵ - transformed data non-normal, Kruskal-Wallis H-test (multiple group comparisons) or Mann-Whitney U-test (pair-wise comparisons) conducted, 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 Mary Lake (north and south basins; BLO), Mary River Project CREMP, 2016.

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	25-Apr-16	1-May-16	25-Apr-16	1-May-16	1-May-16	1-May-16	6-May-16	6-May-16	6-May-16	6-May-16	-	-	-
	Summer	26-Jul-16	26-Jul-16	26-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	29-Jul-16	-	-	-
	Fall	21-Aug-16	21-Aug-16	21-Aug-16	23-Aug-16	23-Aug-16	23-Aug-16	24-Aug-16	23-Aug-16	23-Aug-16	23-Aug-16	-	-	-
Winter	Surface	0.23	0.30	0.27	0.30	0.31	0.87	0.15	0.48	0.27	0.59	0.38	0.21	0.07
	Bottom	<0.10	<0.10	-	<0.10	<0.10	0.55	<0.10	<0.10	0.17	0.19	0.17	0.15	0.05
	Average	0.17	0.20	-	0.20	0.21	0.71	0.13	0.29	0.22	0.39	0.28	0.18	0.06
Summer	Surface	1.35	1.43	1.08	1.31	1.56	1.09	1.84	1.50	1.61	0.77	1.35	0.31	0.10
	Bottom	0.92	1.10	1.08	0.86	0.45	1.21	0.80	0.50	0.77	0.79	0.85	0.25	0.08
	Average	1.14	1.27	1.08	1.09	1.01	1.15	1.32	1.00	1.19	0.78	1.10	0.15	0.05
Fall	Surface	1.20	1.03	1.03	0.70	0.87	0.71	1.28	0.87	0.81	1.46	1.00	0.25	0.08
	Bottom	0.85	0.76	1.11	<0.10	0.78	0.84	0.70	0.31	0.45	0.65	0.66	0.29	0.09
	Average	1.03	0.90	1.07	0.40	0.83	0.78	0.99	0.59	0.63	1.06	0.83	0.23	0.07

Analyte		Phaeophytin 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	25-Apr-16	1-May-16	25-Apr-16	1-May-16	1-May-16	1-May-16	6-May-16	6-May-16	6-May-16	6-May-16			
	Summer	26-Jul-16	26-Jul-16	26-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	30-Jul-16	29-Jul-16			
	Fall	21-Aug-16	21-Aug-16	21-Aug-16	23-Aug-16	23-Aug-16	23-Aug-16	24-Aug-16	23-Aug-16	23-Aug-16	23-Aug-16			
Winter	Surface	<0.39	0.35	<0.39	0.36	0.34	0.57	0.28	0.44	0.32	0.59	0.40	0.10	0.03
	Bottom	<0.39	0.24	-	0.26	0.25	0.47	0.24	0.23	0.21	0.28	0.29	0.09	0.03
	Average	0.39	0.30	-	0.31	0.30	0.52	0.26	0.34	0.27	0.44	0.35	0.09	0.03
Summer	Surface	0.60	0.72	0.67	0.77	0.96	0.71	0.98	0.79	0.91	0.64	0.78	0.13	0.04
	Bottom	0.58	0.71	0.72	0.74	0.42	0.77	0.70	0.51	0.72	0.65	0.65	0.11	0.04
	Average	0.59	0.72	0.70	0.76	0.69	0.74	0.84	0.65	0.82	0.65	0.71	0.08	0.02
Fall	Surface	0.56	0.61	0.47	0.50	0.54	0.52	0.54	0.50	0.54	0.74	0.55	0.08	0.02
	Bottom	0.50	0.52	0.52	0.19	0.67	0.50	0.53	0.40	0.56	0.49	0.49	0.12	0.04
	Average	0.53	0.57	0.50	0.35	0.61	0.51	0.54	0.45	0.55	0.62	0.52	0.08	0.02

Table E.15: Statistical comparisons of chlorophyll a concentrations among years of mine construction (2014) and operation (2015, 2016) at the Mary Lake north basin, Mary River Project CREMP.

Season	Overall 3-group Comparison			Summary		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Winter	NO	0.57698	β , γ	2014	0.59	2014	2015	NO	0.9700	Tukey's (β , γ)
				2015	0.65	2014	2016	NO	0.6836	
				2016	0.18	2015	2016	NO	0.5678	
Summer	NO	0.65930	α	2014	0.92	2014	2015	NO	0.9670	Tukey's (α)
				2015	0.83	2014	2016	NO	0.7904	
				2016	1.16	2015	2016	NO	0.6521	
Fall	YES	0.02366	α	2014	0.52	2014	2015	NO	0.7072	Tukey's (α)
				2015	0.62	2014	2016	YES	0.0242	
				2016	1.00	2015	2016	NO	0.0649	
Annual	NO	0.65816	β , γ	2014	0.67	2014	2015	NO	0.8207	Tukey's (β , γ)
				2015	0.70	2014	2016	NO	0.6433	
				2016	0.85	2015	2016	NO	0.9451	

^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 0.05.

Table E.16: Statistical comparisons of chlorophyll a concentrations among years of mine construction (2014) and operation (2015, 2016) at the Mary Lake south basin, Mary River Project CREMP.

Season	Overall 3-group Comparison			Summary		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean Concentration (mg/L)	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Winter	NO	0.26761	β , γ	2014	0.88	2014	2015	NO	0.6987	Tukey's (β , γ)
				2015	0.65	2014	2016	NO	0.6657	
				2016	0.31	2015	2016	NO	0.2380	
Summer	NO	0.33073	α	2014	0.86	2014	2015	NO	0.9845	Tamhane's (α)
				2015	0.79	2014	2016	NO	0.7789	
				2016	1.08	2015	2016	NO	0.0118	
Fall	NO	0.40871	α	2014	0.75	2014	2015	NO	0.4710	Tukey's (α)
				2015	0.90	2014	2016	NO	0.9999	
				2016	0.75	2015	2016	NO	0.4794	
Annual	NO	0.41963	β , γ	2014	0.83	2014	2015	NO	0.5285	Tamhane's (β , γ)
				2015	0.78	2014	2016	NO	0.9961	
				2016	0.71	2015	2016	NO	0.5288	

^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 lotic environments evaluated as part of the 2016 Mary River Project CREMP benthic invertebrate community assessment.

Habitat Characteristic		Reference Creek	Camp Lake Tributary 1			Camp Lake Tributary 2		Sheardown Tributaries			Mary River Upstream		Mary River Downstream		
		REF-CRK	CLT-1 US	CLT-1-L2	CLT-1 DS	CLT-2 US	CLT-2 DS	SDLT-1 Reach 1	SDLT-12 DS	SDLT-9 DS	GO-09	GO-03	EO-01	EO-20	CO-05
Mean Width (m)	Wetted	9	4.7	1.9	5.7	4.3	4.8	4.2	0.5	0.9	33.0	20.0	20.0	12.5	90
	Bankfull	36	30.0	3.3	5.7	9.0	4.8	8.0	35.5	10.0	90.0	120.0	170.0	59.5	110
Mean Depth (m)	Average	0.13	0.12	0.19	0.29	0.15	0.97	0.09	0.06	0.06	0.36	0.28	-	0.34	-
Mean Velocity (m/s)	Average	0.26	0.30	0.24	0.12	0.36	0.27	0.33	0.16	0.21	0.20	0.61	-	0.52	-
Stream Morphology	% Pool	5	15	5	0	20	0	0	30	15	20	0	5	10	20
	% Rapid	15	10	0	10	30	30	40	60	5	30	70	40	40	20
	% Riffle	50	50	50	80	30	60	60	10	75	20	10	15	20	20
	% Run	30	25	45	10	20	10	0	0	10	30	20	40	30	40
Substrate (% areal coverage)		40% cobble 30% pebble 15% gravel 10% sand 5% boulder	40% cobble 30% boulder 20% pebble 5% gravel 5% sand	30% cobble 30% pebble 30% gravel 10% sand	60% cobble 20% pebble 10% gravel 5% boulder 5% sand	60% boulder 30% cobble 10% pebble	60% cobble 30% pebble 10% gravel	40% cobble 30% boulder 20% pebble 10% gravel	80% boulder 15% cobble 5% pebble	20% cobble 15% boulder 10% pebble 10% gravel 5% sand	70% boulder 20% cobble 10% pebble	60% boulder 30% cobble 10% pebble	60% boulder 25% cobble 10% pebble 5% gravel	40% boulder 30% cobble 20% pebble 10% gravel	30% cobble 20% pebble 20% gravel 20% sand 10% boulder
Aquatic Vegetation (% areal coverage)	Periphyton Coverage	25%	50%	50%	50%	25%	25%	50%	25%	50%	25%	25%	25%	25%	25%
	Periphyton Description	0.5 to 1 mm thick of attached algae/periphyton on rocks	1 to 5 mm thick of attached algae/periphyton on rocks	1 to 5 mm thick of attached algae/periphyton on rocks	1 to 5 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks	1 to 5 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks	1 to 5 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks	0.5 to 1 mm thick of attached algae/periphyton on rocks
Functional Instream Cover (% areal coverage)		5% undercut banks 2% boulder 2% deep pool	30% boulder 10% undercut banks 5% deep pool	5% undercut banks	none	60% boulder 10% deep pool	none	30% boulder	10% boulder	5% undercut banks 5% boulder	50% boulder	30% boulder	30% boulder	30% boulder	5% boulder 5% deep pool

Table F.2: Replicate grab data for benthic invertebrate community samples collected at the Camp Lake Tributaries, Mary River Project CREMP, August 2016.

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
Camp Lake Tributary 1 Upstream	CLT-1 US B1	12	12	14	0.38	0.34	0.32	6.4	6.1	6.8	50%	25%	25%
	CLT-1 US B2	12	12	14	0.36	0.45	0.37	7.4	7.6	6.1	50%	50%	50%
	CLT-1 US B3	10	10	14	0.37	0.44	0.40	6.5	5.5	8.6	50%	25%	50%
	CLT-1 US B4	12	14	12	0.33	0.30	0.46	8.7	6.4	7.4	25%	25%	-
	CLT-1 US B5	8	8	10	0.28	0.39	0.26	7.1	6.3	6.8	25%	25%	25%
Camp Lake Tributary 1 Downstream	CLT-1 DS B1	12	12	14	0.38	0.51	0.48	4.7	6.0	5.3	-	25%	25%
	CLT-1 DS B2	14	14	14	0.41	0.46	0.39	6.5	5.4	7.1	25%	25%	25%
	CLT-1 DS B3	14	12	12	0.28	0.40	0.44	5.3	6.8	4.8	25%	25%	50%
	CLT-1 DS B4	12	14	14	0.41	0.36	0.31	5.2	3.8	6.5	25%	25%	25%
	CLT-1 DS B5	12	10	12	0.31	0.34	0.48	5.0	6.0	5.8	25%	25%	25%
Camp Lake Tributary 1 L2 Mine Exposed	CLT-1 L2 B1	8	8	8	0.35	0.38	0.38	6.2	6.6	5.6	25%	25%	25%
	CLT-1 L2 B2	6	8	8	0.26	0.28	0.33	5.0	6.7	5.3	25%	25%	25%
	CLT-1 L2 B3	6	6	8	0.38	0.27	0.26	4.6	4.7	6.5	25%	25%	25%
	CLT-1 L2 B4	6	14	10	0.33	0.37	0.41	6.6	4.4	4.9	25%	25%	25%
	CLT-1 L2 B5	10	12	12	0.28	0.22	0.23	5.4	8.0	8.2	25%	25%	25%
Camp Lake Tributary 2 Upstream	CLT-2 US B1	14	14	10	0.51	0.30	0.44	5.4	7.3	4.5	25%	50%	25%
	CLT-2 US B2	12	12	10	0.43	0.38	0.33	7.7	5.9	6.1	25%	25%	25%
	CLT-2 US B3	16	18	12	0.41	0.39	0.33	4.0	8.1	9.7	25%	25%	25%
	CLT-2 US B4	14	14	14	0.44	0.22	0.41	9.3	6.4	7.5	50%	50%	50%
	CLT-2 US B5	12	14	8	0.28	0.47	0.32	7.4	7.1	10.5	50%	75%	50%
Camp Lake Tributary 2 Downstream	CLT-2 DS B1	10	10	12	0.43	0.51	0.36	5.2	4.8	6.9	50%	50%	50%
	CLT-2 DS B2	12	14	12	0.51	0.43	0.46	5.1	7.0	5.2	25%	50%	25%
	CLT-2 DS B3	10	12	10	0.43	0.31	0.31	5.5	4.6	7.6	25%	25%	25%
	CLT-2 DS B4	16	12	10	0.38	0.51	0.28	3.7	6.5	4.8	25%	25%	25%
	CLT-2 DS B5	12	12	10	0.55	0.48	0.53	5.1	4.9	5.5	25%	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 5 - 14 measurements per replicate grab, with a mean of 9 for the Camp Lake tributaries as part of the 2016 stream sampling program.

Table F.3: Replicate station habitat feature summary statistics for the Camp Lake Tributary benthic stations, Mary River Project CREMP, August 2016. Five stations were sampled at each study area.

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Depth (cm)	Unnamed Reference Creek	12.5	2.3	1.0	9.7	15.4	10.7	15.3
	CLT1-US North Branch	11.6	1.7	0.8	9.4	13.8	8.7	12.7
	CLT1-L2 Upper Main Stem	8.7	1.9	0.9	6.3	11.1	6.7	11.3
	CLT1-DS Lower Main Stem	12.8	1.0	0.4	11.6	14.0	11.3	14.0
	CLT2-US Upstream	12.9	1.7	0.8	10.8	15.1	11.3	15.3
	CLT2-DS Downstream	11.6	1.0	0.5	10.3	12.9	10.7	12.7
Water Velocity (cm/s)	Unnamed Reference Creek	29.8	3.6	1.6	25.4	34.2	24.0	33.3
	CLT1-US North Branch	36.3	3.7	1.7	31.7	41.0	31.0	40.3
	CLT1-L2 Upper Main Stem	31.5	5.5	2.4	24.7	38.3	24.3	37.0
	CLT1-DS Lower Main Stem	39.7	4.0	1.8	34.8	44.7	36.0	45.7
	CLT2-US Upstream	37.7	2.5	1.1	34.7	40.8	35.7	41.7
	CLT2-DS Downstream	42.0	8.0	3.6	32.1	51.9	33.0	52.0
Substrate Size (cm diameter)	Unnamed Reference Creek	7.0	0.7	0.3	6.1	7.8	5.9	7.5
	CLT1-US North Branch	6.9	0.4	0.2	6.4	7.4	6.4	7.5
	CLT1-L2 Upper Main Stem	5.9	0.8	0.4	4.9	6.9	5.3	7.2
	CLT1-DS Lower Main Stem	5.6	0.4	0.2	5.1	6.2	5.2	6.3
	CLT2-US Upstream	7.1	1.0	0.5	5.9	8.4	5.7	8.3
	CLT2-DS Downstream	5.5	0.4	0.2	5.0	6.0	5.0	5.9
Substrate Embeddedness (%)	Unnamed Reference Creek	25	0	0	25	25	25	25
	CLT1-US North Branch	35	11	5	22	48	25	50
	CLT1-L2 Upper Main Stem	25	0	0	25	25	25	25
	CLT1-DS Lower Main Stem	27	4	2	22	31	25	33
	CLT2-US Upstream	38	15	7	20	57	25	58
	CLT2-DS Downstream	32	11	5	18	45	25	50

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 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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 2 Areas?	p-value	Statistical Test
Water Depth (cm)	YES	0.0083	α, ζ	Unnamed Reference Creek	CLT1 North Branch	NO	0.8410	Tukey's HSD
				Unnamed Reference Creek	CLT1 Upper Main Stem	YES	0.0171	
				Unnamed Reference Creek	CLT1 Lower Main Stem	NO	0.9956	
				CLT1 North Branch	CLT1 Upper Main Stem	YES	0.0847	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.7203	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	YES	0.0108	
Water Velocity (cm/s)	YES	0.0078	α	Unnamed Reference Creek	CLT1 North Branch	NO	0.1125	Tukey's HSD
				Unnamed Reference Creek	CLT1 Upper Main Stem	NO	0.9165	
				Unnamed Reference Creek	CLT1 Lower Main Stem	YES	0.0097	
				CLT1 North Branch	CLT1 Upper Main Stem	NO	0.3180	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.5992	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	YES	0.0353	
Substrate Size (cm diameter)	YES	0.0048	α	Unnamed Reference Creek	CLT1 North Branch	NO	0.9995	Tukey's HSD
				Unnamed Reference Creek	CLT1 Upper Main Stem	YES	0.0669	
				Unnamed Reference Creek	CLT1 Lower Main Stem	YES	0.0145	
				CLT1 North Branch	CLT1 Upper Main Stem	YES	0.0819	
				CLT1 North Branch	CLT1 Lower Main Stem	YES	0.0181	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	NO	0.8631	
Substrate Embeddedness (%)	YES	0.0409	α, ζ	Unnamed Reference Creek	CLT1 North Branch	NO	0.4987	Tamhane's
				Unnamed Reference Creek	CLT1 Upper Main Stem	NO	1.0000	
				Unnamed Reference Creek	CLT1 Lower Main Stem	NO	0.9398	
				CLT1 North Branch	CLT1 Upper Main Stem	NO	0.4987	
				CLT1 North Branch	CLT1 Lower Main Stem	NO	0.6648	
				CLT1 Upper Main Stem	CLT1 Lower Main Stem	NO	0.9398	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data logit transformed, single factor ANOVA test conducted;

Table F.5: Benthic invertebrate community data for Camp Lake Tributary 1 study areas, August 2016.
Densities expressed in number of organisms per square meter.

Station Replicate	Unnamed Reference Creek					Camp Lake Tributary 1 - North Branch (CLT1-US)				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS										
P. Nemata	29	29	29	22	18	7	7	29	32	39
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	57	29	50	43	22	0	11	36	36	36
F. Naididae										
S.F. Tubificinae										
immatures with hair chaetae						0	0	0	0	0
F. Lumbriculidae										
<i>Lumbriculus</i>	0	0	0	0	0	7	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina	0	0	0	0	0	0	0	0	0	0
F. Hygrobatidae										
<i>Hygrobates</i>	0	0	0	0	0	0	0	0	0	0
F. Lebertiidae										
<i>Lebertia</i>	0	0	0	0	0	0	0	0	0	0
F. Sperchonidae										
<i>Sperchon</i>	258	144	179	187	122	57	104	208	158	237
HARPACTICOIDS										
O. Harpacticoida	0	0	0	0	0	0	0	0	0	0
SEED SHRIMPS										
Cl. Ostracoda	57	29	36	22	29	0	0	0	0	0
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	0	0	0	0	0	0	0	0	0	0
INSECTS										
Cl. Insecta										
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
<i>Acentrella feropagus</i>	0	7	14	0	0	0	4	0	0	0
STONEFLIES										
O. Plecoptera										
F. Capniidae										
immature	0	0	0	0	0	7	7	0	7	0
TRUE FLIES										
O. Diptera										
BITING-MIDGE										
F. Ceratopogonidae										
<i>Culicoides</i>	0	0	0	0	0	0	0	0	0	0
indeterminate	0	0	0	0	0	0	0	0	0	0
MIDGES										
F. Chironomidae										
chironomid pupae	201	108	72	129	75	36	18	72	50	36
S.F. Chironominae										
<i>Cladotanytarsus</i>	0	0	0	0	0	0	0	0	0	0
<i>Micropsectra</i>	0	0	11	14	0	0	4	0	0	0
<i>Paratanytarsus</i>	0	0	0	0	0	0	0	0	0	0
<i>Rheotanytarsus</i>	43	29	0	14	14	0	0	0	0	0
<i>Tanytarsus</i>	0	7	0	29	0	0	4	0	0	0
S.F. Diamesinae										
<i>Diamesa</i>	0	0	0	0	4	0	0	0	0	14
<i>Pseudokiefferiella</i>	57	237	140	61	29	14	83	36	165	624

Table F.5: Benthic invertebrate community data for Camp Lake Tributary 1 study areas, August 2016.
Densities expressed in number of organisms per square meter.

Station Replicate	Unnamed Reference Creek					Camp Lake Tributary 1 - North Branch (CLT1-US)				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
S.F. Orthoclaadiinae										
<i>Chaetocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Corynoneura</i>	0	0	11	0	0	0	0	0	0	0
<i>Cricotopus</i>	388	258	276	244	83	165	222	215	563	222
<i>Cricotopus/Orthocladus</i>	0	72	115	90	18	43	47	115	388	402
<i>Diplocladius</i>	14	0	0	0	0	0	0	0	0	0
<i>Doncricotopus</i>	0	0	0	0	0	0	0	0	0	0
<i>Eukiefferiella</i>	0	0	14	0	11	0	0	0	0	0
<i>Hydrobaenus</i>	14	0	0	14	0	0	11	14	0	0
<i>Hydrosmittia</i>	29	14	0	0	0	43	47	86	309	233
<i>Krenosmittia</i>	0	0	0	0	4	0	0	7	0	0
<i>Limnophyes</i>	0	29	0	14	4	14	0	22	0	14
<i>Metriocnemus</i>	0	0	0	0	0	0	0	0	0	0
<i>Nanocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Orthocladus (Euorthocladus)</i>	0	0	0	0	0	72	133	330	176	431
<i>Parakiefferiella</i>	0	7	11	0	0	0	0	0	0	0
<i>Paraphaenocladus</i>	14	0	25	47	4	0	0	0	0	0
<i>Synorthocladus</i>						0	0	0	0	0
<i>Thienemanniella</i>	0	0	0	0	0	0	0	0	0	0
<i>Tokunagaia</i>	660	179	581	954	90	43	36	57	57	97
<i>Tvetenia</i>	57	86	115	75	39	0	4	0	0	0
indeterminate	14	14	0	0	0	0	18	0	29	0
S.F. Tanypodinae										
<i>Procladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Thienemannimyia complex</i>	0	7	7	14	4	0	0	0	0	0
F. Empididae										
<i>Clinocera</i>	201	93	79	43	39	0	4	36	0	50
pupae	0	0	0	0	0	0	0	0	0	14
F. Ephydriidae										
	0	0	0	0	0	0	0	0	0	0
F. Muscidae										
	4	0	0	0	0	0	0	0	0	0
F. Simuliidae										
<i>Gymnopaia</i>	0	0	7	0	4	0	4	0	0	0
<i>Prosimulium</i>	14	14	0	7	0	7	0	7	0	0
pupae	0	0	0	0	0	0	0	0	0	0
F. Tipulidae										
<i>Tipula</i>	68	25	97	65	57	305	161	158	237	219
Number of Organisms (No. organisms per m²)										
	2,179	1,417	1,869	2,088	670	820	929	1,428	2,207	2,668
Richness (total number of taxa)^a										
	17	19	19	19	19	13	18	15	11	13
Simpson's Evenness (E)										
	0.853	0.924	0.885	0.764	0.940	0.854	0.903	0.923	0.926	0.932
Bray-Curtis Index										
	0.207	0.276	0.092	0.173	0.437	0.645	0.537	0.490	0.587	0.602
Percent Composition										
% Nemata	1.3%	2.0%	1.6%	1.1%	2.7%	0.9%	0.8%	2.0%	1.4%	1.5%
% Oligochaeta	2.6%	2.0%	2.7%	2.1%	3.3%	0.9%	1.2%	2.5%	1.6%	1.3%
% Hydracarina	11.8%	10.2%	9.6%	9.0%	18.2%	7.0%	11.2%	14.6%	7.2%	8.9%
% Ostracods	2.6%	2.0%	1.9%	1.1%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%
% Chironomids	68.4%	73.9%	73.7%	81.4%	56.6%	52.4%	67.5%	66.8%	78.7%	77.7%
% Metal Sensitive Chironomids	4.6%	19.3%	8.1%	5.7%	7.0%	1.7%	9.8%	2.5%	7.5%	23.9%
% Tipulidae	3.1%	1.8%	5.2%	3.1%	8.5%	37.2%	17.3%	11.1%	10.7%	8.2%
Functional Feeding Group Composition										
% Shredders	24.0%	28.2%	27.2%	20.4%	27.3%	65.7%	49.0%	36.1%	56.3%	32.0%
% Collector - Gatherers	51.9%	50.7%	57.6%	64.6%	44.6%	26.5%	38.0%	46.4%	36.5%	56.7%
% Filterers	2.9%	3.8%	1.0%	3.3%	3.3%	0.9%	1.4%	0.5%	0.0%	0.0%
Habitat Preference Group Composition										
% Clingers	44.8%	47.0%	36.2%	30.9%	46.1%	35.5%	42.9%	42.6%	52.4%	35.1%
% Sprawlers	48.1%	47.1%	54.4%	62.9%	39.4%	25.6%	37.2%	41.8%	33.8%	53.9%
% Burrowers	7.1%	5.9%	9.4%	6.2%	14.5%	38.9%	19.3%	15.6%	13.8%	11.0%

^a Bold entries excluded from taxa count

Table F.5: Benthic invertebrate community data for Camp Lake Tributary 1 study areas, August 2016.
Densities expressed in number of organisms per square meter.

Station Replicate	Camp Lake Tributary 1 - Upper Main Stem (CLT1-L2)					Camp Lake Tributary 1 - Lower Main Stem (CLT1-DS)				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS										
P. Nemata	29	187	86	115	86	14	22	158	100	11
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	301	1,005	1,234	2,009	201	72	36	158	172	126
F. Naididae										
S.F. Tubificinae										
immatures with hair chaetae	0	0	0	0	0	0	0	0	0	0
F. Lumbriculidae										
<i>Lumbriculus</i>	14	50	0	0	39	0	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina	0	0	0	0	0	0	0	0	0	0
F. Hygrobatidae										
<i>Hygrobates</i>	0	14	0	0	0	0	7	14	14	0
F. Lebertiidae										
<i>Lebertia</i>	0	14	0	29	57	0	0	0	0	0
F. Sperchonidae										
<i>Sperchon</i>	1,651	2,139	2,009	1,808	1,005	43	29	43	86	32
HARPACTICOIDS										
O. Harpacticoida	0	0	0	29	115	0	7	0	0	0
SEED SHRIMPS										
Cl. Ostracoda	14	14	14	0	57	0	0	0	0	0
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	0	0	0	0	0	0	0	0	0	11
INSECTS										
Cl. Insecta										
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
<i>Acentrella feropagus</i>	0	0	0	0	0	0	0	0	0	0
STONEFLIES										
O. Plecoptera										
F. Capniidae										
immature	0	0	0	0	0	0	0	0	0	0
TRUE FLIES										
O. Diptera										
BITING-MIDGE										
F. Ceratopogonidae										
<i>Culicoides</i>	0	0	0	0	29	0	0	0	14	0
indeterminate	14	0	14	0	0	0	0	0	0	0
MIDGES										
F. Chironomidae										
chironomid pupae	115	86	72	29	0	86	43	29	14	36
S.F. Chironominae										
<i>Cladotanytarsus</i>	0	165	0	230	330	14	0	0	0	0
<i>Micropsectra</i>	0	0	0	0	0	0	7	14	0	0
<i>Paratanytarsus</i>	1668	1554	832	1722	4116	0	0	0	14	0
<i>Rheotanytarsus</i>	0	0	0	0	0	14	0	0	0	0
<i>Tanytarsus</i>	183	136	0	86	111	0	0	0	0	0
S.F. Diamesinae										
<i>Diamesa</i>	0	0	0	0	0	0	0	0	0	4
<i>Pseudokiefferiella</i>	25	380	201	201	0	0	7	14	158	18

Table F.5: Benthic invertebrate community data for Camp Lake Tributary 1 study areas, August 2016.
Densities expressed in number of organisms per square meter.

Station Replicate	Camp Lake Tributary 1 - Upper Main Stem (CLT1-L2)					Camp Lake Tributary 1 - Lower Main Stem (CLT1-DS)				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
S.F. Orthocladinae										
<i>Chaetocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Corynoneura</i>	0	0	0	0	0	0	0	0	0	0
<i>Cricotopus</i>	965	872	847	1,349	1,098	57	22	57	187	144
<i>Cricotopus/Orthocladus</i>	83	190	43	29	111	57	22	57	57	43
<i>Diplocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Doncricotopus</i>	287	438	129	144	384	0	0	0	0	0
<i>Eukiefferiella</i>	0	0	0	0	0	29	0	14	0	0
<i>Hydrobaenus</i>	0	0	0	0	0	14	7	57	29	4
<i>Hydromittia</i>	108	83	57	230	273	187	431	574	531	190
<i>Krenomittia</i>	0	0	0	0	0	0	0	14	0	0
<i>Limnophyes</i>	129	273	115	545	165	43	14	72	115	22
<i>Metriocnemus</i>	0	0	0	0	0	29	0	0	0	0
<i>Nanocladius</i>	57	0	0	0	0	0	0	0	0	0
<i>Orthocladus (Euorthocladus)</i>	0	0	0	0	0	0	57	29	129	68
<i>Parakiefferiella</i>	57	136	115	603	603	0	0	14	14	7
<i>Paraphaenocladius</i>	0	0	0	0	0	0	0	0	14	0
<i>Synorthocladus</i>	0	0	14	57	0	0	0	0	0	0
<i>Thienemanniella</i>	0	0	0	0	0	0	0	0	0	0
<i>Tokunagaia</i>	57	0	0	0	0	72	43	43	29	25
<i>Tvetenia</i>	57	29	14	0	0	29	14	14	43	11
indeterminate	0	0	0	0	0	0	0	0	0	0
S.F. Tanypodinae										
<i>Procladius</i>	25	0	29	29	0	0	0	0	0	0
<i>Thienemannimyia complex</i>	183	165	129	115	273	0	0	0	0	0
F. Empididae										
<i>Clinocera</i>	0	29	14	0	0	0	0	14	0	18
pupae	0	0	0	0	0	0	0	0	0	0
F. Ephydriidae										
	0	0	0	0	0	0	0	0	0	0
F. Muscidae										
	4	0	29	0	0	0	0	0	0	0
F. Simuliidae										
<i>Gymnopaia</i>	0	0	0	0	0	0	0	0	0	0
<i>Prosimulium</i>	0	0	0	0	0	0	0	0	0	0
pupae	0	0	0	0	0	0	0	0	0	0
F. Tipulidae										
<i>Tipula</i>	61	29	50	0	11	54	54	32	72	97
Number of Organisms (No. organisms per m²)										
	6,087	7,988	6,047	9,359	9,064	814	822	1,421	1,792	867
Richness (total number of taxa)^a										
	22	21	20	18	19	15	16	19	18	17
Simpson's Evenness (E)										
	0.851	0.894	0.846	0.901	0.798	0.943	0.710	0.835	0.914	0.920
Bray-Curtis Index										
	0.780	0.834	0.804	0.883	0.875	0.656	0.784	0.768	0.634	0.656
Percent Composition										
% Nemata	0.5%	2.3%	1.4%	1.2%	0.9%	1.7%	2.7%	11.1%	5.6%	1.3%
% Oligochaeta	5.2%	13.2%	20.4%	21.5%	2.6%	8.8%	4.4%	11.1%	9.6%	14.5%
% Hydracarina	27.1%	27.1%	33.2%	19.6%	11.7%	5.3%	4.4%	4.0%	5.6%	3.7%
% Ostracods	0.2%	0.2%	0.2%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
% Chironomids	65.7%	56.4%	42.9%	57.4%	82.3%	77.5%	81.1%	70.5%	74.4%	66.0%
% Metal Sensitive Chironomids	30.8%	28.0%	17.1%	23.9%	50.3%	3.4%	1.7%	2.0%	9.6%	2.5%
% Tipulidae	1.0%	0.4%	0.8%	0.0%	0.1%	6.6%	6.6%	2.3%	4.0%	11.2%
Functional Feeding Group Composition										
% Shredders	18.7%	13.9%	16.0%	14.8%	13.5%	22.7%	12.4%	10.6%	17.8%	34.3%
% Collector - Gatherers	19.0%	32.8%	33.0%	42.1%	21.2%	68.1%	82.4%	83.4%	75.1%	60.0%
% Filterers	31.3%	23.7%	14.2%	21.9%	50.3%	3.9%	0.9%	1.0%	0.8%	0.0%
Habitat Preference Group Composition										
% Clingers	44.8%	41.0%	48.6%	34.4%	25.1%	21.4%	10.2%	13.4%	19.4%	28.8%
% Sprawlers	45.2%	39.2%	28.5%	39.5%	66.0%	53.3%	76.2%	62.1%	60.7%	42.9%
% Burrowers	6.9%	15.9%	22.9%	22.7%	4.0%	21.4%	13.6%	24.5%	20.0%	27.0%

^a Bold entries excluded from taxa count

Table F.6: Benthic invertebrate community summary statistics for Camp Lake Tributary 1 study areas, Mary River Project CREMP, August 2016. Sample size equals five for all study areas.

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Density (no. organisms / m ²)	Unnamed Reference Creek	1,645	619	277	876	2,414	670	2,179
	CLT1 North Branch	1,610	806	360	610	2,611	820	2,668
	CLT1 Upper Main Stem	7,709	1,583	708	5,743	9,675	6,047	9,359
	CLT1 Lower Main Stem	1,143	443	198	593	1,694	814	1,792
Richness (Number of Taxa)	Unnamed Reference Creek	18.6	0.9	0.4	17.5	19.7	17.0	19.0
	CLT1 North Branch	14.0	2.6	1.2	10.7	17.3	11.0	18.0
	CLT1 Upper Main Stem	20.0	1.6	0.7	18.0	22.0	18.0	22.0
	CLT1 Lower Main Stem	17.0	1.6	0.7	15.0	19.0	15.0	19.0
Simpson's Evenness	Unnamed Reference Creek	0.873	0.070	0.031	0.786	0.960	0.764	0.940
	CLT1 North Branch	0.908	0.032	0.014	0.868	0.947	0.854	0.932
	CLT1 Upper Main Stem	0.858	0.042	0.019	0.806	0.910	0.798	0.901
	CLT1 Lower Main Stem	0.864	0.095	0.043	0.746	0.982	0.710	0.943
Bray-Curtis Index	Unnamed Reference Creek	0.237	0.130	0.058	0.076	0.398	0.092	0.437
	CLT1 North Branch	0.572	0.060	0.027	0.498	0.647	0.490	0.645
	CLT1 Upper Main Stem	0.835	0.044	0.020	0.780	0.890	0.780	0.883
	CLT1 Lower Main Stem	0.700	0.071	0.032	0.612	0.787	0.634	0.784
Oligochaeta (% of community)	Unnamed Reference Creek	2.5%	0.5%	0.2%	1.9%	3.2%	2.0%	3.3%
	CLT1 North Branch	1.5%	0.6%	0.3%	0.7%	2.3%	0.9%	2.5%
	CLT1 Upper Main Stem	12.6%	8.6%	3.8%	1.9%	23.2%	2.6%	21.5%
	CLT1 Lower Main Stem	9.7%	3.7%	1.6%	5.1%	14.3%	4.4%	14.5%
Hydracarina (% of community)	Unnamed Reference Creek	11.7%	3.8%	1.7%	7.1%	16.4%	9.0%	18.2%
	CLT1 North Branch	9.8%	3.2%	1.4%	5.8%	13.7%	7.0%	14.6%
	CLT1 Upper Main Stem	23.8%	8.3%	3.7%	13.5%	34.0%	11.7%	33.2%
	CLT1 Lower Main Stem	4.6%	0.8%	0.4%	3.6%	5.6%	3.7%	5.6%
Chironomidae (% of community)	Unnamed Reference Creek	70.8%	9.2%	4.1%	59.4%	82.2%	56.6%	81.4%
	CLT1 North Branch	68.6%	10.6%	4.7%	55.5%	81.8%	52.4%	78.7%
	CLT1 Upper Main Stem	61.0%	14.5%	6.5%	43.0%	78.9%	42.9%	82.3%
	CLT1 Lower Main Stem	73.9%	5.9%	2.6%	66.6%	81.3%	66.0%	81.1%
Metal-Sensitive Chironomidae (% of community)	Unnamed Reference Creek	8.9%	5.9%	2.7%	1.6%	16.3%	4.6%	19.3%
	CLT1 North Branch	9.1%	9.0%	4.0%	-2.0%	20.2%	1.7%	23.9%
	CLT1 Upper Main Stem	30.0%	12.4%	5.6%	14.6%	45.5%	17.1%	50.3%
	CLT1 Lower Main Stem	3.8%	3.3%	1.5%	-0.2%	7.9%	1.7%	9.6%
Tipulidae (% of community)	Unnamed Reference Creek	4.3%	2.6%	1.2%	1.1%	7.6%	1.8%	8.5%
	CLT1 North Branch	16.9%	11.8%	5.3%	2.2%	31.6%	8.2%	37.2%
	CLT1 Upper Main Stem	0.5%	0.4%	0.2%	-0.1%	1.0%	0.0%	1.0%
	CLT1 Lower Main Stem	6.1%	3.4%	1.5%	1.9%	10.3%	2.3%	11.2%
Shredder FFG (% of community)	Unnamed Reference Creek	25.4%	3.2%	1.5%	21.4%	29.5%	20.4%	28.2%
	CLT1 North Branch	47.8%	14.0%	6.3%	30.5%	65.2%	32.0%	65.7%
	CLT1 Upper Main Stem	15.4%	2.1%	0.9%	12.8%	18.0%	13.5%	18.7%
	CLT1 Lower Main Stem	19.6%	9.5%	4.2%	7.8%	31.3%	10.6%	34.3%
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	53.9%	7.5%	3.4%	44.5%	63.2%	44.6%	64.6%
	CLT1 North Branch	40.8%	11.4%	5.1%	26.7%	54.9%	26.5%	56.7%
	CLT1 Upper Main Stem	29.6%	9.5%	4.3%	17.8%	41.4%	19.0%	42.1%
	CLT1 Lower Main Stem	73.8%	9.9%	4.4%	61.5%	86.0%	60.0%	83.4%
Filterer FFG (% of community)	Unnamed Reference Creek	2.9%	1.1%	0.5%	1.5%	4.2%	1.0%	3.8%
	CLT1 North Branch	0.5%	0.6%	0.3%	-0.2%	1.3%	0.0%	1.4%
	CLT1 Upper Main Stem	28.3%	13.7%	6.1%	11.2%	45.3%	14.2%	50.3%
	CLT1 Lower Main Stem	1.3%	1.5%	0.7%	-0.6%	3.2%	0.0%	3.9%
Clinger HPG (% of community)	Unnamed Reference Creek	41.0%	7.1%	3.2%	32.2%	49.8%	30.9%	47.0%
	CLT1 North Branch	41.7%	7.1%	3.2%	32.9%	50.5%	35.1%	52.4%
	CLT1 Upper Main Stem	38.8%	9.3%	4.2%	27.3%	50.3%	25.1%	48.6%
	CLT1 Lower Main Stem	18.6%	7.3%	3.2%	9.6%	27.6%	10.2%	28.8%
Sprawler HPG (% of community)	Unnamed Reference Creek	50.4%	8.8%	3.9%	39.5%	61.3%	39.4%	62.9%
	CLT1 North Branch	38.5%	10.5%	4.7%	25.5%	51.5%	25.6%	53.9%
	CLT1 Upper Main Stem	43.7%	13.9%	6.2%	26.5%	60.9%	28.5%	66.0%
	CLT1 Lower Main Stem	59.0%	12.2%	5.5%	43.9%	74.2%	42.9%	76.2%
Burrower HPG (% of community)	Unnamed Reference Creek	8.6%	3.6%	1.6%	4.2%	13.0%	5.9%	14.5%
	CLT1 North Branch	19.7%	11.1%	5.0%	5.9%	33.5%	11.0%	38.9%
	CLT1 Upper Main Stem	14.5%	8.8%	3.9%	3.6%	25.4%	4.0%	22.9%
	CLT1 Lower Main Stem	21.3%	5.1%	2.3%	15.0%	27.6%	13.6%	27.0%

Table F.7: Benthic invertebrate community statistical comparison results among Camp Lake Tributary 1 and Unnamed Reference Creek study areas for Functional Feeding Groups (FFG) and Habitat Preference Groups (HPG), Mary River Project CREMP, August 2016.

Metric	Overall four-group ANOVA ^a			ANOVA Comparison to Reference ^b				
	Significant Difference Among Areas?	p-value	Statistical Test	CLT1 Study Area	Significantly Different from Reference?	p-value	Magnitude of Difference (no. of SD) ^c	Post-hoc Statistical Test
Shredder FFG (% of community)	YES	0.0001	β , δ	Upstream (North Branch)	YES	0.0935	6.9	Tamhane's
				L2 (Upper Main Stem)	YES	0.0022	-3.1	
				Downstream (Lower Main Stem)	NO	0.7324	-	
Collector-Gatherer FFG (% of Community)	YES	0.0000	β , δ	Upstream (North Branch)	NO	0.2604	-	Tukey's HSD
				L2 (Upper Main Stem)	YES	0.0091	-3.2	
				Downstream (Lower Main Stem)	YES	0.0231	2.6	
Filterer FFG (% of community)	YES	0.0001	β , γ	Upstream (North Branch)	NO	0.2506	-	Tamhane's
				L2 (Upper Main Stem)	YES	0.0011	23.5	
				Downstream (Lower Main Stem)	NO	0.5598	-	
Clinger HPG (% of Community)	YES	0.0003	β , δ	Upstream (North Branch)	NO	0.9992	-	Tukey's HSD
				L2 (Upper Main Stem)	NO	0.9727	-	
				Downstream (Lower Main Stem)	YES	0.0010	-3.1	
Sprawler HPG (% of Community)	YES	0.0613	β , δ	Upstream (North Branch)	NO	0.3893	-	Tukey's HSD
				L2 (Upper Main Stem)	NO	0.7998	-	
				Downstream (Lower Main Stem)	NO	0.6310	-	
Burrower HPG (% of Community)	YES	0.0448	β , δ	Upstream (North Branch)	NO	0.1113	-	Tukey's HSD
				L2 (Upper Main Stem)	NO	0.6570	-	
				Downstream (Lower Main Stem)	YES	0.0491	3.6	

^a Data analysis included: α - data untransformed; β - data probit transformed; δ - single factor ANOVA test conducted; γ - ANOVA test validated using Kruskal-Wallis H-test.

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

 Highlighted values indicate significant differences among/between study areas based on ANOVA p-value less than 0.10 that were also outside of a Critical Effect Size of ± 2 SD, suggesting an ecologically meaningful difference.

 **BOLD** Bold text values indicate significant differences between study areas based on ANOVA p-value less than 0.10, but a CES within ± 2 SD, suggesting the difference is not ecologically meaningful.

Table F.8: Statistical comparison of benthic metrics at Camp Lake Tributary 1 North Branch among years of mine operation (2015, 2016) and baseline (2007, 2011) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Density	NO	0.1735	α , ϵ	2007	2011	NO	0.8558	Tukey's HSD
				2007	2015	NO	0.2870	
				2007	2016	NO	0.1764	
				2011	2015	NO	0.7574	
				2011	2016	NO	0.5686	
				2015	2016	NO	0.9805	
Richness	NO	0.8860	α , ϵ	2007	2011	NO	0.9879	Tukey's HSD
				2007	2015	NO	0.8876	
				2007	2016	NO	0.9978	
				2011	2015	NO	0.9833	
				2011	2016	NO	0.9978	
				2015	2016	NO	0.9228	
Simpson's Evenness	YES	0.0029	α , ϵ	2007	2011	YES	0.0310	Tukey's HSD
				2007	2015	YES	0.0044	
				2007	2016	YES	0.0029	
				2011	2015	NO	0.8809	
				2011	2016	NO	0.7581	
				2015	2016	NO	0.9908	
Oligochaeta (% of community)	NO	0.8373	β , ϵ	2007	2011	NO	0.9972	Tamhane's
				2007	2015	NO	1.0000	
				2007	2016	NO	1.0000	
				2011	2015	NO	0.9257	
				2011	2016	NO	0.5340	
				2015	2016	NO	1.0000	
Hydracarina (% of community)	YES	0.0007	β , ϵ	2007	2011	NO	0.3452	Tamhane's
				2007	2015	NO	0.6633	
				2007	2016	YES	0.0113	
				2011	2015	NO	0.4038	
				2011	2016	NO	0.9238	
				2015	2016	YES	0.0209	
Chironomidae (% of community)	YES	0.0521	β , ϵ	2007	2011	NO	0.3448	Tukey's HSD
				2007	2015	NO	0.2189	
				2007	2016	YES	0.0330	
				2011	2015	NO	0.9994	
				2011	2016	NO	0.6045	
				2015	2016	NO	0.5691	
Metal Sensitive Taxa (% of community)	NO	0.6810	β , ϵ	2007	2011	NO	0.8250	Tukey's HSD
				2007	2015	NO	0.6294	
				2007	2016	NO	0.8848	
				2011	2015	NO	0.9939	
				2011	2016	NO	0.9952	
				2015	2016	NO	0.9407	
Tipulidae (% of community)	NO	0.2039	β , ϵ	2007	2011	NO	0.9883	Tukey's HSD
				2007	2015	NO	0.5036	
				2007	2016	NO	0.4948	
				2011	2015	NO	0.3243	
				2011	2016	NO	0.3174	
				2015	2016	NO	1.0000	

Table F.8: Statistical comparison of benthic metrics at Camp Lake Tributary 1 North Branch among years of mine operation (2015, 2016) and baseline (2007, 2011) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Collector-Gatherer FFG (% of community)	YES	0.0079	β , ϵ	2007	2011	YES	0.0171	Tukey's HSD
				2007	2015	YES	0.0590	
				2007	2016	YES	0.0072	
				2011	2015	NO	0.6773	
				2011	2016	NO	0.9999	
				2015	2016	NO	0.5283	
Shredder FFG (% of community)	YES	0.0528	β , ϵ	2007	2011	NO	0.3085	Tukey's HSD
				2007	2015	YES	0.0704	
				2007	2016	YES	0.0494	
				2011	2015	NO	0.8842	
				2011	2016	NO	0.7875	
				2015	2016	NO	0.9950	
Filterer FFG (% of community)	NO	0.1160	β , ϵ	2007	2011	NO	0.7043	Tamhane's
				2007	2015	NO	0.7043	
				2007	2016	NO	0.9739	
				2011	2015	NO	1.0000	
				2011	2016	NO	0.4989	
				2015	2016	NO	0.4989	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data logit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis H-test.

Table F.9: Statistical comparison of benthic metrics at Camp Lake Tributary 1 Upper Main Stem (L2) between 2016 and baseline (2011) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Benthic Endpoint	Statistical Test Results			Summary Statistics						
	Significant Difference Between Years?	p-value	Statistical Analysis ^a	Year	N	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Density	NO	0.238	α , δ	2011	3	12,153	7,723	4,459	3,296	17,485
				2016	5	7,709	1,583	708	6,047	9,359
Richness	NO	0.194	α	2011	3	17.7	3.1	1.8	15.0	21.0
				2016	5	20.0	1.6	0.7	18.0	22.0
Simpson's Evenness	NO	0.321	α	2011	3	0.9	0.0	0.0	0.8	0.9
				2016	5	0.9	0.0	0.0	0.8	0.9
Oligochaeta (% of Community)	NO	0.191	β	2011	3	4.4	5.0	2.9	0.0	9.8
				2016	5	12.6	8.6	3.8	2.6	21.5
Hydracarina (% of Community)	NO	0.639	β	2011	3	19.0	19.8	11.4	1.1	40.3
				2016	5	23.8	8.3	3.7	11.7	33.2
Chironomidae (% of Community)	NO	0.338	β	2011	3	73.7	20.7	12.0	54.0	95.3
				2016	5	61.0	14.5	6.5	42.9	82.3
Metal Sensitive Taxa (% of Community)	NO	0.925	β	2011	3	28.8	22.6	13.0	13.0	54.7
				2016	5	30.0	12.4	5.6	17.1	50.3
Tipulidae (% of Community)	NO	0.375	β	2011	3	0.2	0.2	0.1	0.0	0.4
				2016	5	0.5	0.4	0.2	0.0	1.0
Shredder FFG (% of Community)	NO	0.984	β , δ	2011	3	29.5	9.2	5.3	23.6	40.1
				2016	5	29.6	9.5	4.3	19.0	42.1
Collector-Gatherer FFG (% of Community)	NO	0.719	β	2011	3	13.0	14.7	8.5	2.8	29.8
				2016	5	15.4	2.1	0.9	13.5	18.7
Filterer FFG (% of Community)	NO	0.971	β	2011	3	28.7	22.7	13.1	12.7	54.7
				2016	5	28.3	13.7	6.1	14.2	50.3

^a Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data probit 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.

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

Table F.10: Statistical comparison of benthic metrics at Camp Lake Tributary 1 Lower Main Stem among years of mine operation (2015, 2016) and baseline (2007, 2011) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Density	NO	0.3775	α , ϵ	2007	2011	NO	0.9786	Tukey's HSD
				2007	2015	NO	0.3811	
				2007	2016	NO	0.6465	
				2011	2015	NO	0.6217	
				2011	2016	NO	0.8760	
				2015	2016	NO	0.9433	
Richness	NO	0.1540	α , ϵ	2007	2011	NO	0.2900	Tukey's HSD
				2007	2015	NO	0.1302	
				2007	2016	NO	0.5257	
				2011	2015	NO	0.9895	
				2011	2016	NO	0.8962	
				2015	2016	NO	0.6619	
Simpson's Evenness	NO	0.9073	α , ϵ	2007	2011	NO	1.0000	Tukey's HSD
				2007	2015	NO	0.9470	
				2007	2016	NO	1.0000	
				2011	2015	NO	0.9452	
				2011	2016	NO	1.0000	
				2015	2016	NO	0.9214	
Oligochaeta (% of community)	YES	0.0594	β , ϵ	2007	2011	NO	0.2530	Tukey's HSD
				2007	2015	NO	0.9305	
				2007	2016	NO	0.8209	
				2011	2015	NO	0.4142	
				2011	2016	YES	0.0422	
				2015	2016	NO	0.3682	
Hydracarina (% of community)	YES	0.0000	β , ϵ	2007	2011	NO	0.1310	Tamhane's
				2007	2015	NO	0.9106	
				2007	2016	NO	0.6384	
				2011	2015	NO	0.1234	
				2011	2016	NO	0.1730	
				2015	2016	YES	0.0606	
Chironomidae (% of community)	YES	0.0073	β , ϵ	2007	2011	YES	0.0563	Tukey's HSD
				2007	2015	NO	0.7959	
				2007	2016	NO	0.4991	
				2011	2015	YES	0.0063	
				2011	2016	NO	0.3195	
				2015	2016	YES	0.0759	
Metal Sensitive Taxa (% of community)	YES	0.0877	β , ϵ	2007	2011	NO	0.9323	Tamhane's
				2007	2015	NO	0.7455	
				2007	2016	NO	0.7160	
				2011	2015	NO	0.9907	
				2011	2016	NO	0.9797	
				2015	2016	NO	0.9999	
Tipulidae (% of community)	YES	0.0857	β , ϵ	2007	2011	NO	0.8104	Tukey's HSD
				2007	2015	NO	0.3413	
				2007	2016	NO	0.9983	
				2011	2015	YES	0.0732	
				2011	2016	NO	0.6617	
				2015	2016	NO	0.3063	

Table F.10: Statistical comparison of benthic metrics at Camp Lake Tributary 1 Lower Main Stem among years of mine operation (2015, 2016) and baseline (2007, 2011) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Collector-Gatherer FFG (% of community)	YES	0.0032	β , ϵ	2007	2011	NO	0.4807	Tukey's HSD
				2007	2015	YES	0.0760	
				2007	2016	NO	0.1635	
				2011	2015	YES	0.0043	
				2011	2016	YES	0.0097	
				2015	2016	NO	0.9473	
Shredder FFG (% of community)	YES	0.0210	β , ϵ	2007	2011	YES	0.0920	Tukey's HSD
				2007	2015	NO	0.9610	
				2007	2016	NO	0.9696	
				2011	2015	YES	0.0234	
				2011	2016	YES	0.0252	
				2015	2016	NO	1.0000	
Filterer FFG (% of community)	NO	0.1037	β , ϵ	2007	2011	NO	0.9012	Tamhane's
				2007	2015	NO	0.8986	
				2007	2016	NO	0.9311	
				2011	2015	NO	0.9999	
				2011	2016	NO	0.7614	
				2015	2016	NO	0.7124	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data logit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis H-test.

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 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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	0.4864	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.9873	Tamhane's
				Unnamed Reference Creek	CLT2 Downstream	NO	0.8173	
				CLT2 Upstream	CLT2 Downstream	NO	0.4596	
Water Velocity (cm/s)	YES	0.0097	α	Unnamed Reference Creek	CLT2 Upstream	YES	0.0133	Tamhane's
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0665	
				CLT2 Upstream	CLT2 Downstream	NO	0.6665	
Substrate Size (cm diameter)	YES	0.0089	α	Unnamed Reference Creek	CLT2 Upstream	NO	0.9328	Tukey's HSD
				Unnamed Reference Creek	CLT2 Downstream	YES	0.0235	
				CLT2 Upstream	CLT2 Downstream	YES	0.0124	
Substrate Embeddedness (%)	NO	0.1890	ζ	Unnamed Reference Creek	CLT2 Upstream	NO	0.3191	Tamhane's
				Unnamed Reference Creek	CLT2 Downstream	NO	0.5644	
				CLT2 Upstream	CLT2 Downstream	NO	0.8328	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data logit transformed, single factor ANOVA test conducted;

Table F.12: Benthic invertebrate community data for Camp Lake Tributary 2 study areas, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Camp Lake Tributary 2 - Upstream (CLT2-US)					Camp Lake Tributary 2 - Downstream (CLT2-DS)				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS										
P. Nemata	0	4	4	7	4	4	0	4	0	11
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	4	4	29	29	29	0	0	0	22	4
F. Naididae										
S.F. Tubificinae										
immatures with hair chaetae	0	4	0	0	0	0	0	0	0	0
F. Lumbriculidae										
<i>Lumbriculus</i>	0	0	0	0	0	0	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina	0	0	0	0	0	0	0	0	0	0
F. Hygrobatidae										
<i>Hygrobates</i>	0	0	0	0	0	0	0	0	0	0
F. Lebertiidae										
<i>Lebertia</i>	0	0	0	0	0	0	0	0	4	0
F. Sperchonidae										
<i>Sperchon</i>	7	25	22	29	29	11	11	7	7	4
HARPACTICIDS										
O. Harpacticoida	0	0	0	0	0	0	0	0	0	0
SEED SHRIMPS										
Cl. Ostracoda	0	0	0	0	0	0	0	0	0	0
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	0	0	0	0	0	0	0	0	0	4
INSECTS										
Cl. Insecta										
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
<i>Acentrella feropagus</i>	0	0	0	0	0	0	0	0	0	4
STONEFLIES										
O. Plecoptera										
F. Capniidae										
immature	4	18	0	14	22	0	4	4	11	0
TRUE FLIES										
O. Diptera										
BITING-MIDGE										
F. Ceratopogonidae										
<i>Culicoides</i>	4	0	0	4	4	0	0	0	4	4
indeterminate	0	0	0	0	0	0	0	0	0	0
MIDGES										
F. Chironomidae										
chironomid pupae	4	29	22	11	7	4	0	0	7	4
S.F. Chironominae										
<i>Cladotanytarsus</i>	0	0	0	0	0	0	0	0	0	0
<i>Micropsectra</i>	0	0	0	0	0	4	0	0	0	0
<i>Paratanytarsus</i>	0	0	0	0	0	0	0	0	0	0
<i>Rheotanytarsus</i>	0	0	0	0	0	0	0	0	0	0
<i>Tanytarsus</i>	0	0	0	0	0	0	0	0	0	0
S.F. Diamesinae										
<i>Diamesa</i>	14	7	14	0	14	4	7	4	7	0
<i>Pseudokiefferiella</i>	4	0	11	11	36	7	0	4	7	11
S.F. Orthoclaadiinae										

Table F.12: Benthic invertebrate community data for Camp Lake Tributary 2 study areas, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Camp Lake Tributary 2 - Upstream (CLT2-US)					Camp Lake Tributary 2 - Downstream (CLT2-DS)				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
<i>Chaetocladius</i>	4	11	7	11	7	0	7	0	0	4
<i>Corynoneura</i>	4	0	0	0	4	0	0	0	0	0
<i>Cricotopus</i>	65	57	111	57	39	11	0	0	47	11
<i>Cricotopus/Orthocladius</i>	0	7	11	4	7	0	0	0	0	32
<i>Diplocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Doncricotopus</i>	0	0	0	0	0	0	0	0	0	0
<i>Eukiefferiella</i>	25	4	29	0	32	0	29	14	47	0
<i>Hydrobaenus</i>	0	4	0	0	4	4	0	0	0	0
<i>Hydrosmitia</i>	0	14	11	0	0	0	4	0	0	4
<i>Krenosmitia</i>	14	11	0	0	11	0	0	0	0	0
<i>Limnophyes</i>	4	4	4	0	7	7	4	18	11	0
<i>Metriocnemus</i>	0	0	0	0	0	0	0	0	0	0
<i>Nanocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Orthocladius (Euorthocladius)</i>	68	86	57	36	65	11	29	18	22	11
<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0	0	0
<i>Paraphaenocladius</i>	0	0	0	0	0	4	0	0	0	0
<i>Synorthocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Thienemanniella</i>	0	0	0	0	0	4	0	0	4	0
<i>Tokunagaia</i>	65	179	97	75	122	122	54	79	90	54
<i>Tvetenia</i>	0	7	7	4	4	7	0	0	0	4
indeterminate	0	0	0	0	0	0	0	0	0	0
S.F. Tanypodinae										
<i>Procladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Thienemannimyia complex</i>	0	0	0	0	0	0	0	0	4	0
F. Empididae										
<i>Clinocera</i>	4	4	11	0	4	14	0	0	0	4
pupae	0	0	0	0	4	0	0	0	0	0
F. Ephyridae	0	4	0	0	0	0	0	4	0	4
F. Muscidae	0	0	0	0	0	0	0	0	0	4
F. Simuliidae										
<i>Gymnops</i>	0	0	0	0	0	0	0	0	0	0
<i>Prosimulium</i>	0	0	4	0	0	0	0	0	0	4
pupae	0	0	0	0	0	0	0	0	4	0
F. Tipulidae										
<i>Tipula</i>	7	22	11	14	32	7	0	7	4	4
Number of Organisms (No. organisms per m²)	301	505	462	306	487	225	149	163	302	186
Richness (total number of taxa)^a	16	20	17	13	20	15	9	11	16	19
Simpson's Evenness (E)	0.893	0.841	0.906	0.924	0.928	0.717	0.878	0.799	0.892	0.902
Bray-Curtis Index	0.830	0.685	0.673	0.751	0.694	0.785	0.921	0.880	0.799	0.836
Percent Composition										
% Nemata	0.0%	0.8%	0.9%	2.3%	0.8%	1.8%	0.0%	2.5%	0.0%	5.9%
% Oligochaeta	1.3%	1.6%	6.3%	9.5%	6.0%	0.0%	0.0%	0.0%	7.3%	2.2%
% Hydracarina	2.3%	5.0%	4.8%	9.5%	6.0%	4.9%	7.4%	4.3%	3.6%	2.2%
% Ostracods	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Chironomids	90.0%	83.2%	82.5%	68.3%	73.7%	84.0%	89.9%	84.0%	81.5%	72.6%
% Metal Sensitive Chironomids	6.0%	1.4%	5.4%	3.6%	10.3%	6.7%	4.7%	4.9%	4.6%	5.9%
% Tipulidae	2.3%	4.4%	2.4%	4.6%	6.6%	3.1%	0.0%	4.3%	1.3%	2.2%
Functional Feeding Group Composition										
% Shredders	25.6%	22.4%	30.5%	30.1%	20.7%	8.0%	2.7%	9.2%	21.2%	28.0%
% Collector - Gatherers	69.4%	71.9%	61.5%	59.2%	70.8%	79.1%	89.9%	86.5%	71.2%	61.3%
% Filterers	0.0%	0.0%	0.9%	0.0%	0.0%	1.8%	0.0%	0.0%	1.3%	2.2%
Habitat Preference Group Composition										
% Clingers	25.6%	19.4%	36.1%	30.4%	17.2%	16.0%	7.4%	4.3%	21.2%	30.1%
% Sprawlers	69.4%	73.1%	54.3%	52.0%	68.6%	79.1%	92.6%	86.5%	68.9%	53.2%
% Burrowers	5.0%	7.5%	9.5%	17.6%	14.2%	4.9%	0.0%	9.2%	9.9%	14.5%

^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 2016. Sample size equals five for all study areas.

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Density (no. organisms / m ²)	Unnamed Reference Creek	1,645	619	277	876	2,414	670	2,179
	CLT2 Upstream	412	100	45	288	537	301	505
	CLT2 Downstream	205	61	27	129	281	149	302
Richness (Number of Taxa)	Unnamed Reference Creek	18.6	0.9	0.4	17.5	19.7	17.0	19.0
	CLT2 Upstream	17.2	2.9	1.3	13.5	20.9	13.0	20.0
	CLT2 Downstream	14.0	4.0	1.8	9.0	19.0	9.0	19.0
Simpson's Evenness	Unnamed Reference Creek	0.873	0.070	0.031	0.786	0.960	0.764	0.940
	CLT2 Upstream	0.898	0.035	0.016	0.855	0.942	0.841	0.928
	CLT2 Downstream	0.838	0.079	0.035	0.740	0.936	0.717	0.902
Bray-Curtis Index	Unnamed Reference Creek	0.237	0.130	0.058	0.076	0.398	0.092	0.437
	CLT2 Upstream	0.726	0.065	0.029	0.646	0.807	0.673	0.830
	CLT2 Downstream	0.844	0.056	0.025	0.774	0.914	0.785	0.921
Oligochaeta (% of community)	Unnamed Reference Creek	2.5%	0.5%	0.2%	1.9%	3.2%	2.0%	3.3%
	CLT2 Upstream	4.9%	3.5%	1.5%	0.6%	9.2%	1.3%	9.5%
	CLT2 Downstream	1.9%	3.2%	1.4%	-2.0%	5.8%	0.0%	7.3%
Hydracarina (% of community)	Unnamed Reference Creek	11.7%	3.8%	1.7%	7.1%	16.4%	9.0%	18.2%
	CLT2 Upstream	5.5%	2.6%	1.2%	2.3%	8.7%	2.3%	9.5%
	CLT2 Downstream	4.5%	1.9%	0.9%	2.1%	6.9%	2.2%	7.4%
Chironomidae (% of community)	Unnamed Reference Creek	70.8%	9.2%	4.1%	59.4%	82.2%	56.6%	81.4%
	CLT2 Upstream	79.5%	8.5%	3.8%	68.9%	90.1%	68.3%	90.0%
	CLT2 Downstream	82.4%	6.3%	2.8%	74.6%	90.2%	72.6%	89.9%
Metal-Sensitive Chironomidae (% of community)	Unnamed Reference Creek	8.9%	5.9%	2.7%	1.6%	16.3%	4.6%	19.3%
	CLT2 Upstream	5.3%	3.3%	1.5%	1.2%	9.4%	1.4%	10.3%
	CLT2 Downstream	5.4%	0.9%	0.4%	4.3%	6.5%	4.6%	6.7%
Tipulidae (% of community)	Unnamed Reference Creek	4.3%	2.6%	1.2%	1.1%	7.6%	1.8%	8.5%
	CLT2 Upstream	4.0%	1.8%	0.8%	1.8%	6.2%	2.3%	6.6%
	CLT2 Downstream	2.2%	1.6%	0.7%	0.1%	4.2%	0.0%	4.3%
Shredder FFG (% of community)	Unnamed Reference Creek	25.4%	3.2%	1.5%	21.4%	29.5%	20.4%	28.2%
	CLT2 Upstream	25.9%	4.4%	2.0%	20.4%	31.3%	20.7%	30.5%
	CLT2 Downstream	13.8%	10.4%	4.7%	0.9%	26.7%	2.7%	28.0%
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	53.9%	7.5%	3.4%	44.5%	63.2%	44.6%	64.6%
	CLT2 Upstream	66.6%	5.8%	2.6%	59.3%	73.8%	59.2%	71.9%
	CLT2 Downstream	77.6%	11.6%	5.2%	63.2%	92.0%	61.3%	89.9%
Filterer FFG (% of community)	Unnamed Reference Creek	2.9%	1.1%	0.5%	1.5%	4.2%	1.0%	3.8%
	CLT2 Upstream	0.2%	0.4%	0.2%	-0.3%	0.7%	0.0%	0.9%
	CLT2 Downstream	1.1%	1.0%	0.4%	-0.2%	2.3%	0.0%	2.2%
Clinger HPG (% of community)	Unnamed Reference Creek	41.0%	7.1%	3.2%	32.2%	49.8%	30.9%	47.0%
	CLT2 Upstream	25.8%	7.8%	3.5%	16.1%	35.4%	17.2%	36.1%
	CLT2 Downstream	15.8%	10.5%	4.7%	2.8%	28.8%	4.3%	30.1%
Sprawler HPG (% of community)	Unnamed Reference Creek	50.4%	8.8%	3.9%	39.5%	61.3%	39.4%	62.9%
	CLT2 Upstream	63.5%	9.6%	4.3%	51.5%	75.4%	52.0%	73.1%
	CLT2 Downstream	76.1%	15.5%	6.9%	56.8%	95.4%	53.2%	92.6%
Burrower HPG (% of community)	Unnamed Reference Creek	8.6%	3.6%	1.6%	4.2%	13.0%	5.9%	14.5%
	CLT2 Upstream	10.8%	5.1%	2.3%	4.4%	17.1%	5.0%	17.6%
	CLT2 Downstream	7.7%	5.5%	2.5%	0.9%	14.5%	0.0%	14.5%

Table F.14: Benthic invertebrate community statistical comparison results among Camp Lake Tributary 2 and Unnamed Reference Creek study areas for Functional Feeding Groups (FFG) and Habitat Preference Groups (HPG), Mary River Project CREMP, August 2016.

Season	Overall 3-group Comparison			Summary		Pair-wise, post-hoc comparisons ^a					
	Significant Difference Among Areas?	p-value	Statistical Test ^b	Area	Mean Value	(I) Area	(J) Area	Significant Difference Between Areas?	p-value	Magnitude of Difference	Statistical Test
Shredder FFG (% of community)	YES	0.03190	α	Reference	25.4%	Reference	CLT2 US	NO	0.9971	-	Tamhane's (β)
				CLT2 Upstream	25.9%	Reference	CLT2 DS	NO	0.2465	-	
				CLT2 Downstream	13.8%	CLT2 US	CLT2 DS	NO	0.2325	-	
Collector-Gatherer FFG (% of Community)	YES	0.00555	α	Reference	53.9%	Reference	CLT2 US	NO	0.2080	-	Tukey's (β)
				CLT2 Upstream	66.6%	Reference	CLT2 DS	YES	0.0042	3.1	
				CLT2 Downstream	77.6%	CLT2 US	CLT2 DS	NO	0.1033	-	
Filterer FFG (% of community)	YES	0.00131	α, γ	Reference	2.9%	Reference	CLT2 US	YES	0.0010	-2.5	Tukey's (β)
				CLT2 Upstream	0.2%	Reference	CLT2 DS	NO	0.1691	-	
				CLT2 Downstream	1.1%	CLT2 US	CLT2 DS	YES	0.0303	2.3	
Clinger HPG (% of Community)	YES	0.00661	α	Reference	41.0%	Reference	CLT2 US	YES	0.0465	-2.1	Tamhane's (β)
				CLT2 Upstream	25.8%	Reference	CLT2 DS	YES	0.0509	-3.5	
				CLT2 Downstream	15.8%	CLT2 US	CLT2 DS	NO	0.3474	-	
Sprawler HPG (% of Community)	YES	0.01866	α	Reference	50.4%	Reference	CLT2 US	NO	0.3763	-	Tukey's (β)
				CLT2 Upstream	63.5%	Reference	CLT2 DS	YES	0.0149	2.9	
				CLT2 Downstream	76.1%	CLT2 US	CLT2 DS	NO	0.1659	-	
Burrower HPG (% of Community)	NO	0.47998	α	Reference	8.6%	Reference	CLT2 US	NO	0.9333	-	Tukey's (β)
				CLT2 Upstream	10.8%	Reference	CLT2 DS	NO	0.6743	-	
				CLT2 Downstream	7.7%	CLT2 US	CLT2 DS	NO	0.4672	-	

^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 F.15: Statistical comparison of benthic metrics at Camp Lake Tributary 2 Upstream among years of mine operation (2015, 2016) and baseline (2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between 2 Yearss?	p-value	Statistical Test
Density	NO	0.1510	α	2007	2015	NO	0.2163	Tukey's HSD
				2007	2016	NO	0.9711	
				2015	2016	NO	0.2122	
Richness	YES	0.0029	α	2007	2015	YES	0.0022	Tukey's HSD
				2007	2016	YES	0.0613	
				2015	2016	YES	0.0870	
Simpson's Evenness	YES	0.0023	α	2007	2015	YES	0.0019	Tukey's HSD
				2007	2016	YES	0.0115	
				2015	2016	NO	0.4103	
Oligochaeta (% of Community)	NO	0.3437	β	2007	2015	NO	0.9620	Tukey's HSD
				2007	2016	NO	0.4002	
				2015	2016	NO	0.4501	
Hydracarina (% of Community)	YES	0.0128	β	2007	2015	NO	0.3621	Tukey's HSD
				2007	2016	NO	0.2205	
				2015	2016	YES	0.0100	
Chironomidae (% of Community)	NO	0.3115	β	2007	2015	NO	0.3765	Tukey's HSD
				2007	2016	NO	0.3266	
				2015	2016	NO	0.9912	
Metal Sensitive Taxa (% of Community)	NO	0.1427	β	2007	2015	NO	0.2513	Tukey's HSD
				2007	2016	NO	1.0000	
				2015	2016	NO	0.1709	
Tipulidae (% of Community)	NO	0.8072	β	2007	2015	NO	0.8402	Tukey's HSD
				2007	2016	NO	0.8125	
				2015	2016	NO	0.9979	
Collector-Gatherer FFG (% of Community)	NO	0.8945	β	2007	2015	NO	0.9249	Tukey's HSD
				2007	2016	NO	0.8908	
				2015	2016	NO	0.9949	
Shredder FFG (% of Community)	NO	0.7165	β	2007	2015	NO	0.7096	Tukey's HSD
				2007	2016	NO	0.9396	
				2015	2016	NO	0.8548	
Filterer FFG (% of Community)	NO	0.2245	β	2007	2015	NO	0.3947	Tukey's HSD
				2007	2016	NO	0.9890	
				2015	2016	NO	0.2391	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.16: Statistical comparison of benthic metrics at Camp Lake Tributary 2 Downstream among years of mine operation (2015, 2016) and baseline (2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between 2 Years?	p-value	Statistical Test
Density	NO	0.1071	α	2007	2015	NO	0.9912	Tukey's HSD
				2007	2016	NO	0.2282	
				2015	2016	NO	0.1211	
Richness	NO	0.3267	α	2007	2015	NO	0.3844	Tukey's HSD
				2007	2016	NO	0.3472	
				2015	2016	NO	0.9953	
Simpson's Evenness	YES	0.0516	α	2007	2015	YES	0.0267	Tamhane's
				2007	2016	NO	0.8756	
				2015	2016	NO	0.1414	
Oligochaeta (% of Community)	NO	0.4060	β	2007	2015	NO	0.5799	Tukey's HSD
				2007	2016	NO	0.9930	
				2015	2016	NO	0.4207	
Hydracarina (% of Community)	YES	0.0023	β	2007	2015	NO	0.3316	Tukey's HSD
				2007	2016	YES	0.0555	
				2015	2016	YES	0.0018	
Chironomidae (% of Community)	NO	0.1532	β	2007	2015	NO	0.1432	Tukey's HSD
				2007	2016	NO	0.6286	
				2015	2016	NO	0.4168	
Metal Sensitive Taxa (% of Community)	NO	0.3674	β	2007	2015	NO	0.9716	Tukey's HSD
				2007	2016	NO	0.4310	
				2015	2016	NO	0.4650	
Tipulidae (% of Community)	NO	0.3488	β	2007	2015	NO	0.9809	Tukey's HSD
				2007	2016	NO	0.4251	
				2015	2016	NO	0.4324	
Collector-Gatherer FFG (% of Community)	NO	0.2260	β	2007	2015	NO	0.8397	Tukey's HSD
				2007	2016	NO	0.5767	
				2015	2016	NO	0.2053	
Shredder FFG (% of Community)	NO	0.3583	β	2007	2015	NO	0.9340	Tukey's HSD
				2007	2016	NO	0.3935	
				2015	2016	NO	0.4961	
Filterer FFG (% of Community)	NO	0.1150	β	2007	2015	NO	0.1134	Tukey's HSD
				2007	2016	NO	0.1874	
				2015	2016	NO	0.9247	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.17: Benthic invertebrate community data for Reference Lake 3, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Reference Lake 03 - Littoral Stations 2016					Reference Lake 03 - Profundal Stations 2016				
	REF-01	REF-02	REF-03	REF-04	REF-05	REF-06	REF-07	REF-08	REF-09	REF-10
ROUNDWORMS										
P. Nemata	26	0	121	112	9	0	0	0	0	0
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Lumbriculidae										
<i>Lumbriculus</i>	0	0	0	0	0	0	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	9	34	0	0	0	0	0	0	0	0
F. Acalyptonotidae										
<i>Acalyptonotus</i>	52	0	34	17	17	9	0	9	0	9
F. Hygrobatidae										
<i>Hygrobates</i>	0	0	0	0	0	0	0	0	0	0
F. Lebertiidae										
<i>Lebertia</i>	0	138	26	26	26	9	0	9	0	0
HARPACTICOIDS										
O. Harpacticoida	0	0	0	0	0	0	0	0	0	0
SEED SHRIMPS										
Cl. Ostracoda	1,241	1,655	371	1,836	457	17	17	34	34	26
WATER SCUDS										
O. Amphipoda										
F. Hyalellidae										
<i>Hyalella</i>	0	0	0	0	0	0	0	0	0	0
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
F. Apataniidae										
<i>Apatania</i>	0	34	0	0	0	0	0	0	0	0
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	9	34	9	0	0	0	0	0	0	0
S.F. Chironominae										
<i>Chironomus</i>	0	0	0	0	0	0	0	0	0	0
<i>Micropsectra</i>	716	828	86	164	172	0	0	0	0	0
<i>Parachironomus</i>	0	0	0	0	0	0	0	0	0	0
<i>Paratanytarsus</i>	17	138	0	0	0	0	0	0	0	0
<i>Sergentia</i>	17	0	0	0	0	0	0	0	0	0
<i>Stictochironomus</i>	440	690	0	0	216	9	0	0	0	0
<i>Tanytarsus</i>	121	0	0	0	0	0	0	0	0	0
S.F. Diamesinae										
<i>Diamesa</i>	0	69	17	17	43	0	0	0	0	9
<i>Pseudodiamesa</i>	0	138	34	0	9	0	17	9	0	0
S.F. Orthoclaadiinae										
<i>Abiskomyia</i>	190	207	43	60	181	0	0	0	0	0
<i>Cricotopus/Orthocladus</i>	0	0	0	0	0	0	0	0	0	0
<i>Heterotrissocladius</i>	52	0	112	69	26	388	371	345	509	414
<i>Paracladius</i>	17	34	9	17	9	0	0	0	0	0
<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0	0	0
<i>Psectrocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Zalutschia</i>	310	207	26	26	43	9	9	0	0	0
Genus "Greenland"	0	0	0	0	0	0	0	0	0	0

Table F.17: Benthic invertebrate community data for Reference Lake 3, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Reference Lake 03 - Littoral Stations 2016					Reference Lake 03 - Profundal Stations 2016				
	REF-01	REF-02	REF-03	REF-04	REF-05	REF-06	REF-07	REF-08	REF-09	REF-10
S.F. Tanypodinae										
<i>Arctopelopia</i>	17	34	0	0	0	0	0	0	0	0
<i>Procladius</i>	17	0	9	9	0	0	0	0	0	0
CRANE FLIES										
F. Tipulidae										
<i>Dicranota</i>	0	0	0	0	0	0	0	0	0	0
Density (No. organisms per m²)	3,251	4,240	897	2,353	1,208	441	414	406	543	458
Richness (total number of taxa)^a	14	12	12	11	12	6	4	5	2	4
Simpson's Evenness (E)	0.831	0.842	0.848	0.420	0.849	0.267	0.257	0.337	0.235	0.239
Bray-Curtis Index	0.249	0.382	0.527	0.245	0.267	0.042	0.073	0.083	0.143	0.040
Percent Composition										
% Nemata	0.8%	0.0%	13.5%	4.8%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
% Hydracarina	1.9%	4.1%	6.7%	1.8%	3.6%	4.1%	0.0%	4.4%	0.0%	2.0%
% Ostracods	38.2%	39.0%	41.4%	78.0%	37.8%	3.9%	4.1%	8.4%	6.3%	5.7%
% Chironomids	59.2%	56.1%	38.5%	15.4%	57.9%	92.1%	95.9%	87.2%	93.7%	92.4%
% Metal Sensitive Chironmids	26.4%	28.1%	15.6%	7.7%	18.5%	0.0%	4.1%	2.2%	0.0%	2.0%
Functional Feeding Group Composition										
% Shredders	9.6%	5.0%	3.0%	1.1%	3.6%	2.0%	2.2%	0.0%	0.0%	0.0%
% Collector - Gatherers	61.1%	66.3%	79.5%	89.7%	78.6%	93.9%	97.8%	95.6%	100.0%	98.0%
% Filterers	26.4%	23.1%	9.8%	7.0%	14.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Habitat Preference Group Composition										
% Clingers	28.3%	24.7%	16.5%	8.8%	17.8%	4.1%	0.0%	4.4%	0.0%	2.0%
% Sprawlers	57.3%	57.2%	68.1%	85.7%	60.0%	93.9%	100.0%	95.6%	100.0%	96.1%
% Burrowers	14.4%	18.2%	15.4%	5.5%	22.2%	2.0%	0.0%	0.0%	0.0%	2.0%

^a Bold entries excluded from taxa count

Table F.18: Benthic invertebrate community data for Camp Lake, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Camp Lake - Littoral Stations 2016				
	JLO-2	JLO-21	JLO-30	JLO-31	JLO-32
ROUNDWORMS					
P. Nemata	34	34	259	121	34
ANNELIDS					
P. Annelida					
WORMS					
Cl. Oligochaeta					
F. Lumbriculidae					
<i>Lumbriculus</i>	34	0	0	17	103
ARTHROPODS					
P. Arthropoda					
MITES					
Cl. Arachnida					
O. Acarina					
immature	0	0	17	0	0
F. Acalyptonotidae					
<i>Acalyptonotus</i>	0	0	69	17	0
F. Hygrobatidae					
<i>Hygrobates</i>	0	0	17	0	34
F. Lebertiidae					
<i>Lebertia</i>	0	0	52	52	0
HARPACTICOIDS					
O. Harpacticoida	34	0	0	69	103
SEED SHRIMPS					
Cl. Ostracoda	69	0	34	52	69
WATER SCUDS					
O. Amphipoda					
F. Hyalellidae					
<i>Hyalella</i>	0	0	0	0	0
INSECTS					
Cl. Insecta					
CADDISFLIES					
O. Trichoptera					
F. Apataniidae					
<i>Apatania</i>	34	103	17	0	0
TRUE FLIES					
O. Diptera					
MIDGES					
F. Chironomidae					
chironomid pupae	414	0	0	34	0
S.F. Chironominae					
<i>Chironomus</i>	34	0	0	0	207
<i>Micropsectra</i>	138	483	707	241	552
<i>Parachironomus</i>	0	0	0	0	0
<i>Paratanytarsus</i>	207	241	34	138	103
<i>Sergentia</i>	345	0	0	34	690
<i>Stictochironomus</i>	345	1,138	138	241	517
<i>Tanytarsus</i>	0	0	52	52	207
S.F. Diamesinae					
<i>Diamesa</i>	0	0	17	17	172
<i>Pseudodiamesa</i>	0	0	207	86	69
S.F. Orthoclaadiinae					
<i>Abiskomyia</i>	207	276	224	224	69
<i>Cricotopus/Orthocladus</i>	103	0	0	17	0
<i>Heterotrissocladius</i>	414	862	224	310	241
<i>Paracladius</i>	0	0	34	0	0
<i>Parakiefferiella</i>	0	0	0	0	0
<i>Psectrocladius</i>	0	0	0	0	0
<i>Zalutschia</i>	0	69	52	86	69
Genus "Greenland"	34	34	0	0	0

Table F.18: Benthic invertebrate community data for Camp Lake, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Camp Lake - Littoral Stations 2016				
	JLO-2	JLO-21	JLO-30	JLO-31	JLO-32
S.F. Tanypodinae					
<i>Arctopelopia</i>	69	103	0	17	34
<i>Procladius</i>	34	0	17	0	0
CRANE FLIES					
F. Tipulidae					
<i>Dicranota</i>	34	0	0	0	0
Density (No. organisms per m²)	2,583	3,343	2,171	1,825	3,273
Richness (total number of taxa)^a	17	10	17	18	17
Simpson's Evenness (E)	0.935	0.869	0.894	0.951	0.936
Bray-Curtis Index	0.679	0.737	0.649	0.576	0.744
Percent Composition					
% Nemata	1.3%	1.0%	11.9%	6.6%	1.0%
% Hydracarina	0.0%	0.0%	7.1%	3.8%	1.0%
% Ostracods	2.7%	0.0%	1.6%	2.8%	2.1%
% Chironomids	90.7%	95.9%	78.6%	82.0%	89.5%
% Metal Sensitive Chironmids	16.2%	21.7%	46.8%	29.9%	33.7%
Functional Feeding Group Composition					
% Shredders	4.8%	2.1%	2.4%	5.8%	2.1%
% Collector - Gatherers	71.5%	70.1%	52.4%	65.3%	69.5%
% Filterers	16.2%	21.7%	36.5%	24.2%	26.3%
Habitat Preference Group Composition					
% Clingers	28.9%	17.5%	42.9%	23.1%	45.3%
% Sprawlers	49.8%	47.4%	38.0%	54.8%	23.1%
% Burrowers	20.4%	35.1%	19.1%	22.0%	31.6%

^a Bold entries excluded from taxa count

Table F.19: Statistical comparison of benthic metrics at Camp Lake littoral stations among years of mine operation (2015, 2016) and baseline (2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 3-group Comparison			Summary Statistics		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	NO	0.2484	α, ζ	2007	7,752	2007	2015	NO	0.3222	Tamhane's
				2015	3,671	2007	2016	NO	0.2082	
				2016	2,639	2015	2016	NO	0.6598	
Richness	NO	0.1803	η, ζ	2007	18.0	2007	2015	NO	0.1700	Tukey's HSD
				2015	12.8	2007	2016	NO	0.7622	
				2016	15.8	2015	2016	NO	0.4148	
Simpson's Evenness	YES	0.0001	α	2007	0.893	2007	2015	YES	0.0007	Tukey's HSD
				2015	0.712	2007	2016	NO	0.7754	
				2016	0.917	2015	2016	YES	0.0002	
Nemata (% of Community)	NO	0.8148	β	2007	5.6%	2007	2015	NO	0.9371	Tukey's HSD
				2015	4.7%	2007	2016	NO	0.7984	
				2016	4.4%	2015	2016	NO	0.9454	
Ostracoda (% of Community)	NO	0.2271	β, ζ	2007	0.7%	2007	2015	NO	0.6444	Tukey's HSD
				2015	0.2%	2007	2016	NO	0.6949	
				2016	1.8%	2015	2016	NO	0.2009	
Chironomidae (% of Community)	NO	0.2847	β, ζ	2007	90.1%	2007	2015	NO	0.5210	Tukey's HSD
				2015	93.1%	2007	2016	NO	0.9096	
				2016	87.4%	2015	2016	NO	0.2738	
Metal Sensitive Taxa (% of Community)	NO	0.9555	β	2007	30.8%	2007	2015	NO	0.9706	Tukey's HSD
				2015	38.5%	2007	2016	NO	0.9995	
				2016	29.7%	2015	2016	NO	0.9579	
Collector-Gatherer FFG (% of Community)	NO	0.1875	β	2007	55.9%	2007	2015	NO	0.8245	Tukey's HSD
				2015	51.1%	2007	2016	NO	0.4576	
				2016	65.7%	2015	2016	NO	0.1724	
Filterer FFG (% of Community)	NO	0.8283	β	2007	30.8%	2007	2015	NO	0.9963	Tamhane's
				2015	38.2%	2007	2016	NO	0.9400	
				2016	25.0%	2015	2016	NO	0.9327	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.20: Replicate grab data for benthic invertebrate community samples collected at the Sheardown Lake Tributaries, Mary River Project CREMP, August 2016.

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
Reference Creek	REF CRK B1	12	10	12	0.38	0.28	0.23	8.8	6.6	6.9	25%	25%	25%
	REF CRK B2	12	16	16	0.24	0.44	0.28	6.9	9.1	6.2	25%	25%	25%
	REF CRK B3	12	10	10	0.37	0.31	0.22	7.3	7.0	8.4	25%	25%	25%
	REF CRK B4	16	18	12	0.38	0.34	0.28	6.8	6.3	6.7	25%	25%	25%
	REF CRK B5	12	12	8	0.26	0.21	0.25	5.3	6.0	6.4	25%	25%	25%
Sheardown Tributary 1 Reach 1	SDLT1 R1 B1	10	10	14	0.42	0.29	0.31	8.4	7.3	6.0	50%	50%	-
	SDLT1 R1 B2	8	10	12	0.29	0.30	0.29	6.2	6.7	8.8	50%	50%	50%
	SDLT1 R1 B3	12	12	8	0.56	0.51	0.45	6.5	10.1	7.0	75%	75%	75%
	SDLT1 R1 B4	10	8	10	0.55	0.42	0.50	7.0	8.1	9.2	50%	50%	50%
	SDLT1 R1 B5	8	8	12	0.36	0.42	0.28	6.7	8.8	6.2	25%	25%	25%
Sheardown Tributary 9	SDLT 9 DS B1	2	2	2	0.20	0.22	0.22	9.0	6.1	6.2	50%	50%	50%
	SDLT 9 DS B2	6	2	4	0.34	0.28	0.26	6.9	5.8	8.2	25%	25%	25%
	SDLT 9 DS B3	2	2	2	0.49	0.31	0.47	7.1	6.4	7.1	25%	25%	25%
	SDLT 9 DS B4	4	8	4	0.34	0.30	0.42	5.3	7.5	4.8	25%	50%	50%
	SDLT 9 DS B5	2	2	2	0.51	0.35	0.44	6.5	6.9	4.8	25%	25%	25%
Sheardown Tributary 12	SDLT 12 DS B1	3	4	4	0.12	0.10	0.14	7.6	9.5	8.6	50%	50%	50%
	SDLT 12 DS B2	1	2	4	0.27	0.08	0.11	6.0	5.9	7.2	75%	50%	75%
	SDLT 12 DS B3	2	3	3	0.11	0.22	0.17	8.1	9.2	7.6	50%	50%	50%

^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 7 - 16 measurements per replicate grab, with a mean of 12 for the entire 2016 stream sampling program.

Table F.21: Replicate station habitat feature summary statistics for the Sheardown Lake Tributary benthic stations, Mary River Project CREMP, August 2016. Five stations were sampled at SDLT1 and SDLT9, and three stations were sampled at SDLT9.

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Depth (cm)	Unnamed Reference Creek	12.5	2.3	1.0	9.7	15.4	10.7	15.3
	Sheardown Tributary 1 (SDLT1)	10.1	0.9	0.4	9.1	11.2	9.3	11.3
	Sheardown Tributary 12 (SDLT12)	2.9	0.7	0.4	1.2	4.6	2.3	3.7
	Sheardown Tributary 9 (SDLT9)	3.1	1.5	0.7	1.2	5.0	2.0	5.3
Water Velocity (cm/s)	Unnamed Reference Creek	29.8	3.6	1.6	25.4	34.2	24.0	33.3
	Sheardown Tributary 1 (SDLT1)	39.7	9.6	4.3	27.8	51.5	29.3	50.7
	Sheardown Tributary 12 (SDLT12)	14.7	2.4	1.4	8.7	20.6	12.0	16.7
	Sheardown Tributary 9 (SDLT9)	34.3	9.2	4.1	22.9	45.8	21.3	43.3
Substrate Size (cm diameter)	Unnamed Reference Creek	7.0	0.7	0.3	6.1	7.8	5.9	7.5
	Sheardown Tributary 1 (SDLT1)	7.5	0.4	0.2	7.0	8.0	7.2	8.1
	Sheardown Tributary 12 (SDLT12)	7.7	1.2	0.7	4.8	10.7	6.4	8.6
	Sheardown Tributary 9 (SDLT9)	6.6	0.6	0.3	5.9	7.3	5.9	7.1
Substrate Embeddedness (%)	Unnamed Reference Creek	25	0	0	25	25	25	25
	Sheardown Tributary 1 (SDLT1)	50	18	8	28	72	25	75
	Sheardown Tributary 12 (SDLT12)	56	10	6	32	79	50	67
	Sheardown Tributary 9 (SDLT9)	33	12	5	19	48	25	50

Table F.22: Benthic station habitat feature statistical comparisons between individual Sheardown Lake Tributaries and Unnamed Reference Creek, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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	YES	0.0591	α , ϵ
	Unnamed Reference Creek	SDLT12	YES	0.0004	α , ϵ
	Unnamed Reference Creek	SDLT9	YES	0.0001	α , ζ
Water Velocity (cm/s)	Unnamed Reference Creek	SDLT1	YES	0.0627	α , ϵ
	Unnamed Reference Creek	SDLT12	YES	0.0007	α
	Unnamed Reference Creek	SDLT9	NO	0.3352	α
Substrate Size (cm diameter)	Unnamed Reference Creek	SDLT1	NO	0.1635	α , ζ
	Unnamed Reference Creek	SDLT12	NO	0.2748	α
	Unnamed Reference Creek	SDLT9	NO	0.3736	α
Substrate Embeddedness (%)	Unnamed Reference Creek	SDLT1	YES	0.0133	α , ζ
	Unnamed Reference Creek	SDLT12	YES	0.0003	α , ζ
	Unnamed Reference Creek	SDLT9	NO	0.1525	α , ζ

^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 - single factor ANOVA test validated using Mann-Whitney U-test; η - data log transformed, single factor ANOVA test conducted; ϵ - single factor ANOVA test validated using t-test assuming unequal variance

Table F.23: Benthic invertebrate community data for Sheardown Lake Tributaries, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Unnamed Reference Creek					Sheardown Lake Tributary 1 (SDLT1) - Lower Reach				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS										
P. Nemata	29	29	29	22	18	129	65	86	43	93
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	57	29	50	43	22	0	244	660	273	409
F. Lumbriculidae										
<i>Lumbriculus</i>	0	0	0	0	0	0	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Trombidiformes										
F. Lebertiidae										
<i>Lebertia</i>	0	0	0	0	0	0	0	0	0	0
F. Sperchonidae										
<i>Sperchon</i>	258	144	179	187	122	115	93	144	144	115
SEED SHRIMPS										
Cl. Ostracoda	57	29	36	22	29	0	7	14	0	0
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	0	0	0	0	0	0	0	0	0	0
INSECTS										
Cl. Insecta										
BEETLES										
O. Coleoptera										
F. Staphylinidae	0	0	0	0	0	0	0	0	0	0
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
<i>Acentrella feropagus</i>	0	7	14	0	0	0	0	0	0	0
CADDISFLIES										
O. Trichoptera										
F. Limnephilidae										
immature	0	0	0	0	0	0	0	0	0	0
TRUE FLIES										
O. Diptera										
indeterminate	0	0	0	0	0	0	0	0	0	0
MIDGES										
F. Chironomidae										
chironomid pupae	201	108	72	129	75	0	14	29	22	7
S.F. Chironominae										
<i>Micropsectra</i>	0	0	11	14	0	183	0	0	0	7
<i>Paratanytarsus</i>	0	0	0	0	0	90	36	0	39	43
<i>Rheotanytarsus</i>	43	29	0	14	14	151	43	215	161	29
<i>Tanytarsus</i>	0	7	0	29	0	0	0	0	0	0
S.F. Diamesinae										
<i>Diamesa</i>	0	0	0	0	4	0	0	0	0	0
<i>Pseudokiefferiella</i>	57	237	140	61	29	29	57	402	244	237
S.F. Orthoclaadiinae										
<i>Chaetocladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Corynoneura</i>	0	0	11	0	0	0	0	0	0	0
<i>Cricotopus</i>	388	258	276	244	83	1216	179	632	499	344
<i>Cricotopus/Orthocladus</i>	0	72	115	90	18	215	22	43	14	22
<i>Diplocladius</i>	14	0	0	0	0	0	0	0	0	0
<i>Doncricotopus</i>	0	0	0	0	0	0	0	0	0	0
<i>Eukiefferiella</i>	0	0	14	0	11	0	0	0	14	0
<i>Hydrobaenus</i>	14	0	0	14	0	0	0	0	0	0
<i>Hydrosmittia</i>	29	14	0	0	0	1033	588	689	703	380
<i>Krenosmittia</i>	0	0	0	0	4	0	0	0	0	0
<i>Limnophyes</i>	0	29	0	14	4	0	0	0	14	0

Table F.23: Benthic invertebrate community data for Sheardown Lake Tributaries, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Unnamed Reference Creek					Sheardown Lake Tributary 1 (SDLT1) - Lower Reach				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
<i>Metriocnemus</i>	0	0	0	0	0	0	0	43	0	0
<i>Orthocladius (Euorthocladius)</i>	0	0	0	0	0	0	0	0	14	0
<i>Parakiefferiella</i>	0	7	11	0	0	183	36	57	25	7
<i>Paraphaenocladius</i>	14	0	25	47	4	0	7	0	0	7
<i>Thienemanniella</i>	0	0	0	0	0	0	0	0	0	0
<i>Tokunagaia</i>	660	179	581	954	90	0	22	0	0	36
<i>Tvetenia</i>	57	86	115	75	39	0	7	0	0	14
indeterminate	14	14	0	0	0	0	0	14	0	0
S.F. Podonominae										
<i>Trichotanypus</i>	0	0	0	0	0	0	0	0	0	0
S.F. Tanypodinae										
<i>Procladius</i>	0	0	0	0	0	0	0	0	0	0
<i>Thienemannimyia</i> complex	0	7	7	14	4	0	14	29	22	22
F. Empididae										
<i>Clinocera</i>	201	93	79	43	39	0	7	0	7	7
pupae	0	0	0	0	0	0	0	14	0	0
F. Muscidae	4	0	0	0	0	0	0	0	0	0
F. Simuliidae										
<i>Gymnopaia</i>	0	0	7	0	4	0	0	0	0	0
<i>Prosimulium</i>	14	14	0	7	0	0	0	0	0	0
<i>Simulium baffinense</i>	0	0	0	0	0	0	0	0	0	0
F. Tipulidae										
Dicranota	0	0	0	0	0	0	0	0	0	0
<i>Ormosia</i>	0	0	0	0	0	0	0	0	0	0
<i>Tipula</i>	68	25	97	65	57	32	68	129	54	108
Number of Organisms (No. organisms per m²)	2,179	1,417	1,869	2,088	670	3,376	1,509	3,200	2,292	1,887
Richness (total number of taxa)^a	17	19	19	19	19	11	17	15	16	17
Simpson's Evenness (E)	0.853	0.924	0.885	0.764	0.940	0.837	0.842	0.904	0.873	0.904
Bray-Curtis Index	0.207	0.276	0.092	0.173	0.437	0.761	0.636	0.694	0.652	0.588
Percent Composition										
% Nemata	1.3%	2.0%	1.6%	1.1%	2.7%	3.8%	4.3%	2.7%	1.9%	4.9%
% Oligochaeta	2.6%	2.0%	2.7%	2.1%	3.3%	0.0%	16.2%	20.6%	11.9%	21.7%
% Hydracarina	11.8%	10.2%	9.6%	9.0%	18.2%	3.4%	6.2%	4.5%	6.3%	6.1%
% Ostracods	2.6%	2.0%	1.9%	1.1%	4.3%	0.0%	0.5%	0.4%	0.0%	0.0%
% Chironomids	68.4%	73.9%	73.7%	81.4%	56.6%	91.8%	67.9%	67.3%	77.3%	61.2%
% Metal Sensitive Chironomids	4.6%	19.3%	8.1%	5.7%	7.0%	13.4%	9.0%	19.3%	19.4%	16.7%
% Tipulidae	3.1%	1.8%	5.2%	3.1%	8.5%	0.9%	4.5%	4.0%	2.4%	5.7%
Functional Feeding Group Composition										
% Shredders	24.0%	28.2%	27.2%	20.4%	27.3%	43.3%	18.0%	25.4%	25.0%	25.2%
% Collector - Gatherers	51.9%	50.7%	57.6%	64.6%	44.6%	40.7%	69.1%	61.9%	58.6%	63.0%
% Filterers	2.9%	3.8%	1.0%	3.3%	3.3%	12.6%	5.4%	6.8%	8.9%	4.2%
Habitat Preference Group Composition										
% Clingers	44.8%	47.0%	36.2%	30.9%	46.1%	50.3%	23.1%	33.2%	36.3%	27.5%
% Sprawlers	48.1%	47.1%	54.4%	62.9%	39.4%	45.0%	52.0%	38.2%	47.5%	40.2%
% Burrowers	7.1%	5.9%	9.4%	6.2%	14.5%	4.8%	25.0%	28.7%	16.1%	32.3%

^a Bold entries excluded from taxa count

Table F.23: Benthic invertebrate community data for Sheardown Lake Tributaries, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Sheardown Lake Tributary 12 (SDLT12)			Sheardown Lake Tributary 9 (SDLT9)				
	B1	B2	B3	B1	B2	B3	B4	B5
ROUNDWORMS								
P. Nemata	57	54	65	108	1,249	151	201	115
ANNELIDS								
P. Annelida								
WORMS								
Cl. Oligochaeta								
F. Enchytraeidae	226	222	287	65	43	29	7	29
F. Lumbriculidae								
<i>Lumbriculus</i>	4	0	0	0	0	0	0	0
ARTHROPODS								
P. Arthropoda								
MITES								
Cl. Arachnida								
O. Trombidiformes								
F. Lebertiidae								
<i>Lebertia</i>	0	0	0	7	0	0	0	0
F. Sperchonidae								
<i>Sperchon</i>	4	0	7	29	201	237	115	14
SEED SHRIMPS								
Cl. Ostracoda	4	4	0	151	57	50	136	43
SPRINGTAILS								
Cl. Entognatha								
O. Collembola	0	4	0	36	14	0	29	0
INSECTS								
Cl. Insecta								
BEETLES								
O. Coleoptera								
F. Staphylinidae	0	0	0	7	0	0	0	0
MAYFLIES								
O. Ephemeroptera								
F. Baetidae								
<i>Acentrella feropagus</i>	0	0	0	0	14	57	0	0
CADDISFLIES								
O. Trichoptera								
F. Limnephilidae								
immature	0	0	0	7	0	0	0	0
TRUE FLIES								
O. Diptera								
indeterminate	14	0	0	0	0	0	0	0
MIDGES								
F. Chironomidae								
chironomid pupae	7	4	36	7	14	29	36	14
S.F. Chironominae								
<i>Micropsectra</i>	0	0	7	0	0	0	0	0
<i>Paratanytarsus</i>	11	14	22	0	0	0	0	0
<i>Rheotanytarsus</i>	0	0	0	0	0	0	0	0
<i>Tanytarsus</i>	0	0	0	0	0	0	14	0
S.F. Diamesinae								
<i>Diamesa</i>	0	4	14	0	0	14	36	0
<i>Pseudokiefferiella</i>	0	0	0	0	14	0	0	0
S.F. Orthocladiinae								
<i>Chaetocladius</i>	18	39	43	0	14	18	7	0
<i>Corynoneura</i>	0	0	7	0	29	0	0	0
<i>Cricotopus</i>	11	7	0	933	574	1245	266	373
<i>Cricotopus/Orthocladius</i>	7	29	65	287	373	104	0	43
<i>Diplocladius</i>	61	72	158	122	29	0	0	14
<i>Doncricotopus</i>	0	0	0	11	0	0	0	0
<i>Eukiefferiella</i>	0	0	0	0	0	14	0	0
<i>Hydrobaenus</i>	0	4	14	0	0	14	0	0
<i>Hydrosmittia</i>	14	0	14	0	29	118	144	29
<i>Krenosmittia</i>	0	11	14	0	115	147	136	287
<i>Limnophyes</i>	36	57	115	0	57	0	0	14

Table F.23: Benthic invertebrate community data for Sheardown Lake Tributaries, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Sheardown Lake Tributary 12 (SDLT12)			Sheardown Lake Tributary 9 (SDLT9)				
	B1	B2	B3	B1	B2	B3	B4	B5
<i>Metriocnemus</i>	7	22	72	47	0	0	22	72
<i>Orthocladius (Euorthocladius)</i>	0	0	0	0	0	0	0	14
<i>Parakiefferiella</i>	0	0	0	0	0	0	0	0
<i>Paraphaenocladius</i>	18	4	0	0	0	0	0	0
<i>Thienemanniella</i>	0	0	0	36	0	14	14	0
<i>Tokunagaia</i>	11	18	93	0	359	43	0	43
<i>Tvetenia</i>	0	0	0	25	29	0	7	0
indeterminate	4	72	395	179	545	104	380	57
S.F. Podonominae								
<i>Trichotanypus</i>	0	0	0	25	0	14	0	0
S.F. Tanypodinae								
<i>Procladius</i>	0	4	0	0	0	0	0	0
<i>Thienemannimyia</i> complex	0	0	0	29	14	0	0	0
F. Empididae								
<i>Clinocera</i>	0	0	0	0	0	7	0	0
pupae	4	0	0	29	0	0	7	0
F. Muscidae	0	0	0	0	0	0	0	0
F. Simuliidae								
<i>Gymnopsis</i>	0	0	0	0	0	7	0	0
<i>Prosimulium</i>	0	0	0	14	0	0	0	0
<i>Simulium baffinense</i>	0	0	0	7	14	0	0	0
F. Tipulidae								
<i>Dicranota</i>	0	0	0	0	0	0	0	29
<i>Ormosia</i>	4	4	0	0	0	0	0	0
<i>Tipula</i>	36	4	43	93	215	341	154	90
Number of Organisms (No. organisms per m²)	558	653	1,471	2,254	4,002	2,757	1,711	1,280
Richness (total number of taxa)^a	19	19	17	21	20	19	16	15
Simpson's Evenness (E)	0.842	0.877	0.933	0.783	0.870	0.769	0.915	0.879
Bray-Curtis Index	0.843	0.859	0.761	0.670	0.549	0.655	0.666	0.615
Percent Composition								
% Nematoda	10.2%	8.3%	4.4%	4.8%	31.2%	5.5%	11.7%	9.0%
% Oligochaeta	41.2%	34.0%	19.5%	2.9%	1.1%	1.1%	0.4%	2.3%
% Hydracarina	0.7%	0.0%	0.5%	1.6%	5.0%	8.6%	6.7%	1.1%
% Ostracods	0.7%	0.6%	0.0%	6.7%	1.4%	1.8%	7.9%	3.4%
% Chironomids	36.7%	55.3%	72.7%	75.5%	54.8%	68.1%	62.1%	75.0%
% Metal Sensitive Chironomids	2.0%	2.8%	2.9%	0.0%	0.3%	0.5%	2.9%	0.0%
% Tipulidae	7.2%	1.2%	2.9%	4.1%	5.4%	12.4%	9.0%	9.3%
Functional Feeding Group Composition								
% Shredders	9.7%	7.7%	10.5%	65.5%	37.3%	65.1%	35.4%	42.2%
% Collector - Gatherers	84.4%	89.6%	86.9%	29.1%	57.0%	25.8%	56.6%	54.5%
% Filterers	2.0%	2.1%	2.0%	0.9%	0.3%	0.3%	0.9%	0.0%
Habitat Preference Group Composition								
% Clingers	4.7%	7.0%	8.1%	65.5%	37.3%	61.8%	34.4%	36.3%
% Sprawlers	33.0%	44.6%	56.6%	17.7%	24.7%	18.8%	40.6%	39.5%
% Burrowers	62.4%	47.8%	35.4%	15.3%	37.7%	19.4%	23.3%	24.3%

^a Bold entries excluded from taxa count

Table F.24: Benthic invertebrate community summary statistics for Sheardown Lake Tributaries, Mary River Project CREMP, August 2016. Sample size equals five for SDLT1 and SDLT9, and three for SDLT12.

Metric	Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Density (no. organisms / m ²)	Unnamed Reference Creek	1,645	619	277	876	2,414	670	2,179
	Sheardown Tributary 1 (SDLT1)	2,453	814	364	1,443	3,463	1,509	3,376
	Sheardown Tributary 12 (SDLT12)	894	502	290	-353	2,141	558	1,471
	Sheardown Tributary 9 (SDLT9)	2,401	1,054	471	1,092	3,710	1,280	4,002
Richness (Number of Taxa)	Unnamed Reference Creek	18.6	0.9	0.4	17.5	19.7	17.0	19.0
	Sheardown Tributary 1 (SDLT1)	15.2	2.5	1.1	12.1	18.3	11.0	17.0
	Sheardown Tributary 12 (SDLT12)	18.3	1.2	0.7	15.5	21.2	17.0	19.0
	Sheardown Tributary 9 (SDLT9)	18.2	2.6	1.2	15.0	21.4	15.0	21.0
Simpson's Evenness	Unnamed Reference Creek	0.873	0.070	0.031	0.786	0.960	0.764	0.940
	Sheardown Tributary 1 (SDLT1)	0.872	0.032	0.014	0.832	0.912	0.837	0.904
	Sheardown Tributary 12 (SDLT12)	0.884	0.046	0.027	0.769	0.998	0.842	0.933
	Sheardown Tributary 9 (SDLT9)	0.843	0.063	0.028	0.764	0.922	0.769	0.915
Bray-Curtis Index	Unnamed Reference Creek	0.237	0.130	0.058	0.076	0.398	0.092	0.437
	Sheardown Tributary 1 (SDLT1)	0.666	0.065	0.029	0.585	0.747	0.588	0.761
	Sheardown Tributary 12 (SDLT12)	0.821	0.053	0.030	0.690	0.952	0.761	0.859
	Sheardown Tributary 9 (SDLT9)	0.631	0.051	0.023	0.568	0.694	0.549	0.670
Oligochaeta (% of community)	Unnamed Reference Creek	2.5%	0.5%	0.2%	1.9%	3.2%	2.0%	3.3%
	Sheardown Tributary 1 (SDLT1)	14.1%	8.8%	3.9%	3.2%	25.0%	0.0%	21.7%
	Sheardown Tributary 12 (SDLT12)	31.6%	11.1%	6.4%	4.1%	59.0%	19.5%	41.2%
	Sheardown Tributary 9 (SDLT9)	1.5%	1.0%	0.5%	0.3%	2.8%	0.4%	2.9%
Hydracarina (% of community)	Unnamed Reference Creek	11.7%	3.8%	1.7%	7.1%	16.4%	9.0%	18.2%
	Sheardown Tributary 1 (SDLT1)	5.3%	1.3%	0.6%	3.7%	6.9%	3.4%	6.3%
	Sheardown Tributary 12 (SDLT12)	0.4%	0.4%	0.2%	-0.5%	1.3%	0.0%	0.7%
	Sheardown Tributary 9 (SDLT9)	4.6%	3.2%	1.4%	0.6%	8.6%	1.1%	8.6%
Chironomidae (% of community)	Unnamed Reference Creek	70.8%	9.2%	4.1%	59.4%	82.2%	56.6%	81.4%
	Sheardown Tributary 1 (SDLT1)	73.1%	11.9%	5.3%	58.3%	87.9%	61.2%	91.8%
	Sheardown Tributary 12 (SDLT12)	54.9%	18.0%	10.4%	10.3%	99.5%	36.7%	72.7%
	Sheardown Tributary 9 (SDLT9)	67.1%	8.8%	3.9%	56.2%	78.0%	54.8%	75.5%
Metal-Sensitive Chironomidae (% of community)	Unnamed Reference Creek	8.9%	5.9%	2.7%	1.6%	16.3%	4.6%	19.3%
	Sheardown Tributary 1 (SDLT1)	15.6%	4.4%	2.0%	10.1%	21.0%	9.0%	19.4%
	Sheardown Tributary 12 (SDLT12)	2.6%	0.5%	0.3%	1.3%	3.8%	2.0%	2.9%
	Sheardown Tributary 9 (SDLT9)	0.8%	1.2%	0.6%	-0.8%	2.3%	0.0%	2.9%
Tipulidae (% of community)	Unnamed Reference Creek	4.3%	2.6%	1.2%	1.1%	7.6%	1.8%	8.5%
	Sheardown Tributary 1 (SDLT1)	3.5%	1.9%	0.8%	1.2%	5.8%	0.9%	5.7%
	Sheardown Tributary 12 (SDLT12)	3.8%	3.1%	1.8%	-3.8%	11.4%	1.2%	7.2%
	Sheardown Tributary 9 (SDLT9)	8.0%	3.3%	1.5%	3.9%	12.1%	4.1%	12.4%
Shredder FFG (% of community)	Unnamed Reference Creek	25.4%	3.2%	1.5%	21.4%	29.5%	20.4%	28.2%
	Sheardown Tributary 1 (SDLT1)	27.4%	9.4%	4.2%	15.7%	39.1%	18.0%	43.3%
	Sheardown Tributary 12 (SDLT12)	9.3%	1.5%	0.9%	5.6%	13.0%	7.7%	10.5%
	Sheardown Tributary 9 (SDLT9)	49.1%	15.0%	6.7%	30.4%	67.7%	35.4%	65.5%
Collector-Gatherer FFG (% of community)	Unnamed Reference Creek	53.9%	7.5%	3.4%	44.5%	63.2%	44.6%	64.6%
	Sheardown Tributary 1 (SDLT1)	58.6%	10.7%	4.8%	45.3%	72.0%	40.7%	69.1%
	Sheardown Tributary 12 (SDLT12)	87.0%	2.6%	1.5%	80.5%	93.4%	84.4%	89.6%
	Sheardown Tributary 9 (SDLT9)	44.6%	15.7%	7.0%	25.1%	64.1%	25.8%	57.0%
Filterer FFG (% of community)	Unnamed Reference Creek	2.9%	1.1%	0.5%	1.5%	4.2%	1.0%	3.8%
	Sheardown Tributary 1 (SDLT1)	7.6%	3.3%	1.5%	3.5%	11.6%	4.2%	12.6%
	Sheardown Tributary 12 (SDLT12)	2.1%	0.1%	0.1%	1.8%	2.3%	2.0%	2.1%
	Sheardown Tributary 9 (SDLT9)	0.5%	0.4%	0.2%	0.0%	1.0%	0.0%	0.9%
Clinger HPG (% of community)	Unnamed Reference Creek	41.0%	7.1%	3.2%	32.2%	49.8%	30.9%	47.0%
	Sheardown Tributary 1 (SDLT1)	34.1%	10.4%	4.7%	21.2%	47.0%	23.1%	50.3%
	Sheardown Tributary 12 (SDLT12)	6.6%	1.8%	1.0%	2.2%	11.0%	4.7%	8.1%
	Sheardown Tributary 9 (SDLT9)	47.0%	15.3%	6.8%	28.1%	66.0%	34.4%	65.5%
Sprawler HPG (% of community)	Unnamed Reference Creek	50.4%	8.8%	3.9%	39.5%	61.3%	39.4%	62.9%
	Sheardown Tributary 1 (SDLT1)	44.6%	5.6%	2.5%	37.6%	51.5%	38.2%	52.0%
	Sheardown Tributary 12 (SDLT12)	44.7%	11.8%	6.8%	15.4%	74.0%	33.0%	56.6%
	Sheardown Tributary 9 (SDLT9)	28.2%	11.1%	5.0%	14.5%	42.0%	17.7%	40.6%
Burrower HPG (% of community)	Unnamed Reference Creek	8.6%	3.6%	1.6%	4.2%	13.0%	5.9%	14.5%
	Sheardown Tributary 1 (SDLT1)	21.4%	11.1%	4.9%	7.6%	35.1%	4.8%	32.3%
	Sheardown Tributary 12 (SDLT12)	48.5%	13.5%	7.8%	14.9%	82.1%	35.4%	62.4%
	Sheardown Tributary 9 (SDLT9)	24.0%	8.4%	3.8%	13.5%	34.5%	15.3%	37.7%

Table F.25: Benthic invertebrate community statistical comparisons between individual Sheardown Lake Tributaries and Unnamed Reference Creek, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison ($p\text{-value} \leq 0.1$).

Metric	Pair-wise comparisons ^a				
	(I) Area	(J) Area	Significant Difference Between Areas?	p-value	Statistical Test ^b
Density	Unnamed Reference Creek	SDLT1	NO	0.1151	α
	Unnamed Reference Creek	SDLT12	NO	0.1283	α
	Unnamed Reference Creek	SDLT9	NO	0.2040	α
Richness	Unnamed Reference Creek	SDLT1	YES	0.0207	α, ζ
	Unnamed Reference Creek	SDLT12	NO	0.7246	α, ζ
	Unnamed Reference Creek	SDLT9	NO	0.7524	α, ζ
Simpson's Evenness	Unnamed Reference Creek	SDLT1	NO	0.9779	α
	Unnamed Reference Creek	SDLT12	NO	0.8247	α
	Unnamed Reference Creek	SDLT9	NO	0.4996	α
Bray-Curtis Index	Unnamed Reference Creek	SDLT1	YES	0.0002	α
	Unnamed Reference Creek	SDLT12	YES	0.0003	α
	Unnamed Reference Creek	SDLT9	YES	0.0002	α
Oligochaeta (% of Community)	Unnamed Reference Creek	SDLT1	NO	0.6760	η, ζ
	Unnamed Reference Creek	SDLT12	YES	0.0000	η
	Unnamed Reference Creek	SDLT9	YES	0.0832	η
Hydracarina (% of Community)	Unnamed Reference Creek	SDLT1	YES	0.0022	η
	Unnamed Reference Creek	SDLT12	YES	0.0006	η, ϵ
	Unnamed Reference Creek	SDLT9	YES	0.0221	η, ϵ
Chironomidae (% of Community)	Unnamed Reference Creek	SDLT1	NO	0.6377	η
	Unnamed Reference Creek	SDLT12	NO	0.1427	η
	Unnamed Reference Creek	SDLT9	NO	0.5092	η
Metal Sensitive Taxa (% of Community)	Unnamed Reference Creek	SDLT1	YES	0.0534	η
	Unnamed Reference Creek	SDLT12	YES	0.0208	η
	Unnamed Reference Creek	SDLT9	YES	0.0045	η, ϵ
Tipulidae (% of Community)	Unnamed Reference Creek	SDLT1	NO	0.5799	η
	Unnamed Reference Creek	SDLT12	NO	0.6763	η
	Unnamed Reference Creek	SDLT9	YES	0.0755	η
Shredder FFG (% of Community)	Unnamed Reference Creek	SDLT1	NO	0.7471	η
	Unnamed Reference Creek	SDLT12	YES	0.0001	η
	Unnamed Reference Creek	SDLT9	YES	0.0066	η, ϵ
Collector-Gatherer FFG (% of Community)	Unnamed Reference Creek	SDLT1	NO	0.4331	η
	Unnamed Reference Creek	SDLT12	YES	0.0001	η
	Unnamed Reference Creek	SDLT9	NO	0.2569	η, ζ
Filterer FFG (% of Community)	Unnamed Reference Creek	SDLT1	YES	0.0123	η
	Unnamed Reference Creek	SDLT12	NO	0.4943	η
	Unnamed Reference Creek	SDLT9	YES	0.0094	η

Table F.25: Benthic invertebrate community statistical comparisons between individual Sheardown Lake Tributaries and Unnamed Reference Creek, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Pair-wise comparisons ^a				
	(I) Area	(J) Area	Significant Difference Between Areas?	p-value	Statistical Test ^b
Clinger HPG (% of Community)	Unnamed Reference Creek	SDLT1	NO	0.2368	η
	Unnamed Reference Creek	SDLT12	YES	0.0000	η
	Unnamed Reference Creek	SDLT9	NO	0.4487	η , ε
Sprawler HPG (% of Community)	Unnamed Reference Creek	SDLT1	NO	0.2433	η
	Unnamed Reference Creek	SDLT12	NO	0.4549	η
	Unnamed Reference Creek	SDLT9	YES	0.0094	η
Burrower HPG (% of Community)	Unnamed Reference Creek	SDLT1	YES	0.0691	η , ζ
	Unnamed Reference Creek	SDLT12	YES	0.0004	η , ζ
	Unnamed Reference Creek	SDLT9	YES	0.0020	η , ζ

^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 - single factor ANOVA test validated using Mann-Whitney U-test; η - data log transformed, single factor ANOVA test conducted; ε - single factor ANOVA test validated using t-test assuming unequal variance

Table F.26: Statistical comparison of benthic metrics at Sheardown Lake Tributary 1 (SDLT1) among years of mine operation (2015, 2016) and baseline (2008, 2013) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	YES	0.0004	α , γ	2008	2013	NO	0.3187	Tamhane's
				2008	2015	NO	0.5462	
				2008	2016	YES	0.0235	
				2013	2015	NO	0.9999	
				2013	2016	YES	0.0374	
				2015	2016	YES	0.0320	
Richness	NO	0.3303	α , ϵ	2008	2013	NO	0.2991	Tukey's HSD
				2008	2015	NO	0.4639	
				2008	2016	NO	0.5128	
				2013	2015	NO	0.9417	
				2013	2016	NO	0.9136	
				2015	2016	NO	0.9996	
Simpson's Evenness	NO	0.8960	α , ϵ	2008	2013	NO	0.9984	Tukey's HSD
				2008	2015	NO	0.9100	
				2008	2016	NO	0.9372	
				2013	2015	NO	0.9623	
				2013	2016	NO	0.9780	
				2015	2016	NO	0.9997	
Oligochaeta (% of community)	NO	0.7778	β , γ	2008	2013	NO	0.9258	Tukey's HSD
				2008	2015	NO	0.7512	
				2008	2016	NO	0.9747	
				2013	2015	NO	0.9885	
				2013	2016	NO	0.9927	
				2015	2016	NO	0.9038	
Hydracarina (% of community)	YES	0.0224	β , ϵ	2008	2013	YES	0.0298	Tukey's HSD
				2008	2015	YES	0.0295	
				2008	2016	YES	0.0645	
				2013	2015	NO	0.9805	
				2013	2016	NO	0.8391	
				2015	2016	NO	0.9525	
Chironomidae (% of community)	NO	0.5300	β , ϵ	2008	2013	NO	0.4923	Tukey's HSD
				2008	2015	NO	0.9698	
				2008	2016	NO	0.8863	
				2013	2015	NO	0.6480	
				2013	2016	NO	0.8033	
				2015	2016	NO	0.9877	
Metal Sensitive Taxa (% of community)	YES	0.0063	β , ϵ	2008	2013	NO	0.9620	Tamhane's
				2008	2015	YES	0.0028	
				2008	2016	NO	0.1068	
				2013	2015	NO	0.7463	
				2013	2016	NO	1.0000	
				2015	2016	YES	0.0271	
Tipulidae (% of community)	YES	0.0383	β , γ	2008	2013	NO	0.3722	Tukey's HSD
				2008	2015	YES	0.0243	
				2008	2016	NO	0.1724	
				2013	2015	NO	0.4673	
				2013	2016	NO	0.9861	
				2015	2016	NO	0.5559	
Collector-Gatherer FFG (% of community)	YES	0.0092	β , ϵ	2008	2013	NO	0.1400	Tukey's HSD
				2008	2015	YES	0.0058	
				2008	2016	YES	0.0339	
				2013	2015	NO	0.4269	
				2013	2016	NO	0.9417	
				2015	2016	NO	0.6548	
Shredder FFG (% of community)	YES	0.0355	β , ϵ	2008	2013	NO	0.2525	Tukey's HSD
				2008	2015	YES	0.0234	
				2008	2016	NO	0.1030	
				2013	2015	NO	0.6357	
				2013	2016	NO	0.9856	
				2015	2016	NO	0.7544	
Filterer FFG (% of community)	NO	0.1817	β , γ	2008	2013	NO	0.3842	Tukey's HSD
				2008	2015	NO	0.9995	
				2008	2016	NO	0.5614	
				2013	2015	NO	0.2532	
				2013	2016	NO	0.9515	
				2015	2016	NO	0.3820	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data logit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis H-test.

Table F.27: Statistical comparison of benthic metrics at Sheardown Lake Tributary 1 (SDLT12) among years of mine operation (2015, 2016) and baseline (2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	NO	0.9180	α	2007	2015	NO	0.9194	Tukey's HSD
				2007	2016	NO	0.9597	
				2015	2016	NO	0.9938	
Richness	YES	0.0006	α, ζ	2007	2015	YES	0.0006	Tukey's HSD
				2007	2016	NO	0.8253	
				2015	2016	YES	0.0024	
Simpson's Evenness	NO	0.3815	α	2007	2015	NO	0.4686	Tamhane's
				2007	2016	NO	0.4775	
				2015	2016	NO	0.9999	
Oligochaeta (% of Community)	YES	0.0000	β	2007	2015	YES	0.0001	Tukey's HSD
				2007	2016	YES	0.0001	
				2015	2016	NO	0.9787	
Hydracarina (% of Community)	YES	0.0000	β	2007	2015	NO	0.1454	Tukey's HSD
				2007	2016	NO	0.6097	
				2015	2016	NO	0.5813	
Chironomidae (% of Community)	YES	0.0148	β	2007	2015	YES	0.0540	Tukey's HSD
				2007	2016	YES	0.0193	
				2015	2016	NO	0.8058	
Metal Sensitive Taxa (% of Community)	NO	0.2440	β	2007	2015	NO	0.7289	Tamhane's
				2007	2016	NO	0.9976	
				2015	2016	NO	0.7472	
Tipulidae (% of Community)	YES	0.0084	β	2007	2015	YES	0.0172	Tukey's HSD
				2007	2016	YES	0.0192	
				2015	2016	NO	0.9973	
Collector-Gatherer FFG (% of Community)	YES	0.0143	β	2007	2015	YES	0.0363	Tukey's HSD
				2007	2016	YES	0.0240	
				2015	2016	NO	0.9648	
Shredder FFG (% of Community)	NO	0.1182	β	2007	2015	NO	0.5212	Tukey's HSD
				2007	2016	NO	0.1038	
				2015	2016	NO	0.5424	
Filterer FFG (% of Community)	YES	0.0233	β	2007	2015	YES	0.0401	Tamhane's
				2007	2016	NO	0.9975	
				2015	2016	YES	0.0453	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.28: Statistical comparison of benthic metrics at Sheardown Lake Tributary 9 (SDLT9) among years of mine operation (2015, 2016) and baseline (2007, 2013) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	YES	0.0682	α , ϵ	2007	2013	NO	0.8757	Tukey's HSD
				2007	2015	NO	0.1587	
				2007	2016	YES	0.0822	
				2013	2015	NO	0.5010	
				2013	2016	NO	0.3025	
				2015	2016	NO	0.9654	
Richness	NO	0.5174	α , ϵ	2007	2013	NO	0.6988	Tukey's HSD
				2007	2015	NO	0.7089	
				2007	2016	NO	0.4571	
				2013	2015	NO	0.9988	
				2013	2016	NO	0.9907	
				2015	2016	NO	0.9553	
Simpson's Evenness	NO	0.4607	α , ϵ	2007	2013	NO	0.8752	Tukey's HSD
				2007	2015	NO	0.9106	
				2007	2016	NO	0.9459	
				2013	2015	NO	0.9978	
				2013	2016	NO	0.5317	
				2015	2016	NO	0.5279	
Oligochaeta (% of community)	YES	0.0159	β , ϵ	2007	2013	NO	0.4828	Tamhane's
				2007	2015	NO	0.1639	
				2007	2016	NO	0.3243	
				2013	2015	NO	0.9149	
				2013	2016	NO	0.8090	
				2015	2016	NO	0.8369	
Hydracarina (% of community)	NO	0.3253	β , γ	2007	2013	NO	0.3585	Tukey's HSD
				2007	2015	NO	0.9959	
				2007	2016	NO	0.9817	
				2013	2015	NO	0.3681	
				2013	2016	NO	0.4427	
				2015	2016	NO	0.9981	
Chironomidae (% of community)	NO	0.1408	β , ϵ	2007	2013	NO	0.8856	Tukey's HSD
				2007	2015	NO	0.9856	
				2007	2016	NO	0.3374	
				2013	2015	NO	0.6666	
				2013	2016	NO	0.7788	
				2015	2016	NO	0.1243	
Metal Sensitive Taxa (% of community)	YES	0.0110	β , ϵ	2007	2013	NO	0.3409	Tamhane's
				2007	2015	NO	0.4627	
				2007	2016	NO	0.2646	
				2013	2015	YES	0.0773	
				2013	2016	NO	0.7011	
				2015	2016	NO	0.1368	
Tipulidae (% of community)	NO	0.1906	β , ϵ	2007	2013	NO	0.9987	Tukey's HSD
				2007	2015	NO	0.7998	
				2007	2016	NO	0.6864	
				2013	2015	NO	0.8777	
				2013	2016	NO	0.5893	
				2015	2016	NO	0.1429	
Collector-Gatherer FFG (% of community)	NO	0.3397	β , γ	2007	2013	NO	0.9932	Tamhane's
				2007	2015	NO	0.9993	
				2007	2016	NO	0.5819	
				2013	2015	NO	1.0000	
				2013	2016	NO	0.4569	
				2015	2016	NO	0.7067	
Shredder FFG (% of community)	NO	0.1191	β , ϵ	2007	2013	NO	0.9986	Tukey's HSD
				2007	2015	NO	0.9772	
				2007	2016	NO	0.1823	
				2013	2015	NO	0.9955	
				2013	2016	NO	0.2362	
				2015	2016	NO	0.2204	
Filterer FFG (% of community)	NO	0.4149	β , ϵ	2007	2013	NO	0.9844	Tukey's HSD
				2007	2015	NO	0.9911	
				2007	2016	NO	0.6271	
				2013	2015	NO	0.9020	
				2013	2016	NO	0.4084	
				2015	2016	NO	0.7112	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data logit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis H-test.

Table F.29: Benthic invertebrate community data for Sheardown Lake, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Sheardown Lake NW (DLO-01) Littoral Stations 2016					Sheardown Lake SE (DLO-02) Littoral Stations 2016				
	DD Hab9 0	DLO1-03	DLO1-08	DLO1-09	DLO1-10	DLO2-01	DLO2-03	DLO2-09	DLO2-11	DLO2-13
ROUNDWORMS										
P. Nemata	69	0	17	207	17	0	0	112	69	17
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Lumbriculidae										
<i>Lumbriculus</i>	0	0	0	69	9	0	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
immature	0	0	9	0	0	0	0	0	0	0
F. Acalyptonotidae										
<i>Acalyptonotus</i>	0	34	52	138	69	26	34	172	34	9
F. Hygrobatidae										
<i>Hygrobates</i>	0	0	69	0	26	9	0	129	0	0
F. Lebertiidae										
<i>Lebertia</i>	0	0	34	0	17	9	0	0	0	9
HARPACTICOIDS										
O. Harpacticoida	0	0	0	69	0	0	0	0	0	0
SEED SHRIMPS										
Cl. Ostracoda	276	966	103	2,000	52	86	0	9	138	9
WATER SCUDS										
O. Amphipoda										
F. Hyalellidae										
<i>Hyalella</i>	0	0	0	0	0	0	0	0	0	0
INSECTS										
Cl. Insecta										
CADDISFLIES										
O. Trichoptera										
F. Apataniidae										
<i>Apatania</i>	34	0	0	0	0	0	0	0	0	0
TRUE FLIES										
O. Diptera										
MIDGES										
F. Chironomidae										
chironomid pupae	34	0	0	69	9	26	0	9	0	0
S.F. Chironominae										
<i>Chironomus</i>	0	190	0	69	0	1,681	1,069	0	328	0
<i>Micropsectra</i>	793	1,267	78	1,034	43	60	103	155	34	34
<i>Parachironomus</i>	0	0	0	69	0	0	0	0	0	0
<i>Paratanytarsus</i>	586	1,905	0	1,517	9	60	0	0	34	0
<i>Sergentia</i>	0	569	0	69	0	9	34	0	0	0
<i>Stictochironomus</i>	1,690	2,405	86	2,138	517	34	1,000	1,957	707	1,052
<i>Tanytarsus</i>	241	500	0	966	0	319	69	138	164	0
S.F. Diamesinae										
<i>Diamesa</i>	0	0	9	0	78	0	0	0	0	26
<i>Pseudodiamesa</i>	0	0	9	0	17	0	0	0	0	0
S.F. Orthoclaadiinae										
<i>Abiskomyia</i>	345	379	112	966	103	34	138	509	345	397
<i>Cricotopus/Orthocladus</i>	0	0	0	0	0	0	0	0	0	0
<i>Heterotrissocladius</i>	517	129	293	690	78	9	0	52	34	0
<i>Paracladius</i>	0	0	60	0	69	0	0	0	0	0
<i>Parakiefferiella</i>	0	0	0	69	0	0	34	9	0	0
<i>Psectrocladius</i>	0	0	0	69	0	0	0	0	0	0
<i>Zalutschia</i>	34	60	17	0	26	0	0	43	0	0
Genus "Greenland"	0	0	0	0	0	0	0	0	0	0

Table F.29: Benthic invertebrate community data for Sheardown Lake, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Sheardown Lake NW (DLO-01) Littoral Stations 2016					Sheardown Lake SE (DLO-02) Littoral Stations 2016				
	DD Hab9 0	DLO1-03	DLO1-08	DLO1-09	DLO1-10	DLO2-01	DLO2-03	DLO2-09	DLO2-11	DLO2-13
S.F. Tanypodinae										
<i>Arctopelopia</i>	552	500	0	207	0	17	0	43	34	0
<i>Procladius</i>	34	60	500	69	276	1,241	724	2,888	422	1,552
CRANE FLIES										
F. Tipulidae	0	0	0	0	0	0	0	0	0	0
<i>Dicranota</i>	0	0	0	0	0	0	0	0	0	0
Density (No. organisms per m²)	5,205	8,964	1,448	10,484	1,415	3,620	3,205	6,225	2,343	3,105
Richness (total number of taxa)^a	12	13	14	18	16	14	9	13	12	9
Simpson's Evenness (E)	0.901	0.908	0.878	0.918	0.860	0.703	0.829	0.732	0.900	0.696
Bray-Curtis Index	0.711	0.684	0.634	0.688	0.628	0.886	0.789	0.736	0.669	0.724
Percent Composition										
% Nemata	1.3%	0.0%	1.2%	2.0%	1.2%	0.0%	0.0%	1.8%	2.9%	0.5%
% Hydracarina	0.0%	0.4%	11.3%	1.3%	7.9%	1.2%	1.1%	4.8%	1.5%	0.6%
% Ostracods	5.3%	10.8%	7.1%	19.1%	3.7%	2.4%	0.0%	0.1%	5.9%	0.3%
% Chironomids	92.7%	88.8%	80.4%	76.3%	86.6%	96.4%	98.9%	93.2%	89.7%	98.6%
% Metal Sensitive Chironmids	31.4%	41.0%	6.6%	33.8%	10.5%	12.2%	5.4%	4.7%	9.9%	1.9%
Functional Feeding Group Composition										
% Shredders	0.7%	0.7%	1.2%	0.0%	1.8%	0.0%	0.0%	0.7%	0.0%	0.0%
% Collector - Gatherers	56.0%	51.7%	47.6%	61.5%	66.9%	51.5%	71.0%	42.6%	69.2%	48.3%
% Filterers	31.4%	41.0%	5.4%	33.8%	3.7%	12.2%	5.4%	4.7%	9.9%	1.1%
Habitat Preference Group Composition										
% Clingers	20.7%	26.4%	16.7%	21.2%	11.0%	12.0%	7.5%	9.6%	9.9%	1.7%
% Sprawlers	45.2%	44.6%	75.6%	54.9%	44.7%	40.0%	28.0%	57.1%	43.0%	63.1%
% Burrowers	34.0%	28.9%	7.7%	23.9%	44.2%	47.7%	64.6%	33.3%	47.1%	35.3%

^a Bold entries excluded from taxa count

Table F.30: Statistical comparison of benthic metrics at Sheardown Lake NW (SDNW) among years of mine operation (2015, 2016) and baseline (2007, 2008, 2013) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 5-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	NO	0.5171	η , γ	2007	2008	NO	0.9979	Tukey's HSD
				2007	2013	NO	0.7838	
				2007	2015	NO	1.0000	
				2007	2016	NO	0.9648	
				2008	2013	NO	0.9082	
				2008	2015	NO	0.9926	
				2008	2016	NO	0.8654	
				2013	2015	NO	0.7033	
				2013	2016	NO	0.4144	
				2015	2016	NO	0.9765	
Richness	NO	0.1992	η , γ	2007	2008	NO	0.1143	Mann-Whitney U-test
				2007	2013	NO	0.1143	
				2007	2015	NO	0.2857	
				2007	2016	NO	0.1905	
				2008	2013	NO	0.4000	
				2008	2015	NO	0.5556	
				2008	2016	NO	0.9048	
				2013	2015	NO	0.1429	
				2013	2016	NO	0.1429	
				2015	2016	NO	0.6905	
Simpson's Evenness	YES	0.0450	α , γ	2007	2008	NO	0.6210	Tukey's HSD
				2007	2013	NO	0.4331	
				2007	2015	NO	0.9997	
				2007	2016	NO	0.1143	
				2008	2013	NO	0.9921	
				2008	2015	NO	0.4635	
				2008	2016	NO	0.7978	
				2013	2015	NO	0.3060	
				2013	2016	NO	0.9775	
				2015	2016	YES	0.0588	
Ostracoda (% of community)	NO	0.3232	ζ	2007	2008	NO	0.9999	Tamhane's
				2007	2013	NO	0.8678	
				2007	2015	NO	1.0000	
				2007	2016	NO	1.0000	
				2008	2013	NO	0.5727	
				2008	2015	NO	1.0000	
				2008	2016	NO	1.0000	
				2013	2015	NO	0.1906	
				2013	2016	NO	0.2679	
				2015	2016	NO	1.0000	
Chironomidae (% of community)	YES	0.0361	β , ϵ	2007	2008	NO	0.9916	Tukey's HSD
				2007	2013	NO	0.3049	
				2007	2015	NO	0.5319	
				2007	2016	NO	0.9946	
				2008	2013	NO	0.5153	
				2008	2015	NO	0.2929	
				2008	2016	NO	0.9099	
				2013	2015	YES	0.0193	
				2013	2016	NO	0.1494	
				2015	2016	NO	0.7191	

Table F.30: Statistical comparison of benthic metrics at Sheardown Lake NW (SDNW) among years of mine operation (2015, 2016) and baseline (2007, 2008, 2013) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 5-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Metal Sensitive Taxa (% of community)	NO	0.7968	β , ϵ	2007	2008	NO	1.0000	Tamhane's
				2007	2013	NO	0.9919	
				2007	2015	NO	0.9988	
				2007	2016	NO	0.9946	
				2008	2013	NO	1.0000	
				2008	2015	NO	1.0000	
				2008	2016	NO	1.0000	
				2013	2015	NO	0.9997	
				2013	2016	NO	1.0000	
				2015	2016	NO	1.0000	
Collector-Gatherer FFG (% of community)	NO	0.3162	β , ϵ	2007	2008	NO	0.6801	Tukey's HSD
				2007	2013	NO	0.8998	
				2007	2015	NO	0.9844	
				2007	2016	NO	0.2820	
				2008	2013	NO	0.9966	
				2008	2015	NO	0.9000	
				2008	2016	NO	0.9609	
				2013	2015	NO	0.9910	
				2013	2016	NO	0.8627	
				2015	2016	NO	0.4946	
Filterer FFG (% of community)	NO	0.8744	β , ϵ	2007	2008	NO	1.0000	Tamhane's
				2007	2013	NO	0.9899	
				2007	2015	NO	0.9986	
				2007	2016	NO	0.9998	
				2008	2013	NO	0.9998	
				2008	2015	NO	1.0000	
				2008	2016	NO	1.0000	
				2013	2015	NO	0.9988	
				2013	2016	NO	1.0000	
				2015	2016	NO	1.0000	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data logit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis H-test.

Table F.31: Statistical comparison of benthic metrics at Sheardown Lake SE littoral stations among years of mine operation (2015, 2016) and baseline (2013) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value $\leq$ 0.1).

Metric	Overall 3-group Comparison			Summary Statistics		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	YES	0.0036	α	2013	10,649	2013	2015	YES	0.0848	Tamhane's
				2015	4,829	2013	2016	YES	0.0455	
				2016	3,700	2015	2016	NO	0.6951	
Richness	NO	0.1829	α	2013	14.2	2013	2015	NO	0.1847	Tukey's HSD
				2015	10.6	2013	2016	NO	0.3399	
				2016	11.4	2015	2016	NO	0.9084	
Simpson's Evenness	NO	0.9249	α	2013	0.785	2013	2015	NO	0.9176	Tukey's HSD
				2015	0.759	2013	2016	NO	0.9767	
				2016	0.772	2015	2016	NO	0.9805	
Nemata (% of Community)	NO	0.8511	β	2013	0.2%	2013	2015	NO	0.9999	Tukey's HSD
				2015	1.5%	2013	2016	NO	0.8784	
				2016	1.1%	2015	2016	NO	0.8717	
Ostracoda (% of Community)	NO	0.8953	β, ζ	2013	5.9%	2013	2015	NO	0.9383	Tukey's HSD
				2015	5.5%	2013	2016	NO	0.8937	
				2016	1.7%	2015	2016	NO	0.9930	
Chironomidae (% of Community)	NO	0.1441	β	2013	89.9%	2013	2015	NO	0.9877	Tukey's HSD
				2015	88.9%	2013	2016	NO	0.2200	
				2016	95.4%	2015	2016	NO	0.1748	
Metal Sensitive Taxa (% of Community)	NO	0.3656	β	2013	15.1%	2013	2015	NO	0.8662	Tukey's HSD
				2015	12.7%	2013	2016	NO	0.3438	
				2016	6.8%	2015	2016	NO	0.6233	
Collector-Gatherer FFG (% of Community)	NO	0.1151	β	2013	44.6%	2013	2015	NO	0.1254	Tukey's HSD
				2015	59.1%	2013	2016	NO	0.2193	
				2016	56.5%	2015	2016	NO	0.9335	
Filterer FFG (% of Community)	NO	0.3224	β	2013	15.1%	2013	2015	NO	0.8751	Tukey's HSD
				2015	12.5%	2013	2016	NO	0.3056	
				2016	6.7%	2015	2016	NO	0.5608	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.32: Replicate grab data for benthic invertebrate community samples collected at the Mary River, Mary River Project CREMP, August 2016.

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 Upstream (Reference)	GO-09 B1	6	8	8	0.29	0.39	0.38	7.8	7.5	10.0	25%	25%	25%
	GO-09 B2	10	14	14	0.21	0.38	0.40	7.2	5.1	5.0	25%	25%	25%
	GO-09 B3	8	14	6	0.26	0.27	0.32	6.4	6.7	8.0	50%	25%	25%
	GO-09 B4	8	6	6	0.22	0.23	0.27	7.7	8.3	10.3	50%	50%	50%
	GO-09 B5	18	10	12	0.28	0.31	0.27	7.0	7.5	9.5	25%	25%	25%
Mary River Upstream	GO-03 B1	16	16	16	0.28	0.24	0.32	7.6	10.6	10.9	50%	25%	25%
	GO-03 B2	8	10	12	0.25	0.21	0.22	7.6	10.9	9.4	25%	50%	50%
	GO-03 B3	12	8	12	0.21	0.32	0.34	9.2	10.5	8.3	50%	25%	25%
	GO-03 B4	12	10	14	0.32	0.33	0.26	6.6	7.3	7.9	50%	50%	25%
	GO-03 B5	12	12	14	0.28	0.28	0.37	7.3	8.6	8.6	25%	25%	25%
Mary River	EO-01 B1	12	12	0	0.32	0.35	0.35	6.8	6.6	7.4	25%	25%	25%
	EO-01 B2	12	12	14	0.27	0.31	0.36	9.7	8.3	7.6	25%	25%	50%
	EO-01 B3	12	8	4	0.23	0.23	0.25	8.3	6.9	7.8	50%	50%	25%
	EO-01 B4	16	16	14	0.23	0.21	0.20	9.0	10.1	7.9	50%	50%	50%
	EO-01 B5	12	12	10	0.22	0.26	0.31	7.9	6.6	7.5	50%	50%	50%
Mary River	EO-20 B1	16	16	16	0.41	0.38	0.24	5.2	6.0	5.3	25%	25%	25%
	EO-20 B2	14	12	14	0.21	0.22	0.25	7.8	7.2	7.2	25%	25%	25%
	EO-20 B3	14	10	14	0.31	0.27	0.36	6.6	6.2	7.3	25%	25%	25%
	EO-20 B4	12	10	16	0.22	0.46	0.36	6.7	10.5	6.4	50%	50%	50%
	EO-20 B5	14	10	10	0.28	0.40	0.34	8.2	7.2	9.4	25%	25%	25%
Mary River Downstream	CO-05 B1	16	10	14	0.38	0.35	0.23	9.4	7.8	6.4	50%	50%	25%
	CO-05 B2	8	8	8	0.32	0.32	0.34	5.8	6.9	5.2	50%	50%	50%
	CO-05 B3	10	14	14	0.23	0.33	0.27	8.2	7.2	7.9	50%	50%	50%
	CO-05 B4	14	8	10	0.25	0.29	0.41	6.1	8.2	7.8	50%	50%	50%
	CO-05 B5	10	12	16	0.23	0.27	0.39	11.3	7.3	7.6	50%	50%	50%

^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 - 16 measurements per replicate grab, with a mean of 12 for the entire 2016 stream sampling program.

Table F.33: Replicate station habitat feature summary statistics for Mary River benthic stations, Mary River Project CREMP, August 2016. Five stations were sampled at each study area.

Metric	Study Area	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Bound	Upper Bound		
Water Depth (cm)	GO-09 Reference Area	9.9	3.0	1.4	6.1	13.6	6.7	13.3
	GO-03 Upstream Area	12.3	2.3	1.0	9.4	15.2	10.0	16.0
	EO-01 Upper Mine-Exposed Area	11.1	3.1	1.4	7.2	15.0	8.0	15.3
	EO-20 Middle Mine-Exposed Area	13.2	1.7	0.8	11.1	15.3	11.3	16.0
	CO-05 Lower Mine-Exposed Area	11.5	2.2	1.0	8.8	14.2	8.0	13.3
Water Velocity (cm/s)	GO-09 Reference Area	29.9	4.4	2.0	24.4	35.3	24.0	35.3
	GO-03 Upstream Area	28.2	3.3	1.5	24.1	32.3	22.7	31.0
	EO-01 Upper Mine-Exposed Area	27.3	5.3	2.4	20.8	33.9	21.3	34.0
	EO-20 Middle Mine-Exposed Area	31.4	5.1	2.3	25.1	37.7	22.7	34.7
	CO-05 Lower Mine-Exposed Area	30.7	2.0	0.9	28.2	33.3	27.7	32.7
Substrate Size (cm diameter)	GO-09 Reference Area	7.6	1.2	0.5	6.1	9.1	5.8	8.8
	GO-03 Upstream Area	8.7	1.0	0.4	7.5	10.0	7.3	9.7
	EO-01 Upper Mine-Exposed Area	7.9	0.9	0.4	6.8	8.9	6.9	9.0
	EO-20 Middle Mine-Exposed Area	7.1	1.1	0.5	5.8	8.5	5.5	8.3
	CO-05 Lower Mine-Exposed Area	7.5	1.0	0.5	6.3	8.8	6.0	8.7
Substrate Embeddedness (%)	GO-09 Reference Area	32	11	5	18	45	25	50
	GO-03 Upstream Area	35	7	3	26	44	25	42
	EO-01 Upper Mine-Exposed Area	40	11	5	27	53	25	50
	EO-20 Middle Mine-Exposed Area	30	11	5	16	44	25	50
	CO-05 Lower Mine-Exposed Area	48	4	2	44	53	42	50

Table F.34: Benthic station habitat feature statistical comparisons among Mary River reference and mine-exposed study areas, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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 Depth (cm)	NO	0.3336	α	GO-09	GO-03	NO	0.5785	Tukey's HSD
				GO-09	EO-01	NO	0.9427	
				GO-09	EO-20	NO	0.2696	
				GO-09	CO-05	NO	0.8544	
				GO-03	EO-01	NO	0.9427	
				GO-03	EO-20	NO	0.9765	
				GO-03	CO-05	NO	0.9867	
				EO-01	EO-20	NO	0.6784	
				EO-01	CO-05	NO	0.9991	
				EO-20	CO-05	NO	0.8155	
Water Velocity (cm/s)	NO	0.5353	η, ζ	GO-09	GO-03	NO	0.9773	Tukey's HSD
				GO-09	EO-01	NO	0.8534	
				GO-09	EO-20	NO	0.9869	
				GO-09	CO-05	NO	0.9954	
				GO-03	EO-01	NO	0.9928	
				GO-03	EO-20	NO	0.8196	
				GO-03	CO-05	NO	0.8733	
				EO-01	EO-20	NO	0.5787	
				EO-01	CO-05	NO	0.6504	
				EO-20	CO-05	NO	1.0000	
Substrate Size (cm diameter)	NO	0.1935	α	GO-09	GO-03	NO	0.4285	Tukey's HSD
				GO-09	EO-01	NO	0.9916	
				GO-09	EO-20	NO	0.9545	
				GO-09	CO-05	NO	1.0000	
				GO-03	EO-01	NO	0.6885	
				GO-03	EO-20	NO	0.1435	
				GO-03	CO-05	NO	0.3742	
				EO-01	EO-20	NO	0.7851	
				EO-01	CO-05	NO	0.9818	
				EO-20	CO-05	NO	0.9740	
Substrate Embeddedness (%)	YES	0.0333	β, ζ	GO-09	GO-03	NO	0.9646	Tukey's HSD
				GO-09	EO-01	NO	0.6012	
				GO-09	EO-20	NO	0.9976	
				GO-09	CO-05	YES	0.0658	
				GO-03	EO-01	NO	0.9259	
				GO-03	EO-20	NO	0.8666	
				GO-03	CO-05	NO	0.2176	
				EO-01	EO-20	NO	0.4157	
				EO-01	CO-05	NO	0.6338	
				EO-20	CO-05	YES	0.0343	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data logit transformed, single factor ANOVA test conducted;

Table F.35: Benthic invertebrate community data for Mary River, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	GO-09 Reference Area					GO-03 Upstream of Mine				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS										
P. Nemata	14	7	14	0	14	7	11	7	4	7
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	0	0	0	0	0	0	0	4	0	0
F. Naididae										
S.F. Tubificinae										
immatures without hair chaetae	0	0	0	0	0	0	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
indeterminate	0	0	0	0	0	0	0	0	0	0
F. Sperchonidae										
<i>Sperchon</i>	11	14	50	47	39	32	14	36	25	22
SEED SHRIMPS										
Cl. Ostracoda	0	0	0	0	0	0	0	0	0	0
INSECTS										
Cl. Insecta										
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
<i>Acentrella feropagus</i>	0	0	0	0	0	0	0	0	0	0
STONEFLIES										
O. Plecoptera										
F. Capniidae										
immature	0	0	0	0	0	0	4	0	0	0
TRUE FLIES										
O. Diptera										
BITING-MIDGE										
F. Ceratopogonidae										
<i>Culicoides</i>	0	0	0	0	0	0	0	4	0	0
MIDGES										
F. Chironomidae										
chironomid pupae	14	7	29	11	11	39	4	7	4	11
S.F. Chironominae										
<i>Micropsectra</i>	0	0	0	0	0	0	0	0	0	0
<i>Paratanytarsus</i>	0	0	0	0	0	0	0	0	0	0
<i>Polypedilum</i>	0	0	0	0	0	0	0	0	0	0
<i>Stictochironomus</i>	0	0	0	0	0	0	0	0	0	0
<i>Tanytarsus</i>	0	0	0	0	0	0	0	0	0	0
S.F. Diamesinae										
<i>Diamesa</i>	75	47	36	14	90	14	4	4	0	0
<i>Pseudokiefferiella</i>	4	14	47	154	413	47	47	11	4	14
S.F. Orthoclaadiinae										
<i>Chaetocladius</i>	4	0	0	0	0	0	7	4	0	0
<i>Cardiocladius</i>	0	0	0	14	0	32	0	0	0	36
<i>Corynoneura</i>	0	0	0	0	0	0	0	7	0	0
<i>Cricotopus</i>	18	36	72	86	90	61	50	22	14	4
<i>Cricotopus/Orthocladus</i>	7	0	7	4	0	11	0	0	7	4
<i>Diplocladius</i>	65	4	4	0	0	7	0	0	0	4
<i>Eukiefferiella</i>	0	39	97	32	118	0	0	0	0	0
<i>Hydrobaenus</i>	0	4	7	22	7	0	7	25	0	4
<i>Hydrosmitia</i>	0	0	0	0	7	4	11	0	4	4
<i>Krenosmitia</i>	4	4	11	4	18	4	36	7	7	22
<i>Limnophyes</i>	0	11	11	14	0	0	7	0	7	7
<i>Orthocladus (Euorthocladus)</i>	65	43	65	18	50	11	0	11	14	29
<i>Parakiefferiella</i>	0	0	0	0	0	7	0	0	0	0
<i>Paraphaenocladus</i>	0	0	0	0	0	0	0	0	0	0
<i>Thienemanniella</i>	0	4	0	0	0	4	0	0	0	0

Table F.35: Benthic invertebrate community data for Mary River, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	GO-09 Reference Area					GO-03 Upstream of Mine				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
<i>Tokunagaia</i>	129	75	194	133	222	126	72	72	75	43
<i>Tvetenia</i>	0	4	0	0	0	4	7	0	7	0
indeterminate	0	0	0	0	0	4	4	0	4	0
S.F. Tanypodinae										
<i>Thienemannimyia</i> complex	0	0	0	0	0	0	0	0	0	0
F. Empididae										
<i>Clinocera</i>	0	0	0	0	0	0	0	0	0	0
F. Simuliidae										
<i>Gymnopsis</i>	22	7	61	83	83	7	0	0	0	0
<i>Metacnephia</i>	0	0	0	0	0	0	0	0	0	4
<i>Prosimulium/Helodon</i>	0	0	0	0	0	0	0	0	0	0
indeterminate	0	0	4	4	0	0	0	0	0	0
F. Tipulidae										
<i>Dicranota</i>	0	0	0	0	0	0	0	0	0	0
<i>Tipula</i>	11	14	14	7	0	4	39	11	11	50
Number of Organisms (No. organisms per m²)	443	334	723	647	1,162	425	324	232	187	265
Richness (total number of taxa)^a	13	16	15	14	12	17	14	14	12	15
Simpson's Evenness (E)	0.893	0.932	0.920	0.914	0.875	0.878	0.931	0.902	0.841	0.942
Bray-Curtis Index	0.351	0.278	0.142	0.228	0.385	0.300	0.473	0.518	0.545	0.613
Percent Composition										
% Nemata	3.2%	2.1%	1.9%	0.0%	1.2%	1.6%	3.4%	3.0%	2.1%	2.6%
% Oligochaeta	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%
% Hydracarina	2.5%	4.2%	6.9%	7.3%	3.4%	7.5%	4.3%	15.5%	13.4%	8.3%
% Ostracods	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Chironomids	86.9%	87.4%	80.2%	78.2%	88.3%	88.2%	79.0%	73.3%	78.6%	68.7%
% Metal Sensitive Chironomids	17.8%	18.3%	11.5%	26.0%	43.3%	14.4%	15.7%	6.5%	2.1%	5.3%
% Tipulidae	2.5%	4.2%	1.9%	1.1%	0.0%	0.9%	12.0%	4.7%	5.9%	18.9%
Functional Feeding Group Composition										
% Shredders	8.4%	15.3%	13.4%	15.3%	7.8%	20.0%	29.3%	14.7%	17.6%	21.9%
% Collector - Gatherers	84.2%	78.4%	70.7%	61.8%	81.7%	62.6%	66.4%	68.1%	69.0%	54.0%
% Filterers	5.0%	2.1%	9.0%	13.4%	7.1%	1.6%	0.0%	0.0%	0.0%	1.5%
Habitat Preference Group Composition										
% Clingers	13.3%	17.4%	27.4%	34.9%	18.3%	28.2%	21.6%	25.4%	25.1%	12.8%
% Sprawlers	81.0%	76.3%	68.7%	61.8%	80.5%	60.9%	63.0%	63.4%	66.8%	51.3%
% Burrowers	5.6%	6.3%	3.9%	3.2%	1.2%	10.8%	15.4%	11.2%	8.0%	35.8%

^a Bold entries excluded from taxa count

Table F.35: Benthic invertebrate community data for Mary River, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	EO-01 Upper Mine-Exposed					EO-20 Middle Mine-Exposed				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
ROUNDWORMS										
P. Nemata	4	0	7	7	4	0	4	4	4	7
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	4	0	0	25	0	0	0	0	0	4
F. Naididae										
S.F. Tubificinae										
immatures without hair chaetae	0	0	0	0	0	0	0	0	0	0
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina										
indeterminate	0	0	0	0	0	0	0	4	0	0
F. Sperchonidae										
<i>Sperchon</i>	0	14	22	36	18	14	22	11	4	39
SEED SHRIMPS										
Cl. Ostracoda	0	0	0	0	0	0	0	0	0	0
INSECTS										
Cl. Insecta										
MAYFLIES										
O. Ephemeroptera										
F. Baetidae										
<i>Acentrella feropagus</i>	0	0	0	0	0	0	0	0	0	0
STONEFLIES										
O. Plecoptera										
F. Capniidae										
immature	0	0	0	0	0	0	0	0	0	0
TRUE FLIES										
O. Diptera										
BITING-MIDGE										
F. Ceratopogonidae										
<i>Culicoides</i>	0	0	0	14	11	4	7	0	0	0
MIDGES										
F. Chironomidae										
chironomid pupae	11	7	0	22	14	14	11	18	14	7
S.F. Chironominae										
<i>Micropsectra</i>	0	0	0	4	4	0	0	0	0	0
<i>Paratanytarsus</i>	0	0	0	0	0	0	0	0	0	0
<i>Polypedilum</i>	0	0	0	0	0	0	0	4	0	0
<i>Stictochironomus</i>	0	0	0	0	0	0	0	0	0	0
<i>Tanytarsus</i>	0	0	0	0	0	0	0	0	0	0
S.F. Diamesinae										
<i>Diamesa</i>	4	4	0	4	0	11	0	7	0	0
<i>Pseudokiefferiella</i>	7	11	0	7	7	7	7	4	4	14
S.F. Orthoclaadiinae										
<i>Chaetocladius</i>	0	0	4	7	0	0	4	4	0	11
<i>Cardiocladius</i>	18	0	0	0	4	36	57	14	22	39
<i>Corynoneura</i>	0	0	7	0	0	0	4	0	0	0
<i>Cricotopus</i>	0	4	0	11	22	4	18	4	0	14
<i>Cricotopus/Orthocladus</i>	0	0	4	7	25	0	4	0	4	4
<i>Diplocladius</i>	0	0	7	0	7	0	4	0	0	7
<i>Eukiefferiella</i>	4	0	0	0	0	0	0	0	0	0
<i>Hydrobaenus</i>	0	11	0	11	0	0	0	0	0	4
<i>Hydrosmittia</i>	0	0	0	7	0	0	0	0	0	0
<i>Krenosmittia</i>	4	25	43	22	0	14	18	7	14	14
<i>Limnophyes</i>	0	0	4	4	11	4	7	0	7	11
<i>Orthocladus (Euorthocladus)</i>	14	0	25	0	29	25	25	0	47	39
<i>Parakiefferiella</i>	0	0	0	0	4	0	0	0	0	0
<i>Paraphaenocladus</i>	0	0	0	0	0	0	0	0	0	0
<i>Thienemanniella</i>	0	0	0	0	0	0	0	0	0	0

Table F.35: Benthic invertebrate community data for Mary River, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	EO-01 Upper Mine-Exposed					EO-20 Middle Mine-Exposed				
	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5
<i>Tokunagaia</i>	39	43	75	136	136	79	118	61	93	172
<i>Tvetenia</i>	0	14	7	4	18	11	7	4	0	4
indeterminate	0	0	0	4	0	0	7	14	4	7
S.F. Tanypodinae										
<i>Thienemannimyia</i> complex	0	0	0	0	0	0	0	0	0	0
F. Empididae										
<i>Clinocera</i>	0	0	4	4	4	0	4	0	0	4
F. Simuliidae										
<i>Gymnopsis</i>	0	0	4	0	0	0	0	0	4	0
<i>Metacnephia</i>	0	0	0	0	0	0	0	0	0	0
<i>Prosimulium/Helodon</i>	0	0	0	0	0	0	0	0	0	0
indeterminate	0	0	0	0	0	0	0	0	0	0
F. Tipulidae										
<i>Dicranota</i>	0	0	0	0	0	0	0	0	0	0
<i>Tipula</i>	4	0	11	7	18	4	14	0	7	57
Number of Organisms (No. organisms per m²)	113	133	224	343	336	227	342	160	228	458
Richness (total number of taxa)^a	10	8	14	18	16	12	17	11	11	17
Simpson's Evenness (E)	0.871	0.913	0.884	0.820	0.839	0.873	0.862	0.789	0.799	0.852
Bray-Curtis Index	0.736	0.738	0.592	0.493	0.440	0.591	0.477	0.664	0.511	0.431
Percent Composition										
% Nemata	3.5%	0.0%	3.1%	2.0%	1.2%	0.0%	1.2%	2.5%	1.8%	1.5%
% Oligochaeta	3.5%	0.0%	0.0%	7.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
% Hydracarina	0.0%	10.5%	9.8%	10.5%	5.4%	6.2%	6.4%	9.4%	1.8%	8.5%
% Ostracods	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% Chironomids	89.4%	89.5%	78.6%	72.9%	83.6%	90.3%	85.1%	88.1%	91.7%	75.8%
% Metal Sensitive Chironomids	9.7%	11.3%	0.0%	4.4%	3.3%	7.9%	2.0%	6.9%	1.8%	3.1%
% Tipulidae	3.5%	0.0%	4.9%	2.0%	5.4%	1.8%	4.1%	0.0%	3.1%	12.4%
Functional Feeding Group Composition										
% Shredders	3.5%	3.0%	6.7%	7.6%	19.9%	3.5%	10.8%	6.3%	4.8%	16.6%
% Collector - Gatherers	78.8%	86.5%	79.9%	75.2%	67.9%	71.4%	61.7%	73.1%	81.1%	65.1%
% Filterers	0.0%	0.0%	1.8%	1.5%	1.2%	0.0%	0.0%	0.0%	1.8%	0.0%
Habitat Preference Group Composition										
% Clingers	0.0%	13.5%	15.2%	17.2%	21.1%	7.9%	14.3%	15.6%	5.3%	13.5%
% Sprawlers	71.7%	86.5%	76.8%	67.3%	67.9%	71.4%	60.5%	70.6%	79.4%	62.7%
% Burrowers	28.3%	0.0%	8.0%	15.5%	11.0%	20.7%	25.1%	13.8%	15.4%	23.8%

^a Bold entries excluded from taxa count

Table F.35: Benthic invertebrate community data for Mary River, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	CO-05 Lower Mine-Exposed				
	B1	B2	B3	B4	B5
ROUNDWORMS					
P. Nemata	18	7	4	39	22
ANNELIDS					
P. Annelida					
WORMS					
Cl. Oligochaeta					
F. Enchytraeidae	0	7	22	4	18
F. Naididae					
S.F. Tubificinae					
immatures without hair chaetae	0	0	0	0	4
ARTHROPODS					
P. Arthropoda					
MITES					
Cl. Arachnida					
O. Acarina					
indeterminate	0	0	0	0	0
F. Sperchonidae					
<i>Sperchon</i>	32	54	68	104	68
SEED SHRIMPS					
Cl. Ostracoda	4	0	7	4	0
INSECTS					
Cl. Insecta					
MAYFLIES					
O. Ephemeroptera					
F. Baetidae					
<i>Acentrella feropagus</i>	0	0	0	25	0
STONEFLIES					
O. Plecoptera					
F. Capniidae					
immature	0	0	0	0	0
TRUE FLIES					
O. Diptera					
BITING-MIDGE					
F. Ceratopogonidae					
<i>Culicoides</i>	0	0	0	0	0
MIDGES					
F. Chironomidae					
chironomid pupae	7	14	7	29	47
S.F. Chironominae					
<i>Micropsectra</i>	0	0	0	4	0
<i>Paratanytarsus</i>	0	0	0	11	4
<i>Polypedilum</i>	0	0	0	0	0
<i>Stictochironomus</i>	4	0	0	0	4
<i>Tanytarsus</i>	0	4	0	0	0
S.F. Diamesinae					
<i>Diamesa</i>	0	0	0	0	0
<i>Pseudokiefferiella</i>	280	190	50	574	750
S.F. Orthoclaadiinae					
<i>Chaetocladius</i>	4	0	0	0	0
<i>Cardiocladius</i>	187	187	283	122	201
<i>Corynoneura</i>	0	0	0	0	0
<i>Cricotopus</i>	29	36	39	111	305
<i>Cricotopus/Orthocladus</i>	0	4	14	0	25
<i>Diplocladius</i>	0	0	0	0	47
<i>Eukiefferiella</i>	0	0	0	0	0
<i>Hydrobaenus</i>	0	11	108	50	4
<i>Hydrosmittia</i>	54	47	47	108	118
<i>Krenosmittia</i>	0	0	0	11	11
<i>Limnophyes</i>	14	0	7	14	11
<i>Orthocladus (Euorthocladus)</i>	0	0	0	36	11
<i>Parakiefferiella</i>	11	4	14	0	0
<i>Paraphaenocladus</i>	0	7	7	4	18
<i>Thienemanniella</i>	0	0	14	0	0

Table F.35: Benthic invertebrate community data for Mary River, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	CO-05 Lower Mine-Exposed				
	B1	B2	B3	B4	B5
<i>Tokunagaia</i>	97	129	43	136	233
<i>Tvetenia</i>	4	11	4	14	36
indeterminate	0	0	4	0	0
S.F. Tanypodinae					
<i>Thienemannimyia</i> complex	7	4	7	50	36
F. Empididae					
<i>Clinocera</i>	0	4	0	0	14
F. Simuliidae					
<i>Gymnopsis</i>	0	0	0	0	4
<i>Metacnephia</i>	4	0	0	0	0
<i>Prosimulium/Helodon</i>	0	0	0	4	0
indeterminate	7	7	0	0	0
F. Tipulidae					
<i>Dicranota</i>	0	0	0	11	4
<i>Tipula</i>	7	7	22	25	43
Number of Organisms (No. organisms per m²)	770	734	771	1,490	2,038
Richness (total number of taxa)^a	16	18	18	22	24
Simpson's Evenness (E)	0.831	0.865	0.862	0.847	0.838
Bray-Curtis Index	0.636	0.563	0.692	0.624	0.716
Percent Composition					
% Nemata	2.3%	1.0%	0.5%	2.6%	1.1%
% Oligochaeta	0.0%	1.0%	2.9%	0.3%	1.1%
% Hydracarina	4.7%	7.4%	9.7%	7.2%	3.3%
% Ostracods	0.5%	0.0%	0.9%	0.3%	0.0%
% Chironomids	90.6%	88.3%	84.0%	85.5%	91.3%
% Metal Sensitive Chironomids	36.4%	26.4%	6.5%	39.5%	37.0%
% Tipulidae	0.9%	1.0%	2.9%	2.4%	2.3%
Functional Feeding Group Composition					
% Shredders	4.7%	6.5%	9.9%	9.3%	18.7%
% Collector - Gatherers	64.3%	57.5%	42.9%	69.9%	64.7%
% Filterers	1.4%	1.5%	0.0%	1.3%	0.4%
Habitat Preference Group Composition					
% Clingers	9.4%	15.0%	15.8%	14.9%	20.9%
% Sprawlers	62.3%	56.1%	40.5%	72.1%	64.6%
% Burrowers	28.3%	28.9%	43.7%	13.0%	14.6%

^a Bold entries excluded from taxa count

Table F.36: Benthic invertebrate community summary statistics for Mary River, Mary River Project CREMP, August 2016.
Sample size equals five for all study areas.

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	662	320	143	265	1,059	334	1,162
	GO-03 Upstream Area	287	92	41	172	401	187	425
	EO-01 Upper Mine-Exposed Area	230	109	49	95	365	113	343
	EO-20 Middle Mine-Exposed Area	283	118	53	137	429	160	458
	CO-05 Lower Mine-Exposed Area	1,161	584	261	435	1,886	734	2,038
Richness (Number of Taxa)	GO-09 Reference Area	14.0	1.6	0.7	12.0	16.0	12.0	16.0
	GO-03 Upstream Area	14.4	1.8	0.8	12.1	16.7	12.0	17.0
	EO-01 Upper Mine-Exposed Area	13.2	4.1	1.9	8.1	18.3	8.0	18.0
	EO-20 Middle Mine-Exposed Area	13.6	3.1	1.4	9.7	17.5	11.0	17.0
	CO-05 Lower Mine-Exposed Area	19.6	3.3	1.5	15.5	23.7	16.0	24.0
Simpson's Evenness	GO-09 Reference Area	0.907	0.023	0.010	0.878	0.935	0.875	0.932
	GO-03 Upstream Area	0.899	0.041	0.018	0.848	0.949	0.841	0.942
	EO-01 Upper Mine-Exposed Area	0.865	0.037	0.016	0.820	0.911	0.820	0.913
	EO-20 Middle Mine-Exposed Area	0.835	0.038	0.017	0.787	0.882	0.789	0.873
	CO-05 Lower Mine-Exposed Area	0.848	0.015	0.007	0.830	0.867	0.831	0.865
Bray-Curtis Index	GO-09 Reference Area	0.277	0.097	0.043	0.156	0.397	0.142	0.385
	GO-03 Upstream Area	0.490	0.117	0.053	0.344	0.636	0.300	0.613
	EO-01 Upper Mine-Exposed Area	0.600	0.136	0.061	0.431	0.769	0.440	0.738
	EO-20 Middle Mine-Exposed Area	0.535	0.093	0.042	0.419	0.651	0.431	0.664
	CO-05 Lower Mine-Exposed Area	0.646	0.060	0.027	0.571	0.721	0.563	0.716
Hydracarina (% of community)	GO-09 Reference Area	4.8%	2.1%	1.0%	2.2%	7.5%	2.5%	7.3%
	GO-03 Upstream Area	9.8%	4.6%	2.0%	4.2%	15.5%	4.3%	15.5%
	EO-01 Upper Mine-Exposed Area	7.2%	4.6%	2.0%	1.5%	12.9%	0.0%	10.5%
	EO-20 Middle Mine-Exposed Area	6.4%	3.0%	1.3%	2.8%	10.1%	1.8%	9.4%
	CO-05 Lower Mine-Exposed Area	6.5%	2.5%	1.1%	3.4%	9.6%	3.3%	9.7%
Chironomidae (% of community)	GO-09 Reference Area	84.2%	4.6%	2.1%	78.4%	90.0%	78.2%	88.3%
	GO-03 Upstream Area	77.6%	7.3%	3.3%	68.5%	86.7%	68.7%	88.2%
	EO-01 Upper Mine-Exposed Area	82.8%	7.2%	3.2%	73.9%	91.7%	72.9%	89.5%
	EO-20 Middle Mine-Exposed Area	86.2%	6.3%	2.8%	78.3%	94.1%	75.8%	91.7%
	CO-05 Lower Mine-Exposed Area	88.0%	3.2%	1.4%	84.0%	91.9%	84.0%	91.3%
Metal-Sensitive Chironomidae (% of community)	GO-09 Reference Area	23.4%	12.3%	5.5%	8.1%	38.6%	11.5%	43.3%
	GO-03 Upstream Area	8.8%	5.9%	2.7%	1.4%	16.2%	2.1%	15.7%
	EO-01 Upper Mine-Exposed Area	5.7%	4.7%	2.1%	-0.1%	11.5%	0.0%	11.3%
	EO-20 Middle Mine-Exposed Area	4.3%	2.9%	1.3%	0.8%	7.9%	1.8%	7.9%
	CO-05 Lower Mine-Exposed Area	29.2%	13.6%	6.1%	12.2%	46.1%	6.5%	39.5%
Tipulidae (% of community)	GO-09 Reference Area	1.9%	1.6%	0.7%	0.0%	3.9%	0.0%	4.2%
	GO-03 Upstream Area	8.5%	7.0%	3.1%	-0.2%	17.2%	0.9%	18.9%
	EO-01 Upper Mine-Exposed Area	3.2%	2.2%	1.0%	0.4%	5.9%	0.0%	5.4%
	EO-20 Middle Mine-Exposed Area	4.3%	4.8%	2.2%	-1.7%	10.3%	0.0%	12.4%
	CO-05 Lower Mine-Exposed Area	1.9%	0.9%	0.4%	0.8%	3.0%	0.9%	2.9%
Shredder FFG (% of community)	GO-09 Reference Area	12.0%	3.7%	1.6%	7.5%	16.6%	7.8%	15.3%
	GO-03 Upstream Area	20.7%	5.5%	2.5%	13.8%	27.6%	14.7%	29.3%
	EO-01 Upper Mine-Exposed Area	8.2%	6.9%	3.1%	-0.4%	16.7%	3.0%	19.9%
	EO-20 Middle Mine-Exposed Area	8.4%	5.3%	2.4%	1.8%	15.0%	3.5%	16.6%
	CO-05 Lower Mine-Exposed Area	9.8%	5.4%	2.4%	3.1%	16.5%	4.7%	18.7%
Collector-Gatherer FFG (% of community)	GO-09 Reference Area	75.4%	9.1%	4.1%	64.0%	86.7%	61.8%	84.2%
	GO-03 Upstream Area	64.0%	6.1%	2.7%	56.4%	71.6%	54.0%	69.0%
	EO-01 Upper Mine-Exposed Area	77.6%	6.8%	3.0%	69.2%	86.1%	67.9%	86.5%
	EO-20 Middle Mine-Exposed Area	70.5%	7.5%	3.4%	61.1%	79.9%	61.7%	81.1%
	CO-05 Lower Mine-Exposed Area	59.9%	10.4%	4.7%	46.9%	72.8%	42.9%	69.9%
Filterer FFG (% of community)	GO-09 Reference Area	7.3%	4.3%	1.9%	2.0%	12.6%	2.1%	13.4%
	GO-03 Upstream Area	0.6%	0.9%	0.4%	-0.4%	1.7%	0.0%	1.6%
	EO-01 Upper Mine-Exposed Area	0.9%	0.8%	0.4%	-0.2%	1.9%	0.0%	1.8%
	EO-20 Middle Mine-Exposed Area	0.4%	0.8%	0.4%	-0.6%	1.3%	0.0%	1.8%
	CO-05 Lower Mine-Exposed Area	0.9%	0.7%	0.3%	0.1%	1.8%	0.0%	1.5%
Clinger HPG (% of community)	GO-09 Reference Area	22.3%	8.7%	3.9%	11.4%	33.1%	13.3%	34.9%
	GO-03 Upstream Area	22.6%	6.0%	2.7%	15.2%	30.1%	12.8%	28.2%
	EO-01 Upper Mine-Exposed Area	13.4%	8.0%	3.6%	3.5%	23.4%	0.0%	21.1%
	EO-20 Middle Mine-Exposed Area	11.3%	4.5%	2.0%	5.8%	16.9%	5.3%	15.6%
	CO-05 Lower Mine-Exposed Area	15.2%	4.1%	1.8%	10.1%	20.3%	9.4%	20.9%
Sprawler HPG (% of community)	GO-09 Reference Area	73.7%	8.3%	3.7%	63.4%	83.9%	61.8%	81.0%
	GO-03 Upstream Area	61.1%	5.9%	2.6%	53.8%	68.4%	51.3%	66.8%
	EO-01 Upper Mine-Exposed Area	74.0%	7.9%	3.5%	64.2%	83.9%	67.3%	86.5%
	EO-20 Middle Mine-Exposed Area	68.9%	7.6%	3.4%	59.5%	78.3%	60.5%	79.4%
	CO-05 Lower Mine-Exposed Area	59.1%	11.9%	5.3%	44.4%	73.9%	40.5%	72.1%
Burrower HPG (% of community)	GO-09 Reference Area	4.1%	2.0%	0.9%	1.5%	6.6%	1.2%	6.3%
	GO-03 Upstream Area	16.3%	11.3%	5.0%	2.3%	30.3%	8.0%	35.8%
	EO-01 Upper Mine-Exposed Area	12.6%	10.5%	4.7%	-0.4%	25.5%	0.0%	28.3%
	EO-20 Middle Mine-Exposed Area	19.8%	5.0%	2.3%	13.5%	26.0%	13.8%	25.1%
	CO-05 Lower Mine-Exposed Area	25.7%	12.5%	5.6%	10.1%	41.2%	13.0%	43.7%

Table F.37: Benthic invertebrate community statistical comparisons between individual Mary River reference (GO-09), upstream (GO-03) and mine-exposed (EO-01, EO-20, CO-05) study areas, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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	Magnitude of Difference	Statistical Test
Density	YES	0.0004	α , ϵ	GO-09	GO-03	NO	0.4423	-	Tamhane's
				GO-09	EO-01	NO	0.3084	-	
				GO-09	EO-20	NO	0.4316	-	
				GO-09	CO-05	NO	0.7873	-	
				GO-03	EO-01	NO	0.9939	-	
				GO-03	EO-20	NO	1.0000	-	
				GO-03	CO-05	NO	0.2450	-	
				EO-01	EO-20	NO	0.9985	-	
				EO-01	CO-05	NO	0.2016	-	
				EO-20	CO-05	NO	0.2381	-	
Richness	YES	0.0359	η , γ	GO-09	GO-03	NO	1.0000	-	Tamhane's
				GO-09	EO-01	NO	0.9998	-	
				GO-09	EO-20	NO	1.0000	-	
				GO-09	CO-05	YES	0.0740	3.5	
				GO-03	EO-01	NO	0.9984	-	
				GO-03	EO-20	NO	0.9997	-	
				GO-03	CO-05	NO	0.1191	-	
				EO-01	EO-20	NO	1.0000	-	
				EO-01	CO-05	NO	0.3687	-	
				EO-20	CO-05	NO	0.1734	-	
Simpson's Evenness	YES	0.0081	α , ϵ	GO-09	GO-03	NO	0.9944	-	Tukey's HSD
				GO-09	EO-01	NO	0.2905	-	
				GO-09	EO-20	YES	0.0166	-3.1	
				GO-09	CO-05	YES	0.0664	-2.6	
				GO-03	EO-01	NO	0.4967	-	
				GO-03	EO-20	YES	0.0386	-1.6	
				GO-03	CO-05	NO	0.1411	-	
				EO-01	EO-20	NO	0.5816	-	
				EO-01	CO-05	NO	0.9192	-	
				EO-20	CO-05	NO	0.9625	-	
Bray Curtis Index	YES	0.0002	α , ϵ	GO-09	GO-03	YES	0.0298	2.2	Tukey's HSD
				GO-09	EO-01	YES	0.0007	3.3	
				GO-09	EO-20	YES	0.0067	2.7	
				GO-09	CO-05	YES	0.0001	3.8	
				GO-03	EO-01	NO	0.4727	-	
				GO-03	EO-20	NO	0.9579	-	
				GO-03	CO-05	NO	0.1634	-	
				EO-01	EO-20	NO	0.8575	-	
				EO-01	CO-05	NO	0.9533	-	
				EO-20	CO-05	NO	0.4609	-	
Hydracarina (% of community)	NO	0.6360	β , γ	GO-09	GO-03	NO	0.5849	-	Tukey's HSD
				GO-09	EO-01	NO	0.9996	-	
				GO-09	EO-20	NO	0.9821	-	
				GO-09	CO-05	NO	0.9718	-	
				GO-03	EO-01	NO	0.7078	-	
				GO-03	EO-20	NO	0.8763	-	
				GO-03	CO-05	NO	0.9038	-	
				EO-01	EO-20	NO	0.9971	-	
				EO-01	CO-05	NO	0.9939	-	
				EO-20	CO-05	NO	1.0000	-	

Table F.37: Benthic invertebrate community statistical comparisons between individual Mary River reference (GO-09), upstream (GO-03) and mine-exposed (EO-01, EO-20, CO-05) study areas, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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	Magnitude of Difference	Statistical Test
Chironomidae (% of community)	NO	0.1351	β , ϵ	GO-09	GO-03	NO	0.5923	-	Tukey's HSD
				GO-09	EO-01	NO	0.9999	-	
				GO-09	EO-20	NO	0.9298	-	
				GO-09	CO-05	NO	0.8097	-	
				GO-03	EO-01	NO	0.6706	-	
				GO-03	EO-20	NO	0.1982	-	
				GO-03	CO-05	NO	0.1168	-	
				EO-01	EO-20	NO	0.8848	-	
				EO-01	CO-05	NO	0.7404	-	
				EO-20	CO-05	NO	0.9982	-	
Metal Sensitive Taxa (% of community)	YES	0.0035	β , γ	GO-09	GO-03	NO	0.3268	-	Tukey's HSD
				GO-09	EO-01	YES	0.0321	-1.4	
				GO-09	EO-20	YES	0.0469	-1.6	
				GO-09	CO-05	NO	0.9960	-	
				GO-03	EO-01	NO	0.7174	-	
				GO-03	EO-20	NO	0.8157	-	
				GO-03	CO-05	NO	0.1836	-	
				EO-01	EO-20	NO	0.9997	-	
				EO-01	CO-05	YES	0.0147	5.0	
				EO-20	CO-05	YES	0.0219	8.7	
Tipulidae (% of community)	NO	0.2858	β , ϵ	GO-09	GO-03	NO	0.2031	-	Tukey's HSD
				GO-09	EO-01	NO	0.8043	-	
				GO-09	EO-20	NO	0.7770	-	
				GO-09	CO-05	NO	0.9632	-	
				GO-03	EO-01	NO	0.7798	-	
				GO-03	EO-20	NO	0.8069	-	
				GO-03	CO-05	NO	0.5197	-	
				EO-01	EO-20	NO	1.0000	-	
				EO-01	CO-05	NO	0.9914	-	
				EO-20	CO-05	NO	0.9869	-	
Shredder FFG (% of community)	YES	0.0167	β , ϵ	GO-09	GO-03	NO	0.3690	-	Tukey's HSD
				GO-09	EO-01	NO	0.5100	-	
				GO-09	EO-20	NO	0.6618	-	
				GO-09	CO-05	NO	0.9182	-	
				GO-03	EO-01	YES	0.0183	-2.3	
				GO-03	EO-20	YES	0.0314	-2.2	
				GO-03	CO-05	YES	0.0911	-2.0	
				EO-01	EO-20	NO	0.9990	-	
				EO-01	CO-05	NO	0.9342	-	
				EO-20	CO-05	NO	0.9837	-	
Collector-Gatherer FFG (% of community)	YES	0.0108	β , ϵ	GO-09	GO-03	NO	0.2018	-	Tukey's HSD
				GO-09	EO-01	NO	0.9817	-	
				GO-09	EO-20	NO	0.8440	-	
				GO-09	CO-05	YES	0.0533	-1.7	
				GO-03	EO-01	YES	0.0745	2.2	
				GO-03	EO-20	NO	0.7325	-	
				GO-03	CO-05	NO	0.9519	-	
				EO-01	EO-20	NO	0.5380	-	
				EO-01	CO-05	YES	0.0169	-2.6	
				EO-20	CO-05	NO	0.3282	-	

Table F.37: Benthic invertebrate community statistical comparisons between individual Mary River reference (GO-09), upstream (GO-03) and mine-exposed (EO-01, EO-20, CO-05) study areas, Mary River Project CREMP, August 2016. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

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	Magnitude of Difference	Statistical Test
Filterer FFG (% of community)	YES	0.0017	β , ϵ	GO-09	GO-03	YES	0.0072	-1.6	Tukey's HSD
				GO-09	EO-01	YES	0.0586	-1.5	
				GO-09	EO-20	YES	0.0013	-1.6	
				GO-09	CO-05	YES	0.0150	-1.5	
				GO-03	EO-01	NO	0.8616	-	
				GO-03	EO-20	NO	0.9431	-	
				GO-03	CO-05	NO	0.9970	-	
				EO-01	EO-20	NO	0.4429	-	
				EO-01	CO-05	NO	0.9659	-	
				EO-20	CO-05	NO	0.8146	-	
Clinger HPG (% of community)	NO	0.2101	β , γ	GO-09	GO-03	NO	1.0000	-	Tamhane's
				GO-09	EO-01	NO	0.9402	-	
				GO-09	EO-20	NO	0.2910	-	
				GO-09	CO-05	NO	0.7735	-	
				GO-03	EO-01	NO	0.9210	-	
				GO-03	EO-20	NO	0.1630	-	
				GO-03	CO-05	NO	0.4643	-	
				EO-01	EO-20	NO	1.0000	-	
				EO-01	CO-05	NO	0.9984	-	
				EO-20	CO-05	NO	0.9200	-	
Sprawler HPG (% of community)	YES	0.0316	β , ϵ	GO-09	GO-03	NO	0.1881	-	Tukey's HSD
				GO-09	EO-01	NO	0.9997	-	
				GO-09	EO-20	NO	0.8930	-	
				GO-09	CO-05	NO	0.1073	-	
				GO-03	EO-01	NO	0.1360	-	
				GO-03	EO-20	NO	0.6396	-	
				GO-03	CO-05	NO	0.9978	-	
				EO-01	EO-20	NO	0.8119	-	
				EO-01	CO-05	YES	0.0753	-1.9	
				EO-20	CO-05	NO	0.4541	-	
Burrower HPG (% of community)	YES	0.0151	β , ϵ	GO-09	GO-03	NO	0.1384	-	Tukey's HSD
				GO-09	EO-01	NO	0.7398	-	
				GO-09	EO-20	YES	0.0460	7.8	
				GO-09	CO-05	YES	0.0186	10.7	
				GO-03	EO-01	NO	0.7251	-	
				GO-03	EO-20	NO	0.9786	-	
				GO-03	CO-05	NO	0.8551	-	
				EO-01	EO-20	NO	0.3944	-	
				EO-01	CO-05	NO	0.2057	-	
				EO-20	CO-05	NO	0.9924	-	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data logit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis

Table F.38: Statistical comparison of benthic metrics at the Mary River reference area (GO-09) among years of mine operation (2015, 2016) and baseline (2006, 2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	NO	0.2834	α , ϵ	2006	2007	NO	0.3796	Tukey's HSD
				2006	2015	NO	0.9805	
				2006	2016	NO	0.5022	
				2007	2015	NO	0.4738	
				2007	2016	NO	0.9720	
				2015	2016	NO	0.6264	
Richness	YES	0.0156	η , γ	2006	2007	NO	0.5742	Tamhane's
				2006	2015	NO	0.7611	
				2006	2016	NO	0.5216	
				2007	2015	NO	0.7554	
				2007	2016	NO	0.9768	
				2015	2016	NO	0.6023	
Simpson's Evenness	YES	0.0000	α , γ	2006	2007	YES	0.0000	Tukey's HSD
				2006	2015	YES	0.0000	
				2006	2016	YES	0.0000	
				2007	2015	YES	0.0004	
				2007	2016	YES	0.0001	
				2015	2016	NO	0.8210	
Hydracarina (% of community)	YES	0.0023	β , ϵ	2006	2007	NO	1.0000	Tamhane's
				2006	2015	NO	0.4449	
				2006	2016	NO	0.4083	
				2007	2015	NO	0.3299	
				2007	2016	NO	0.3082	
				2015	2016	NO	0.9855	
Chironomidae (% of community)	YES	0.0000	β , ϵ	2006	2007	YES	0.0967	Tukey's HSD
				2006	2015	YES	0.0000	
				2006	2016	YES	0.0000	
				2007	2015	YES	0.0006	
				2007	2016	YES	0.0001	
				2015	2016	NO	0.6145	
Metal Sensitive Taxa (% of community)	YES	0.0043	β , γ	2006	2007	NO	0.1759	Tamhane's
				2006	2015	YES	0.0025	
				2006	2016	YES	0.0411	
				2007	2015	NO	0.1676	
				2007	2016	NO	0.9262	
				2015	2016	NO	0.2865	
Tipulidae (% of community)	YES	0.0942	β , γ	2006	2007	NO	0.5893	Tukey's HSD
				2006	2015	YES	0.0676	
				2006	2016	NO	0.5203	
				2007	2015	NO	0.5467	
				2007	2016	NO	1.0000	
				2015	2016	NO	0.4124	
Shredder FFG (% of community)	YES	0.0006	β , ϵ	2006	2007	YES	0.0183	Tukey's HSD
				2006	2015	YES	0.0008	
				2006	2016	YES	0.0007	
				2007	2015	NO	0.4824	
				2007	2016	NO	0.4368	
				2015	2016	NO	0.9996	
Collector-Gatherer FFG (% of community)	YES	0.0001	β , ϵ	2006	2007	YES	0.0502	Tukey's HSD
				2006	2015	YES	0.0003	
				2006	2016	YES	0.0001	
				2007	2015	YES	0.0691	
				2007	2016	YES	0.0299	
				2015	2016	NO	0.9419	
Filterer FFG (% of community)	YES	0.0005	β , ϵ	2006	2007	NO	0.9988	Tukey's HSD
				2006	2015	NO	0.1018	
				2006	2016	YES	0.0014	
				2007	2015	YES	0.0773	
				2007	2016	YES	0.0011	
				2015	2016	YES	0.0583	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data logit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis H-test.

Table F.39: Statistical comparison of benthic metrics at Mary River GO-03 upstream study area among years of mine operation (2015, 2016) and baseline (2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	NO	0.1071	α	2007	2015	NO	0.9194	Tukey's HSD
				2007	2016	NO	0.9597	
				2015	2016	NO	0.9938	
Richness	YES	0.0137	η, ζ	2007	2015	YES	0.0006	Tukey's HSD
				2007	2016	NO	0.8253	
				2015	2016	YES	0.0024	
Simpson's Evenness	YES	0.0000	α, ζ	2007	2015	NO	0.4686	Tamhane's
				2007	2016	NO	0.4775	
				2015	2016	NO	0.9999	
Hydracarina (% of Community)	YES	0.0007	β	2007	2015	NO	0.1454	Tukey's HSD
				2007	2016	NO	0.6097	
				2015	2016	NO	0.5813	
Chironomidae (% of Community)	YES	0.0000	β	2007	2015	YES	0.0540	Tukey's HSD
				2007	2016	YES	0.0193	
				2015	2016	NO	0.8058	
Metal Sensitive Taxa (% of Community)	NO	0.9176	β, ζ	2007	2015	NO	0.7289	Tamhane's
				2007	2016	NO	0.9976	
				2015	2016	NO	0.7472	
Tipulidae (% of Community)	YES	0.0145	β	2007	2015	YES	0.0172	Tukey's HSD
				2007	2016	YES	0.0192	
				2015	2016	NO	0.9973	
Shredder FFG (% of Community)	YES	0.0000	β	2007	2015	YES	0.0363	Tukey's HSD
				2007	2016	YES	0.0240	
				2015	2016	NO	0.9648	
Collector-Gatherer FFG (% of Community)	YES	0.0000	β	2007	2015	NO	0.5212	Tukey's HSD
				2007	2016	NO	0.1038	
				2015	2016	NO	0.5424	
Filterer FFG (% of Community)	NO	0.5382	β	2007	2015	YES	0.0401	Tamhane's
				2007	2016	NO	0.9975	
				2015	2016	YES	0.0453	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.40: Statistical comparison of benthic metrics at Mary River EO-01 upper mine-exposed area among years of mine operation (2015, 2016) and baseline (2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	YES	0.0304	α	2007	2015	NO	0.5041	Tamhane's
				2007	2016	NO	0.6066	
				2015	2016	NO	0.3123	
Richness	NO	0.0799	α	2007	2015	NO	0.4992	Tamhane's
				2007	2016	NO	0.9284	
				2015	2016	NO	0.1296	
Simpson's Evenness	YES	0.0127	α, ζ	2007	2015	YES	0.0158	Tukey's HSD
				2007	2016	YES	0.0205	
				2015	2016	NO	0.9820	
Hydracarina (% of Community)	NO	0.0996	β, ζ	2007	2015	NO	0.2801	Tukey's HSD
				2007	2016	NO	0.0847	
				2015	2016	NO	0.6443	
Chironomidae (% of Community)	NO	0.3363	β	2007	2015	NO	0.3987	Tukey's HSD
				2007	2016	NO	0.3537	
				2015	2016	NO	0.9934	
Metal Sensitive Taxa (% of Community)	NO	0.3959	β	2007	2015	NO	0.6086	Tukey's HSD
				2007	2016	NO	0.3666	
				2015	2016	NO	0.8644	
Tipulidae (% of Community)	NO	0.1503	β	2007	2015	NO	0.1830	Tukey's HSD
				2007	2016	NO	0.8940	
				2015	2016	NO	0.2542	
Shredder FFG (% of Community)	NO	0.1948	β	2007	2015	NO	0.2771	Tukey's HSD
				2007	2016	NO	0.9852	
				2015	2016	NO	0.2539	
Collector-Gatherer FFG (% of Community)	NO	0.0593	β	2007	2015	NO	0.1030	Tukey's HSD
				2007	2016	NO	0.0603	
				2015	2016	NO	0.9226	
Filterer FFG (% of Community)	YES	0.0212	β	2007	2015	NO	0.4095	Tamhane's
				2007	2016	NO	0.4930	
				2015	2016	NO	0.7822	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.41: Statistical comparison of benthic metrics at Mary River EO-20 middle mine-exposed area among years of mine operation (2015, 2016) and baseline (2011) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value $\leq$ 0.1).

Metric	Overall 3-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	YES	0.0043	α	2011	2015	YES	0.0062	Tukey's HSD
				2011	2016	YES	0.0065	
				2015	2016	NO	0.9992	
Richness	NO	0.3955	η, ζ	2011	2015	NO	0.4513	Tukey's HSD
				2011	2016	NO	0.9667	
				2015	2016	NO	0.5018	
Simpson's Evenness	YES	0.0229	α	2011	2015	NO	0.1002	Tukey's HSD
				2011	2016	YES	0.0185	
				2015	2016	NO	0.4811	
Hydracarina (% of Community)	YES	0.0021	β	2011	2015	YES	0.0098	Tukey's HSD
				2011	2016	YES	0.0018	
				2015	2016	NO	0.4478	
Chironomidae (% of Community)	YES	0.0369	β	2011	2015	YES	0.0597	Tukey's HSD
				2011	2016	YES	0.0413	
				2015	2016	NO	0.9637	
Metal Sensitive Taxa (% of Community)	NO	0.0932	β	2011	2015	NO	0.1261	Tukey's HSD
				2011	2016	NO	0.1065	
				2015	2016	NO	0.9915	
Tipulidae (% of Community)	NO	0.4475	β	2011	2015	NO	0.4246	Tukey's HSD
				2011	2016	NO	0.7958	
				2015	2016	NO	0.7383	
Shredder FFG (% of Community)	NO	0.1220	β	2011	2015	NO	0.1092	Tukey's HSD
				2011	2016	NO	0.5242	
				2015	2016	NO	0.4202	
Collector-Gatherer FFG (% of Community)	YES	0.0003	β	2011	2015	YES	0.0003	Tukey's HSD
				2011	2016	YES	0.0009	
				2015	2016	NO	0.6429	
Filterer FFG (% of Community)	NO	0.8918	β	2011	2015	NO	0.9807	Tukey's HSD
				2011	2016	NO	0.9718	
				2015	2016	NO	0.8818	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

Table F.42: Statistical comparison of benthic metrics at the Mary River lower mine-exposed area (CO-05) among years of mine operation (2015, 2016) and baseline (2007, 2011) for the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 4-group Comparison			Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	YES	0.0172	α , ϵ	2007	2011	NO	0.9948	Tamhane's
				2007	2015	NO	0.9981	
				2007	2016	NO	0.1653	
				2011	2015	NO	0.9670	
				2011	2016	NO	0.5569	
				2015	2016	NO	0.1213	
Richness	YES	0.0073	α , ϵ	2007	2011	YES	0.0420	Tukey's HSD
				2007	2015	NO	0.7284	
				2007	2016	YES	0.0145	
				2011	2015	NO	0.1324	
				2011	2016	NO	0.9944	
				2015	2016	YES	0.0440	
Simpson's Evenness	YES	0.0000	α , ϵ	2007	2011	NO	0.1947	Tamhane's
				2007	2015	YES	0.0001	
				2007	2016	YES	0.0046	
				2011	2015	NO	0.9694	
				2011	2016	NO	0.9937	
				2015	2016	YES	0.0521	
Hydracarina (% of community)	YES	0.0346	β , ϵ	2007	2011	NO	0.9999	Tukey's HSD
				2007	2015	NO	0.9452	
				2007	2016	YES	0.0748	
				2011	2015	NO	0.9239	
				2011	2016	YES	0.0663	
				2015	2016	NO	0.1063	
Chironomidae (% of community)	YES	0.0000	β , ϵ	2007	2011	YES	0.0003	Tukey's HSD
				2007	2015	YES	0.0000	
				2007	2016	YES	0.0000	
				2011	2015	YES	0.0542	
				2011	2016	NO	0.8000	
				2015	2016	NO	0.1470	
Metal Sensitive Taxa (% of community)	NO	0.2045	β , γ	2007	2011	NO	0.2442	Tukey's HSD
				2007	2015	NO	0.3593	
				2007	2016	NO	0.8933	
				2011	2015	NO	0.9542	
				2011	2016	NO	0.4554	
				2015	2016	NO	0.6594	
Tipulidae (% of community)	NO	0.2263	β , ϵ	2007	2011	NO	0.4419	Tukey's HSD
				2007	2015	NO	0.2661	
				2007	2016	NO	0.2167	
				2011	2015	NO	0.9969	
				2011	2016	NO	0.9855	
				2015	2016	NO	0.9984	
Shredder FFG (% of community)	YES	0.0353	β , ϵ	2007	2011	YES	0.0311	Tukey's HSD
				2007	2015	NO	0.2044	
				2007	2016	YES	0.0689	
				2011	2015	NO	0.4603	
				2011	2016	NO	0.8334	
				2015	2016	NO	0.8646	
Collector-Gatherer FFG (% of community)	YES	0.0080	β , ϵ	2007	2011	NO	0.1437	Tukey's HSD
				2007	2015	YES	0.0053	
				2007	2016	NO	0.2621	
				2011	2015	NO	0.3932	
				2011	2016	NO	0.9060	
				2015	2016	YES	0.0831	
Filterer FFG (% of community)	YES	0.0170	β , γ	2007	2011	NO	1.0000	Tukey's HSD
				2007	2015	YES	0.0745	
				2007	2016	YES	0.0688	
				2011	2015	YES	0.0747	
				2011	2016	YES	0.0690	
				2015	2016	NO	0.9999	

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

^b Data analysis included: α - data untransformed; η - data log transformed; β - data probit transformed; ϵ - single factor ANOVA test conducted; γ - ANOVA validated using Kruskal-Wallis H-test

Table F.43: Benthic invertebrate community data for Mary Lake, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Mary Lake - Littoral Stations 2016					
	BLO-1	BLO-6	BLO-11	BLO-20	BLO-21	BLO-22
ROUNDWORMS						
P. Nemata	9	86	0	0	26	9
ANNELIDS						
P. Annelida						
WORMS						
Cl. Oligochaeta						
F. Lumbriculidae						
<i>Lumbriculus</i>	0	0	0	0	0	0
ARTHROPODS						
P. Arthropoda						
MITES						
Cl. Arachnida						
O. Acarina						
immature	0	0	17	0	0	0
F. Acalyptonotidae						
<i>Acalyptonotus</i>	52	52	17	0	9	9
F. Hygrobatidae						
<i>Hygrobates</i>	9	0	0	0	0	0
F. Lebertiidae						
<i>Lebertia</i>	0	0	9	34	0	0
HARPACTICOIDS						
O. Harpacticoida	0	0	0	0	0	0
SEED SHRIMPS						
Cl. Ostracoda	164	17	9	0	0	52
WATER SCUDS						
O. Amphipoda						
F. Hyalellidae						
<i>Hyalella</i>	0	0	9	0	0	0
INSECTS						
Cl. Insecta						
CADDISFLIES						
O. Trichoptera						
F. Apataniidae						
<i>Apatania</i>	0	0	0	0	0	0
TRUE FLIES						
O. Diptera						
MIDGES						
F. Chironomidae						
chironomid pupae	0	0	0	0	0	9
S.F. Chironominae						
<i>Chironomus</i>	0	0	0	302	0	0
<i>Micropsectra</i>	905	0	60	1,233	129	9
<i>Parachironomus</i>	0	0	0	0	0	0
<i>Paratanytarsus</i>	0	0	0	0	0	0
<i>Sergentia</i>	0	0	0	190	0	0
<i>Stictochironomus</i>	776	0	0	1,793	0	0
<i>Tanytarsus</i>	121	0	0	0	0	0
S.F. Diamesinae						
<i>Diamesa</i>	0	60	26	34	9	0
<i>Pseudodiamesa</i>	0	95	9	0	9	9
S.F. Orthoclaadiinae						
<i>Abiskomyia</i>	190	26	0	78	0	0
<i>Cricotopus/Orthocladus</i>	0	0	0	0	0	0
<i>Heterotrissocladius</i>	0	78	741	78	1,129	914
<i>Paracladius</i>	0	0	0	0	0	0
<i>Parakiefferiella</i>	0	0	0	0	0	0
<i>Psectrocladius</i>	0	0	0	0	0	0
<i>Zalutschia</i>	0	34	0	0	9	9
Genus "Greenland"	0	0	0	0	0	0

Table F.43: Benthic invertebrate community data for Mary Lake, August 2016. Densities expressed in number of organisms per square meter.

Station Replicate	Mary Lake - Littoral Stations 2016					
	BLO-1	BLO-6	BLO-11	BLO-20	BLO-21	BLO-22
S.F. Tanypodinae						
<i>Arctopelopia</i>	0	0	0	0	0	0
<i>Procladius</i>	1,810	9	9	155	17	26
CRANE FLIES						
F. Tipulidae						
<i>Dicranota</i>	0	0	0	0	0	0
Density (No. organisms per m²)	4,036	457	906	3,897	1,337	1,046
Richness (total number of taxa)^a	9	9	9	9	8	8
Simpson's Evenness (E)	0.795	0.958	0.365	0.762	0.316	0.249
Bray-Curtis Index	0.642	0.839	0.877	0.805	0.854	0.902
Percent Composition						
% Nemata	0.2%	18.8%	0.0%	0.0%	1.9%	0.9%
% Hydracarina	1.5%	11.4%	4.7%	0.9%	0.7%	0.9%
% Ostracods	4.1%	3.7%	1.0%	0.0%	0.0%	5.0%
% Chironomids	94.2%	66.1%	93.3%	99.1%	97.4%	93.3%
% Metal Sensitive Chironmids	25.4%	33.9%	10.5%	32.5%	11.0%	1.7%
Functional Feeding Group Composition						
% Shredders	0.0%	7.4%	0.0%	0.0%	0.7%	0.9%
% Collector - Gatherers	28.2%	79.2%	87.6%	63.5%	87.7%	94.9%
% Filterers	25.4%	0.0%	6.6%	31.6%	9.6%	0.9%
Habitat Preference Group Composition						
% Clingers	26.9%	11.4%	11.4%	37.4%	10.3%	1.7%
% Sprawlers	53.6%	56.7%	85.8%	8.0%	87.1%	97.4%
% Burrowers	19.4%	31.9%	2.9%	54.6%	2.6%	0.9%

^a Bold entries excluded from taxa count

Table F.44: Statistical comparison of benthic metrics at Mary Lake littoral stations among years of mine operation (2015, 2016) and baseline (2007) as part of the Mary River Project CREMP. Shading indicates a significant difference for respective comparison (p-value ≤ 0.1).

Metric	Overall 3-group Comparison			Summary Statistics		Pair-wise, post-hoc comparisons ^a				
	Significant Difference Among Years?	p-value	Statistical Test ^b	Year	Mean	(I) Year	(J) Year	Significant Difference Between Years?	p-value	Statistical Test
Density	NO	0.8238	α	2007	2,667	2007	2015	NO	0.9863	Tukey's HSD
				2015	2,453	2007	2016	NO	0.8355	
				2016	1,947	2015	2016	NO	0.8980	
Richness	NO	0.6083	η, ζ	2007	8.0	2007	2015	NO	0.8978	Tamhane's
				2015	9.0	2007	2016	NO	0.9205	
				2016	8.7	2015	2016	NO	0.9957	
Simpson's Evenness	NO	0.3927	α	2007	0.718	2007	2015	NO	0.6587	Tamhane's
				2015	0.761	2007	2016	NO	0.6530	
				2016	0.574	2015	2016	NO	0.4705	
Nemata (% of Community)	NO	0.5331	β	2007	7.3%	2007	2015	NO	0.9609	Tukey's HSD
				2015	5.6%	2007	2016	NO	0.7579	
				2016	3.6%	2015	2016	NO	0.5314	
Ostracoda (% of Community)	NO	0.5424	β	2007	0.2%	2007	2015	NO	0.6843	Tukey's HSD
				2015	1.9%	2007	2016	NO	0.5217	
				2016	2.3%	2015	2016	NO	0.9712	
Chironomidae (% of Community)	NO	0.9883	β	2007	90.8%	2007	2015	NO	0.9877	Tukey's HSD
				2015	91.1%	2007	2016	NO	0.9922	
				2016	90.6%	2015	2016	NO	0.9988	
Metal Sensitive Taxa (% of Community)	NO	0.7685	β	2007	22.4%	2007	2015	NO	0.7502	Tukey's HSD
				2015	15.8%	2007	2016	NO	0.9137	
				2016	19.2%	2015	2016	NO	0.9074	
Collector-Gatherer FFG (% of Community)	NO	0.8999	β	2007	66.0%	2007	2015	NO	0.9137	Tukey's HSD
				2015	72.8%	2007	2016	NO	0.9069	
				2016	73.5%	2015	2016	NO	0.9998	
Filterer FFG (% of Community)	NO	0.5744	β	2007	22.0%	2007	2015	NO	0.6010	Tukey's HSD
				2015	14.4%	2007	2016	NO	0.6172	
				2016	12.4%	2015	2016	NO	0.9925	

^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 - single factor ANOVA test validated using Kruskal-Wallis H-test; η - data log transformed, single factor ANOVA test conducted; β - data probit transformed, single factor ANOVA test conducted;

APPENDIX G

**FISH POPULATION SURVEY
DATA**

Table G.1: Electrofishing catch records, Mary River Project CREMP, August 2016. Catch-per-unit-effort (CPUE) represents the number of fish captured per electrofishing minute.

Lake	Sample Station Identifier	Location (NAD83, UTM Zone 17W)				Date	Electrofisher Settings			Effort (seconds)	Fish Species				Total (all species)	
		Start		Finish			Output Voltage (volts)	Cycle Freq. (Hz)	Duty Cycle (%)		Arctic Charr		Nine-spine Stickleback			
		Easting	Northing	Easting	Northing						No. Captured	CPUE	No. Captured	CPUE	No. Captured	CPUE
Reference Lake 3	R316-EF-1	574894	7853037	575170	7853094	14-Aug-16	445	30	12	6,154	36	0.35	5	0.05	41	0.40
	R316-EF-2	574894	7853037	574774	7853057	14-Aug-16	445	30	12	2,446	25	0.61	13	0.32	38	0.93
	R316-EF-3	574774	7853057	574560	7853038	15-Aug-16	445	30	12	5,160	40	0.47	10	0.12	50	0.58
	Total									13,760	101	0.48	28	0.16	129	0.64
Camp Lake	CL16-EF-1	557800	7914653	557810	7914604	10-Aug-16	600	50	3	942	98	6.24	2	0.13	100	6.37
Sheardown Lake NW	SDNW16-EF-1	560285	7913485	560235	7913484	12-Aug-16	600	50	3	1,210	106	5.26	0	0.00	106	5.26
Sheardown Lake SE	SDSE16-EF-1	560744	7912333	560873	7912223	12-Aug-16	600	50	3	2,430	109	2.69	19	0.47	128	3.16
Mary Lake	ML16-EF-1	555443	7905149	555509	7904995	14-Aug-16	400	30	12	4,711	107	1.36	1	0.01	108	1.38

Table G.2: Gill netting catch records for Reference Lake 3, Mary River Project CREMP, August 2016. Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Gill Net Set ID	Net Mesh	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"		
REF316-GN-1	1½", 2", 3"	0574968	7852932	91	14-Aug-16	14-Aug-16	11:51	13:56	2.08	1.90	0	0	0	0	0.00
					14-Aug-16	14-Aug-16	14:20	15:56	1.60	1.46	0	0	0	0	0.00
REF316-GN-2	1½", 2", 3"	0576157	7852461	91	14-Aug-16	14-Aug-16	12:05	14:35	2.50	2.29	0	1	0	1	0.44
					14-Aug-16	14-Aug-16	14:40	16:17	1.62	1.48	0	0	0	0	0.00
					14-Aug-16	14-Aug-16	16:27	17:46	1.32	1.20	0	0	0	0	0.00
REF316-GN-3	1½", 2", 3"	0575883	7852569	91	14-Aug-16	14-Aug-16	12:16	14:45	2.48	2.27	0	0	0	0	0.00
					14-Aug-16	14-Aug-16	14:47	16:29	1.70	1.55	0	0	0	0	0.00
					14-Aug-16	14-Aug-16	16:40	17:55	1.25	1.14	0	0	0	0	0.00
REF316-GN-4	1½", 2", 3"	0575556	7852583	91	14-Aug-16	14-Aug-16	12:38	14:51	2.22	2.03	0	0	0	0	0.00
					14-Aug-16	14-Aug-16	14:53	16:45	1.87	1.71	0	0	0	0	0.00
REF316-GN-5	1½", 2", 3"	0574297	7852528	91	14-Aug-16	14-Aug-16	12:54	14:54	2.00	1.83	0	1	0	1	0.55
					14-Aug-16	14-Aug-16	15:00	17:00	2.00	1.83	0	0	0	0	0.00
					14-Aug-16	14-Aug-16	17:04	18:08	1.07	0.98	0	0	0	0	0.00
REF316-GN-6	1½", 2", 3"	0574043	7852885	91	14-Aug-16	14-Aug-16	13:10	15:13	2.05	1.87	0	0	1	1	0.53
					14-Aug-16	14-Aug-16	15:21	17:09	1.80	1.65	0	0	0	0	0.00
REF316-GN-7	1½", 2", 3"	0573689	7853524	91	14-Aug-16	14-Aug-16	13:20	15:30	2.17	1.98	0	1	0	1	0.50
					14-Aug-16	14-Aug-16	15:44	17:21	1.62	1.48	0	0	0	0	0.00
REF316-GN-8	1½", 2", 3"	0575562	7852825	91	14-Aug-16	14-Aug-16	16:12	17:37	1.42	1.30	0	0	0	0	0.00
REF316-GN-9	1½", 2", 3"	0575203	7853013	91	15-Aug-16	15-Aug-16	10:50	15:40	4.83	4.42	0	0	1	1	0.23
REF316-GN-10	1½", 2", 3"	0575551	7852907	91	15-Aug-16	15-Aug-16	11:00	16:00	5.00	4.57	0	0	0	0	0.00
REF316-GN-11	1½", 2", 3"	0576077	7852519	91	15-Aug-16	15-Aug-16	11:15	16:15	5.00	4.57	0	0	0	0	0.00
REF316-GN-12	1½", 2", 3"	0574389	7852268	91	15-Aug-16	15-Aug-16	11:30	16:35	5.08	4.65	0	1	0	1	0.22
REF316-GN-13	1½", 2", 3"	0573836	7852703	91	15-Aug-16	15-Aug-16	11:45	17:00	5.25	4.80	0	0	0	0	0.00
REF316-GN-14	1½", 2", 3"	0574043	7854041	91	15-Aug-16	15-Aug-16	11:55	17:15	5.33	4.88	1	2	0	3	0.62
REF316-GN-15	1½", 2", 3"	0573615	7853819	91	15-Aug-16	15-Aug-16	12:00	17:40	5.67	5.18	0	0	5	5	0.96
REF316-GN-16	1½", 2", 3"	0575215	7853056	91	15-Aug-16	15-Aug-16	16:30	18:15	1.75	1.60	0	0	0	0	0.00
REF316-GN-17	1½", 2", 3"	0573897	7852975	91	15-Aug-16	15-Aug-16	17:15	18:00	0.75	0.69	0	0	0	0	0.00
Total										65.30	1	6	7	14	0.15

Table G.3: Gill netting catch records for Camp Lake, Mary River Project CREMP, August 2016. Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Gill Net Set ID	Net Mesh	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"		
CL16-GN-1	1½", 3"	0557751	7914760	60.96	11-Aug-16	11-Aug-16	8:10	9:10	1.00	0.61	1	-	4	5	8.2
					11-Aug-16	11-Aug-16	9:20	12:05	2.75	1.68	0	-	1	1	0.60
CL16-GN-2	1½", 2", 3"	0557745	7914625	91.44	11-Aug-16	11-Aug-16	8:20	9:45	1.42	1.30	1	1	3	5	3.86
					11-Aug-16	11-Aug-16	9:55	12:25	2.50	2.29	0	1	2	3	1.31
					12-Aug-16	12-Aug-16	8:10	10:15	2.08	1.90	0	0	1	1	0.52
CL16-GN-3	1½", 2", 3"	0557630	7914315	91.44	11-Aug-16	11-Aug-16	8:35	10:05	1.50	1.37	0	5	2	7	5.1
					11-Aug-16	11-Aug-16	10:25	12:55	2.50	2.29	2	5	1	8	3.50
					12-Aug-16	12-Aug-16	7:55	9:30	1.58	1.45	2	2	1	5	3.45
CL16-GN-4	1½", 2", 3"	0557632	7914464	91.44	11-Aug-16	11-Aug-16	8:45	10:45	2.00	1.83	2	1	2	5	2.73
					11-Aug-16	11-Aug-16	11:00	13:30	2.50	2.29	2	5	5	12	5.2
					11-Aug-16	11-Aug-16	13:50	15:45	1.92	1.75	2	1	4	7	3.99
					12-Aug-16	12-Aug-16	8:05	9:55	1.83	1.68	2	0	1	3	1.79
CL16-GN-5	1½", 2", 3"	0557284	7914847	91.44	11-Aug-16	11-Aug-16	9:00	11:20	2.33	2.13	0	4	2	6	2.81
					11-Aug-16	11-Aug-16	11:35	13:50	2.25	2.06	0	2	1	3	1.46
					12-Aug-16	12-Aug-16	8:15	10:30	2.25	2.06	0	1	0	1	0.49
CL16-GN-6	1½", 3"	0557557	7914793	60.96	10-Aug-16	10-Aug-16	12:50	14:40	1.83	1.12	1	-	4	5	4.47
CL16-GN-7	1½", 2", 3"	0557461	7914841	91.44	11-Aug-16	11-Aug-16	12:55	15:05	2.17	1.98	1	1	2	4	2.02
					12-Aug-16	12-Aug-16	8:20	10:45	2.42	2.21	2	1	1	4	1.81
CL16-GN-8	1½", 2", 3"	0557717	7914236	91.44	11-Aug-16	11-Aug-16	14:00	16:05	2.08	1.90	0	3	0	3	1.57
Total										33.9	18	33	37	88	2.89

Table G.4: Gill netting catch records for Sheardown Lake NW, Mary River Project CREMP, August 2016. Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Gill Net Set ID	Net Mesh	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"		
SDNW16-GN-1	1½", 2", 3"	0560540	7913231	91	11-Aug-16	11-Aug-16	8:40	10:45	2.08	1.90	0	2	0	2	1.05
					11-Aug-16	11-Aug-16	11:20	15:39	4.32	3.95	0	0	2	2	0.51
					12-Aug-16	12-Aug-16	9:29	12:32	3.05	2.79	1	2	1	4	1.43
					12-Aug-16	12-Aug-16	12:41	15:26	2.75	2.51	1	3	2	6	2.39
SDNW16-GN-2	1½", 2", 3"	0560681	7913119	91	11-Aug-16	11-Aug-16	9:00	11:35	2.58	2.36	3	1	1	5	2.12
					11-Aug-16	11-Aug-16	11:58	15:45	3.78	3.46	0	0	2	2	0.58
SDNW16-GN-3	1½", 2", 3"	0559788	7913351	91	11-Aug-16	11-Aug-16	9:20	12:20	3.00	2.74	0	2	0	2	0.73
SDNW16-GN-4	1½", 2", 3"	0559853	7913527	91	11-Aug-16	11-Aug-16	9:40	12:50	3.17	2.90	3	5	2	10	3.45
					11-Aug-16	11-Aug-16	13:53	16:50	2.95	2.70	2	2	1	5	1.85
					11-Aug-16	11-Aug-16	17:07	18:16	1.15	1.05	1	0	1	2	1.90
					12-Aug-16	12-Aug-16	9:53	13:45	3.87	3.54	2	2	1	5	1.41
					12-Aug-16	12-Aug-16	13:51	16:51	3.00	2.74	0	0	1	1	0.36
SDNW16-GN-5	1½", 2", 3"	0559997	7913418	91	11-Aug-16	11-Aug-16	10:00	14:43	4.72	4.31	1	1	2	4	0.93
					12-Aug-16	12-Aug-16	14:22	17:07	2.75	2.51	1	1	0	2	0.80
SDNW16-GN-6	1½", 2", 3"	0559967	7913485	91	11-Aug-16	11-Aug-16	10:20	13:55	3.58	3.28	4	2	2	8	2.44
					11-Aug-16	11-Aug-16	15:23	17:31	2.13	1.95	2	0	3	5	2.56
					11-Aug-16	11-Aug-16	17:53	18:36	0.72	0.66	0	0	0	0	0.00
					12-Aug-16	12-Aug-16	10:03	14:39	4.60	4.21	1	4	1	6	1.43
					12-Aug-16	12-Aug-16	17:32	18:30	0.97	0.88	0	1	0	1	1.13
SDNW16-GN-7	1½", 2", 3"	0559752	7913552	91	11-Aug-16	11-Aug-16	12:30	16:24	3.90	3.57	3	1	0	4	1.12
					12-Aug-16	12-Aug-16	9:48	13:00	3.20	2.93	1	2	0	3	1.03
					12-Aug-16	12-Aug-16	13:10	16:10	3.00	2.74	1	2	1	4	1.46
					12-Aug-16	12-Aug-16	17:37	18:14	0.62	0.56	3	0	0	3	5.32
SDNW16-GN-8	1½", 2", 3"	0560444	7913294	91	12-Aug-16	12-Aug-16	9:20	10:50	1.50	1.37	0	4	3	7	5.10
Total										61.62	30	37	26	93	1.71

Table G.5: Gill netting catch records for Sheardown Lake SE, Mary River Project CREMP, August 2016. Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Gill Net Set ID	Net Mesh	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"		
SDSE16-GN-1	1½", 2", 3"	0560781	7912251	91	13-Aug-16	13-Aug-16	9:30	10:48	1.30	1.19	5	8	2	15	12.62
SDSE16-GN-2	1½", 2", 3"	0560874	7912095	91	13-Aug-16	13-Aug-16	9:41	11:16	1.58	1.45	5	5	7	17	11.74
SDSE16-GN-3	1½", 2", 3"	0561034	7911947	91	13-Aug-16	13-Aug-16	9:51	12:51	3.00	2.74	6	3	6	15	5.47
SDSE16-GN-4	1½", 2", 3"	0561294	7911852	91	13-Aug-16	13-Aug-16	10:05	13:19	3.23	2.96	2	6	9	17	5.75
SDSE16-GN-5	1½", 2", 3"	0561425	7911888	91	13-Aug-16	13-Aug-16	10:23	14:48	4.42	4.04	2	9	8	19	4.70
Total										12.37	20	31	32	83	8.06

Table G.6: Gill netting catch records for Mary Lake, Mary River Project CREMP, August 2016. Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

Gill Net Set ID	Net Mesh	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"		
ML16-GN-1	1½", 2", 3"	0556169	7903786	91.44	13-Aug-16	13-Aug-16	9:45	11:20	1.58	1.45	1	8	6	15	10.36
	1½", 2", 3"	0556169	7903786	91.44	13-Aug-16	13-Aug-16	11:45	14:45	3.00	2.74	2	8	4	14	5.10
ML16-GN-2	1½", 2", 3"	0555906	7903971	91.44	13-Aug-16	13-Aug-16	9:55	11:50	1.92	1.75	2	6	7	15	8.56
ML16-GN-3	1½", 2", 3"	0555125	7905782	91.44	13-Aug-16	13-Aug-16	10:10	13:00	2.83	2.59	1	0	7	8	3.09
					13-Aug-16	13-Aug-16	17:20	18:10	0.83	0.76	0	2	3	5	6.56
ML16-GN-4	1½", 2", 3"	0554816	7906071	91.44	13-Aug-16	13-Aug-16	10:15	13:30	3.25	2.97	7	5	3	15	5.05
					13-Aug-16	13-Aug-16	13:50	15:45	1.92	1.75	3	4	0	7	3.99
ML16-GN-5	1½", 2", 3"	0554871	7906046	91.44	13-Aug-16	13-Aug-16	10:35	14:10	3.58	3.28	2	6	0	8	2.44
ML16-GN-6	1½", 2", 3"	0555995	7903812	91.44	13-Aug-16	13-Aug-16	14:50	16:40	1.83	1.68	0	3	3	6	3.58
ML16-GN-7	1½", 2", 3"	0555251	7905387	91.44	13-Aug-16	13-Aug-16	16:15	17:15	1.00	0.91	2	2	0	4	4.37
Total										19.89	20	44	33	97	5.31

Table G.7: Summary of Arctic charr gill net catches by mesh size, Mary River Project CREMP, August 2016.

Waterbody	Effort (m*hrs/100 m)	Arctic Charr Catch per Mesh Size			Total Catch	CPUE ^a	Mortalities
		1½"	2"	3"			
Reference Lake 3	65.30	1	6	7	14	0.15	5
Camp Lake	33.88	18	33	37	88	2.89	24
Sheardown Lake NW	61.62	30	37	26	93	1.71	15
Sheardown Lake SE	12.37	20	31	32	83	8.06	25
Mary Lake	19.89	20	44	33	97	5.31	27
Total	193.07	89	151	135	375	3.62	96

^a Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m-hours of net.

Table G.8: Arctic charr measurements from fish captured at Reference Lake 3 by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Liver Weight (g)	Age (years)	Fulton's Condition Factor (K)
REF316-ACJ-1	5.9	6.3	1.804	0.030	1	0.878
REF316-ACJ-2	7.0	7.6	3.219	0.054	2	0.938
REF316-ACJ-3	7.8	8.5	4.377	0.076	2	0.922
REF316-ACJ-4	11.5	12.4	15.167	0.110	5	0.997
REF316-ACJ-5	3.9	4.1	0.547	0.008	0	0.922
REF316-ACJ-6	3.2	3.3	0.388	0.004	0	1.184
REF316-ACJ-7	5.4	5.7	1.491	0.011	1	0.947
REF316-ACJ-8	5.1	5.4	1.026	0.022	0	0.773
REF316-ACJ-9	8.8	9.4	6.221	0.073	3	0.913
REF316-ACJ-10	3.3	3.4	0.317	0.004	0	0.882
REF316-ACJ-11	5.7	6.1	1.608	-	-	0.868
REF316-ACJ-12	6.2	6.6	2.072	-	-	0.869
REF316-ACJ-13	14.5	15.7	25.212	-	-	0.827
REF316-ACJ-14	10.0	10.8	10.188	-	-	1.019
REF316-ACJ-15	11.4	12.3	12.304	-	-	0.830
REF316-ACJ-16	9.7	10.5	9.344	-	-	1.024
REF316-ACJ-17	13.2	14.2	24.087	-	-	1.047
REF316-ACJ-18	7.3	7.8	3.684	-	-	0.947
REF316-ACJ-19	6.6	7.0	2.420	-	-	0.842
REF316-ACJ-20	6.2	6.6	2.251	-	-	0.944
REF316-ACJ-21	6.0	6.4	1.682	-	-	0.779
REF316-ACJ-22	17.0	18.4	49.518	-	-	1.008
REF316-ACJ-23	7.8	8.4	5.606	-	-	1.181
REF316-ACJ-24	8.9	9.1	6.390	-	-	0.906
REF316-ACJ-25	10.0	11.0	9.212	-	-	0.921
REF316-ACJ-26	7.7	8.4	4.671	-	-	1.023
REF316-ACJ-27	7.1	7.6	2.950	-	-	0.824
REF316-ACJ-28	7.2	7.7	3.071	-	-	0.823
REF316-ACJ-29	7.9	8.4	4.359	-	-	0.884
REF316-ACJ-30	7.6	8.1	4.211	-	-	0.959
REF316-ACJ-31	9.7	10.4	7.606	-	-	0.833
REF316-ACJ-32	10.4	11.3	9.972	-	-	0.887
REF316-ACJ-33	6.1	6.6	1.885	-	-	0.830
REF316-ACJ-34	6.0	6.3	1.783	-	-	0.825
REF316-ACJ-35	3.8	3.9	0.419	-	-	0.764
REF316-ACJ-36	5.0	5.3	1.066	-	-	0.853
REF316-ACJ-37	3.5	3.7	0.315	-	-	0.735
REF316-ACJ-38	3.4	3.5	0.266	-	-	0.677
REF316-ACJ-39	3.8	3.9	0.387	-	-	0.705
REF316-ACJ-40	7.4	7.9	3.535	-	-	0.872
REF316-ACJ-41	5.6	5.9	1.457	-	-	0.830
REF316-ACJ-42	7.5	8.0	3.580	-	-	0.849
REF316-ACJ-43	8.0	8.6	4.242	-	-	0.829
REF316-ACJ-44	8.2	8.8	4.940	-	-	0.896
REF316-ACJ-45	6.7	7.1	3.069	-	-	1.020
REF316-ACJ-46	8.0	8.6	4.517	-	-	0.882
REF316-ACJ-47	3.2	3.3	0.271	-	-	0.827
REF316-ACJ-48	6.9	7.4	3.087	-	-	0.940
REF316-ACJ-49	7.1	7.6	3.381	-	-	0.945
REF316-ACJ-50	6.3	6.7	2.030	-	-	0.812
REF316-ACJ-51	5.7	6.0	1.696	-	-	0.916
REF316-ACJ-52	8.7	9.3	5.983	-	-	0.909
REF316-ACJ-53	6.7	7.1	2.550	-	-	0.848
REF316-ACJ-54	5.2	5.5	1.307	-	-	0.930
REF316-ACJ-55	4.0	4.3	0.596	-	-	0.931
REF316-ACJ-56	4.1	4.2	0.593	-	-	0.860
REF316-ACJ-57	4.2	4.3	0.576	-	-	0.777
REF316-ACJ-58	6.9	7.3	2.001	-	-	0.609
REF316-ACJ-59	4.1	4.3	0.598	-	-	0.868
REF316-ACJ-60	3.9	4.0	0.501	-	-	0.845
REF316-ACJ-61	4.1	4.2	0.588	-	-	0.853
REF316-ACJ-62	6.2	6.5	2.135	-	-	0.896

Table G.8: Arctic charr measurements from fish captured at Reference Lake 3 by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Liver Weight (g)	Age (years)	Fulton's Condition Factor (K)
REF316-ACJ-63		7.8	8.1	3.395	-	-	0.715
REF316-ACJ-64		5.2	5.6	1.137	-	-	0.809
REF316-ACJ-65		6.6	7.0	2.245	-	-	0.781
REF316-ACJ-66		5.0	5.2	0.995	-	-	0.796
REF316-ACJ-67		7.0	7.3	2.506	-	-	0.731
REF316-ACJ-68		4.1	4.2	0.381	-	-	0.553
REF316-ACJ-69		6.1	6.3	1.776	-	-	0.782
REF316-ACJ-70		7.3	7.8	3.246	-	-	0.834
REF316-ACJ-71		4.3	4.6	0.653	-	-	0.821
REF316-ACJ-72		3.3	3.5	0.379	-	-	1.055
REF316-ACJ-73		4.0	4.2	0.507	-	-	0.792
REF316-ACJ-74		6.3	6.8	2.191	-	-	0.876
REF316-ACJ-75		4.0	4.2	0.776	-	-	1.213
REF316-ACJ-76		3.8	3.9	0.367	-	-	0.669
REF316-ACJ-77		9.0	9.6	6.207	-	-	0.851
REF316-ACJ-78		7.7	8.1	3.707	-	-	0.812
REF316-ACJ-79		15.3	16.6	31.755	-	-	0.887
REF316-ACJ-80		6.0	6.4	1.756	-	-	0.813
REF316-ACJ-81		9.2	9.9	5.990	-	-	0.769
REF316-ACJ-82		15.0	16.1	25.471	-	-	0.755
REF316-ACJ-83		7.8	8.3	4.503	-	-	0.949
REF316-ACJ-84		3.8	4.0	0.393	-	-	0.716
REF316-ACJ-85		4.1	4.2	0.462	-	-	0.670
REF316-ACJ-86		3.5	3.6	0.369	-	-	0.861
REF316-ACJ-87		6.0	6.3	1.670	-	-	0.773
REF316-ACJ-88		5.7	5.9	1.317	-	-	0.711
REF316-ACJ-89		7.3	7.9	3.306	-	-	0.850
REF316-ACJ-90		7.1	7.6	3.210	-	-	0.897
REF316-ACJ-91		5.9	6.3	1.572	-	-	0.765
REF316-ACJ-92		7.5	8.1	3.680	-	-	0.872
REF316-ACJ-93		3.8	3.9	0.355	-	-	0.647
REF316-ACJ-94		9.6	10.4	7.873	-	-	0.890
REF316-ACJ-95		3.9	4.1	0.528	-	-	0.890
REF316-ACJ-96		6.1	6.4	2.050	-	-	0.903
REF316-ACJ-97		3.8	4.0	0.460	-	-	0.838
REF316-ACJ-98		4.2	4.4	0.601	-	-	0.811
REF316-ACJ-99*		9.9	10.6	9.201	-	-	0.948
REF316-ACJ-100		3.9	4.0	0.516	-	-	0.870
Overall Catch Summary	total number	100	100	100	10	10	100
	average	6.7	7.1	4.338	0.039	1.4	0.861
	median	6.3	6.7	2.104	0.026	1	0.857
	standard deviation	2.8	3.1	7.148	0.037	1.6	0.110
	standard error	0.3	0.3	0.715	0.012	0.5	0.011
	minimum	3.2	3.3	0.266	0.004	0	0.553
	maximum	17.0	18.4	49.518	0.110	5	1.213
Young-of-the-Year Catch Summary	proportion of YOY	31%					
	total number	31	31	31	4	4	31
	average	3.9	4.1	0.522	0.010	0	0.828
	median	3.9	4.1	0.501	0.006	0	0.827
	standard deviation	0.5	0.5	0.207	0.009	0.0	0.140
	standard error	0.1	0.1	0.037	0.004	0.0	0.025
	minimum	3.2	3.3	0.266	0.004	0	0.553
	maximum	5.1	5.4	1.066	0.022	0	1.213

* Initial screening indicated sample was an outlier, and therefore the sample was removed from all subsequent statistical analysis data sets.

Table G.9: Arctic charr measurements from fish captured at Reference Lake 3 by gill netting, Mary River Project CREMP, August 2016.

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	34.5	37.5	370	17	0.901
REF316-AC-02	2	33.6	36.3	320	21	0.844
REF316-AC-03	3	33.4	36.2	410	-	1.100
REF316-AC-04	2	31.8	34.1	300	-	0.933
REF316-AC-05	3	32.8	35.7	295	-	0.836
REF316-AC-06	2	35.0	38.0	375	-	0.875
REF316-AC-07	3	33.2	36.2	335	-	0.915
REF316-AC-08	3	49.6	52.8	1,100	-	0.901
REF316-AC-09	3	60.0	64.5	1,930	-	0.894
REF316-AC-10	3	55.5	59.4	1,430	-	0.836
REF316-AC-11	3	51.9	56.0	1,540	17	1.102
REF316-AC-12	1.5	21.1	23.2	77	-	0.820
REF316-AC-13	2	32.8	35.3	315	14	0.893
REF316-AC-14	2	35.0	37.6	340	19	0.793
Overall Catch Summary	total number	14	14	14	5	14
	average	38.6	41.6	653	17.6	0.903
	median	34.1	36.9	355	17	0.893
	standard deviation	11.0	11.7	585	2.6	0.093
	standard error	3.0	3.1	156	1.2	0.025
	minimum	21.1	23.2	77	14	0.793
	maximum	60.0	64.5	1,930	21	1.102

Table G.10: Arctic charr measurements from fish captured at Camp Lake by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Liver Weight (g)	Age (years)	Fulton's Condition Factor (K)
CL16-ACJ-1	5.7	6.1	1.534	0.045	1	0.828
CL16-ACJ-2	7.1	7.7	2.721	0.070	2	0.760
CL16-ACJ-3	13.5	14.7	19.937	0.206	2	0.810
CL16-ACJ-4	5.8	6.1	1.579	0.024	1	0.809
CL16-ACJ-5	4.2	4.5	0.686	0.071	0	0.926
CL16-ACJ-6	5.0	5.3	1.020	0.013	1	0.816
CL16-ACJ-7	10.1	10.8	7.908	0.133	2	0.768
CL16-ACJ-8	9.0	9.2	6.258	0.083	2	0.858
CL16-ACJ-9	4.2	4.4	0.572	0.011	0	0.772
CL16-ACJ-10	10.9	11.3	8.874	0.110	2	0.685
CL16-ACJ-11	5.8	6.1	1.822	-	-	0.934
CL16-ACJ-12	6.3	6.7	2.314	-	-	0.925
CL16-ACJ-13	5.8	6.0	1.515	-	-	0.776
CL16-ACJ-14	5.8	6.0	1.700	-	-	0.871
CL16-ACJ-15	5.8	6.2	1.484	-	-	0.761
CL16-ACJ-16	6.9	7.2	2.553	-	-	0.777
CL16-ACJ-17	12.0	13.0	14.205	-	-	0.822
CL16-ACJ-18	6.6	7.0	2.476	-	-	0.861
CL16-ACJ-19	10.0	10.7	7.301	-	-	0.730
CL16-ACJ-20	5.2	5.5	1.187	-	-	0.844
CL16-ACJ-21	6.9	7.3	2.869	-	-	0.873
CL16-ACJ-22	5.7	5.9	1.285	-	-	0.694
CL16-ACJ-23	13.3	14.4	21.783	-	-	0.926
CL16-ACJ-24	6.9	7.2	2.599	-	-	0.791
CL16-ACJ-25	8.3	8.9	4.792	-	-	0.838
CL16-ACJ-26	5.0	5.4	1.053	-	-	0.842
CL16-ACJ-27	12.9	14.0	17.755	-	-	0.827
CL16-ACJ-28	5.9	6.2	1.675	-	-	0.816
CL16-ACJ-29	6.0	6.4	1.855	-	-	0.859
CL16-ACJ-30	6.8	7.3	2.929	-	-	0.932
CL16-ACJ-31	5.4	5.7	1.355	-	-	0.861
CL16-ACJ-32	5.7	6.1	1.705	-	-	0.921
CL16-ACJ-33	14.1	15.4	24.696	-	-	0.881
CL16-ACJ-34	17.1	18.5	38.558	-	-	0.771
CL16-ACJ-35	10.5	11.3	11.304	-	-	0.976
CL16-ACJ-36	7.5	7.9	3.707	-	-	0.879
CL16-ACJ-37	6.0	6.5	1.997	-	-	0.925
CL16-ACJ-38	6.2	6.5	1.990	-	-	0.835
CL16-ACJ-39	10.4	11.3	10.564	-	-	0.939
CL16-ACJ-40	16.0	17.0	34.482	-	-	0.842
CL16-ACJ-41	11.5	12.5	11.240	-	-	0.739
CL16-ACJ-42	12.7	14.0	19.246	-	-	0.940
CL16-ACJ-43	6.5	6.8	2.255	-	-	0.821
CL16-ACJ-44	10.2	11.1	8.139	-	-	0.767
CL16-ACJ-45	6.9	7.4	2.638	-	-	0.803
CL16-ACJ-46	5.7	6.1	1.629	-	-	0.880
CL16-ACJ-47	7.5	7.9	3.211	-	-	0.761
CL16-ACJ-48	6.4	6.8	2.167	-	-	0.827
CL16-ACJ-49	10.1	10.9	7.576	-	-	0.735
CL16-ACJ-50	11.0	12.0	9.791	-	-	0.736
CL16-ACJ-51	10.3	11.0	8.675	-	-	0.794
CL16-ACJ-52	5.2	5.5	1.099	-	-	0.782
CL16-ACJ-53	10.4	11.2	10.162	-	-	0.903
CL16-ACJ-54	6.4	6.8	2.111	-	-	0.805
CL16-ACJ-55	6.0	6.4	1.889	-	-	0.875
CL16-ACJ-56	10.9	11.7	11.131	-	-	0.860
CL16-ACJ-57	7.5	7.8	3.300	-	-	0.782
CL16-ACJ-58	6.8	7.3	2.678	-	-	0.852
CL16-ACJ-59	5.9	6.2	1.628	-	-	0.793
CL16-ACJ-60	5.8	6.2	1.535	-	-	0.787

Table G.10: Arctic charr measurements from fish captured at Camp Lake by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Liver Weight (g)	Age (years)	Fulton's Condition Factor (K)
	CL16-ACJ-61	6.5	6.8	2.409	-	-	0.877
	CL16-ACJ-62	7.4	7.9	2.992	-	-	0.738
	CL16-ACJ-63	5.5	5.9	1.461	-	-	0.878
	CL16-ACJ-64	8.1	8.6	4.332	-	-	0.815
	CL16-ACJ-65	10.9	11.4	8.959	-	-	0.692
	CL16-ACJ-66	8.6	9.2	4.713	-	-	0.741
	CL16-ACJ-67	7.0	7.4	2.770	-	-	0.808
	CL16-ACJ-68	8.7	9.4	5.528	-	-	0.839
	CL16-ACJ-69	6.3	6.6	2.066	-	-	0.826
	CL16-ACJ-70	5.8	6.2	1.724	-	-	0.884
	CL16-ACJ-71	5.3	5.6	1.265	-	-	0.850
	CL16-ACJ-72	15.4	16.9	33.715	-	-	0.923
	CL16-ACJ-73	5.6	5.9	1.411	-	-	0.803
	CL16-ACJ-74	5.5	5.7	1.296	-	-	0.779
	CL16-ACJ-75	6.0	6.4	1.764	-	-	0.817
	CL16-ACJ-76	5.6	5.9	1.508	-	-	0.859
	CL16-ACJ-77	15.9	17.1	34.325	-	-	0.854
	CL16-ACJ-78	13.5	14.6	19.102	-	-	0.776
	CL16-ACJ-79	5.9	6.2	1.592	-	-	0.775
	CL16-ACJ-80	8.6	9.1	4.905	-	-	0.771
	CL16-ACJ-81	6.2	6.5	2.045	-	-	0.858
	CL16-ACJ-82	10.1	10.9	7.111	-	-	0.690
	CL16-ACJ-83	5.8	6.2	1.697	-	-	0.870
	CL16-ACJ-84	6.8	7.1	2.609	-	-	0.830
	CL16-ACJ-85	5.2	5.5	1.204	-	-	0.856
	CL16-ACJ-86	6.0	6.5	1.905	-	-	0.882
	CL16-ACJ-87	16.2	17.6	36.662	-	-	0.862
	CL16-ACJ-88	8.1	8.6	4.053	-	-	0.763
	CL16-ACJ-89	6.6	7.0	2.341	-	-	0.814
	CL16-ACJ-90	11.4	12.3	10.942	-	-	0.739
	CL16-ACJ-91	11.0	11.8	9.943	-	-	0.747
	CL16-ACJ-92	5.3	5.7	1.315	-	-	0.883
	CL16-ACJ-93	6.3	6.6	2.133	-	-	0.853
	CL16-ACJ-94	5.4	5.7	1.326	-	-	0.842
	CL16-ACJ-95	4.8	5.2	1.078	-	-	0.975
	CL16-ACJ-96	17.4	18.8	42.651	-	-	0.810
	CL16-ACJ-97	5.2	5.5	1.295	-	-	0.921
	CL16-ACJ-98	8.3	8.8	4.292	-	-	0.751
Overall Catch Summary	total number	98	98	98	10	10	98
	average	8.1	8.7	6.746	0.077	1.3	0.827
	median	6.8	7.2	2.576	0.071	2	0.827
	standard deviation	3.2	3.5	9.249	0.061	0.8	0.065
	standard error	0.3	0.4	0.934	0.019	0.3	0.007
	minimum	4.2	4.4	0.572	0.011	0	0.685
	maximum	17.4	18.8	42.651	0.206	2	0.976
Young-of-the-Year Catch Summary	proportion of YOY	3%					
	total number	3	3	3	2	2	3
	average	4.4	4.7	0.8	0.0	0.0	0.891
	median	4.2	4.5	0.7	0.0	0.0	0.926
	standard deviation	0.3	0.4	0.3	0.0	0.0	0.106
	standard error	0.2	0.3	0.2	0.0	0.0	0.061
	minimum	4.2	4.4	0.6	0.0	0.0	0.772
	maximum	4.8	5.2	1.1	0.1	0.0	0.975

Table G.11: Results of health endpoint statistical comparisons for nearshore (juvenile) Arctic charr captured between mine-exposed Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Ref	Exp	Reference		Exposed					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	99	98	-	-	-	-	K-S Test	Yes	0.002	-
	Log ₁₀ Age (years)	none	10	10	-	-	-	-	ANOVA	No	0.675	-
Energy Use (non-YOY)	Log ₁₀ Body Weight (g)	none	68	95	-	-	-	-	ANOVA	No	0.890	-
	Log ₁₀ Fork Length (cm)	none	68	95	-	-	-	-	ANOVA	No	0.813	-
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ¹	9	10	0.980	0.000	0.730	0.002	ANCOVA	No	0.165	-
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years) ¹	9	10	0.978	0.000	0.000	0.001	ANCOVA	Yes	0.045	0.668
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ²	68	95	0.985	0.000	0.994	0.000	ANCOVA	Yes	0.000	0.989

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Ref	Exp		Ref	Exp		Increase	Decrease
Survival	Age (years)	none	10	10	Mean	0.9	1.1	-	283.1	-73.9
Energy Use	Body Weight (g)	none	68	95	Mean	3.862	3.782	-	55	-36
	Fork Length (cm)	none	68	95	Mean	7.6	7.7	-	15.7	-13.6
	Body Weight (g)	Age (years) ¹	9	10	Adjusted Mean	1.839	2.544	-	112.8	-53.0
	Fork Length (cm)	Age (years) ¹	9	10	Adjusted Mean	5.8	6.8	17.9	-	-
Energy Storage	Body Weight (g)	Fork Length (cm) ²	68	95	Adjusted Mean	3.9	3.7	-5.5	-	-

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Studentized outlier REF316-ACJ-8 removed.

² Slopes not equal, however r^2 of both ANCOVA models (interaction = 0.991, parallel slope = 0.991) using all data was above 0.80 and within 0.20.

Table G.12: Results of health endpoint statistical comparisons for nearshore (juvenile) Arctic charr captured at Camp Lake in 2016 and during the mine baseline period, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Data Sets (p-value)		Power
	Parameter	Covariate	Baseline	2016	Baseline		2016					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	51	98	-	-	-	-	K-S Test	Yes	0.000	-
Energy Use	Log ₁₀ Body Weight (g)	none	51	98	-	-	-	-	ANOVA	Yes	0.000	1.000
	Log ₁₀ Fork Length (cm)	none	51	98	-	-	-	-	ANOVA	Yes	0.000	1.000
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ¹	51	98	0.988	0.000	0.994	0.000	ANCOVA	Yes	0.000	1.000

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Baseline	2016	Statistic	Baseline	2016		Increase	Decrease
Energy Use	Body Weight (g)	none	51	98	Mean	12.303	3.600	-70.7	-	-
	Fork Length (cm)	none	51	98	Mean	11.2	7.6	-32.3	-	-
Energy Storage	Body Weight (g)	Fork Length (cm) ¹	51	98	Adjusted Mean	5.9	5.3	-9.7	-	-

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the $\hat{r}^2$ for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Slopes not equal, however r^2 of both ANCOVA models (interaction = 0.995, parallel slope = 0.994) using all data was above 0.80 and within 0.20.

Table G.13: Sample sizes required to detect differences in Arctic charr non-lethal population endpoints for nearshore and littoral/profundal populations at Camp Lake compared to Reference Lake 3 or Camp Lake baseline data, as appropriate, with power = 0.90 and alpha = 0.10 using the 2016 data. Highlighted values indicate sample sizes sufficient to meet CES used for EEM studies.

Mine Lake	Endpoint		Model ^a	Minimum Sample Size (Increase ^b / Decrease ^c)							
	Parameter	Covariate		i=5%	i=10%	i=20%	i=25%	i=30%	i=40%	i=50%	i=100%
				d=4%	d=9%	d=17%	d=20	d=23%	d=29%	d=33%	d=50%
Nearshore Electrofishing: Camp Lake versus Reference Lake 3	Body Weight	none	ANOVA	9,128	2394	655	438	317	193	134	46
	Fork Length	none	ANOVA	987	260	72	48	35	22	15	6
	Body Weight	Age	ANCOVA	1,741	457	126	84	61	38	26	10
	Fork Length	Age	ANCOVA	200	53	15	11	8	5	4	2
	Body Weight	Fork Length	All - ANCOVA	83	23	7	5	4	3	2	2
	Body Weight	Fork Length	YOY Only ANCOVA	-	-	-	-	-	-	-	-
	Body Weight	Fork Length	Non-YOY Only ANCOVA	43	12	4	3	3	2	2	1
Nearshore Electrofishing: Camp Lake versus Baseline	Body Weight	none	ANOVA	7,288	1,912	523	350	253	155	107	37
	Fork Length	none	ANOVA	845	223	62	42	30	19	13	5
	Body Weight	Fork Length	ANCOVA	37	11	4	3	2	2	2	1
Littoral / Profundal Gill Netting: Camp Lake versus Baseline	Body Weight	none	ANOVA	3,071	806	221	148	107	66	46	16
	Fork Length	none	ANOVA	350	93	26	18	13	9	6	3
	Body Weight	Age	ANCOVA	1,928	506	139	93	68	42	29	11
	Fork Length	Age	ANCOVA	197	53	15	11	8	5	4	2
	Body Weight	Fork Length	ANCOVA	103	28	8	6	5	3	3	2

^a Statistical tests include Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), Mann-Whitney U-Test (MW U-test) and Kolmogorov-Smirnov test (K-S Test).

^b Increase relative to reference mean using log transformed data

^c Decrease relative to reference mean using log transformed data

Table G.14: Arctic charr measurements from fish captured at Camp Lake by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
CL16-AC-01	3"	38.2	41.7	480	-	0.861
CL16-AC-02	3"	37.6	40.8	515	-	0.969
CL16-AC-03	3"	37.0	40.5	485	-	0.957
CL16-AC-04	3"	35.4	38.2	455	-	1.026
CL16-AC-05	1½"	41.0	44.3	590	-	0.856
CL16-AC-06	3"	35.5	38.7	440	-	0.983
CL16-AC-07	3"	37.2	40.7	485	-	0.942
CL16-AC-08	3"	35.6	39.0	450	-	0.997
CL16-AC-09	2"	34.5	37.5	415	-	1.011
CL16-AC-10	1½"	37.0	40.2	455	-	0.898
CL16-AC-11	3"	36.0	39.1	525	-	1.125
CL16-AC-12	3"	35.2	38.4	450	-	1.032
CL16-AC-13*	2"	34.7	37.7	400	14	0.957
CL16-AC-14	2"	37.2	40.3	460	-	0.894
CL16-AC-15	2"	32.6	35.2	335	-	0.967
CL16-AC-16	2"	34.4	37.5	410	13	1.007
CL16-AC-17	2"	28.9	31.4	232	-	0.961
CL16-AC-18	3"	39.1	42.2	510	-	0.853
CL16-AC-19	3"	34.9	38.0	440	-	1.035
CL16-AC-20	2"	29.4	31.7	234	-	0.921
CL16-AC-21	1½"	34.0	37.4	370	14	0.941
CL16-AC-22	1½"	35.8	38.7	415	13	0.904
CL16-AC-23	2"	37.5	41.7	495	14	0.939
CL16-AC-24	2"	36.9	39.9	425	18	0.846
CL16-AC-25	2"	35.2	38.6	430	17	0.986
CL16-AC-26	2"	35.9	39.0	420	-	0.908
CL16-AC-27	3"	36.8	40.1	460	-	0.923
CL16-AC-28	3"	38.0	41.1	480	-	0.875
CL16-AC-29	3"	37.9	41.7	520	-	0.955
CL16-AC-30	3"	36.5	39.4	460	-	0.946
CL16-AC-31	3"	35.1	37.9	450	-	1.041
CL16-AC-32	2"	35.1	38.0	425	11	0.983
CL16-AC-33	3"	36.2	39.5	460	-	0.970
CL16-AC-34	2"	39.7	43.5	500	18	0.799
CL16-AC-35	2"	38.2	41.4	435	-	0.780
CL16-AC-36	2"	37.1	40.7	425	-	0.832
CL16-AC-37	2"	34.9	37.9	405	13	0.953
CL16-AC-38	2"	39.4	42.7	525	16	0.858
CL16-AC-39	1½"	36.8	40.1	495	-	0.993
CL16-AC-40	1½"	38.8	42.2	530	-	0.907
CL16-AC-41	3"	37.2	41.2	525	-	1.020
CL16-AC-42	3"	36.2	39.5	425	-	0.896
CL16-AC-43	3"	36.8	40.2	530	-	1.063
CL16-AC-44	3"	36.1	39.1	440	-	0.935
CL16-AC-45	3"	37.6	40.9	435	21	0.818
CL16-AC-46	2"	33.1	36.1	375	9	1.034
CL16-AC-47	2"	36.0	39.2	440	11	0.943
CL16-AC-48	2"	40.4	43.5	600	16	0.910
CL16-AC-49	2"	36.3	39.7	460	-	0.962
CL16-AC-50	2"	35.4	38.6	405	-	0.913
CL16-AC-51	1½"	35.5	38.6	430	16	0.961
CL16-AC-52	1½"	35.0	38.4	420	-	0.980
CL16-AC-53	3"	36.8	39.8	435	-	0.873
CL16-AC-54	2"	34.9	38.0	365	-	0.859
CL16-AC-55	2"	37.0	40.4	480	13	0.948
CL16-AC-56	3"	35.8	39.2	450	-	0.981

Table G.14: Arctic charr measurements from fish captured at Camp Lake by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
CL16-AC-57	3"	36.1	39.3	460	-	0.978
CL16-AC-58	3"	35.7	39.0	445	-	0.978
CL16-AC-59	3"	35.9	38.7	440	-	0.951
CL16-AC-60	1½"	36.2	39.5	390	-	0.822
CL16-AC-61	3"	36.4	39.4	475	-	0.985
CL16-AC-62	3"	37.3	40.6	515	-	0.992
CL16-AC-63	2"	35.6	38.6	425	-	0.942
CL16-AC-64	1½"	37.2	40.4	500	-	0.971
CL16-AC-65	3"	35.7	39.1	390	-	0.857
CL16-AC-66	3"	37.5	42.2	460	-	0.872
CL16-AC-67	3"	36.0	39.2	415	-	0.889
CL16-AC-68	3"	36.7	39.6	455	-	0.920
CL16-AC-69	2"	35.9	39.3	425	14	0.919
CL16-AC-70	1½"	35.5	38.7	430	-	0.961
CL16-AC-71	1½"	37.6	41.1	535	-	1.006
CL16-AC-72	2"	35.6	38.8	415	12	0.920
CL16-AC-73	2"	35.2	38.3	425	18	0.974
CL16-AC-74	2"	35.8	38.9	450	-	0.981
CL16-AC-75	3"	34.3	37.9	395	-	0.979
CL16-AC-76*	2"	41.3	44.7	335	17	0.476
CL16-AC-77	2"	35.7	38.8	435	15	0.956
CL16-AC-78	1½"	34.3	37.6	445	-	1.103
CL16-AC-79	1½"	39.8	43.2	465	-	0.738
CL16-AC-80	3"	36.4	39.5	465	-	0.964
CL16-AC-81	1½"	34.5	37.4	460	-	1.120
CL16-AC-82	1½"	35.8	39.1	460	-	1.003
CL16-AC-83	3"	56.5	61.5	1,690	17	0.937
CL16-AC-84	2"	33.1	36.2	325	13	0.896
CL16-AC-85	3"	37.1	41.0	505	-	0.989
CL16-AC-86	2"	34.7	37.1	380	-	0.909
CL16-AC-87	1½"	18.3	19.9	51.5	-	0.840
CL16-AC-88	1½"	37.3	40.8	510	-	0.983
Overall Catch Summary	total number	88	88	88	24	88
	average	36.2	39.5	455	14.7	0.938
	median	36.1	39.3	448	14	0.952
	standard deviation	3.5	3.8	152	2.8	0.086
	standard error	0.4	0.4	16	0.6	0.009
	minimum	18.3	19.9	52	9	0.476
	maximum	56.5	61.5	1,690	21	1.125

* Initial screening indicated sample was an outlier, and therefore the sample was removed from all subsequent statistical analysis data sets.

Table G.15: Additional meristics collected from adult Arctic charr incidental mortalities at Camp Lake in 2016, Mary River Project CREMP, August 2016.

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
CL16-AC-16	13	34.4	37.5	410	406	1.01	i	4.072	1.00	-	-	2"	ew (A)
CL16-AC-23	14	37.5	41.7	495	491	0.94	i	4.263	0.87	-	-	2"	ew (A)
CL16-AC-24	18	36.9	39.9	425	420	0.85	i	4.752	1.13	-	-	2"	ew (VA)
CL16-AC-25	17	35.2	38.6	430	426	0.99	i	3.902	0.92	-	-	2"	ew (A)
CL16-AC-34	18	39.7	43.5	500	494	0.80	i	5.842	1.18	-	-	2"	ew (A)
CL16-AC-38	16	39.4	42.7	525	519	0.86	i	5.989	1.15	-	-	2"	ew (A)
CL16-AC-45	21	37.6	40.9	435	431	0.82	i	3.884	0.90	-	-	3"	ew (A)
CL16-AC-46	9	33.1	36.1	375	371	1.03	i	4.382	1.18	-	-	2"	none observed
CL16-AC-47	11	36.0	39.2	440	436	0.94	i	4.215	0.97	-	-	2"	ew (VA) + mark on caudal fin
CL16-AC-48	16	40.4	43.5	600	596	0.91	i	4.328	0.73	-	-	2"	ew (A)
CL16-AC-51	16	35.5	38.6	430	426	0.96	i	4.112	0.97	-	-	1½"	ew (VA)
CL16-AC-55	13	37.0	40.4	480	474	0.95	i	6.084	1.28	-	-	2"	ew (VA)
CL16-AC-72	12	35.6	38.8	415	411	0.92	i	3.765	0.92	-	-	2"	ew (A)
CL16-AC-76	17	41.3	44.7	335	331	0.48	i	3.809	1.15	-	-	2"	ew (S), emaciated condition
CL16-AC-77	15	35.7	38.8	435	429	0.96	i	5.780	1.35	-	-	2"	ew (A)
CL16-AC-83	17	56.5	61.5	1,690	1,667	0.94	i	22.71	1.36	-	-	3"	ew (A)
CL16-AC-13	14	34.7	37.7	400	390	0.96	F	5.893	1.51	4.203	1.078	2"	ew (A)
CL16-AC-21	14	34.0	37.4	370	362	0.94	F	5.420	1.50	2.270	0.627	1½"	ew (A)
CL16-AC-22	13	35.8	38.7	415	409	0.90	F	4.468	1.09	1.602	0.392	1½"	ew (S)
CL16-AC-32	11	35.1	38.0	425	415	0.98	F	5.697	1.37	4.067	0.979	2"	ew (A)
CL16-AC-37	13	34.9	37.9	405	398	0.95	F	4.639	1.17	2.315	0.582	2"	ew (C)
CL16-AC-69	14	35.9	39.3	425	415	0.92	F	5.253	1.27	4.609	1.110	2"	ew (A)
CL16-AC-73	18	35.2	38.3	425	416	0.97	F	4.700	1.13	4.595	1.105	2"	ew (A)
CL16-AC-84	13	33.1	36.2	325	318	0.90	F	4.802	1.51	2.643	0.832	2"	ew (C)
Adult Non-Spawner Statistics	Average	15	38.2	41.7	526	521	0.90	-	5.743	1.07	-	-	-
	St. deviation	3.0	5.4	5.8	316	312	0.13	-	4.599	0.18	-	-	-
	Minimum	9	33.1	36.1	335	331	0.48	-	3.765	0.73	-	-	-
	Maximum	21	56.5	61.5	1690	1667	1.03	-	22.71	1.36	-	-	-
	Sample Size (N)	16	16	16	16	16	16	16	16	16	-	-	-
Females Statistics	Average	14	34.8	37.9	399	390	0.94	-	5.109	1.32	3.29	0.84	-
	St. deviation	2.0	0.9	0.9	35	35	0.03	-	0.531	0.18	1.20	0.28	-
	Minimum	11	33.1	36.2	325	318	0.90	-	4.468	1.09	1.60	0.39	-
	Maximum	18	35.9	39.3	425	416	0.98	-	5.893	1.51	4.61	1.11	-
	Sample Size (N)	8	8	8	8	8	8	8	8	8	8	-	-

^a - Abnormalities include encysted worms (ew) 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.16: Results of health endpoint statistical comparisons for (adult) Arctic charr captured at Camp Lake littoral/profundal areas in 2016 and during the mine baseline period, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Baseline	2016	Baseline		2016					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	63	87	-	-	-	-	K-S Test	Yes	0.000	-
	Log ₁₀ Age (years)	none	30	24	-	-	-	-	ANOVA	Yes	0.000	1.000
Energy Use	Log ₁₀ Body Weight (g)	none	63	87	-	-	-	-	ANOVA	No	0.235	-
	Log ₁₀ Fork Length (cm)	none	63	87	-	-	-	-	ANOVA	No	0.125	-
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ¹	29	24	0.605	0.000	0.073	0.202	ANCOVA	Yes	0.008	-
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years) ¹	30	24	0.689	0.000	0.199	0.029	ANCOVA	Yes	0.010	-
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	63	87	0.971	0.000	0.940	0.000	ANCOVA	Yes	0.080	0.543

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}		Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Baseline	2016	Statistic	Baseline	2016			Increase	Decrease
Survival	Age (years)	none	30	24	Mean	9.1	14.5	58.0		-	-
Energy Use	Body Weight (g)	none	63	87	Mean	385.4	438.5	-		37.1	-27.1
	Fork Length (cm)	none	63	87	Mean	34.0	36.0	-		11.2	-10.1
	Body Weight (g)	Age (years) ¹	29	24	Predicted Values	1,025.0	509.5	Max overlap	-50.3	-	-
						202.5	368.9	Min overlap	82.2		
	Fork Length (cm)	Age (years) ¹	30	24	Predicted Values	477.6	394.7	Max overlap	-17.4	-	-
						269.2	327.9	Min overlap	21.8		
Energy Storage	Body Weight (g)	Fork Length (cm)	63	87	Adjusted Mean	423.9	409.2	-3.5		-	-

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the $\bar{r}^2$ for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Poor covariate (age) overlap.

Table G.17: Arctic charr measurements from fish captured at Sheardown Lake NW by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW16-ACJ-01	7.4	7.9	2.95	1	0.728
SDNW16-ACJ-02	6.7	6.7	2.16	1	0.717
SDNW16-ACJ-03	4.0	4.2	0.492	0	0.769
SDNW16-ACJ-04	3.9	4.2	0.564	0	0.951
SDNW16-ACJ-05	5.0	5.3	1.17	0	0.938
SDNW16-ACJ-06	8.1	8.8	4.62	2	0.870
SDNW16-ACJ-07	9.0	9.7	6.58	2	0.903
SDNW16-ACJ-08	11.2	11.9	11.1	2	0.789
SDNW16-ACJ-09	4.0	4.2	0.564	0	0.881
SDNW16-ACJ-10	4.6	4.9	0.796	0	0.818
SDNW16-ACJ-11	7.3	7.8	3.57	-	0.917
SDNW16-ACJ-12	13.2	15.0	24.6	-	1.069
SDNW16-ACJ-13	6.3	6.7	2.10	-	0.839
SDNW16-ACJ-14	6.8	7.4	2.74	-	0.871
SDNW16-ACJ-15	13.3	15.0	23.6	-	1.002
SDNW16-ACJ-16	9.7	10.3	7.13	-	0.781
SDNW16-ACJ-17	6.4	6.8	2.31	-	0.880
SDNW16-ACJ-18	10.5	11.3	9.79	-	0.846
SDNW16-ACJ-19	11.3	12.0	12.3	-	0.856
SDNW16-ACJ-20	8.9	9.4	6.34	-	0.899
SDNW16-ACJ-21	9.1	9.7	7.11	-	0.943
SDNW16-ACJ-22	7.4	8.0	3.67	-	0.906
SDNW16-ACJ-23	9.2	10.1	6.57	-	0.843
SDNW16-ACJ-24	6.8	7.5	2.87	-	0.914
SDNW16-ACJ-25	6.6	6.9	2.26	-	0.784
SDNW16-ACJ-26	6.3	6.7	2.67	-	1.069
SDNW16-ACJ-27	6.9	7.3	2.76	-	0.839
SDNW16-ACJ-28	6.8	7.2	2.70	-	0.858
SDNW16-ACJ-29	8.4	9.1	5.10	-	0.860
SDNW16-ACJ-30	6.2	6.7	2.26	-	0.946
SDNW16-ACJ-31	8.0	8.6	4.51	-	0.880
SDNW16-ACJ-32	7.2	7.6	2.95	-	0.791
SDNW16-ACJ-33	9.2	9.9	6.66	-	0.855
SDNW16-ACJ-34	17.2	18.6	44.3	-	0.871
SDNW16-ACJ-35	11.1	11.9	10.7	-	0.784
SDNW16-ACJ-36	6.4	6.8	2.18	-	0.831
SDNW16-ACJ-37	14.6	15.7	27.6	-	0.888
SDNW16-ACJ-38	17.6	19.1	49.1	-	0.901
SDNW16-ACJ-39	13.8	15.0	26.4	-	1.005
SDNW16-ACJ-40	7.0	7.5	2.70	-	0.787
SDNW16-ACJ-41	9.2	9.8	6.80	-	0.873
SDNW16-ACJ-42	6.6	7.0	2.28	-	0.794
SDNW16-ACJ-43	16.2	17.6	38.0	-	0.895
SDNW16-ACJ-44	9.3	10.1	7.56	-	0.940
SDNW16-ACJ-45	9.9	10.6	7.99	-	0.823
SDNW16-ACJ-46	7.3	7.8	3.41	-	0.877
SDNW16-ACJ-47	8.1	8.7	4.62	-	0.869
SDNW16-ACJ-48	14.1	15.3	25.2	-	0.898
SDNW16-ACJ-49	8.6	9.2	5.00	-	0.786
SDNW16-ACJ-50	9.4	10.3	7.50	-	0.903
SDNW16-ACJ-51	10.4	11.2	10.7	-	0.950
SDNW16-ACJ-52	12.2	13.1	15.4	-	0.848
SDNW16-ACJ-53	8.4	9.2	5.82	-	0.982
SDNW16-ACJ-54	13.4	14.6	24.0	-	0.999
SDNW16-ACJ-55	8.5	9.1	5.29	-	0.861
SDNW16-ACJ-56	7.4	8.0	3.58	-	0.883
SDNW16-ACJ-57	7.3	7.7	3.22	-	0.827
SDNW16-ACJ-58	10.1	10.9	8.70	-	0.845
SDNW16-ACJ-59	9.2	9.9	7.43	-	0.954

Table G.17: Arctic charr measurements from fish captured at Sheardown Lake NW by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW16-ACJ-60		13.3	14.4	19.7	-	0.839
SDNW16-ACJ-61		6.3	6.6	2.20	-	0.879
SDNW16-ACJ-62		8.7	9.3	5.37	-	0.816
SDNW16-ACJ-63		6.7	7.1	2.58	-	0.856
SDNW16-ACJ-64		7.2	7.7	3.26	-	0.872
SDNW16-ACJ-65		10.4	11.3	10.0	-	0.889
SDNW16-ACJ-66		9.2	9.8	6.64	-	0.852
SDNW16-ACJ-67		6.1	6.5	1.94	-	0.853
SDNW16-ACJ-68		6.9	7.3	3.18	-	0.969
SDNW16-ACJ-69		12.2	13.2	16.6	-	0.913
SDNW16-ACJ-70		18.7	20.3	45.1	-	0.690
SDNW16-ACJ-71		6.7	7.1	2.73	-	0.906
SDNW16-ACJ-72		12.1	13.1	15.0	-	0.847
SDNW16-ACJ-73		4.5	4.8	0.801	-	0.879
SDNW16-ACJ-74		5.8	6.1	1.64	-	0.842
SDNW16-ACJ-75		4.2	4.4	0.600	-	0.810
SDNW16-ACJ-76		11.6	12.5	12.4	-	0.794
SDNW16-ACJ-77		6.8	7.2	2.80	-	0.892
SDNW16-ACJ-78		8.4	9.1	5.02	-	0.846
SDNW16-ACJ-79		6.9	7.4	2.93	-	0.893
SDNW16-ACJ-80		11.4	12.3	11.9	-	0.803
SDNW16-ACJ-81		13.2	14.4	20.3	-	0.882
SDNW16-ACJ-82		11.5	12.5	12.8	-	0.844
SDNW16-ACJ-83		11.3	12.3	12.3	-	0.854
SDNW16-ACJ-84		9.0	9.7	4.80	-	0.659
SDNW16-ACJ-85		6.6	7.1	2.56	-	0.890
SDNW16-ACJ-86		9.6	10.4	8.01	-	0.905
SDNW16-ACJ-87		12.5	13.5	16.4	-	0.840
SDNW16-ACJ-88		10.9	11.8	11.3	-	0.869
SDNW16-ACJ-89		9.6	10.3	6.94	-	0.784
SDNW16-ACJ-90		6.7	7.2	2.65	-	0.882
SDNW16-ACJ-91		4.6	4.9	0.840	-	0.863
SDNW16-ACJ-92		16.7	18.2	47.0	-	1.010
SDNW16-ACJ-93		9.7	10.5	7.84	-	0.859
SDNW16-ACJ-94		4.0	4.2	0.576	-	0.900
SDNW16-ACJ-95		6.3	6.7	2.14	-	0.856
SDNW16-ACJ-96		8.0	8.6	4.68	-	0.915
SDNW16-ACJ-97		5.8	6.2	1.61	-	0.827
SDNW16-ACJ-98		6.9	7.3	2.60	-	0.791
SDNW16-ACJ-99		7.5	8.1	3.97	-	0.941
SDNW16-ACJ-100		6.4	6.7	2.20	-	0.838
Overall Catch Summary	total number	100	100	100	10	100
	average	9	10	8.77	0.8	0.868
	median	8	9	4.90	0.5	0.869
	standard deviation	3	4	10.5	0.9	0.069
	standard error	0	0	1.05	0.3	0.007
	minimum	4	4	0.492	0	0.659
	maximum	19	20	49.1	2	1.069
Young-of-the-Year Catch Summary	proportion of YOY	9%				
	total number	9	9	9	5	9
	average	4.3	4.6	0.712	0	0.868
	median	4.2	4.4	0.600	0	0.879
	standard deviation	0.4	0.4	0.214	0.0	0.060
	standard error	0.1	0.1	0.071	0.0	0.020
	minimum	3.9	4.2	0.492	0	0.769
	maximum	5.0	5.3	1.172	0	0.951

Table G.18: Results of health endpoint statistical comparisons for nearshore non-YOY Arctic charr captured between mine-exposed Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2016.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Ref	Exp	Reference		Exposed					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	99	100	-	-	-	-	K-S Test	Yes	0.000	-
	Log ₁₀ Age (years)	none	10	10	-	-	-	-	ANOVA	No	0.477	-
Energy Use (non-YOY)	Log ₁₀ Body Weight (g)	none	68	91	-	-	-	-	ANOVA	Yes	0.001	0.960
	Log ₁₀ Fork Length (cm)	none	68	91	-	-	-	-	ANOVA	Yes	0.001	0.969
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ¹	9	10	0.980	0.000	0.914	0.000	ANCOVA	Yes	0.001	0.980
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ¹	9	10	0.978	0.000	0.919	0.000	ANCOVA	Yes	0.000	0.999
Energy Storage (non-YOY)	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	68	91	0.985	0.000	0.992	0.000	ANCOVA	No	0.363	-

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Ref	Exp		Ref	Exp		Increase	Decrease
Survival	Age (years)	none	10	10	Mean	0.9	0.7	-	315.3	-75.9
Energy Use	Body Weight (g)	none	68	91	Mean	3.862	6.197	60.5	-	-
	Fork Length (cm)	none	68	91	Mean	7.6	8.9	17.3	-	-
	Body Weight (g)	Age (years) ¹	9	10	Adjusted Mean	1.839	3.050	65.8	-	-
	Fork Length (cm)	Age (years) ¹	9	10	Adjusted Mean	5.8	7.2	24.2	-	-
Energy Storage	Body Weight (g)	Fork Length (cm)	68	91	Adjusted Mean	5.1	5.0	-	4.4	-4.2

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the R^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Studentized outlier REF316-ACJ-8 removed.

Table G.19: Results of health endpoint statistical comparisons for nearshore YOY Arctic charr captured between mine-exposed Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2016.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Ref	Exp	Reference		Exposed					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	31	9	-	-	-	-	K-S Test	No	0.139	-
Energy Use	Log ₁₀ Body Weight (g)	none	31	9	-	-	-	-	ANOVA	Yes	0.013	0.820
	Log ₁₀ Fork Length (cm)	none	31	9	-	-	-	-	ANOVA	Yes	0.032	0.706
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	31	9	0.799	0.000	0.937	0.000	ANCOVA	No	0.205	-
	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ¹	18	9	0.705	0.000	0.937	0.000	ANCOVA	No	0.404	-

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Ref	Exp		Ref	Exp		Increase	Decrease
Energy Use	Body Weight (g)	none	31	9	Mean	0.489	0.687	40.4	-	-
	Fork Length (cm)	none	31	9	Mean	3.9	4.3	9.8	-	-
Energy Storage	Body Weight (g)	Fork Length (cm)	31	9	Adjusted Mean	0.5	0.5	-	15.5	-13.4
	Body Weight (g)	Fork Length (cm) ¹	18	9	Adjusted Mean	0.6	0.7	-	18.1	-15.3

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: $[(\text{exposed adjusted mean} - \text{reference adjusted mean}) / \text{reference adjusted mean}] \times 100$.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: $[(\text{exposed predicted value} - \text{reference predicted value}) / \text{reference predicted value}] \times 100$.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Comparison using fish with fork length of 3.9 cm and greater to satisfy statistical assumption of covariate overlap.

Table G.20: Results of health endpoint statistical comparisons for nearshore (juvenile) Arctic charr captured at Sheardown Lake NW in 2016 and during the mine baseline period, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Data Sets (p-value)		Power
	Parameter	Covariate	Baseline	2016	Baseline		2016					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	253	100	-	-	-	-	K-S Test	Yes	0.048	-
Energy Use	Log ₁₀ Body Weight (g)	none	253	100	-	-	-	-	ANOVA	Yes	0.019	0.763
	Log ₁₀ Fork Length (cm)	none	253	100	-	-	-	-	ANOVA	No	0.144	-
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	253	100	0.981	0.000	0.994	0.000	ANCOVA	Yes	0.000	1.000

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Baseline	2016	Statistic	Baseline	2016		Increase	Decrease
Energy Use	Body Weight (g)	none	253	100	Mean	7.151	5.084	-28.9	-	-
	Fork Length (cm)	none	253	100	Mean	9.0	8.4	-	13.6	-12.0
Energy Storage	Body Weight (g)	Fork Length (cm)	253	100	Adjusted Mean	6.741	5.923	-12.1	-	-

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

Table G.21: Sample sizes required to detect differences in Arctic charr non-lethal population endpoints for nearshore and littoral/profundal populations at Sheardown Lake NW compared to Reference Lake 3 or Sheardown Lake NW baseline data, as appropriate, with power at 0.90 and alpha = 0.10 using the 2016 data. Highlighted values indicate sample sizes sufficient to meet CES used for EEM studies.

Mine Lake	Endpoint		Model ^a	Minimum Sample Size (Increase ^b / Decrease ^c)							
	Parameter	Covariate		i=5%	i=10%	i=20%	i=25%	i=30%	i=40%	i=50%	i=100%
				d=4%	d=9%	d=17%	d=20	d=23%	d=29%	d=33%	d=50%
Nearshore Electrofishing: Sheardown Lake NW versus Reference Lake 3	Body Weight	none	ANOVA	9,219	2418	662	442	320	195	135	47
	Fork Length	none	ANOVA	981	258	71	48	35	22	15	6
	Body Weight	Age	ANCOVA	565	149	42	28	21	13	9	4
	Fork Length	Age	ANCOVA	65	18	6	4	3	3	2	1
	Body Weight	Fork Length	All - ANCOVA	82	22	7	5	4	3	2	2
	Body Weight	Fork Length	YOY Only ANCOVA	132	35	11	7	6	4	3	2
	Body Weight	Fork Length	Non-YOY Only ANCOVA	61	17	5	4	3	2	2	1
Nearshore Electrofishing: Sheardown Lake NW versus Baseline	Body Weight	none	ANOVA	10,722	2,812	769	514	372	227	157	54
	Fork Length	none	ANOVA	1,198	315	87	58	43	26	19	7
	Body Weight	Fork Length	ANCOVA	173	46	14	9	7	5	4	2
Littoral / Profundal Gill Netting: Sheardown Lake NW versus Baseline	Body Weight	none	ANOVA	4,687	1230	337	225	163	100	69	24
	Fork Length	none	ANOVA	499	132	37	25	18	12	8	4
	Body Weight	Age	ANCOVA	1,404	369	102	68	50	31	22	8
	Fork Length	Age	ANCOVA	148	40	12	8	6	4	3	2
	Body Weight	Fork Length	ANCOVA	100	27	8	6	5	3	3	2

^a Statistical tests include Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), Mann-Whitney U-Test (MW U-test) and Kolmogorov-Smirnov test (K-S Test).

^b Increase relative to reference mean using log transformed data

^c Decrease relative to reference mean using log transformed data

Table G.22: Arctic charr measurements from fish captured at Sheardown Lake NW by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW16-AC-01	2"	26.3	28.4	161	-	0.885
SDNW16-AC-02	2"	36.1	38.8	462	16	0.982
SDNW16-AC-03	3"	37.0	40.0	480	-	0.948
SDNW16-AC-04	2"	27.4	29.6	180	-	0.875
SDNW16-AC-05	1½"	35.2	38.6	415	-	0.952
SDNW16-AC-06	1½"	18.0	19.5	52	-	0.892
SDNW16-AC-07	1½"	18.5	20.0	56.5	-	0.892
SDNW16-AC-08	2"	36.0	39.1	400	-	0.857
SDNW16-AC-09	2"	24.4	26.0	132	-	0.909
SDNW16-AC-10	3"	52.8	56.4	1,900	-	1.291
SDNW16-AC-11	2"	34.0	36.6	380	-	0.967
SDNW16-AC-12	3"	35.8	38.6	445	-	0.970
SDNW16-AC-13	2"	35.8	38.4	435	-	0.948
SDNW16-AC-14	2"	34.2	37.7	405	-	1.012
SDNW16-AC-15	2"	39.4	42.8	480	-	0.785
SDNW16-AC-16	2"	37.8	40.9	550	-	1.018
SDNW16-AC-17	1½"	20.2	22.0	80	-	0.971
SDNW16-AC-18	1½"	18.7	20.1	65	-	0.994
SDNW16-AC-19	1½"	19.5	21.0	71	4	0.958
SDNW16-AC-20	1½"	20.9	22.6	80	5	0.876
SDNW16-AC-21	1½"	20.3	21.7	72	-	0.861
SDNW16-AC-22	1½"	21.0	22.6	81	-	0.875
SDNW16-AC-23	1½"	20.5	22.0	88	-	1.021
SDNW16-AC-24	2"	36.8	38.8	410	-	0.823
SDNW16-AC-25	3"	35.5	36.1	340	-	0.760
SDNW16-AC-26	3"	33.4	35.9	380	10	1.020
SDNW16-AC-27	2"	34.6	37.5	360	13	0.869
SDNW16-AC-28	1½"	32.6	34.9	330	-	0.952
SDNW16-AC-29	3"	34.9	37.9	420	-	0.988
SDNW16-AC-30	3"	42.1	45.3	780	-	1.045
SDNW16-AC-31	2"	62.5	66.4	2,000	-	0.819
SDNW16-AC-32	3"	38.2	41.9	545	-	0.978
SDNW16-AC-33	3"	41.3	44.3	710	-	1.008
SDNW16-AC-34	1½"	20.6	22.1	80	-	0.915
SDNW16-AC-35	1½"	20.4	21.9	77	-	0.907
SDNW16-AC-36	1½"	18.4	19.9	61	-	0.979
SDNW16-AC-37	2"	33.0	35.8	365	10	1.016
SDNW16-AC-38	1½"	29.7	32.2	235	-	0.897
SDNW16-AC-39	1½"	23.5	25.2	124	-	0.955
SDNW16-AC-40	2"	37.8	41.2	515	-	0.954
SDNW16-AC-41	2"	48.8	52.1	1,150	-	0.990
SDNW16-AC-42	3"	52.2	56.1	1,900	-	1.336
SDNW16-AC-43	1½"	20.7	22.3	83	-	0.936
SDNW16-AC-44	1½"	19.2	20.6	67	-	0.947
SDNW16-AC-45	3"	34.5	37.9	420	-	1.023
SDNW16-AC-46	3"	35.6	38.1	515	-	1.141
SDNW16-AC-47	3"	50.0	53.5	1,200	-	0.960
SDNW16-AC-48	3"	32.6	35.6	370	-	1.068
SDNW16-AC-49	1½"	37.7	41.5	510	-	0.952
SDNW16-AC-50	3"	36.1	39.9	505	-	1.073
SDNW16-AC-51	3"	35.2	38.2	425	-	0.974
SDNW16-AC-52	2"	28.6	31.1	203	-	0.868
SDNW16-AC-53	3"	42.0	45.2	705	-	0.952
SDNW16-AC-54	2"	31.8	34.2	300	9	0.933
SDNW16-AC-55	2"	32.4	34.5	310	8	0.911
SDNW16-AC-56	2"	34.0	36.9	380	10	0.967

Table G.22: Arctic charr measurements from fish captured at Sheardown Lake NW by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDNW16-AC-57	1½"	35.0	38.3	400	-	0.933
SDNW16-AC-58	2"	36.6	39.7	435	-	0.887
SDNW16-AC-59	2"	33.5	36.0	330	10	0.878
SDNW16-AC-60	3"	43.0	46.3	845	-	1.063
SDNW16-AC-61	2"	32.5	35.9	360	-	1.049
SDNW16-AC-62	1½"	52.8	56.3	1,300	-	0.883
SDNW16-AC-63	2"	40.9	43.8	650	10	0.950
SDNW16-AC-64	3"	35.6	38.8	490	-	1.086
SDNW16-AC-65	2"	33.0	35.8	380	-	1.057
SDNW16-AC-66	2"	37.7	41.0	500	-	0.933
SDNW16-AC-67	1½"	18.6	20.0	59	-	0.917
SDNW16-AC-68	1½"	18.8	20.4	66	5	0.993
SDNW16-AC-69	3"	36.8	40.3	480	-	0.963
SDNW16-AC-70	2"	33.4	36.4	365	-	0.980
SDNW16-AC-71	2"	28.3	30.5	220	-	0.971
SDNW16-AC-72	1½"	21.8	23.6	106	-	1.023
SDNW16-AC-73	2"	34.6	38.0	445	15	1.074
SDNW16-AC-74	2"	30.8	33.4	320	13	1.095
SDNW16-AC-75	3"	40.6	44.0	640	-	0.956
SDNW16-AC-76	3"	35.0	37.9	400	-	0.933
SDNW16-AC-77	2"	32.6	36.0	370	-	1.068
SDNW16-AC-78	2"	29.0	31.2	245	-	1.005
SDNW16-AC-79	2"	26.5	28.6	173	-	0.930
SDNW16-AC-80	1½"	19.8	21.1	71	-	0.915
SDNW16-AC-81	3"	35.4	39.2	465	-	1.048
SDNW16-AC-82	2"	34.3	37.5	370	-	0.917
SDNW16-AC-83	2"	35.9	39.3	470	-	1.016
SDNW16-AC-84	1½"	35.0	38.2	390	-	0.910
SDNW16-AC-85	1½"	34.9	37.9	395	-	0.929
SDNW16-AC-86	2"	36.5	39.7	470	-	0.967
SDNW16-AC-87	1½"	20.9	22.1	84	-	0.920
SDNW16-AC-88	1½"	20.6	22.3	78	-	0.892
SDNW16-AC-89	1½"	20.1	21.8	77	-	0.948
SDNW16-AC-90	1½"	22.3	23.9	98	-	0.884
SDNW16-AC-91	2"	35.4	38.0	440	-	0.992
Overall Catch Summary	total number	91	91	91	14	91
	average	32.3	34.9	409	9.9	0.963
	median	34.2	36.9	380	10	0.954
	standard deviation	9.1	9.8	375	3.6	0.088
	standard error	1.0	1.0	39.3	1.0	0.009
	minimum	18.0	19.5	52	4	0.760
	maximum	62.5	66.4	2,000	16	1.336

* Initial screening indicated sample was an outlier, and therefore the sample was removed from all subsequent statistical analysis data sets.

Table G.23: Additional meristics collected from adult Arctic charr incidental mortalities at Sheardown Lake NW in 2016, Mary River Project CREMP, August 2016.

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
SDNW16-AC-02	16	36.1	38.8	462	456	0.98	i	5.651	1.22	-	-	2"	ew (VA)
SDNW16-AC-19	4	19.5	21.0	71	70	0.96	i	0.714	1.01	-	-	1½"	none observed
SDNW16-AC-20	5	20.9	22.6	80	79	0.88	i	0.688	0.86	-	-	1½"	none observed
SDNW16-AC-26	10	33.4	35.9	380	376	1.02	i	4.056	1.07	-	-	3"	ew (S)
SDNW16-AC-27	13	34.6	37.5	360	357	0.87	i	3.258	0.91	-	-	2"	ew (C)
SDNW16-AC-37	10	33.0	35.8	365	361	1.02	i	3.655	1.00	-	-	2"	ew (S)
SDNW16-AC-54	9	31.8	34.2	300	298	0.93	i	2.413	0.80	-	-	2"	ew (A)
SDNW16-AC-55	8	32.4	34.5	310	307	0.91	i	2.885	0.93	-	-	2"	ew (A)
SDNW16-AC-56	10	34.0	36.9	380	377	0.97	i	3.332	0.88	-	-	2"	ew (C)
SDNW16-AC-59	10	33.5	36.0	330	327	0.88	i	3.277	0.99	-	-	2"	ew (C)
SDNW16-AC-63	10	40.9	43.8	650	642	0.95	i	7.540	1.16	-	-	2"	ew (S)
SDNW16-AC-68	5	18.8	20.4	66	65	0.99	i	0.680	1.03	-	-	1½"	tape worms (S)
SDNW16-AC-73	15	34.6	38.0	445	442	1.07	i	3.221	0.72	-	-	2"	ew (C)
SDNW16-AC-74	13	30.8	33.4	320	303	1.10	M	2.609	0.82	14.412	4.757	2"	ew (S)
Adult Non-Spawner Statistics	Average	9.6	31.0	33.5	323	320	0.96	-	3.182	0.97	-	-	-
	St. deviation	3.6	6.8	7.3	168	166	0.06	-	1.944	0.14	-	-	-
	Minimum	4	18.8	20.4	66	65	0.87	-	0.680	0.72	-	-	-
	Maximum	16	40.9	43.8	650	642	1.07	-	7.540	1.22	-	-	-
	Sample Size (N)	13	13	13	13	13	13	13	13	-	-	-	-

^a - Abnormalities include encysted worms (ew) in body cavity; letter in parentheses indicates Scarce (1-5), Common (6-15), Abundant (16-50) and Very Abundant (>50) observation.

Sex - Male (M), Indeterminate (i)

Table G.24: Results of health endpoint statistical comparisons for (adult) Arctic charr captured at Sheardown Lake NW littoral/profundal areas in 2016 and during the mine baseline period, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Data Sets (p-value)		Power
	Parameter	Covariate	Baseline	2016	Baseline		2016					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	118	91	-	-	-	-	K-S Test	Yes	0.001	-
	Log ₁₀ Age (years)	none	30	14	-	-	-	-	ANOVA	Yes	0.016	0.797
Energy Use	Log ₁₀ Body Weight (g)	none	118	91	-	-	-	-	ANOVA	Yes	0.001	0.948
	Log ₁₀ Fork Length (cm)	none	118	91	-	-	-	-	ANOVA	Yes	0.000	0.995
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years)	30	14	0.680	0.000	0.790	0.000	ANCOVA	No	0.153	-
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years)	30	14	0.717	0.000	0.756	0.000	ANCOVA	No	0.500	-
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	118	91	0.965	0.000	0.991	0.000	ANCOVA	Yes	0.000	1.000

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Baseline	2016	Statistic	Baseline	2016		Increase	Decrease
Survival	Age (years)	none	30	14	Mean	12.7	9.2	-27.7	-	-
Energy Use	Body Weight (g)	none	118	91	Mean	411.8	284.7	-30.9	-	-
	Fork Length (cm)	none	118	91	Mean	36.2	31.0	-14.5	-	-
	Body Weight (g)	Age (years)	30	14	Adjusted Mean	308.5	377.1	-	50.0	-33.3
	Fork Length (cm)	Age (years)	30	14	Adjusted Mean	330.7	338.2	-	14.0	-12.3
Energy Storage	Body Weight (g)	Fork Length (cm)	118	91	Adjusted Mean	336.1	373.3	11.1	-	-

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the t^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

Table G.25: Arctic charr measurements from fish captured at Sheardown Lake SE by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE16-ACJ-01	7.6	8.1	3.853	0	0.878
SDSE16-ACJ-02	11.3	12.1	12.118	2	0.840
SDSE16-ACJ-03*	4.7	4.9	0.556	0	0.536
SDSE16-ACJ-04	4.9	5.2	1.096	0	0.932
SDSE16-ACJ-05	3.9	4.1	0.443	0	0.747
SDSE16-ACJ-06	7.0	7.5	2.897	1	0.845
SDSE16-ACJ-07	9.6	10.1	8.764	2	0.991
SDSE16-ACJ-08	6.2	6.5	1.930	1	0.810
SDSE16-ACJ-09	8.1	8.6	4.192	1	0.789
SDSE16-ACJ-10	5.0	5.2	1.112	0	0.890
SDSE16-ACJ-11	7.9	8.3	4.473	-	0.907
SDSE16-ACJ-12	7.3	7.8	3.083	-	0.793
SDSE16-ACJ-13	7.4	7.9	3.612	-	0.891
SDSE16-ACJ-14	8.4	9.0	5.529	-	0.933
SDSE16-ACJ-15	7.9	8.6	4.682	-	0.950
SDSE16-ACJ-16	4.6	4.9	0.933	-	0.959
SDSE16-ACJ-17	4.7	5.0	0.900	-	0.867
SDSE16-ACJ-18	4.3	4.5	0.692	-	0.870
SDSE16-ACJ-19	4.6	4.9	0.832	-	0.855
SDSE16-ACJ-20	4.4	4.6	0.654	-	0.768
SDSE16-ACJ-21	4.9	5.2	1.074	-	0.913
SDSE16-ACJ-22	4.6	4.8	0.717	-	0.737
SDSE16-ACJ-23	5.1	5.4	1.059	-	0.798
SDSE16-ACJ-24	4.2	4.4	0.689	-	0.930
SDSE16-ACJ-25	8.6	9.1	5.123	-	0.805
SDSE16-ACJ-26	4.0	4.2	0.536	-	0.838
SDSE16-ACJ-27	4.6	4.8	0.963	-	0.989
SDSE16-ACJ-28	8.1	8.5	4.410	-	0.830
SDSE16-ACJ-29	4.8	5.1	0.919	-	0.831
SDSE16-ACJ-30	4.5	4.8	0.831	-	0.912
SDSE16-ACJ-31	4.4	4.6	0.747	-	0.877
SDSE16-ACJ-32	4.3	4.5	0.712	-	0.896
SDSE16-ACJ-33	5.0	5.2	1.110	-	0.888
SDSE16-ACJ-34	4.2	4.4	0.643	-	0.868
SDSE16-ACJ-35	4.2	4.4	0.593	-	0.800
SDSE16-ACJ-36	8.0	8.4	4.859	-	0.949
SDSE16-ACJ-37	7.3	7.8	3.733	-	0.960
SDSE16-ACJ-38	4.5	4.7	0.831	-	0.912
SDSE16-ACJ-39	4.4	4.6	0.734	-	0.862
SDSE16-ACJ-40	4.4	4.6	0.776	-	0.911
SDSE16-ACJ-41	4.0	4.2	0.475	-	0.742
SDSE16-ACJ-42	6.5	7.0	2.414	-	0.879
SDSE16-ACJ-43	4.3	4.5	0.660	-	0.830
SDSE16-ACJ-44	7.3	7.7	3.323	-	0.854
SDSE16-ACJ-45	7.2	7.6	3.026	-	0.811
SDSE16-ACJ-46	6.9	7.4	3.263	-	0.993
SDSE16-ACJ-47	7.2	7.7	3.744	-	1.003
SDSE16-ACJ-48	4.8	4.9	0.959	-	0.867
SDSE16-ACJ-49	7.8	8.3	4.482	-	0.944
SDSE16-ACJ-50	4.7	4.9	1.026	-	0.988
SDSE16-ACJ-51	7.9	8.4	5.024	-	1.019
SDSE16-ACJ-52	7.9	8.5	4.188	-	0.849
SDSE16-ACJ-53	7.8	8.2	4.076	-	0.859
SDSE16-ACJ-54	4.6	4.8	0.770	-	0.791
SDSE16-ACJ-55	7.3	7.8	3.810	-	0.979
SDSE16-ACJ-56	4.5	4.7	0.682	-	0.748
SDSE16-ACJ-57	5.0	5.2	1.184	-	0.947
SDSE16-ACJ-58	7.0	7.4	3.003	-	0.876
SDSE16-ACJ-59	4.5	4.7	0.871	-	0.956

Table G.25: Arctic charr measurements from fish captured at Sheardown Lake SE by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE16-ACJ-60		4.5	4.7	0.792	-	0.869
SDSE16-ACJ-61		4.0	4.2	0.604	-	0.944
SDSE16-ACJ-62		4.5	4.7	0.772	-	0.847
SDSE16-ACJ-63		7.1	7.5	3.292	-	0.920
SDSE16-ACJ-64		4.4	4.6	0.813	-	0.954
SDSE16-ACJ-65		4.7	4.9	0.871	-	0.839
SDSE16-ACJ-66		4.2	4.3	0.631	-	0.852
SDSE16-ACJ-67		4.4	4.6	0.648	-	0.761
SDSE16-ACJ-68		4.2	4.4	0.651	-	0.879
SDSE16-ACJ-69		7.5	8.0	3.677	-	0.872
SDSE16-ACJ-70		4.7	4.9	0.803	-	0.773
SDSE16-ACJ-71		4.0	4.2	0.446	-	0.697
SDSE16-ACJ-72		3.8	4.0	0.409	-	0.745
SDSE16-ACJ-73		7.8	8.3	4.247	-	0.895
SDSE16-ACJ-74		4.5	4.7	0.786	-	0.863
SDSE16-ACJ-75		4.0	4.2	0.574	-	0.897
SDSE16-ACJ-76		4.7	4.9	0.887	-	0.854
SDSE16-ACJ-77		5.0	5.3	1.169	-	0.935
SDSE16-ACJ-78		4.0	4.2	0.432	-	0.675
SDSE16-ACJ-79		8.3	8.8	5.124	-	0.896
SDSE16-ACJ-80		4.4	4.6	0.763	-	0.896
SDSE16-ACJ-81		6.9	7.3	2.885	-	0.878
SDSE16-ACJ-82		6.5	6.9	2.195	-	0.799
SDSE16-ACJ-83		5.0	5.3	1.182	-	0.946
SDSE16-ACJ-84		4.3	4.5	0.602	-	0.757
SDSE16-ACJ-85		4.5	4.4	0.638	-	0.700
SDSE16-ACJ-86		4.3	4.5	0.606	-	0.762
SDSE16-ACJ-87		4.5	4.7	0.810	-	0.889
SDSE16-ACJ-88		7.5	8.0	3.744	-	0.887
SDSE16-ACJ-89		4.7	5.0	0.929	-	0.895
SDSE16-ACJ-90		7.2	7.6	2.874	-	0.770
SDSE16-ACJ-91		4.0	4.2	0.539	-	0.842
SDSE16-ACJ-92		4.4	4.6	0.771	-	0.905
SDSE16-ACJ-93		5.0	5.3	1.198	-	0.958
SDSE16-ACJ-94		4.9	5.1	1.038	-	0.882
SDSE16-ACJ-95		4.3	4.5	0.671	-	0.844
SDSE16-ACJ-96		4.3	4.5	0.693	-	0.872
SDSE16-ACJ-97		7.4	7.9	3.998	-	0.987
SDSE16-ACJ-98		4.1	4.2	0.586	-	0.850
SDSE16-ACJ-99		4.3	4.4	0.668	-	0.840
SDSE16-ACJ-100		4.3	4.5	0.656	-	0.825
Overall Catch Summary	total number	100	100	100	10	100
	average	5.6	5.9	1.961	0.7	0.864
	median	4.7	4.9	0.924	1	0.871
	standard deviation	1.6	1.8	1.953	1	0.081
	standard error	0.2	0.2	0.195	0.3	0.008
	minimum	3.8	4.0	0.409	0	0.536
	maximum	11.3	12.1	12.118	2	1.019
Young-of-the-Year Catch Summary	proportion of YOY	64%				
	total number	64	64	64	4	64
	average	4.5	4.7	0.771	0	0.852
	median	4.5	4.6	0.755	0	0.867
	standard deviation	0.3	0.3	0.200	0.0	0.084
	standard error	0.0	0.0	0.025	0.0	0.011
	minimum	3.8	4.0	0.409	0	0.536
	maximum	5.0	5.3	1.198	0	0.989

* Initial screening indicated sample was an outlier, and therefore the sample was removed from all subsequent statistical analysis data sets.

Table G.26: Results of health endpoint statistical comparisons for nearshore (non-YOY) Arctic charr captured between mine-exposed Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2016.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Ref	Exp	Reference		Exposed					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	99	100	-	-	-	-	K-S Test	Yes	0.000	-
	Log ₁₀ Age (years)	none	10	10	-	-	-	-	ANOVA	No	0.374	0.227
Energy Use (non-YOY)	Log ₁₀ Body Weight (g)	none	68	35	-	-	-	-	ANOVA	No	0.951	0.101
	Log ₁₀ Fork Length (cm)	none	68	35	-	-	-	-	ANOVA	No	0.944	0.101
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ¹	9	9	0.980	0.000	0.647	0.009	ANCOVA	Yes	0.003	0.960
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years) ¹	9	10	0.978	0.000	0.698	0.003	ANCOVA	Yes	0.001	0.994
Energy Storage (non-YOY)	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	68	35	0.985	0.000	0.951	0.000	ANCOVA	No	0.329	0.256

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Ref	Exp	Statistic	Ref	Exp		Increase	Decrease
Survival	Age (years)	none	10	10	Mean	0.9	0.6	-32.4	297.4	-74.8
Energy Use	Body Weight (g)	none	68	35	Mean	3.862	3.897	-	52	-34
	Fork Length (cm)	none	68	35	Mean	7.6	7.6	-	14.3	-12.5
	Body Weight (g)	Age (years) ¹	9	9	Adjusted Mean	1.839	4.045	120.0	-	-
	Fork Length (cm)	Age (years) ¹	9	10	Adjusted Mean	5.8	7.8	34.1	-	-
Energy Storage	Body Weight (g)	Fork Length (cm)	68	35	Adjusted Mean	3.8	3.9	-	5.7	-5.4

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Studentized outlier REF316-ACJ-8 removed.

Table G.27: Results of health endpoint statistical comparisons for nearshore YOY Arctic charr captured between mine-exposed Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2016.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Ref	Exp	Reference		Exposed					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	31	65	-	-	-	-	K-S Test	Yes	0.000	-
Energy Use	Log ₁₀ Body Weight (g)	none	31	64	-	-	-	-	ANOVA	Yes	0.000	1.000
	Log ₁₀ Fork Length (cm)	none	31	65	-	-	-	-	ANOVA	Yes	0.000	1.000
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ¹	31	64	0.799	0.000	0.905	0.000	ANCOVA	No	0.316	-
	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ²	24	64	0.761	0.000	0.905	0.000	ANCOVA	No	0.273	-

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Ref	Exp	Statistic	Ref	Exp		Increase	Decrease
Energy Use	Body Weight (g)	none	31	64	Mean	0.489	0.753	54.0	-	-
	Fork Length (cm)	none	31	65	Mean	3.9	4.5	14.0	-	-
Energy Storage	Body Weight (g)	Fork Length (cm) ¹	31	64	Adjusted Mean	0.6	0.6	4.4	7.6	-7.0
	Body Weight (g)	Fork Length (cm) ²	24	64	Adjusted Mean	0.7	0.7	4.5	7.0	-6.6

 - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the η^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Slopes not equal, however r^2 of both ANCOVA models (interaction = 0.901, parallel slope = 0.893) using all data was above 0.80 and within 0.20.

Table G.28: Results of health endpoint statistical comparisons for nearshore (juvenile) Arctic charr captured at Sheardown Lake SE in 2016 and during the mine baseline period, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Data Sets (p-value)		Power
	Parameter	Covariate	Baseline	2016	Baseline		2016					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	16	100	-	-	-	-	K-S Test	Yes	0.000	-
Energy Use	Log ₁₀ Body Weight (g)	none	16	99	-	-	-	-	ANOVA	Yes	0.010	0.832
	Log ₁₀ Fork Length (cm)	none	16	100	-	-	-	-	ANOVA	Yes	0.020	0.757
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ¹	16	99	0.811	0.000	0.990	0.000	ANCOVA	Yes	0.029	0.712
	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ²	14	11	0.705	0.000	0.811	0.000	ANCOVA	Yes	0.008	0.878

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Baseline	2016	Statistic	Baseline	2016		Increase	Decrease
Energy Use	Body Weight (g)	none	16	99	Mean	2.371	1.347	-43.2	-	-
	Fork Length (cm)	none	16	100	Mean	6.3	5.4	-14.8	-	-
Energy Storage	Body Weight (g)	Fork Length (cm) ¹	16	99	Adjusted Mean	1.207	1.396	15.7	-	-
	Body Weight (g)	Fork Length (cm) ²	14	11	Adjusted Mean	2.967	2.487	-16.2	-	-

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Poor overlap of covariate values between areas.

² Comparison using fish with fork length between 5.7 and 7.3 cm to satisfy statistical assumption of covariate overlap.

Table G.29: Sample sizes required to detect differences in Arctic charr non-lethal population endpoints for nearshore and littoral/profundal populations at Sheardown Lake SE compared to Reference Lake 3 or Sheardown Lake SE baseline data, as appropriate, with power at 0.90 and alpha = 0.10 using the 2016 data. Highlighted values indicate sample sizes sufficient to meet CES used for EEM studies.

Mine Lake	Endpoint		Model ^a	Minimum Sample Size (Increase ^b / Decrease ^c)							
	Parameter	Covariate		i=5%	i=10%	i=20%	i=25%	i=30%	i=40%	i=50%	i=100%
				d=4%	d=9%	d=17%	d=20	d=23%	d=29%	d=33%	d=50%
Nearshore Electrofishing: Sheardown Lake SE versus Reference Lake 3	Body Weight	none	ANOVA	-	-	-	-	-	-	-	-
	Fork Length	none	ANOVA	-	-	-	-	-	-	-	-
	Body Weight	Age	ANCOVA	1,713	450	124	83	60	37	26	10
	Fork Length	Age	ANCOVA	167	45	13	9	7	5	4	2
	Body Weight	Fork Length	All - ANCOVA	82	22	7	5	4	3	2	2
	Body Weight	Fork Length	YOY Only ANCOVA	103	28	8	6	5	3	3	2
	Body Weight	Fork Length	Non-YOY Only ANCOVA	66	18	6	4	3	3	2	1
Nearshore Electrofishing: Sheardown Lake SE versus Baseline	Body Weight	none	ANOVA	4,599	1,207	331	221	160	98	68	24
	Fork Length	none	ANOVA	463	122	34	23	17	11	8	3
	Body Weight	Fork Length	ANCOVA	93	25	8	6	4	3	3	2
Littoral / Profundal Gill Netting: Sheardown Lake SE versus Baseline	Body Weight	none	ANOVA	1,265	333	92	62	45	28	20	7
	Fork Length	none	ANOVA	134	36	11	8	6	4	3	2
	Body Weight	Age	ANCOVA	340	90	25	17	13	8	6	3
	Fork Length	Age	ANCOVA	39	11	4	3	2	2	2	1
	Body Weight	Fork Length	ANCOVA	73	20	6	5	4	3	2	2

^a Statistical tests include Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), Mann-Whitney U-Test (MW U-test) and Kolmogorov-Smirnov test (K-S Test).

^b Increase relative to reference mean using log transformed data

^c Decrease relative to reference mean using log transformed data

Table G.30: Arctic charr measurements from fish captured at Sheardown Lake SE by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE16-AC-01	3"	38.2	41.6	470	14	0.843
SDSE16-AC-02	2"	37.5	40.4	450	-	0.853
SDSE16-AC-03	2"	35.0	38.3	460	-	1.073
SDSE16-AC-04	2"	53.1	56.3	1,200	-	0.801
SDSE16-AC-05	2"	33.2	35.9	380	-	1.038
SDSE16-AC-06	2"	33.3	36.7	365	-	0.988
SDSE16-AC-07	2"	35.1	37.7	485	-	1.122
SDSE16-AC-08	1½"	38.0	40.7	550	-	1.002
SDSE16-AC-09	1½"	39.1	42.3	530	-	0.887
SDSE16-AC-10	1½"	36.2	39.6	430	-	0.906
SDSE16-AC-11	1½"	35.2	38.2	430	-	0.986
SDSE16-AC-12	1½"	35.9	39.2	460	-	0.994
SDSE16-AC-13	3"	34.5	37.7	500	13	1.218
SDSE16-AC-14	2"	34.9	37.6	430	16	1.012
SDSE16-AC-15	2"	32.7	35.2	380	12	1.087
SDSE16-AC-16	3"	38.0	41.2	540	-	0.984
SDSE16-AC-17	1½"	35.2	38.1	415	-	0.952
SDSE16-AC-18	1½"	34.5	38.2	395	-	0.962
SDSE16-AC-19	1½"	36.8	40.1	440	-	0.883
SDSE16-AC-20	1½"	40.4	44.1	665	-	1.009
SDSE16-AC-21	2"	36.1	39.2	470	-	0.999
SDSE16-AC-22	3"	36.4	39.3	530	-	1.099
SDSE16-AC-23	3"	32.9	35.4	385	-	1.081
SDSE16-AC-24	3"	35.3	38.5	430	-	0.978
SDSE16-AC-25	3"	34.0	37.1	405	-	1.030
SDSE16-AC-26	3"	37.7	40.5	530	-	0.989
SDSE16-AC-27	1½"	24.1	25.9	122	-	0.872
SDSE16-AC-28	3"	37.0	40.1	520	-	1.027
SDSE16-AC-29	1½"	24.4	26.3	134	-	0.922
SDSE16-AC-30	3"	38.5	41.2	570	-	0.999
SDSE16-AC-31	3"	40.4	44.1	660	-	1.001
SDSE16-AC-32	1½"	23.5	25.4	120	-	0.925
SDSE16-AC-33	1½"	23.0	25.0	113	-	0.929
SDSE16-AC-34	3"	39.5	42.2	605	-	0.982
SDSE16-AC-35	3"	38.2	41.3	555	-	0.996
SDSE16-AC-36	3"	42.2	45.1	745	-	0.991
SDSE16-AC-37	3"	39.1	42.2	570	-	0.954
SDSE16-AC-38	3"	38.5	41.5	650	-	1.139
SDSE16-AC-39	3"	39.1	42.2	535	-	0.895
SDSE16-AC-40	1½"	21.9	23.7	113	-	1.076
SDSE16-AC-41	1½"	19.2	20.8	67	-	0.947
SDSE16-AC-42	2"	34.9	37.7	370	15	0.870
SDSE16-AC-43	1½"	22.5	24.6	124	4	1.089
SDSE16-AC-44	2"	34.3	37.2	470	11	1.165
SDSE16-AC-45	2"	37.3	40.5	510	17	0.983
SDSE16-AC-46	1½"	36.1	39.2	545	14	1.158
SDSE16-AC-47	3"	41.7	44.5	770	-	1.062
SDSE16-AC-48	3"	39.9	43.0	645	-	1.015
SDSE16-AC-49	3"	41.1	44.5	640	-	0.922
SDSE16-AC-50	3"	35.2	38.1	460	-	1.055
SDSE16-AC-51	2"	35.0	37.6	440	-	1.026
SDSE16-AC-52	2"	29.7	31.8	262	-	1.000
SDSE16-AC-53	3"	36.4	39.7	510	-	1.057
SDSE16-AC-54	3"	32.2	34.1	272	8	0.815
SDSE16-AC-55	3"	36.1	39.2	520	-	1.105
SDSE16-AC-56	3"	35.6	38.9	490	-	1.086

Table G.30: Arctic charr measurements from fish captured at Sheardown Lake SE by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor (K)
SDSE16-AC-57	3"	33.1	36.7	375	13	1.034
SDSE16-AC-58	2"	33.3	36.1	345	12	0.934
SDSE16-AC-59	2"	35.5	38.6	500	12	1.118
SDSE16-AC-60	2"	38.5	42.3	655	13	1.148
SDSE16-AC-61	3"	38.5	40.6	540	-	0.946
SDSE16-AC-62	3"	38.5	41.8	625	-	1.095
SDSE16-AC-63	3"	34.1	37.1	420	-	1.059
SDSE16-AC-64	3"	40.2	43.5	500	-	0.770
SDSE16-AC-65	3"	38.5	41.8	550	-	0.964
SDSE16-AC-66	3"	38.5	42.2	520	-	0.911
SDSE16-AC-67	2"	40.5	43.5	585	-	0.881
SDSE16-AC-68	1½"	35.3	38.5	390	-	0.887
SDSE16-AC-69	1½"	17.5	18.9	53	-	0.989
SDSE16-AC-70	2"	41.1	44.3	705	-	1.015
SDSE16-AC-71	2"	40.2	43.6	555	-	0.854
SDSE16-AC-72	2"	32.8	35.2	380	-	1.077
SDSE16-AC-73	2"	39.7	43.1	590	19	0.943
SDSE16-AC-74	2"	40.8	44.1	660	13	0.972
SDSE16-AC-75	2"	34.2	36.9	435	10	1.087
SDSE16-AC-76	2"	36.1	39.3	435	14	0.925
SDSE16-AC-77	2"	41.8	44.9	710	15	0.972
SDSE16-AC-78*	1½"	27.4	29.8	126	7	0.613
SDSE16-AC-79	3"	39.2	43.1	550	23	0.913
SDSE16-AC-80	2"	34.0	37.0	400	9	1.018
SDSE16-AC-81	2"	36.5	39.6	430	14	0.884
SDSE16-AC-82	2"	40.0	43.5	615	15	0.961
SDSE16-AC-83	2"	34.2	37.4	370	11	0.925
Overall Catch Summary	total number	83	83	83	25	83
	average	35.5	38.4	468	13.0	0.985
	median	36.1	39.2	470	13.0	0.989
	standard deviation	5.6	6.0	179	3.8	0.098
	standard error	0.6	0.7	19.66	0.8	0.011
	minimum	17.5	18.9	53	4.0	0.613
	maximum	53.1	56.3	1,200	23.0	1.218

* Initial screening indicated sample was an outlier, and therefore the sample was removed from all subsequent statistical analysis data sets.

Table G.31: Results of health endpoint statistical comparisons for (adult) Arctic charr captured at Sheardown Lake SE littoral/profundal areas in 2016 and during the mine baseline period, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Data Sets (p-value)		Power
	Parameter	Covariate	Baseline	2016	Baseline		2016					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	89	82	-	-	-	-	K-S Test	Yes	0.000	-
	Log ₁₀ Age (years)	none	9	23	-	-	-	-	ANOVA	No	0.885	-
Energy Use	Log ₁₀ Body Weight (g)	none	89	82	-	-	-	-	ANOVA	Yes	0.001	0.964
	Log ₁₀ Fork Length (cm)	none	89	82	-	-	-	-	ANOVA	Yes	0.000	0.974
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ¹	9	22	0.418	0.060	0.317	0.006	ANCOVA	Yes	0.011	0.842
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years) ¹	9	22	0.323	0.111	0.401	0.002	ANCOVA	No	0.218	-
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ^{2,3}	89	82	0.848	0.000	0.971	0.000	ANCOVA	No	0.840	-

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Baseline	2016	Statistic	Baseline	2016		Increase	Decrease
Survival	Age (years)	none	9	23	Mean	12.9	12.7	-	41.1	-29.1
Energy Use	Body Weight (g)	none	89	82	Mean	531.1	425.5	-19.9	-	-
	Fork Length (cm)	none	89	82	Mean	37.8	35.1	-7.2	-	-
	Body Weight (g)	Age (years) ¹	9	22	Adjusted Mean	371.6	463.5	24.7	-	-
	Fork Length (cm)	Age (years) ¹	9	22	Adjusted Mean	348.9	360.8	-	8.1	-7.5
Energy Storage	Body Weight (g)	Fork Length (cm) ^{2,3}	89	82	Adjusted Mean	472.4	477.4	-	4.6	-4.4

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Young (small) Fish (SDSE16-AC-43) removed to satisfy statistical assumption of covariate overlap.

² Poor covariate (length) overlap.

³ Slopes not equal, however r^2 of both ANCOVA models (interaction = 0.948, parallel slope = 0.947) using all data was above 0.80 and within 0.20.

Table G.32: Additional meristics collected from adult Arctic charr incidental mortalities at Sheardown Lake SE in 2016, Mary River Project CREMP, August 2016.

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
SDSE16-AC-42	15	34.9	37.7	370	365	0.870	i	5.375	1.45	-	-	2"	ew (A)
SDSE16-AC-43	4	22.5	24.6	124	122	1.089	i	1.639	1.32	-	-	1½"	none observed
SDSE16-AC-45	17	37.3	40.5	510	503	0.983	i	6.602	1.29	-	-	2"	ew (C)
SDSE16-AC-46	14	36.1	39.2	545	538	1.158	i	6.721	1.23	-	-	1½"	ew (C)
SDSE16-AC-54	8	32.2	34.1	272	270	0.815	i	2.082	0.77	-	-	3"	ew (S)
SDSE16-AC-57	13	33.1	36.7	375	372	1.034	i	3.257	0.87	-	-	3"	ew (C)
SDSE16-AC-58	12	33.3	36.1	345	341	0.934	i	4.099	1.19	-	-	2"	ew (C)
SDSE16-AC-60	13	38.5	42.3	655	648	1.148	i	6.832	1.04	-	-	2"	is (S)
SDSE16-AC-74	13	40.8	44.1	660	651	0.972	i	8.836	1.34	-	-	2"	ew (C)
SDSE16-AC-75	10	34.2	36.9	435	430	1.087	i	4.745	1.09	-	-	2"	ew (C)
SDSE16-AC-80	9	34.0	37.0	400	396	1.018	i	3.526	0.88	-	-	2"	ew (C)
SDSE16-AC-82	15	40.0	43.5	615	610	0.961	i	5.022	0.82	-	-	2"	ew (A)
SDSE16-AC-83	11	34.2	37.4	370	366	0.925	i	3.684	1.00	-	-	2"	ew (A)
SDSE16-AC-01	14	38.2	41.6	470	462	0.843	F	4.468	0.95	3.676	0.782	3"	ew (VA)
SDSE16-AC-13	13	34.5	37.7	500	451	1.218	F	6.763	1.35	42.34	8.468	3"	ew (C)
SDSE16-AC-14	16	34.9	37.6	430	422	1.012	F	4.453	1.04	3.273	0.761	2"	ew (A)
SDSE16-AC-15	12	32.7	35.2	380	336	1.087	F	7.718	2.03	36.747	9.670	2"	ew (C)
SDSE16-AC-59	12	35.5	38.6	500	487	1.118	F	7.729	1.55	5.038	1.008	2"	ew (C)
SDSE16-AC-76	14	36.1	39.3	435	427	0.925	F	3.833	0.88	3.707	0.852	2"	ew (A)
SDSE16-AC-79	23	39.2	43.1	550	539	0.913	F	5.882	1.07	5.229	0.951	3"	ew (C)
SDSE16-AC-81	14	36.5	39.6	430	423	0.884	F	4.437	1.03	2.226	0.518	2"	ew (VA)
SDSE16-AC-73	19	39.7	43.1	590	571	0.943	M	4.907	0.83	14.036	2.379	2"	ew (A)
SDSE16-AC-77	15	41.8	44.9	710	688	0.972	M	8.405	1.18	13.945	1.964	2"	ew (C)
Adult Non-Spawner Statistics	Average	11.8	34.7	37.7	437	432	1.00	-	4.802	1.10	-	-	-
	St. deviation	3.5	4.6	5.0	156	155	0.10	-	2.059	0.22	-	-	-
	Minimum	4	22.5	24.6	124	122	0.81	-	1.639	0.77	-	-	-
	Maximum	17	40.8	44.1	660	651	1.16	-	8.836	1.45	-	-	-
	Sample Size (N)	13	13	13	13	13	13	13	13	-	-	-	-
Females Statistics	Average	14.8	36.0	39.1	462	443	1.00	-	5.660	1.24	12.780	2.876	-
	St. deviation	3.6	2.1	2.5	54	59	0.13	-	1.581	0.39	16.614	3.839	-
	Minimum	12	32.7	35.2	380	336	0.84	-	3.833	0.88	2.226	0.518	-
	Maximum	23	39.2	43.1	550	539	1.22	-	7.729	2.03	42.340	9.670	-
	Sample Size (N)	8	8	8	8	8	8	8	8	8	8	-	-

^a - Abnormalities include encysted worms (ew) 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.33: Arctic charr measurements from fish captured at Mary Lake by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Liver Weight (g)	Age (years)	Fulton's Condition Factor (K)
ML16-ACJ-01	8.5	9.1	4.495	0.053	2	0.732
ML16-ACJ-02	10.9	11.9	12.989	0.182	4	1.003
ML16-ACJ-03	6.5	6.9	2.799	0.048	1	1.019
ML16-ACJ-04	6.6	7.0	2.662	0.034	1	0.926
ML16-ACJ-05	6.2	6.6	2.320	0.047	1	0.973
ML16-ACJ-06	5.0	5.3	1.085	0.014	1	0.868
ML16-ACJ-07	5.4	5.9	1.525	0.036	1	0.968
ML16-ACJ-08	3.5	3.6	0.369	0.009	0	0.861
ML16-ACJ-09	4.5	4.7	0.840	0.018	0	0.922
ML16-ACJ-10	7.7	8.3	3.967	0.052	2	0.869
ML16-ACJ-11	8.1	8.8	4.626	-	-	0.870
ML16-ACJ-12	8.3	8.8	4.254	-	-	0.744
ML16-ACJ-13	8.6	9.2	4.868	-	-	0.765
ML16-ACJ-14	8.2	8.8	4.539	-	-	0.823
ML16-ACJ-15	6.2	6.5	2.347	-	-	0.985
ML16-ACJ-16	6.0	6.4	2.109	-	-	0.976
ML16-ACJ-17	7.1	7.5	3.159	-	-	0.883
ML16-ACJ-18	11.1	12.0	15.206	-	-	1.112
ML16-ACJ-19	8.2	8.9	4.701	-	-	0.853
ML16-ACJ-20	13.6	14.7	25.937	-	-	1.031
ML16-ACJ-21	11.8	12.7	13.345	-	-	0.812
ML16-ACJ-22	9.3	10.1	8.195	-	-	1.019
ML16-ACJ-23	8.3	8.8	4.969	-	-	0.869
ML16-ACJ-24	8.8	9.4	6.157	-	-	0.903
ML16-ACJ-25	9.8	10.8	8.027	-	-	0.853
ML16-ACJ-26	8.2	8.9	4.627	-	-	0.839
ML16-ACJ-27	7.5	8.0	3.804	-	-	0.902
ML16-ACJ-28	8.8	9.6	5.642	-	-	0.828
ML16-ACJ-29	9.2	9.7	7.019	-	-	0.901
ML16-ACJ-30	9.9	10.8	8.944	-	-	0.922
ML16-ACJ-31	7.0	7.5	2.741	-	-	0.799
ML16-ACJ-32	8.6	9.3	5.454	-	-	0.857
ML16-ACJ-33	10.7	11.6	9.901	-	-	0.808
ML16-ACJ-34	12.7	13.8	19.760	-	-	0.965
ML16-ACJ-35	13.0	14.2	20.760	-	-	0.945
ML16-ACJ-36	10.8	11.8	11.388	-	-	0.904
ML16-ACJ-37	7.8	8.4	4.220	-	-	0.889
ML16-ACJ-38	8.4	9.0	5.094	-	-	0.859
ML16-ACJ-39	7.2	7.7	3.254	-	-	0.872
ML16-ACJ-40*	7.2	7.7	19.541	-	-	5.235
ML16-ACJ-41	7.0	7.5	3.187	-	-	0.929
ML16-ACJ-42	7.9	8.4	4.342	-	-	0.881
ML16-ACJ-43	9.4	10.1	7.014	-	-	0.844
ML16-ACJ-44	6.3	6.7	2.190	-	-	0.876
ML16-ACJ-45	6.6	6.9	2.425	-	-	0.843
ML16-ACJ-46	6.9	7.3	3.078	-	-	0.937
ML16-ACJ-47	7.0	7.5	2.778	-	-	0.810
ML16-ACJ-48	6.5	7.0	2.434	-	-	0.886
ML16-ACJ-49	8.8	9.5	6.155	-	-	0.903
ML16-ACJ-50	6.6	7.1	2.809	-	-	0.977
ML16-ACJ-51	9.9	10.6	7.730	-	-	0.797
ML16-ACJ-52	8.2	8.8	4.935	-	-	0.895
ML16-ACJ-53	7.0	7.5	2.938	-	-	0.857
ML16-ACJ-54	8.8	9.5	5.687	-	-	0.835
ML16-ACJ-55	6.7	7.4	3.119	-	-	1.037
ML16-ACJ-56	6.7	7.2	2.859	-	-	0.951
ML16-ACJ-57	6.7	7.2	2.501	-	-	0.832
ML16-ACJ-58	6.2	6.7	2.128	-	-	0.893
ML16-ACJ-59	6.2	6.7	2.011	-	-	0.844

Table G.33: Arctic charr measurements from fish captured at Mary Lake by electrofishing, Mary River Project CREMP, August 2016.

Specimen ID		Fork Length (cm)	Total Length (cm)	Body Weight (g)	Liver Weight (g)	Age (years)	Fulton's Condition Factor (K)
ML16-ACJ-60		8.8	9.5	5.009	-	-	0.735
ML16-ACJ-61		10.0	10.8	8.885	-	-	0.889
ML16-ACJ-62		7.2	7.7	3.451	-	-	0.925
ML16-ACJ-63		11.1	11.9	11.497	-	-	0.841
ML16-ACJ-64		7.1	7.6	3.213	-	-	0.898
ML16-ACJ-65		6.3	6.6	2.119	-	-	0.847
ML16-ACJ-66		9.4	10.1	7.504	-	-	0.903
ML16-ACJ-67		6.0	6.4	2.007	-	-	0.929
ML16-ACJ-68		6.6	7.0	2.615	-	-	0.910
ML16-ACJ-69		7.3	7.7	3.481	-	-	0.895
ML16-ACJ-70		7.3	7.2	3.677	-	-	0.945
ML16-ACJ-71		7.0	7.5	2.893	-	-	0.843
ML16-ACJ-72		8.0	8.5	5.392	-	-	1.053
ML16-ACJ-73		5.7	6.1	1.554	-	-	0.839
ML16-ACJ-74		5.2	5.4	1.203	-	-	0.856
ML16-ACJ-75		7.2	7.5	2.899	-	-	0.777
ML16-ACJ-76		8.8	9.4	4.500	-	-	0.660
ML16-ACJ-77		7.3	7.7	2.992	-	-	0.769
ML16-ACJ-78		8.3	8.8	4.163	-	-	0.728
ML16-ACJ-79		5.3	5.5	1.112	-	-	0.747
ML16-ACJ-80		8.5	9.2	5.807	-	-	0.946
ML16-ACJ-81		5.8	6.1	1.612	-	-	0.826
ML16-ACJ-82		9.9	10.6	8.093	-	-	0.834
ML16-ACJ-83		9.2	9.8	4.686	-	-	0.602
ML16-ACJ-84		8.8	9.4	5.393	-	-	0.791
ML16-ACJ-85		12.4	13.4	16.240	-	-	0.852
ML16-ACJ-86		7.4	7.9	3.499	-	-	0.863
ML16-ACJ-87		7.8	8.3	4.005	-	-	0.844
ML16-ACJ-88		8.7	9.6	5.601	-	-	0.851
ML16-ACJ-89		5.7	6.0	1.744	-	-	0.942
ML16-ACJ-90		6.3	6.7	2.149	-	-	0.859
ML16-ACJ-91		5.8	6.2	1.689	-	-	0.866
ML16-ACJ-92		6.9	7.2	2.856	-	-	0.869
ML16-ACJ-93		6.5	7.0	2.290	-	-	0.834
ML16-ACJ-94		6.9	7.5	3.006	-	-	0.915
ML16-ACJ-95		6.2	6.7	2.017	-	-	0.846
ML16-ACJ-96		5.3	5.8	1.732	-	-	1.163
ML16-ACJ-97		4.9	5.1	1.102	-	-	0.937
ML16-ACJ-98		3.5	3.6	0.485	-	-	1.131
ML16-ACJ-99		6.5	7.0	2.349	-	-	0.855
ML16-ACJ-100		9.3	10.1	6.984	-	-	0.868
Overall Catch Summary	total number	100	100	100	10	10	100
	average	7.8	8.3	5.115	0.049	1.3	0.925
	median	7.3	7.7	3.588	0.042	1	0.869
	standard deviation	1.9	2.2	4.579	0.049	1.2	0.444
	standard error	0.2	0.2	0.458	0.016	0.4	0.044
	minimum	3.5	3.6	0.369	0.009	0	0.602
	maximum	13.6	14.7	25.937	0.182	4	5.235
Young-of-the-Year Catch Summary	proportion of YOY	4%					
	total number	4	4	4	2	2	4
	average	4.1	4.3	0.699	0.014	0.0	0.963
	median	4.0	4.2	0.663	0.014	0	0.929
	standard deviation	0.7	0.8	0.335	0.006	0.0	0.117
	standard error	0.4	0.4	0.168	0.005	0.0	0.059
	minimum	3.5	3.6	0.369	0.009	0	0.861
	maximum	4.9	5.1	1.102	0.018	0	1.131

Table G.34: Results of health endpoint statistical comparisons for nearshore (non-YOY) Arctic charr captured between mine-exposed Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Ref	Exp	Reference		Exposed					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	99	99	-	-	-	-	K-S Test	Yes	0.000	-
	Log ₁₀ Age (years)	none	10	10	-	-	-	-	ANOVA	No	0.801	-
Energy Use (non-YOY)	Log ₁₀ Body Weight (g)	none	68	94	-	-	-	-	ANOVA	No	0.610	-
	Log ₁₀ Fork Length (cm)	none	68	94	-	-	-	-	ANOVA	No	0.626	-
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ¹	9	10	0.980	0.000	0.875	0.000	ANCOVA	No	0.219	-
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years) ¹	9	10	0.978	0.000	0.890	0.000	ANCOVA	No	0.117	-
Energy Storage (non-YOY)	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm) ²	68	94	0.985	0.000	0.977	0.000	ANCOVA	No	0.848	-

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}	Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Ref	Exp	Statistic	Ref	Exp		Increase	Decrease
Survival	Age (years)	none	10	10	Mean	0.9	1.0	-	292.6	-74.5
Energy Use (non-YOY)	Body Weight (g)	none	68	94	Mean	3.862	4.099	-	41	-29
	Fork Length (cm)	none	68	94	Mean	7.6	7.8	-	11.8	-10.5
	Body Weight (g)	Age (years) ¹	9	10	Adjusted Mean	1.839	2.187	-	57.6	-36.5
	Fork Length (cm)	Age (years) ¹	9	10	Adjusted Mean	5.8	6.2	-	15.7	-13.6
Energy Storage	Body Weight (g)	Fork Length (cm) ²	68	94	Adjusted Mean	4.0	4.0	-	4.9	-4.6

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: $[(\text{exposed adjusted mean} - \text{reference adjusted mean}) / \text{reference adjusted mean}] \times 100$.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: $[(\text{exposed predicted value} - \text{reference predicted value}) / \text{reference predicted value}] \times 100$.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Studentized outlier REF316-ACJ-8 removed.

² Slopes not equal, however r^2 of both ANCOVA models (interaction = 0.981, parallel slope = 0.981) using all data was above 0.80 and within 0.20.

Table G.35: Sample sizes required to detect differences in Arctic charr non-lethal population endpoints for nearshore and littoral/profundal populations at Mary Lake compared to Reference Lake 3 or Mary Lake baseline data, as appropriate, with power = 0.90 and alpha = 0.10 using the 2016 data. Highlighted values indicate sample sizes sufficient to meet CES used for EEM studies.

Mine Lake	Endpoint		Model ^a	Minimum Sample Size (Increase ^b / Decrease ^c)							
	Parameter	Covariate		i=5%	i=10%	i=20%	i=25%	i=30%	i=40%	i=50%	i=100%
				d=4%	d=9%	d=17%	d=20	d=23%	d=29%	d=33%	d=50%
Nearshore Electrofishing: Mary Lake versus Reference Lake 3	Body Weight	none	ANOVA	7,202	1889	517	346	250	153	106	37
	Fork Length	none	ANOVA	770	203	56	38	28	17	12	5
	Body Weight	Age	ANCOVA	632	167	46	31	23	14	10	4
	Fork Length	Age	ANCOVA	66	18	6	4	3	3	2	1
	Body Weight	Fork Length	All - ANCOVA	68	19	6	4	3	3	2	2
	Body Weight	Fork Length	YOY Only ANCOVA	-	-	-	-	-	-	-	-
	Body Weight	Fork Length	Non-YOY Only ANCOVA	48	13	5	3	3	2	2	1
Nearshore Electrofishing: Mary Lake versus 2014 data	Body Weight	none	ANOVA	4,436	1,164	319	213	155	95	66	23
	Fork Length	none	ANOVA	489	129	36	25	18	11	8	4
	Body Weight	Fork Length	ANCOVA	117	32	9	7	5	4	3	2
Littoral / Profundal Gill Netting: Mary Lake versus Baseline	Body Weight	none	ANOVA	3,239	850	233	156	113	69	48	17
	Fork Length	none	ANOVA	382	101	28	19	14	9	7	3
	Body Weight	Age	ANCOVA	1,962	515	142	95	69	42	30	11
	Fork Length	Age	ANCOVA	183	49	14	10	7	5	4	2
	Body Weight	Fork Length	ANCOVA	120	32	10	7	5	4	3	2

^a Statistical tests include Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), Mann-Whitney U-Test (MW U-test) and Kolmogorov-Smirnov test (K-S Test).

^b Increase relative to reference mean using log transformed data

^c Decrease relative to reference mean using log transformed data

Table G.36: Arctic charr measurements from fish captured at Mary Lake by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor
ML16-AC-01	3"	56.0	59.8	1,280	-	0.729
ML16-AC-02	3"	38.2	41.6	560	-	1.005
ML16-AC-03	3"	35.6	39.0	395	-	0.875
ML16-AC-04	3"	38.2	41.3	565	-	1.014
ML16-AC-05	3"	37.2	40.2	485	-	0.942
ML16-AC-06	3"	38.9	42.2	620	-	1.053
ML16-AC-07	2"	38.0	41.2	535	16	0.975
ML16-AC-08	2"	28.9	31.4	210	8	0.870
ML16-AC-09	2"	44.5	48.2	760	-	0.862
ML16-AC-10	2"	40.8	44.7	625	-	0.920
ML16-AC-11	2"	35.5	38.8	440	-	0.983
ML16-AC-12	2"	37.5	40.7	485	-	0.920
ML16-AC-13	2"	37.2	40.2	445	-	0.864
ML16-AC-14	2"	36.1	39.2	465	-	0.988
ML16-AC-15	1½"	38.3	41.5	485	-	0.863
ML16-AC-16	3"	73.0	77.8	> 2,500	-	> 0.64
ML16-AC-17	3"	66.0	71.4	> 2,500	-	> 0.87
ML16-AC-18	3"	33.5	36.4	355	-	0.944
ML16-AC-19	3"	67.6	72.5	> 2,500	-	> 0.81
ML16-AC-20	3"	68.1	73.0	2,440	-	0.773
ML16-AC-21	3"	41.1	44.4	700	-	1.008
ML16-AC-22	3"	36.5	39.5	460	12	0.946
ML16-AC-23	2"	35.0	37.9	315	-	0.735
ML16-AC-24	2"	25.5	27.8	151	-	0.911
ML16-AC-25	2"	38.1	41.5	560	15	1.013
ML16-AC-26	2"	38.4	41.6	460	19	0.812
ML16-AC-27	2"	35.0	38.0	435	10	1.015
ML16-AC-28	2"	37.8	41.2	565	-	1.046
ML16-AC-29	1½"	40.9	44.1	600	-	0.877
ML16-AC-30	1½"	40.5	43.4	625	-	0.941
ML16-AC-31	3"	60.2	64.3	2,040	21	0.935
ML16-AC-32	3"	38.5	41.7	495	-	0.867
ML16-AC-33	3"	37.7	41.3	535	-	0.998
ML16-AC-34	3"	38.7	35.9	450	-	0.776
ML16-AC-35	3"	34.1	37.2	435	-	1.097
ML16-AC-36	3"	38.7	42.3	510	-	0.880
ML16-AC-37	3"	40.6	44.1	590	-	0.882
ML16-AC-38	1½"	36.5	39.8	465	-	0.956
ML16-AC-39	3"	40.5	44.1	630	19	0.948
ML16-AC-40	3"	38.5	41.8	530	-	0.929
ML16-AC-41	3"	35.8	38.9	470	-	1.024
ML16-AC-42	2"	35.4	38.1	425	9	0.958
ML16-AC-43	2"	33.0	35.6	315	11	0.877
ML16-AC-44	2"	30.4	33.1	245	8	0.872
ML16-AC-45	2"	40.3	44.3	650	-	0.993
ML16-AC-46	2"	38.3	41.6	500	-	0.890
ML16-AC-47	1½"	33.6	36.6	480	10	1.265
ML16-AC-48	1½"	30.2	32.8	360	9	1.307
ML16-AC-49	1½"	30.4	33.0	280	9	0.997
ML16-AC-50	1½"	28.8	31.4	222	7	0.929
ML16-AC-51	1½"	30.6	33.3	276	4	0.963
ML16-AC-52	1½"	30.8	33.7	285	-	0.975
ML16-AC-53	1½"	35.9	39.1	445	-	0.962
ML16-AC-54	2"	39.4	42.5	530	15	0.867
ML16-AC-55	2"	31.7	34.8	294	-	0.923
ML16-AC-56	2"	29.9	32.4	262	-	0.980

Table G.36: Arctic charr measurements from fish captured at Mary Lake by gill netting, Mary River Project CREMP, August 2016.

Specimen ID	Net Mesh Size (inches)	Fork Length (cm)	Total Length (cm)	Body Weight (g)	Age (years)	Fulton's Condition Factor
ML16-AC-57	2"	38.5	42.2	520	15	0.911
ML16-AC-58	2"	33.2	36.3	405	13	1.107
ML16-AC-59	2"	31.5	34.7	295	10	0.944
ML16-AC-60	1½"	35.4	38.5	475	-	1.071
ML16-AC-61	1½"	18.0	19.5	47	-	0.806
ML16-AC-62	3"	40.3	42.9	540	-	0.825
ML16-AC-63	3"	39.9	43.0	590	-	0.929
ML16-AC-64	3"	36.2	39.0	460	-	0.970
ML16-AC-65	3"	39.6	42.7	625	-	1.006
ML16-AC-66	2"	32.6	35.6	345	8	0.996
ML16-AC-67	2"	37.9	41.3	555	14	1.019
ML16-AC-68	2"	31.4	34.0	285	-	0.921
ML16-AC-69	2"	39.2	42.5	540	15	0.896
ML16-AC-70	2"	36.1	38.8	505	13	1.073
ML16-AC-71	2"	37.1	41.0	545	-	1.067
ML16-AC-72	2"	36.1	38.9	450	-	0.957
ML16-AC-73	2"	41.1	44.4	570	-	0.821
ML16-AC-74	1½"	40.1	43.4	475	-	0.737
ML16-AC-75	1½"	36.9	40.1	475	-	0.945
ML16-AC-76	2"	36.7	40.0	490	11	0.991
ML16-AC-77	2"	35.0	38.1	485	11	1.131
ML16-AC-78	2"	28.2	30.3	180	-	0.803
ML16-AC-79	2"	28.8	31.2	204	9	0.854
ML16-AC-80	1½"	28.6	31.2	233	-	0.996
ML16-AC-81	1½"	37.5	40.5	480	-	0.910
ML16-AC-82	1½"	33.3	36.1	365	-	0.988
ML16-AC-83	3"	65.3	70.2	2,490	-	0.894
ML16-AC-84	3"	40.0	44.4	590	-	0.922
ML16-AC-85	3"	40.2	43.9	640	-	0.985
ML16-AC-86	2"	42.9	46.5	675	-	0.855
ML16-AC-87	2"	39.0	42.5	525	-	0.885
ML16-AC-88	2"	37.1	40.6	500	-	0.979
ML16-AC-89	2"	31.8	34.6	325	-	1.011
ML16-AC-90	2"	28.2	31.0	215	-	0.959
ML16-AC-91	1½"	37.1	40.1	460	-	0.901
ML16-AC-92	1½"	27.4	29.7	199	-	0.967
ML16-AC-93	3"	37.8	41.3	545	-	1.009
ML16-AC-94	3"	37.3	40.5	515	-	0.992
ML16-AC-95	3"	40.8	44.6	640	-	0.942
ML16-AC-96	2"	30.9	33.7	258	-	0.874
ML16-AC-97	2"	40.8	44.1	530	-	0.780
Overall Catch Summary	total number	97	97	94	27	97
	average	38.0	41.1	521	11.9	0.9
	median	37.2	40.5	483	11	0.9
	standard deviation	8.9	9.4	369	4.0	0.1
	standard error	0.9	1.0	38.0	0.8	0.0
	minimum	18.0	19.5	47	4	0.6
	maximum	73.0	77.8	2,490	21	1.3

Table G.37: Results of health endpoint statistical comparisons for (adult) Arctic charr captured at Mary Lake littoral/profundal areas in 2016 and during the mine baseline period, Mary River Project CREMP.

a) Statistical results based on log-transformed data

Response	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (p-value)		Power
	Parameter	Covariate	Baseline	2015	Baseline		2015					
					r	p-value	r	p-value				
Survival	Fork Length Distribution	none	161	94	-	-	-	-	K-S Test	Yes	0.000	-
	Log ₁₀ Age (years)	none	84	27	-	-	-	-	ANOVA	Yes	0.022	0.749
Energy Use	Log ₁₀ Body Weight (g)	none	161	94	-	-	-	-	ANOVA	No	0.606	-
	Log ₁₀ Fork Length (cm)	none	161	94	-	-	-	-	ANOVA	No	0.358	-
	Log ₁₀ Body Weight (g)	Log ₁₀ Age (years) ^{2,3}	84	25	0.470	0.000	0.640	0.000	ANCOVA	Yes	0.007	-
	Log ₁₀ Fork Length (cm)	Log ₁₀ Age (years) ^{2,3}	84	25	0.499	0.000	0.774	0.000	ANCOVA	Yes	0.004	-
Energy Storage	Log ₁₀ Adj. Body Weight (g)	Log ₁₀ Fork Length (cm)	161	94	0.964	0.000	0.963	0.000	ANCOVA	Yes	0.044	0.645

b) Results expressed as anti-logged values

Response	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value ^a			Magnitude of Difference (%) ^{b,c}		Minimum Detectable Effect Size (%) ^d	
	Parameter	Covariate	Baseline	2015	Statistic	Baseline	2015			Increase	Decrease
Survival	Age (years)	none	84	27	Mean	13.0	11.2	-13.7		-	-
Energy Use	Body Weight (g)	none	161	94	Mean	472.6	451.8	-		28.2	-22.0
	Fork Length (cm)	none	161	94	Mean	37.4	36.4	-		8.9	-8.2
	Body Weight (g)	Age (years) ^{2,3}	84	25	Predicted Values	1,082.1	651.2	Max overlap	-39.8	-	-
						158.1	284.7	Min overlap	80.1		
	Fork Length (cm)	Age (years) ^{2,3}	84	25	Predicted Values	495.5	409.7	Max overlap	-17.3	-	-
						247.7	305.6	Min overlap	23.4		
Energy Storage	Body Weight (g)	Fork Length (cm)	161	94	Adjusted Mean	459.1	475.0	3.5		-	-

■ - indicates a significant (p < 0.10) difference between areas.

^a The mean and adjusted mean is reported for ANOVAs and ANCOVAs, 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., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

^b ANCOVA: magnitude of difference between antilogged adjusted means for reference and exposed areas calculated as: [(exposed adjusted mean - reference adjusted mean) / reference adjusted mean] x 100.

^c ANCOVA with Interaction: magnitude of difference between predicted minimum and maximum values for reference and exposed areas calculated as: [(exposed predicted value - reference predicted value) / reference predicted value] x 100.

^d Minimum detectable effect size (see methods section of report for formula).

¹ Poor covariate (age) overlap.

² Young (small) Fish (ML16-AC-51) removed to satisfy statistical assumption of covariate overlap.

³ Studentized outlier CL16-AC-83 removed.

Table G.38: Additional meristics collected from Arctic charr incidental mortalities at Mary Lake in 2016, Mary River Project CREMP, August 2016

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
ML16-AC-08		8	28.9	31.4	210	208	0.870	i	2.247	1.07	-	-	2"	ew (S)
ML16-AC-22		12	36.5	39.5	460	455	0.946	i	4.535	0.99	-	-	3"	ew (A)
ML16-AC-25		15	38.1	41.5	560	554	1.013	i	5.716	1.02	-	-	2"	ew (VA)
ML16-AC-31		21	60.2	64.3	2,040	2,019	0.935	i	21.297	1.04	-	-	3"	ew (A)
ML16-AC-39		19	40.5	44.1	630	624	0.948	i	6.382	1.01	-	-	3"	ew (C)
ML16-AC-42		9	35.4	38.1	425	420	0.958	i	4.903	1.15	-	-	2"	ew (S)
ML16-AC-43		11	33.0	35.6	315	313	0.877	i	2.274	0.72	-	-	2"	ew (C)
ML16-AC-44		8	30.4	33.1	245	243	0.872	i	2.256	0.92	-	-	2"	ew (S)
ML16-AC-47		10	33.6	36.6	480	476	1.265	i	4.158	0.87	-	-	1½"	ew (C)
ML16-AC-48		9	30.2	32.8	360	358	1.307	i	2.465	0.68	-	-	1½"	ew (S)
ML16-AC-50		7	28.8	31.4	222	220	0.929	i	2.496	1.12	-	-	1½"	ew (S)
ML16-AC-51		4	30.6	33.3	276	273	0.963	i	2.972	1.08	-	-	1½"	is (C)
ML16-AC-54		15	39.4	42.5	530	524	0.867	i	5.773	1.09	-	-	2"	ew (A)
ML16-AC-57		15	38.5	42.2	520	515	0.911	i	4.820	0.93	-	-	2"	ew (C)
ML16-AC-67		14	37.9	41.3	555	549	1.019	i	5.883	1.06	-	-	2"	ew (VA)
ML16-AC-76		11	36.7	40.0	490	485	0.991	i	5.132	1.05	-	-	2"	ew (C)
ML16-AC-79		9	28.8	31.2	204	202	0.854	i	2.014	0.99	-	-	2"	none observed
ML16-AC-07		16	38.0	41.2	535	477	0.975	F	9.677	1.81	48.548	9.074	2"	ew (C)
ML16-AC-26		19	38.4	41.6	460	452	0.812	F	4.751	1.03	3.179	0.691	2"	ew (C)
ML16-AC-27		10	35.0	38.0	435	429	1.015	F	3.049	0.70	3.124	0.718	2"	none observed
ML16-AC-49		9	30.4	33.0	280	276	0.997	F	2.722	0.97	1.012	0.361	1½"	ew (C)
ML16-AC-58		13	33.2	36.3	405	397	1.107	F	3.947	0.97	3.830	0.946	2"	ew (VA)
ML16-AC-59		10	31.5	34.7	295	291	0.944	F	2.675	0.91	1.445	0.490	2"	ew (A)
ML16-AC-66		8	32.6	35.6	345	340	0.996	F	3.908	1.13	0.852	0.247	2"	ew (C) + liver parasite
ML16-AC-69		15	39.2	42.5	540	531	0.896	F	4.506	0.83	4.505	0.834	2"	none observed
ML16-AC-70		13	36.1	38.8	505	441	1.073	F	9.082	1.80	54.793	10.850	2"	none observed
ML16-AC-77		11	35.0	38.1	485	478	1.131	F	4.181	0.86	2.546	0.525	2"	ew (VA)
Adult Non-Spawner Statistics	Average	11.6	35.7	38.8	501	496	0.972	-	5.019	0.99	-	-	-	-
	St. deviation	4.4	7.5	7.9	420	416	0.129	-	4.463	0.13	-	-	-	-
	Minimum	4	28.8	31.2	204	202	0.854	-	2.014	0.68	-	-	-	-
	Maximum	21	60.2	64.3	2,040	2019	1.307	-	21.297	1.15	-	-	-	-
	Sample Size (N)	17	17	17	17	17	17	17	17	17	-	-	-	-
Females Statistics	Average	12.4	34.9	38.0	429	411	0.995	-	4.850	1.10	12.383	2.474	-	-
	St. deviation	3.5	3.0	3.1	95	84	0.096	-	2.494	0.39	20.792	3.974	-	-
	Minimum	8	30.4	33.0	280	276	0.812	-	2.675	0.70	0.852	0.247	-	-
	Maximum	19	39.2	42.5	540	531	1.131	-	9.677	1.81	54.793	10.850	-	-
	Sample Size (N)	10	10	10	10	10	10	10	10	10	10	10	-	-

^a - Abnormalities include encysted worms (ew) in body cavity; letter in paraentheses indicates Scarce (1-5), Common (6-15), Abundant (16-50) and Very Abundant (>50) observation.

Sex - Female (F), Indeterminate (i).

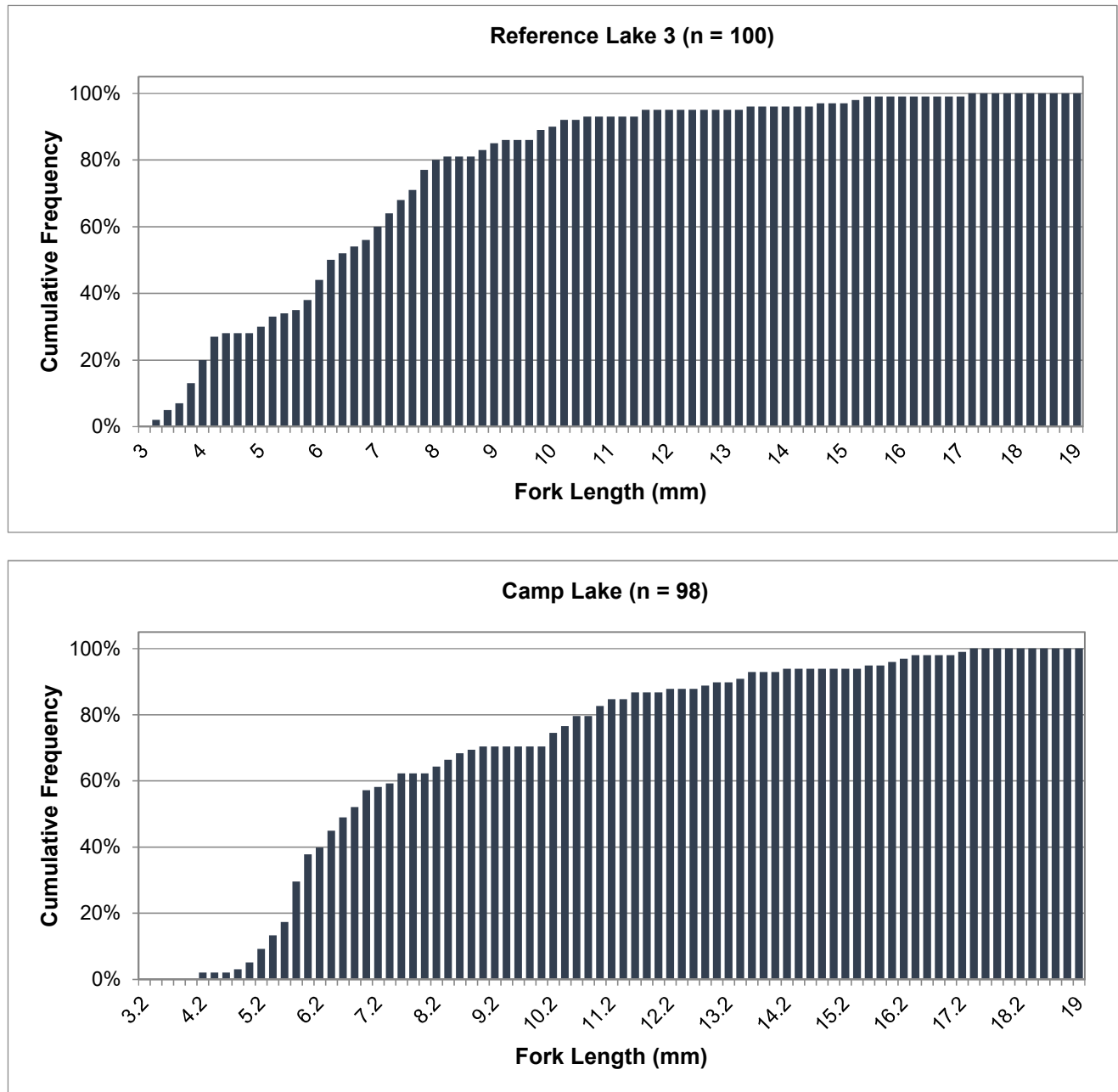


Figure G.1: Cumulative length-frequency distributions for juvenile Arctic charr captured by electrofishing at nearshore areas of Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

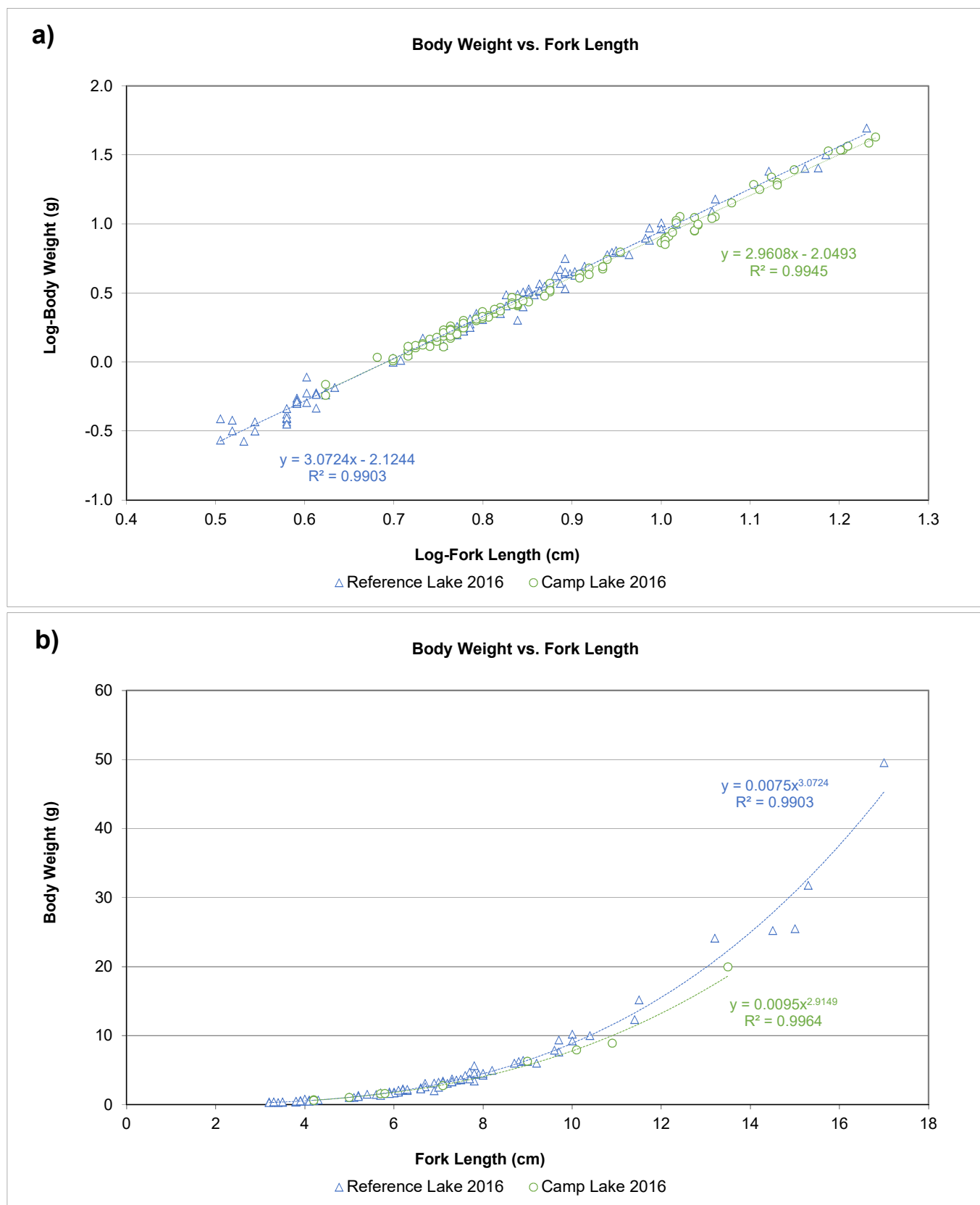


Figure G.2: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected at the nearshore area of Camp Lake and Reference Lake 3 in August 2016 using log-transformed (a) and untransformed (b) data, Mary River Project CREMP, 2016.

a)



b)

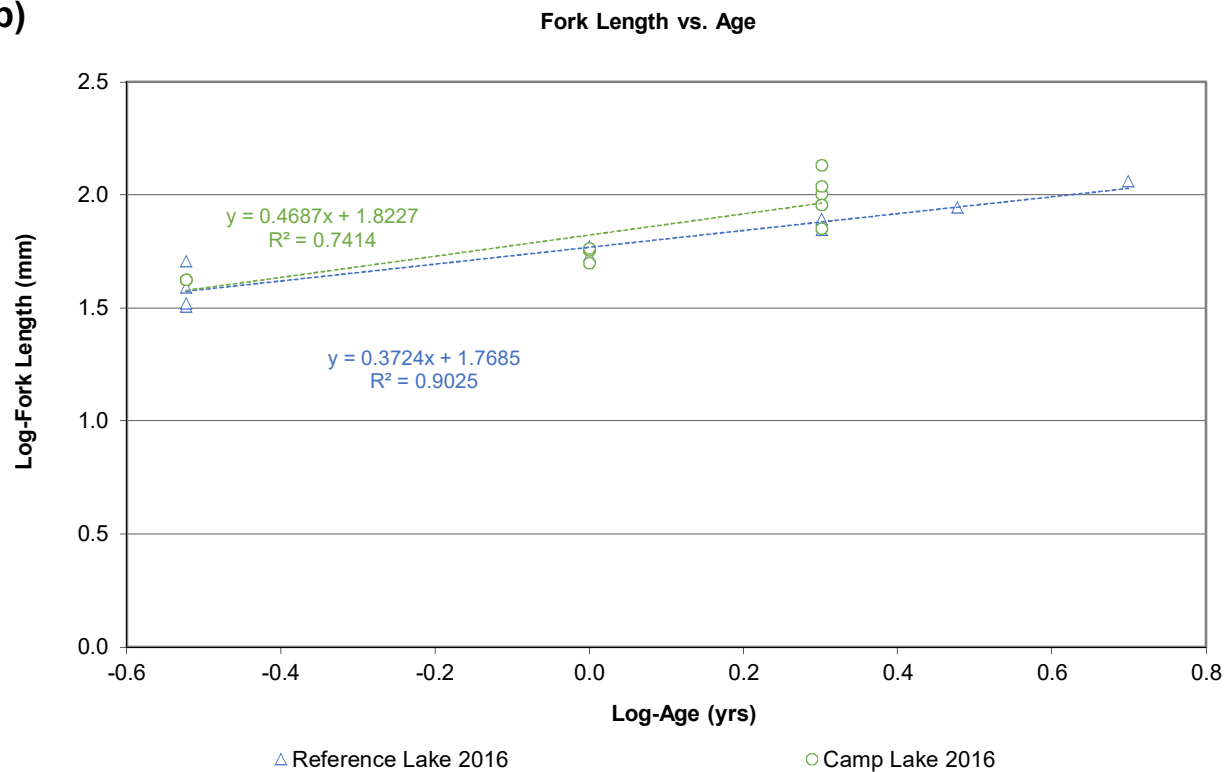


Figure G.3: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected at the nearshore area of Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

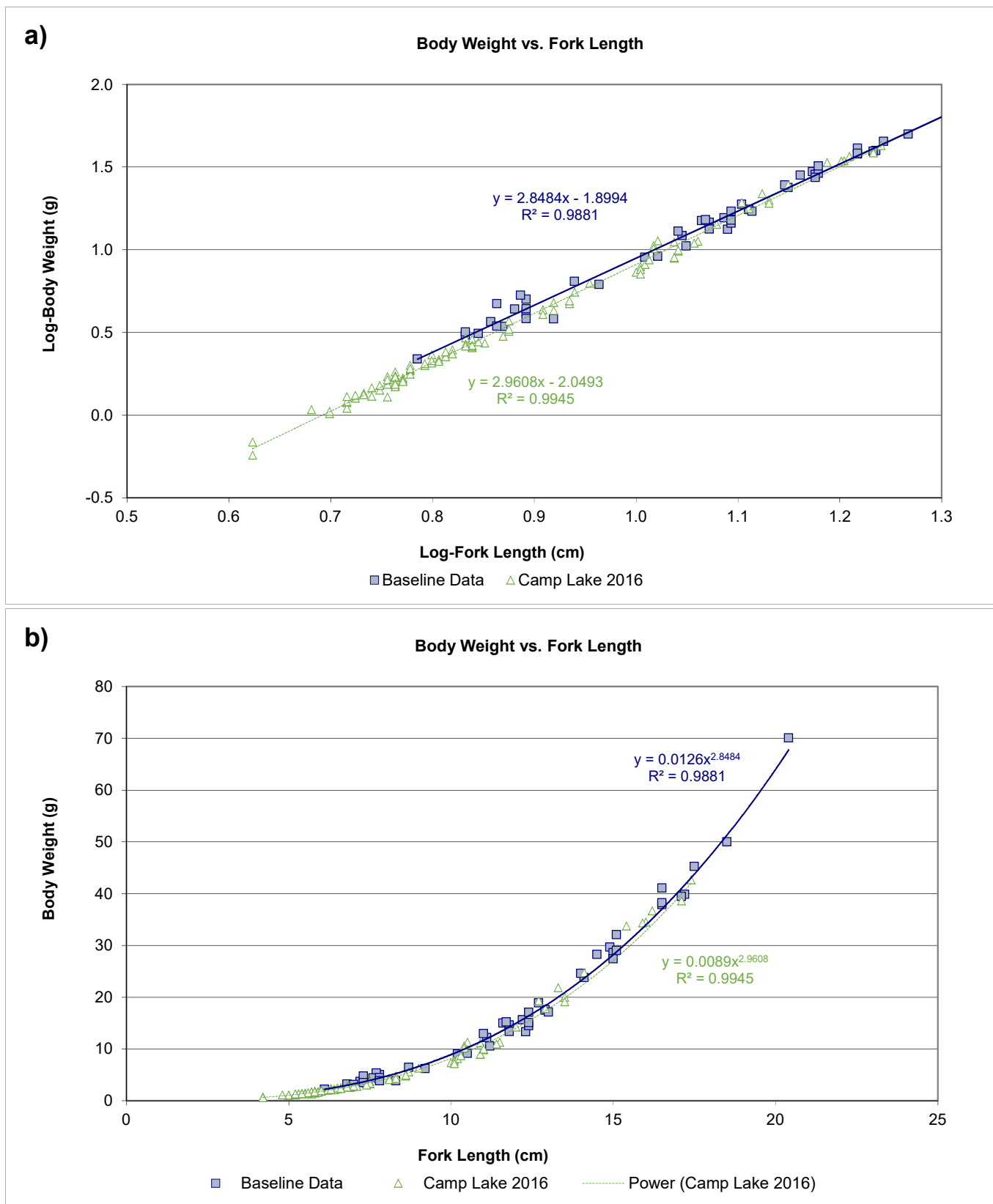


Figure G.4: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected in fall (August-September) at Camp Lake nearshore areas in 2016 and during the mine baseline period (2013) using log-transformed (a) and untransformed (b) data, Mary River Project CREMP.

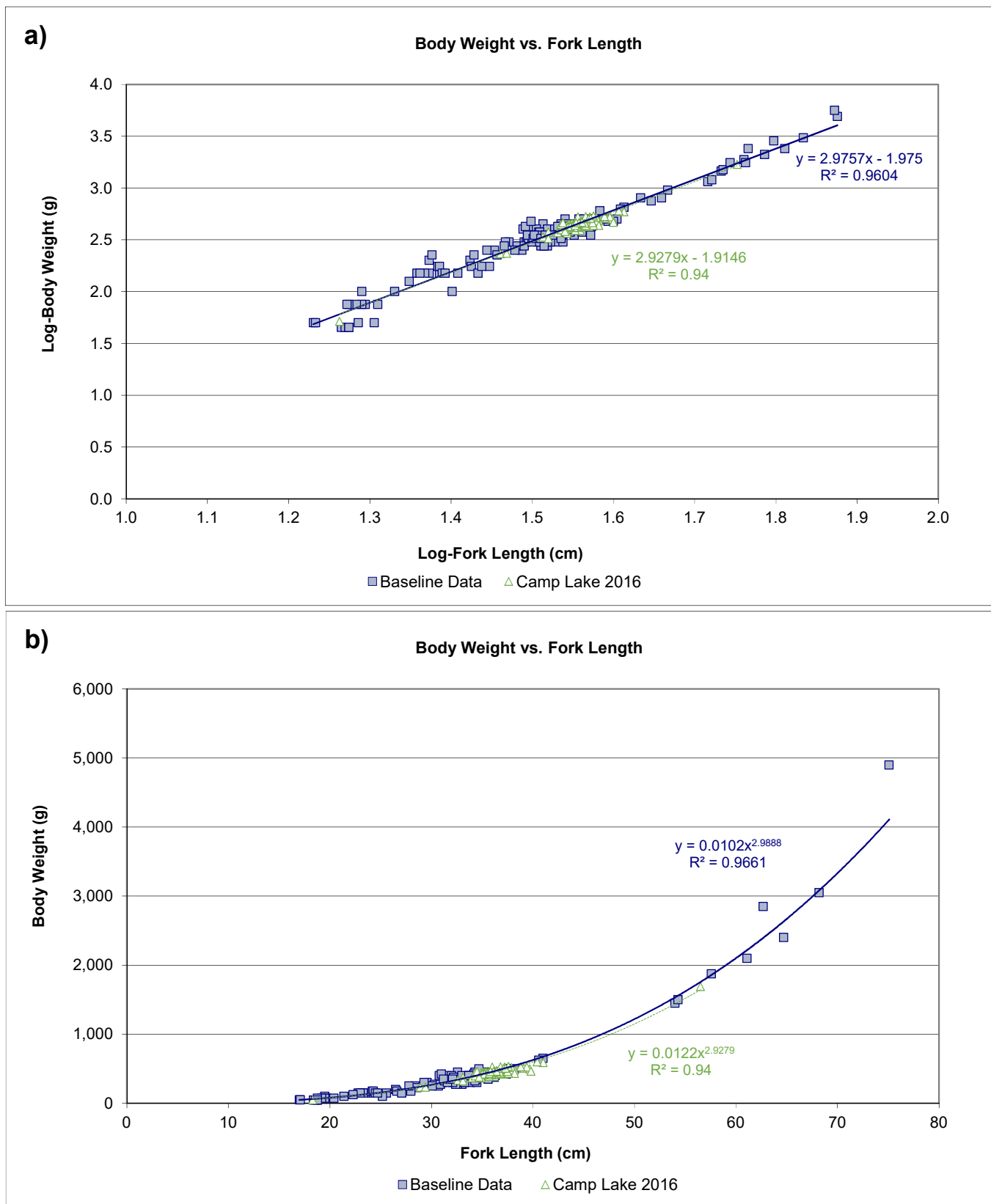


Figure G.5: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected in fall (August-September) at Camp Lake littoral/profundal areas in 2016 and during the mine baseline period (2006, 2007, 2008, 2013) using log-transformed (a) and untransformed (b) data, Mary River Project CREMP.

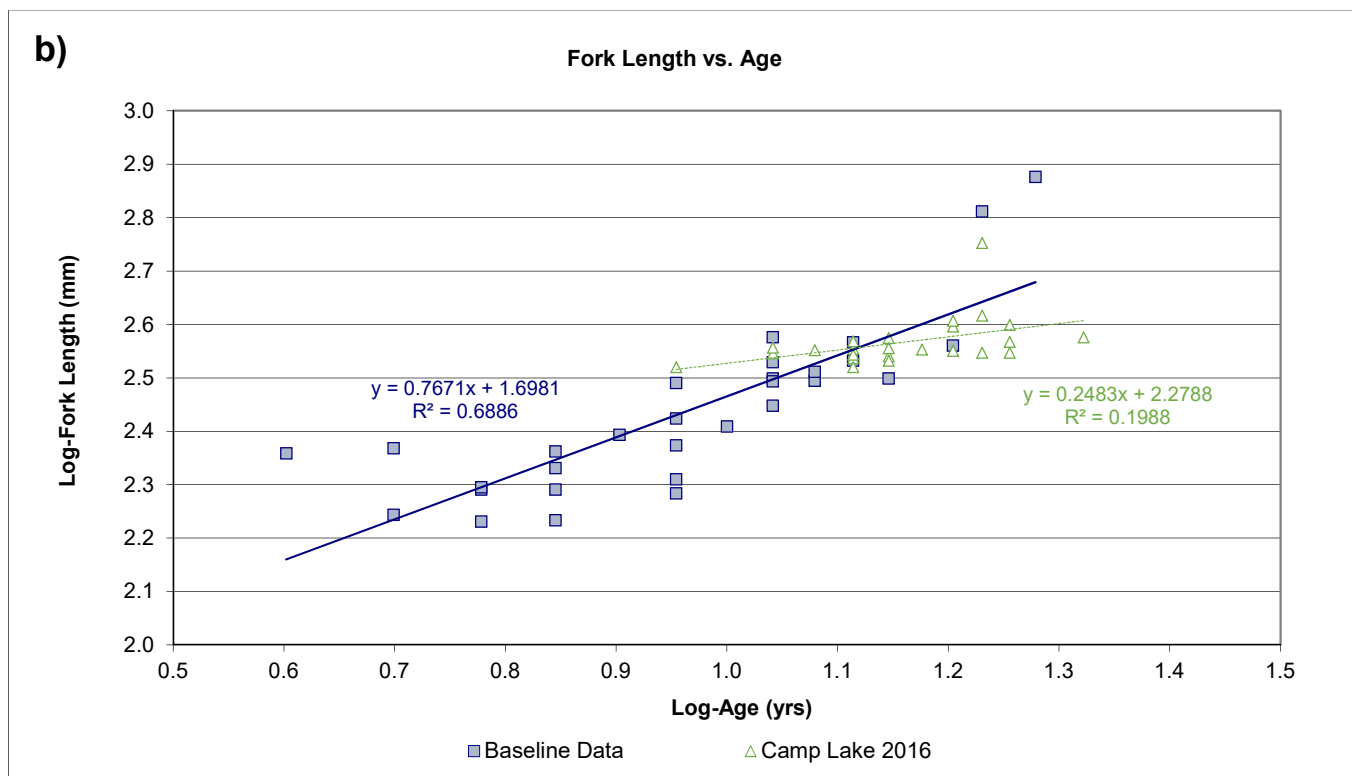


Figure G.6: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected in fall (August-September) at Camp Lake nearshore areas in 2016 and during the baseline period (2006, 2007, 2013), Mary River Project CREMP.

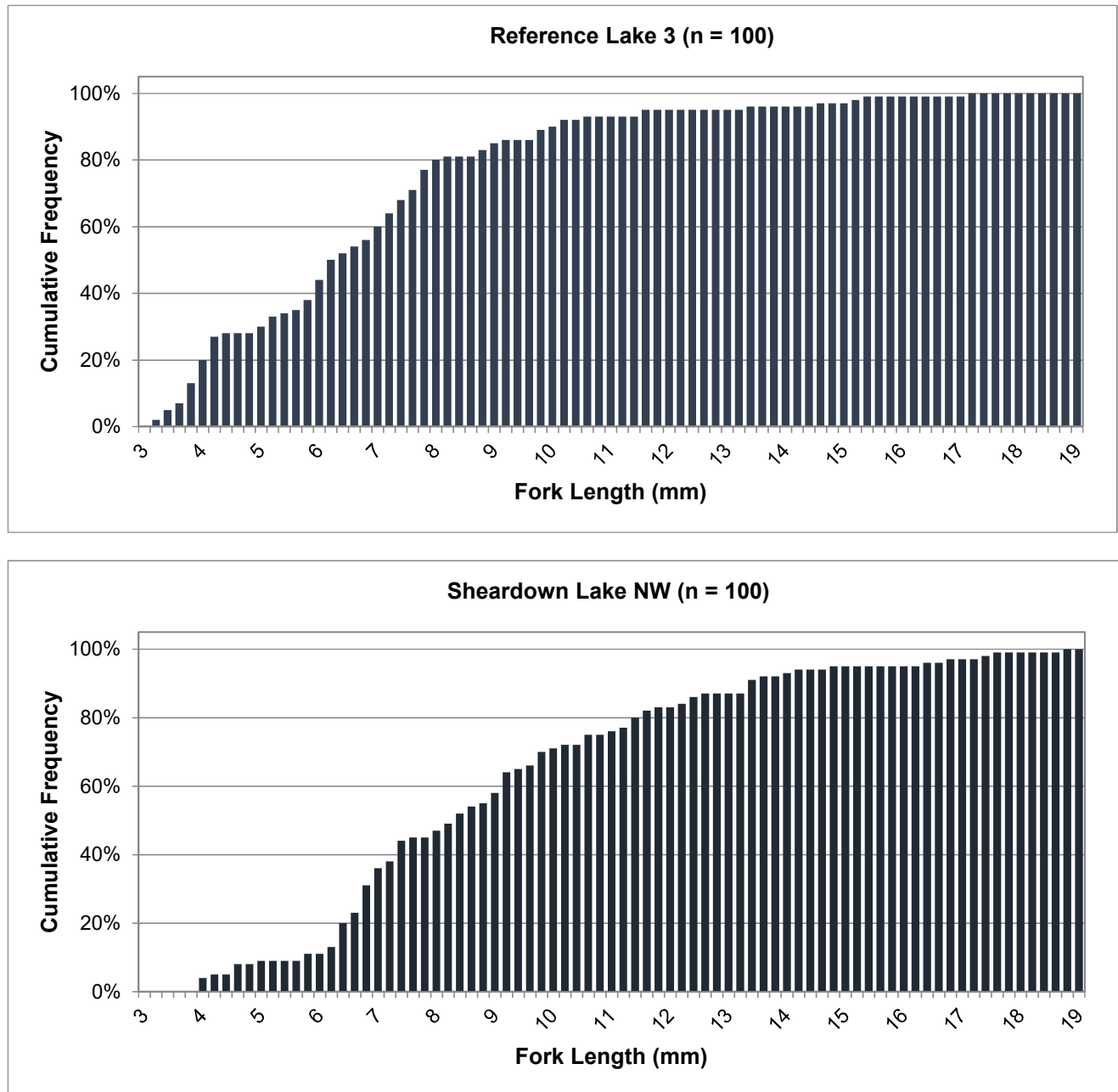


Figure G.7: Cumulative length-frequency distributions for juvenile Arctic charr captured by electrofishing at nearshore areas of Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2016.

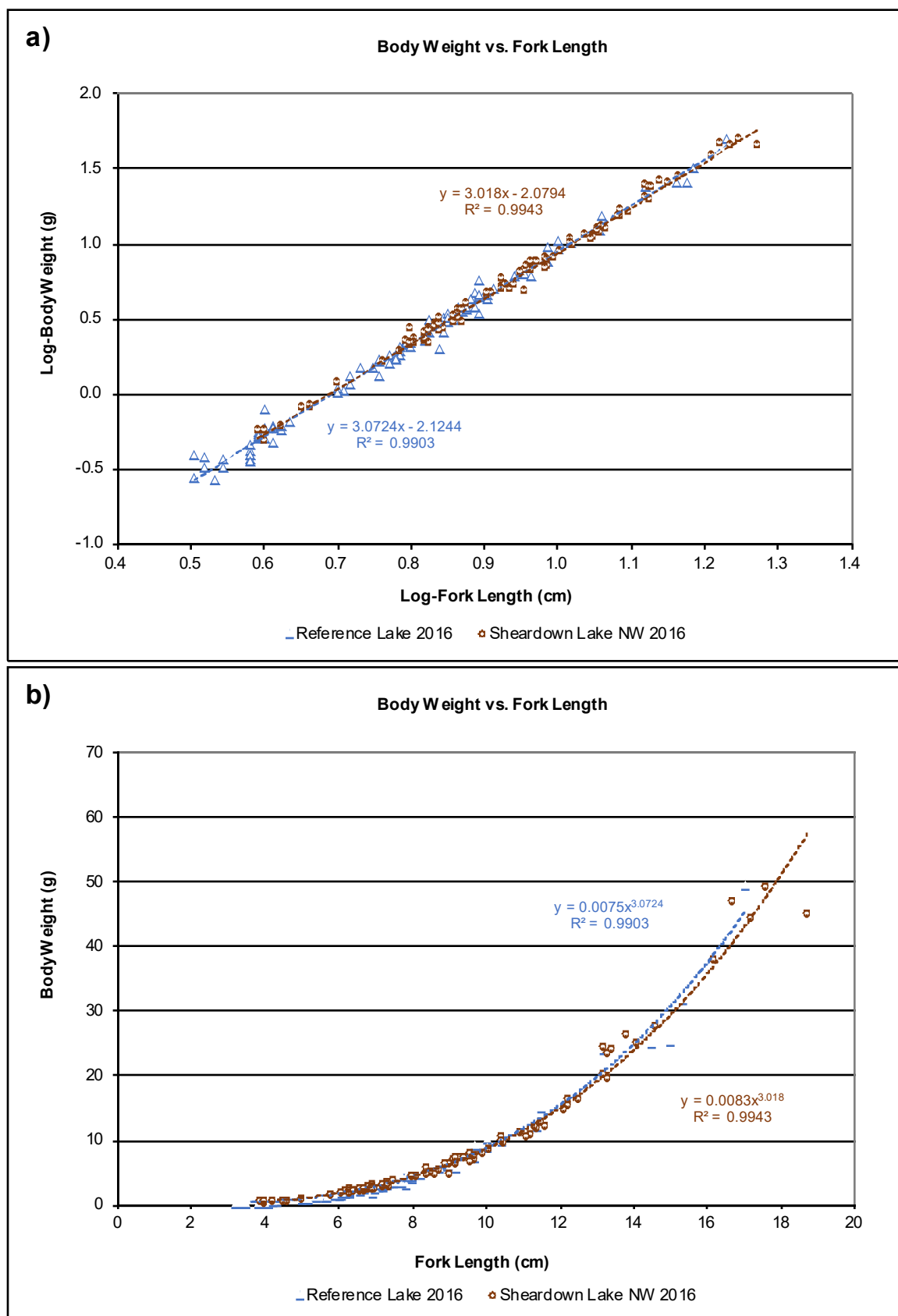


Figure G.8: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected at the nearshore area of Sheardown Lake NW and Reference Lake 3 in August 2016 using log-transformed (a) and untransformed (b) data, Mary River Project CREMP, 2016.

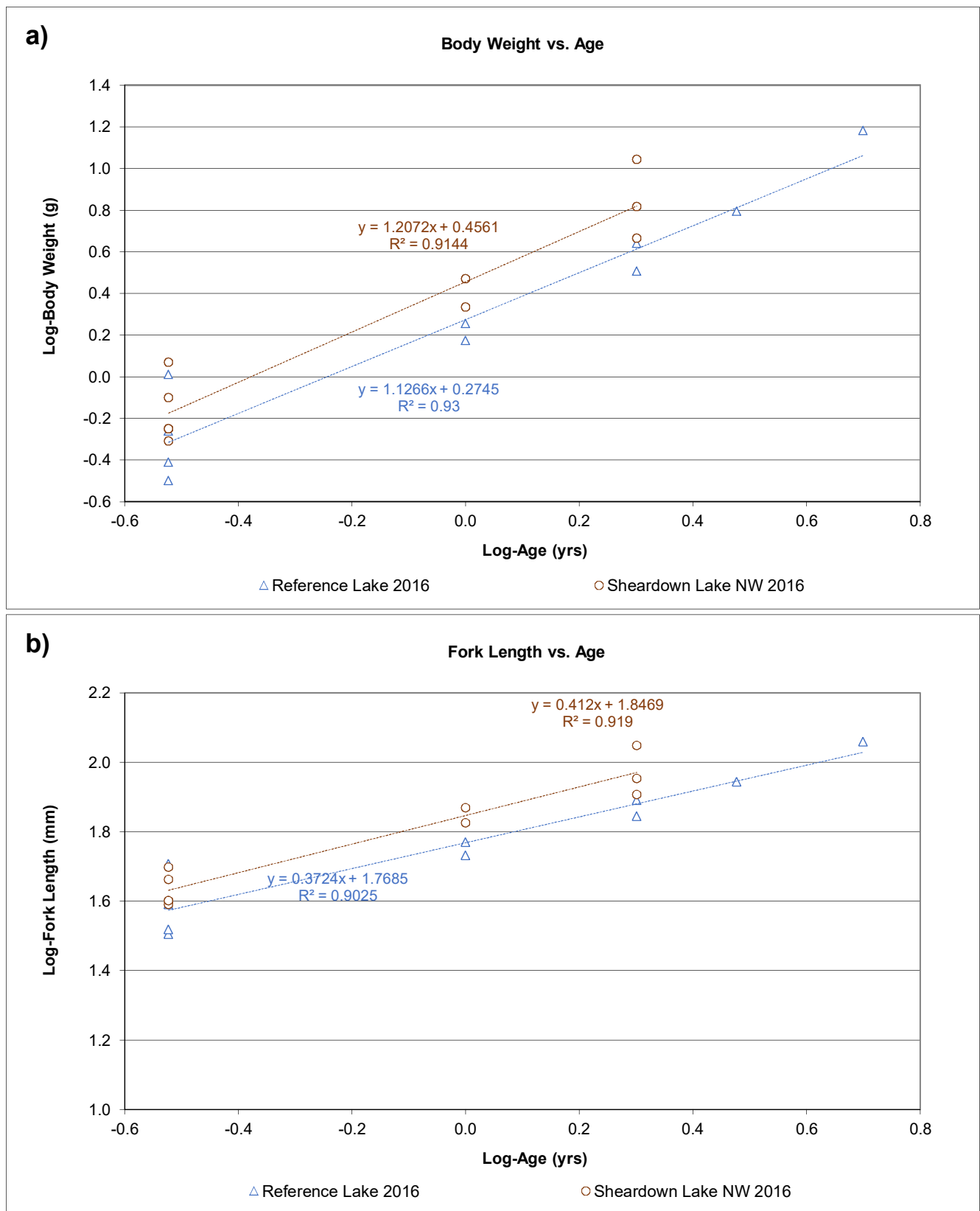


Figure G.9: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected at the nearshore area of Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2016.

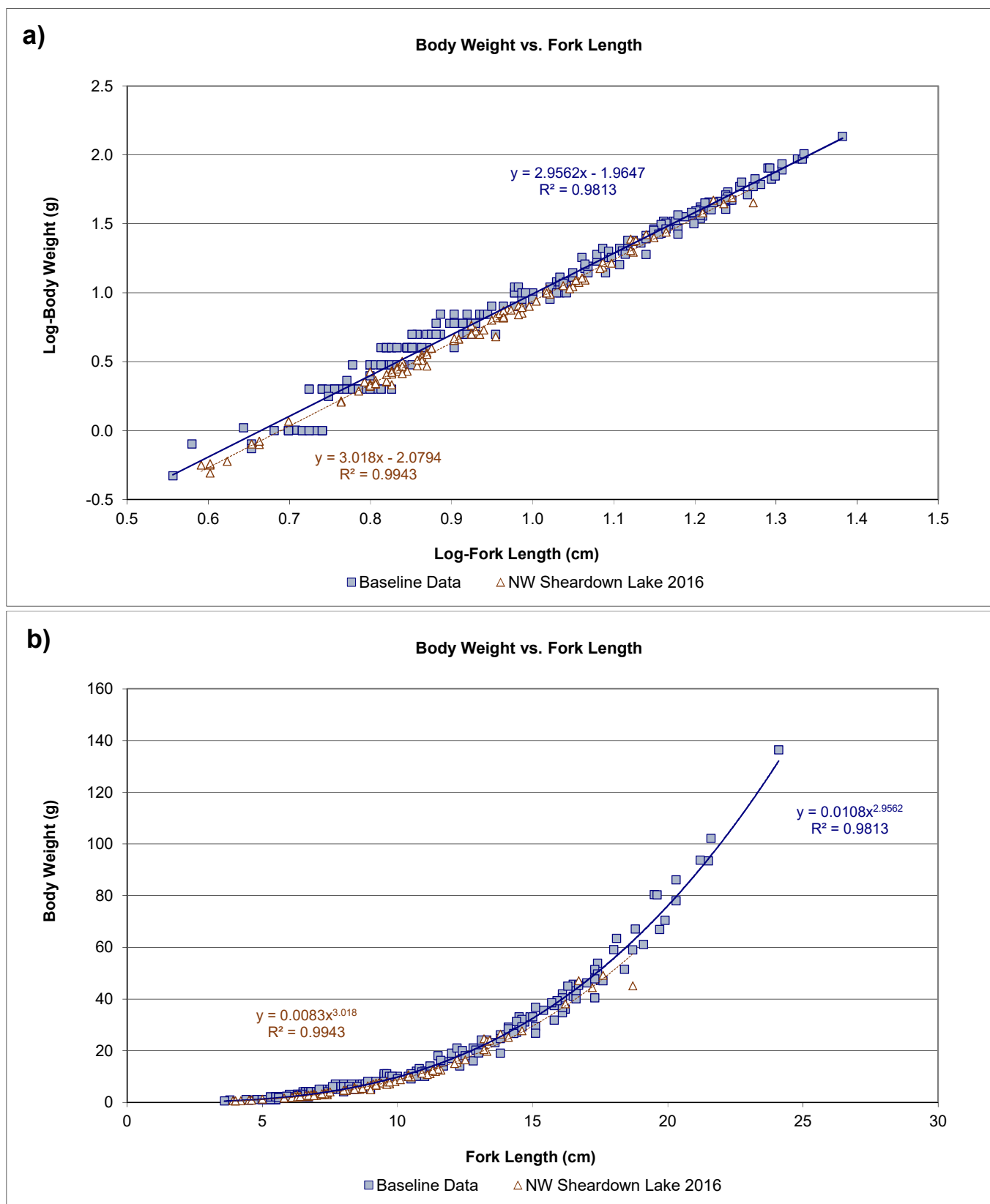


Figure G.10: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected in fall (August-September) at Sheardown Lake NW nearshore areas in 2016 and during the mine baseline period (2007, 2008, 2013) using log-transformed (a) and untransformed (b) data, Mary River Project CREMP.

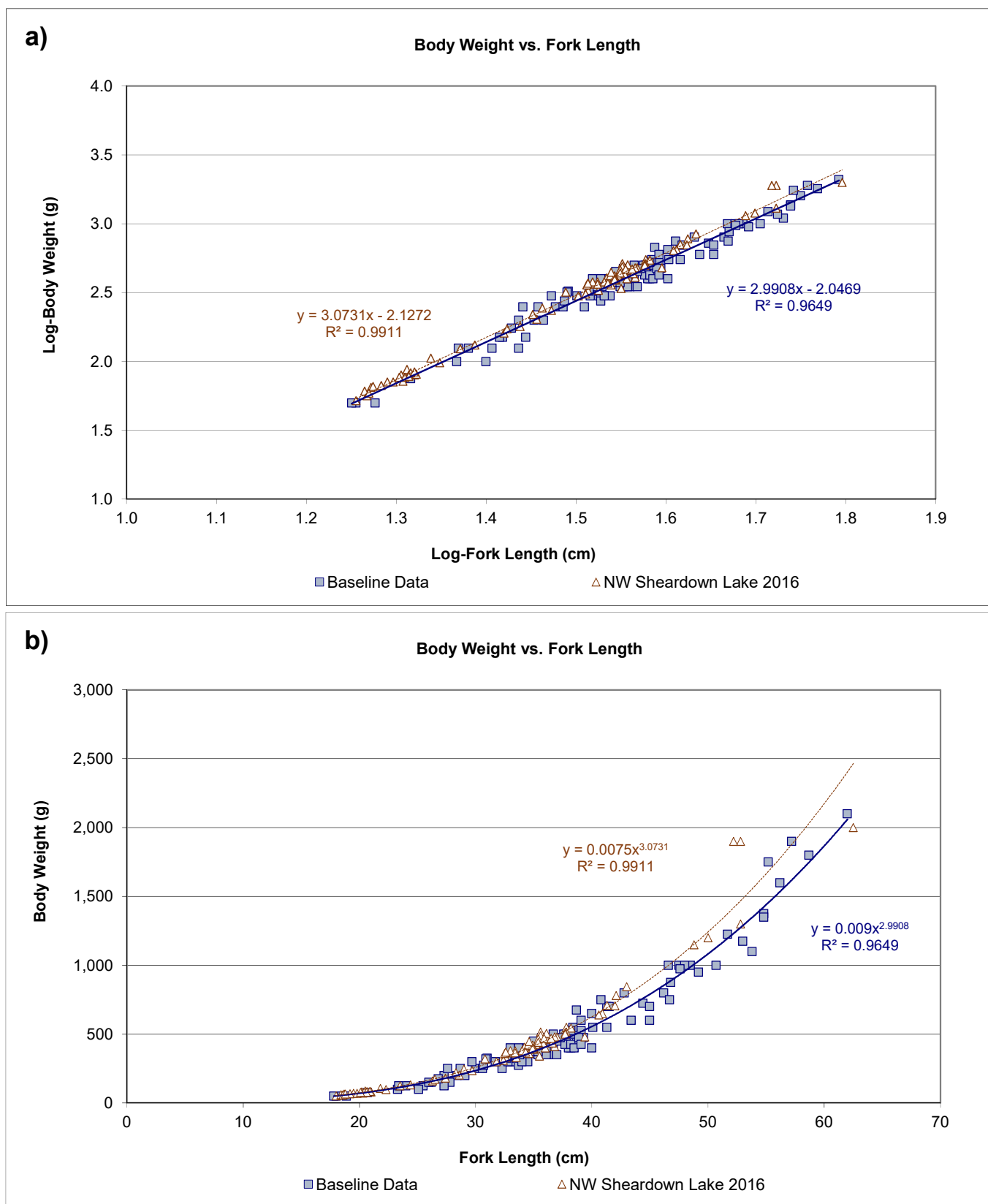


Figure G.11: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected in fall (August-September) at Sheardown Lake NW nearshore areas in 2016 and during the mine baseline period (2006, 2007, 2008, 2013) using log-transformed (a) and untransformed (b) data, Mary River Project CREMP.

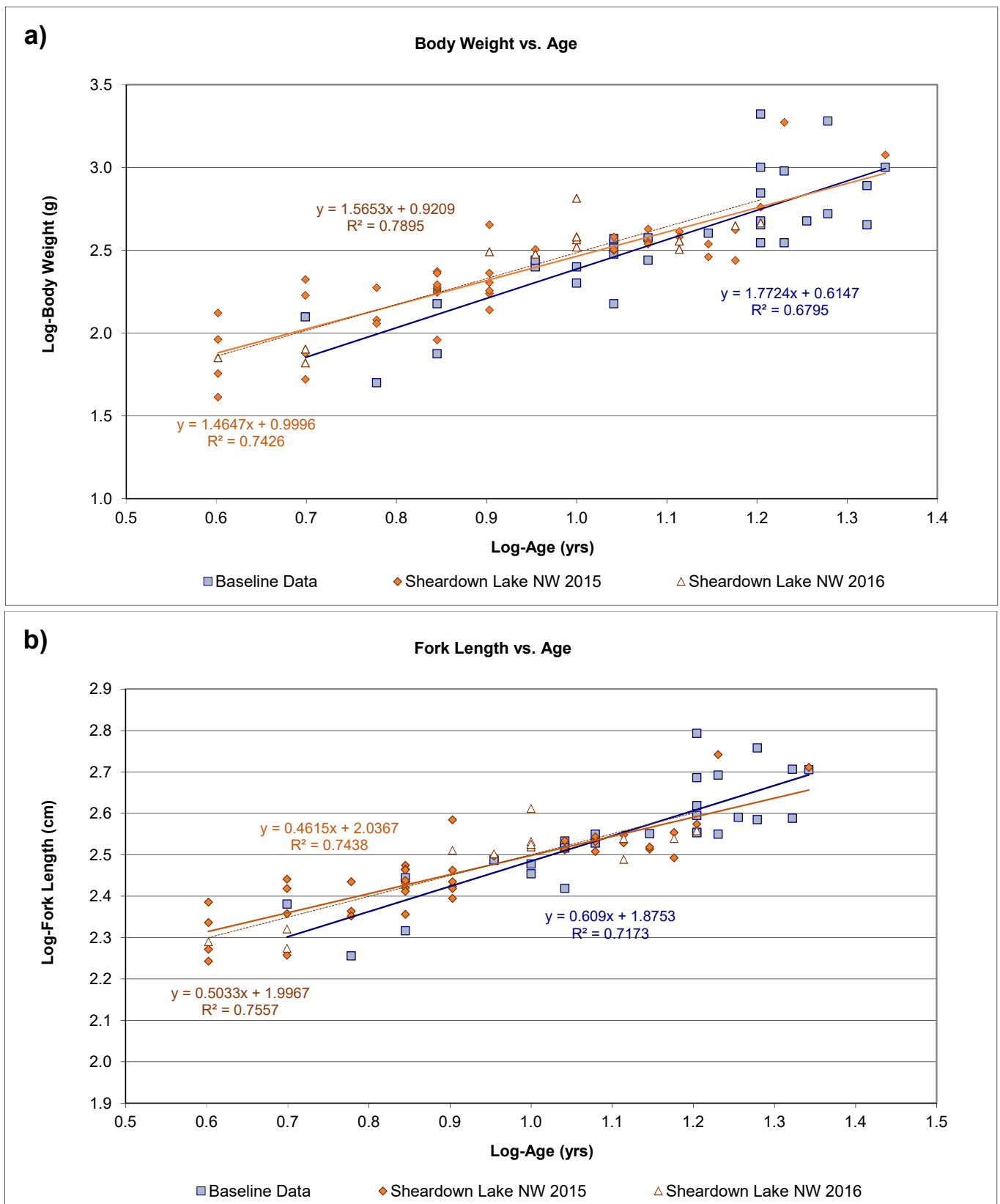


Figure G.12: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected in fall (August-September) at Sheardown Lake NW nearshore areas in 2016, 2015 and over the baseline period (2006, 2007, 2013), Mary River Project CREMP.

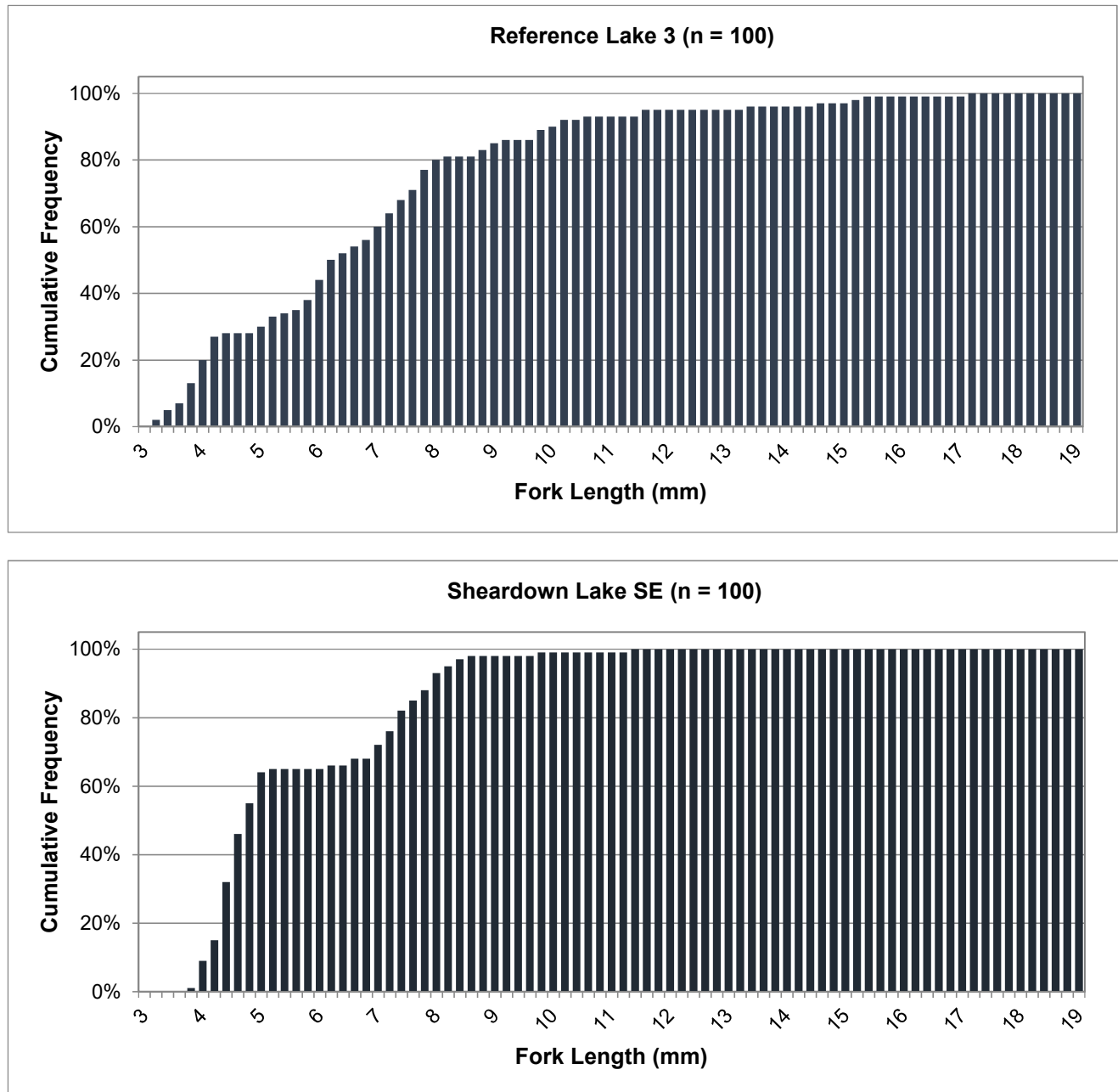


Figure G.13: Cumulative length-frequency distributions for juvenile Arctic charr captured by electrofishing at nearshore areas of Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2016.

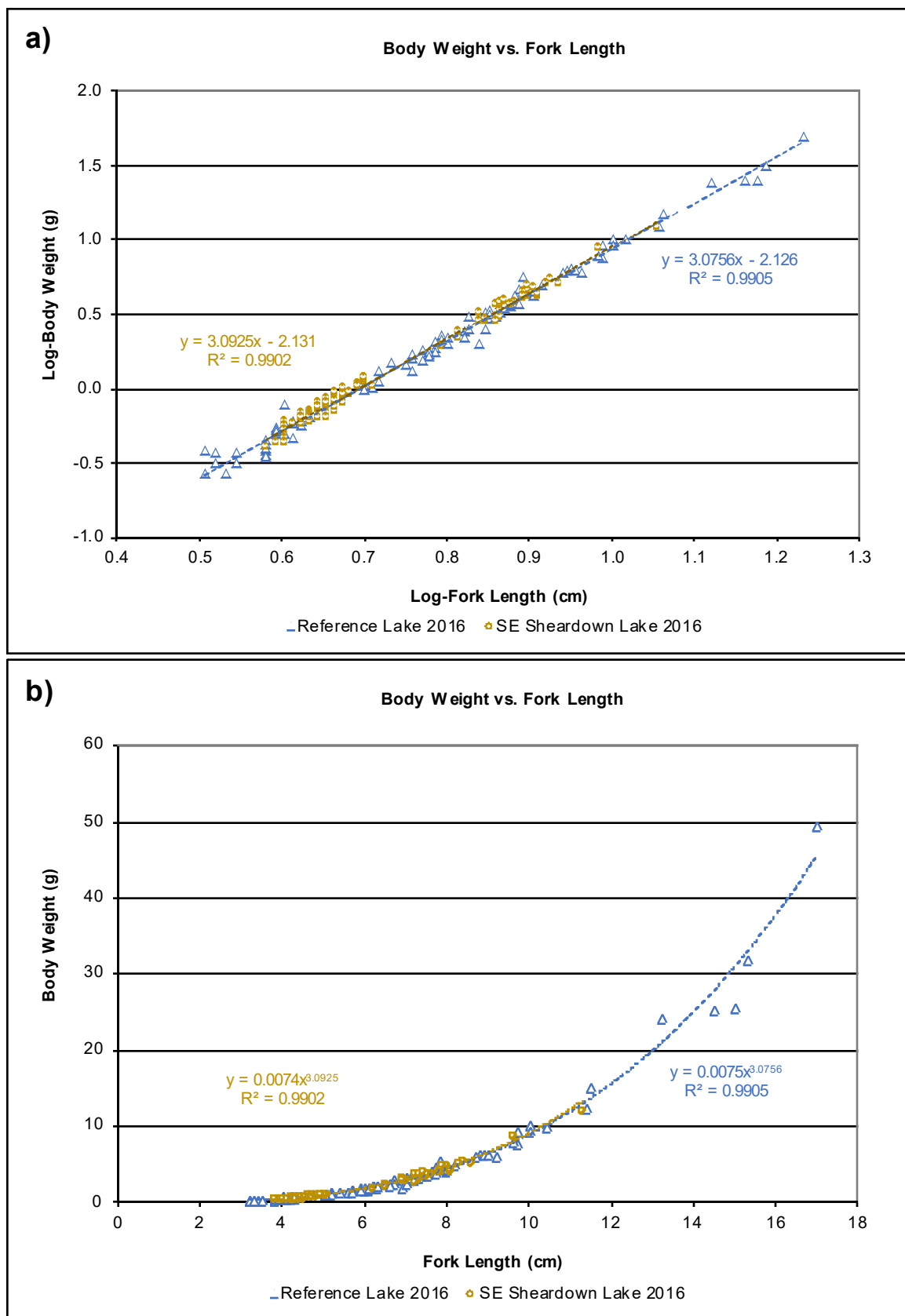


Figure G.14: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected at the nearshore area of Sheardown Lake SE and Reference Lake 3 in August 2016 using log-transformed (a) and untransformed (b) data, Mary River Project CREMP, 2016.

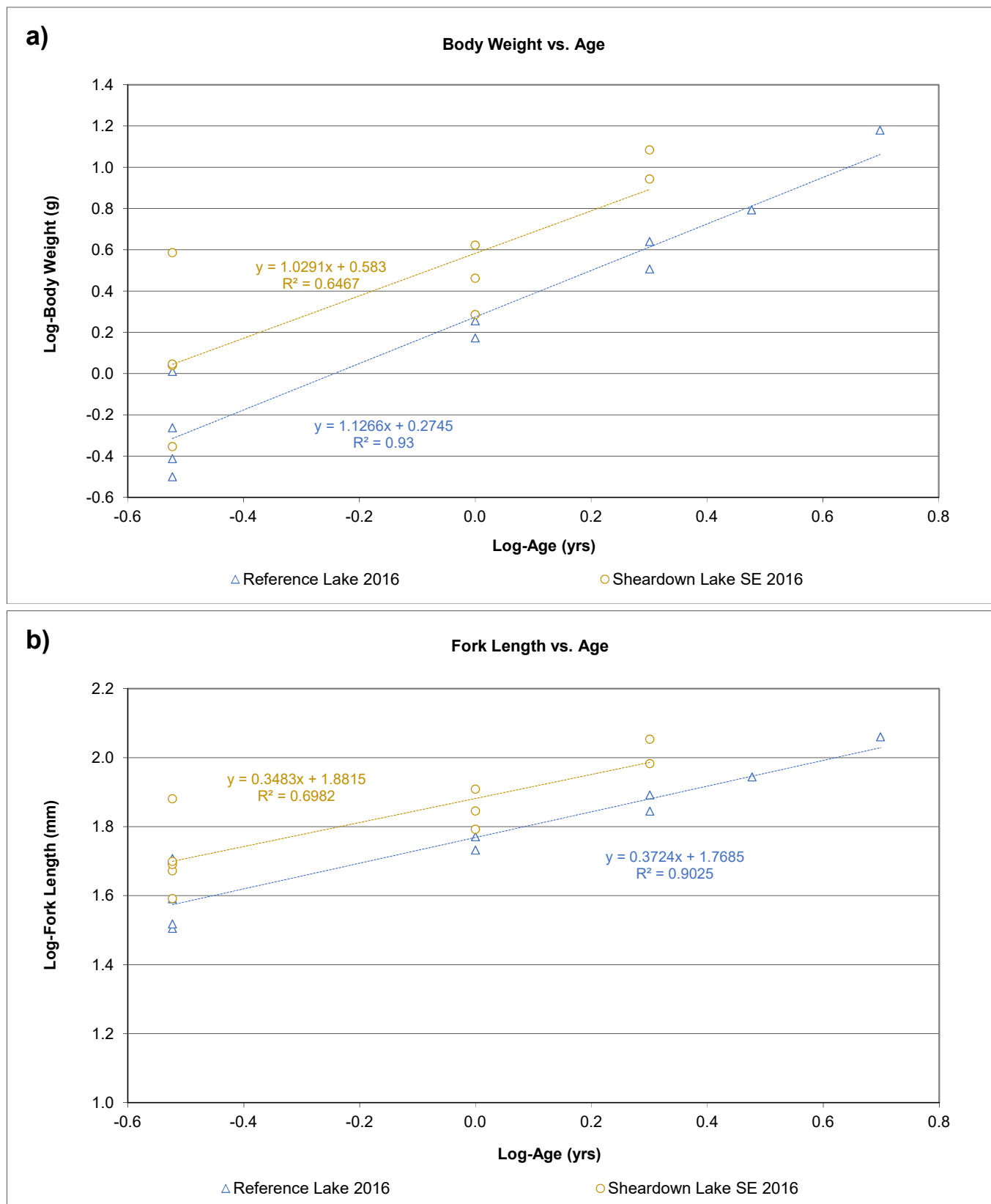


Figure G.15: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected at the nearshore area of Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2016.

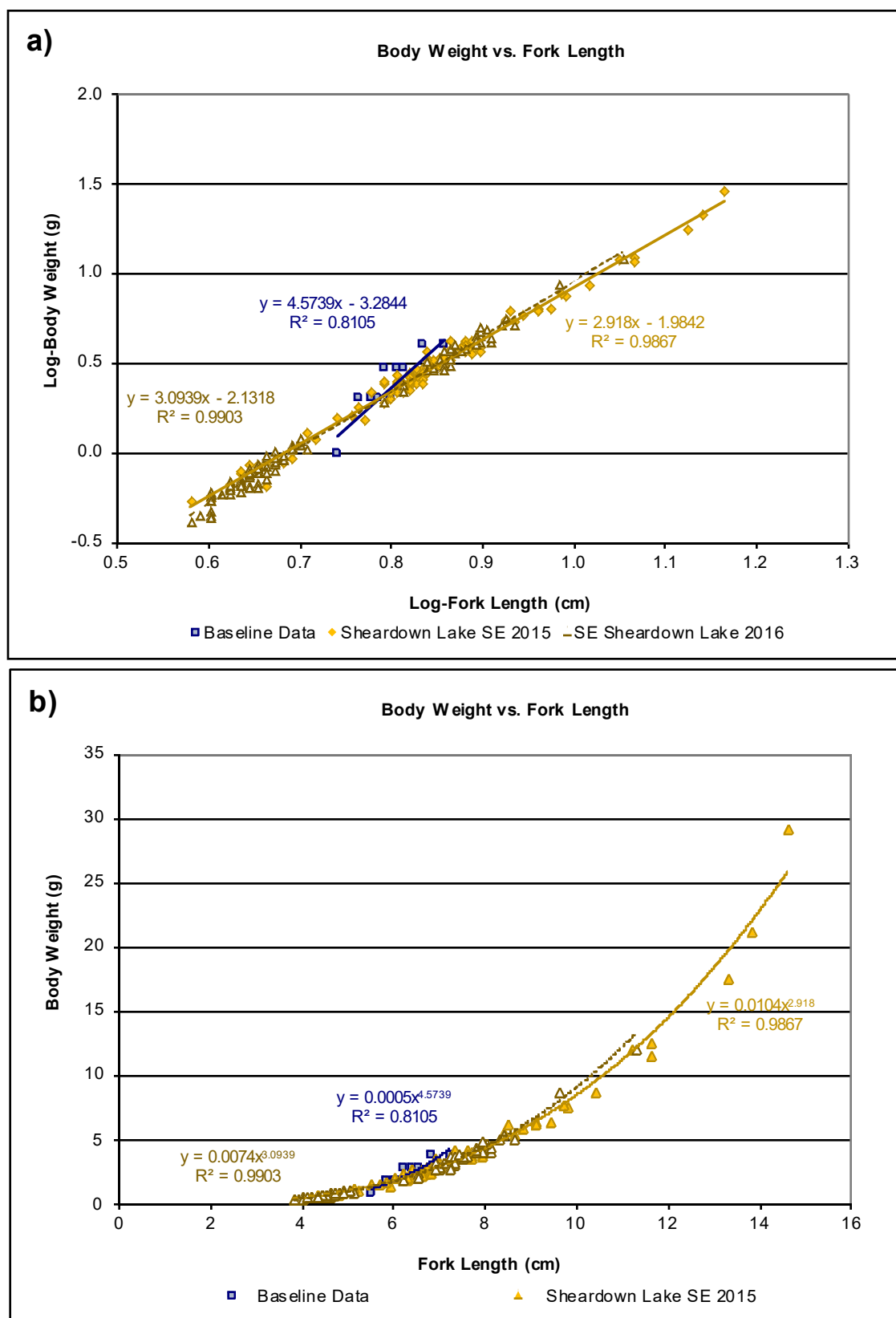


Figure G.16: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected in fall (August-September) at Sheardown Lake SE nearshore areas in 2016, 2015 and over the mine baseline period (2007) using log-transformed (a) and untransformed (b) data, Mary River Project CREMP.

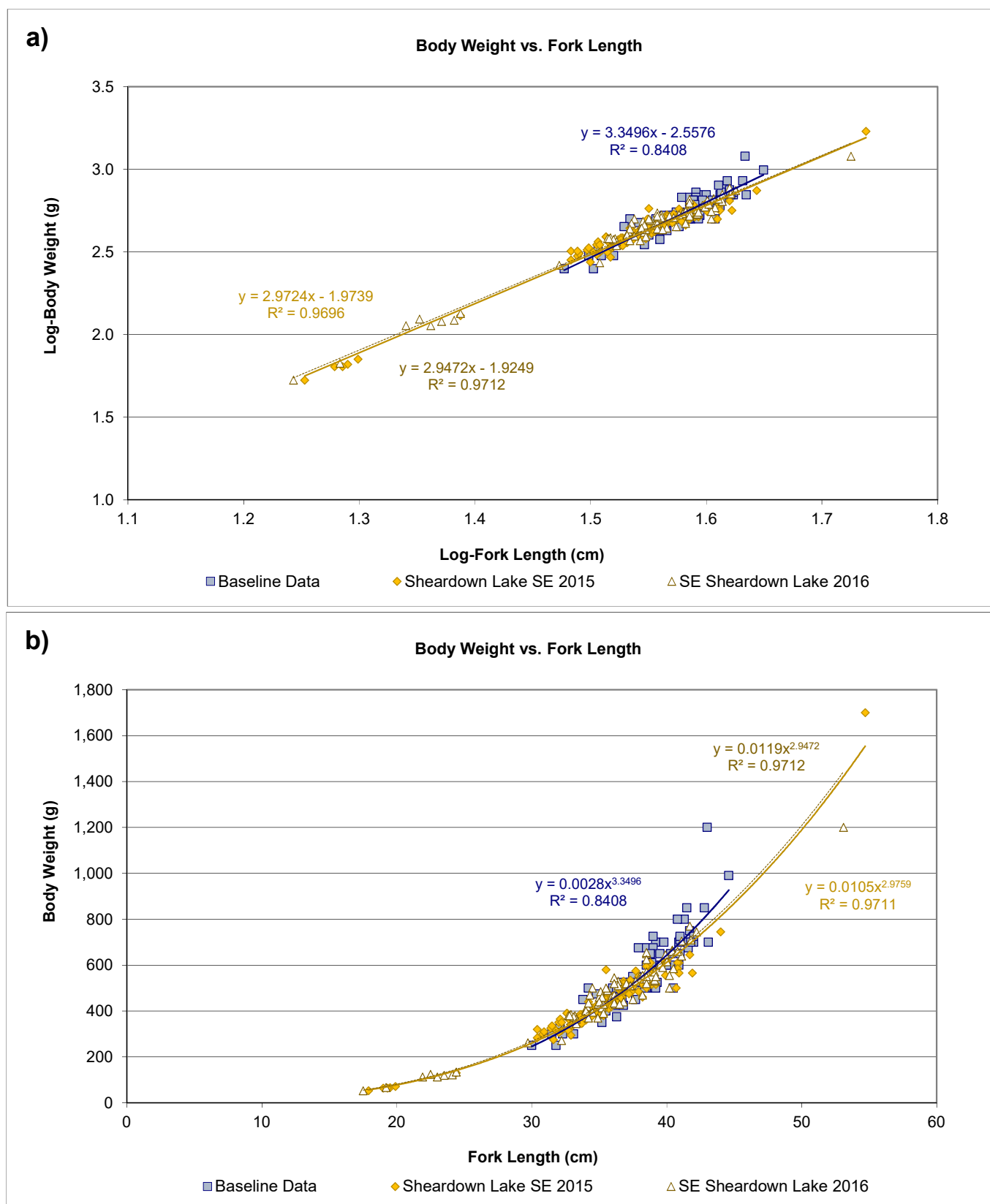


Figure G.17: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected in fall (August-September) at Sheardown Lake SE nearshore areas in 2016, 2015 and during the mine baseline period (2007, 2008) using log-transformed (a) and untransformed (b) data, Mary River Project CREMP.

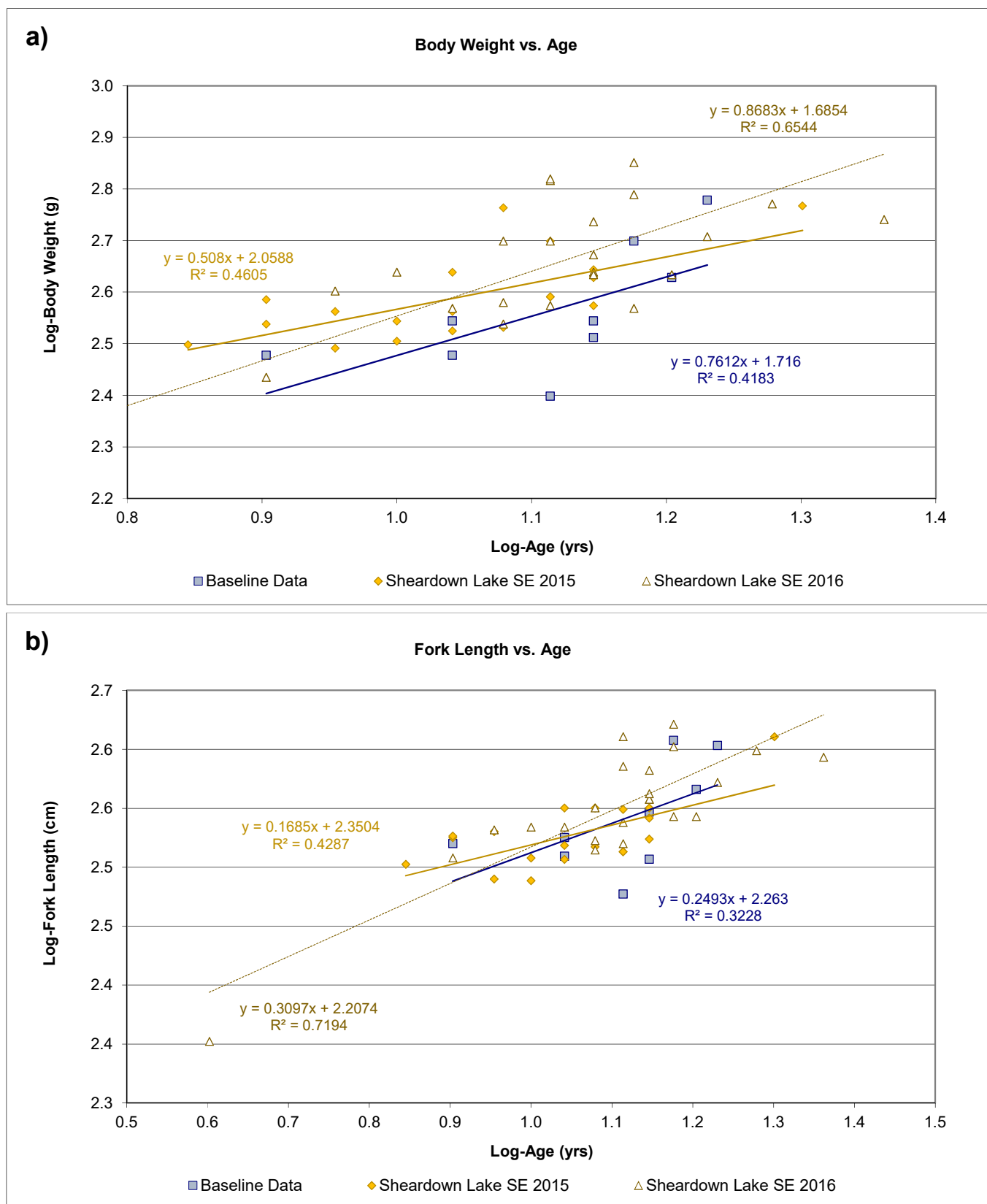


Figure G.18: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected in fall (August-September) at Sheardown Lake SE nearshore areas in 2016, 2015 and during the baseline period (2007), Mary River Project CREMP.

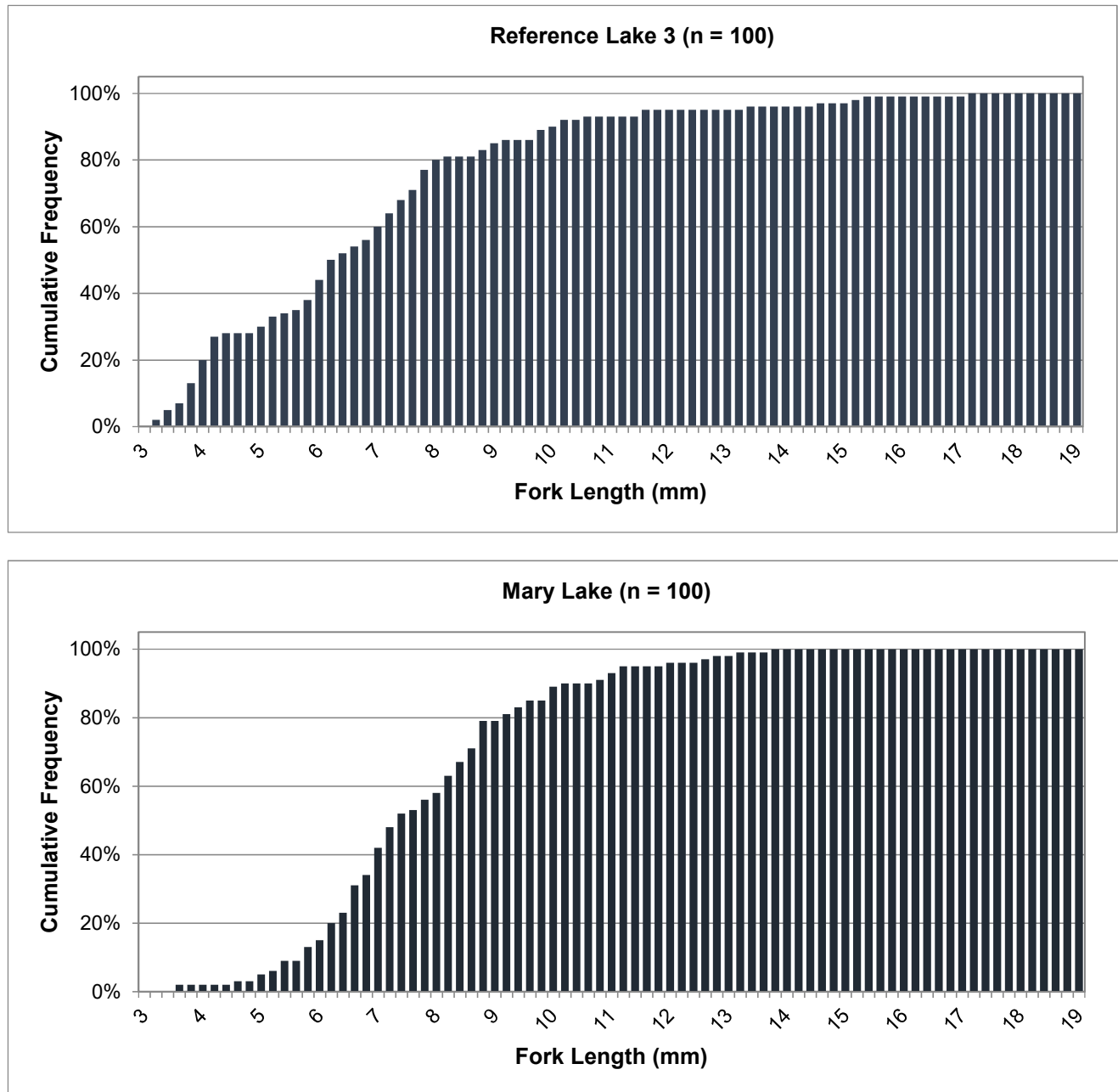


Figure G.19: Cumulative length-frequency distributions for juvenile Arctic charr captured by electrofishing at nearshore areas of Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

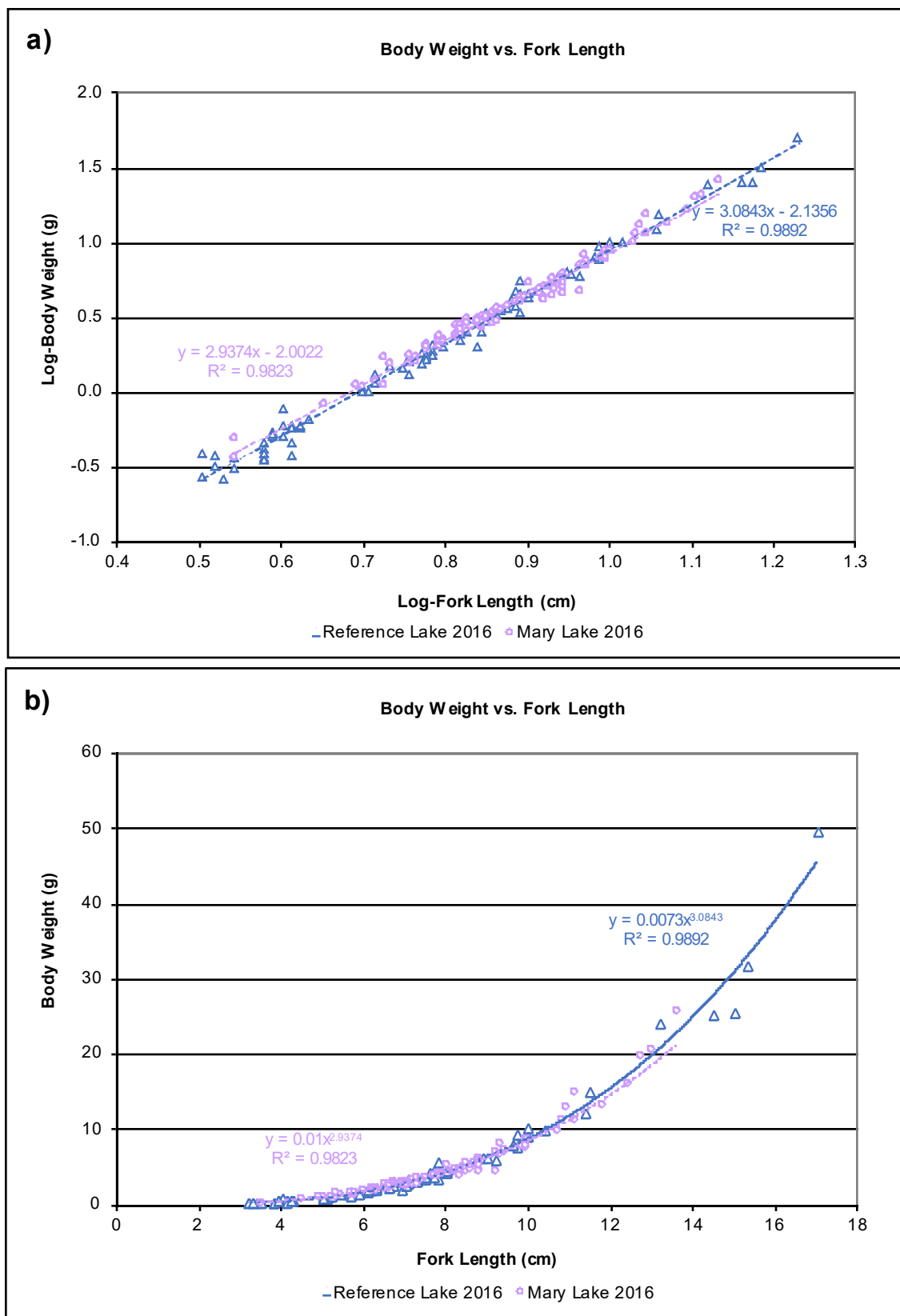


Figure G.20: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected at the nearshore area of Mary Lake and Reference Lake 3 in August 2016 using log-transformed (a) and untransformed (b) data, Mary River Project CREMP, 2016.

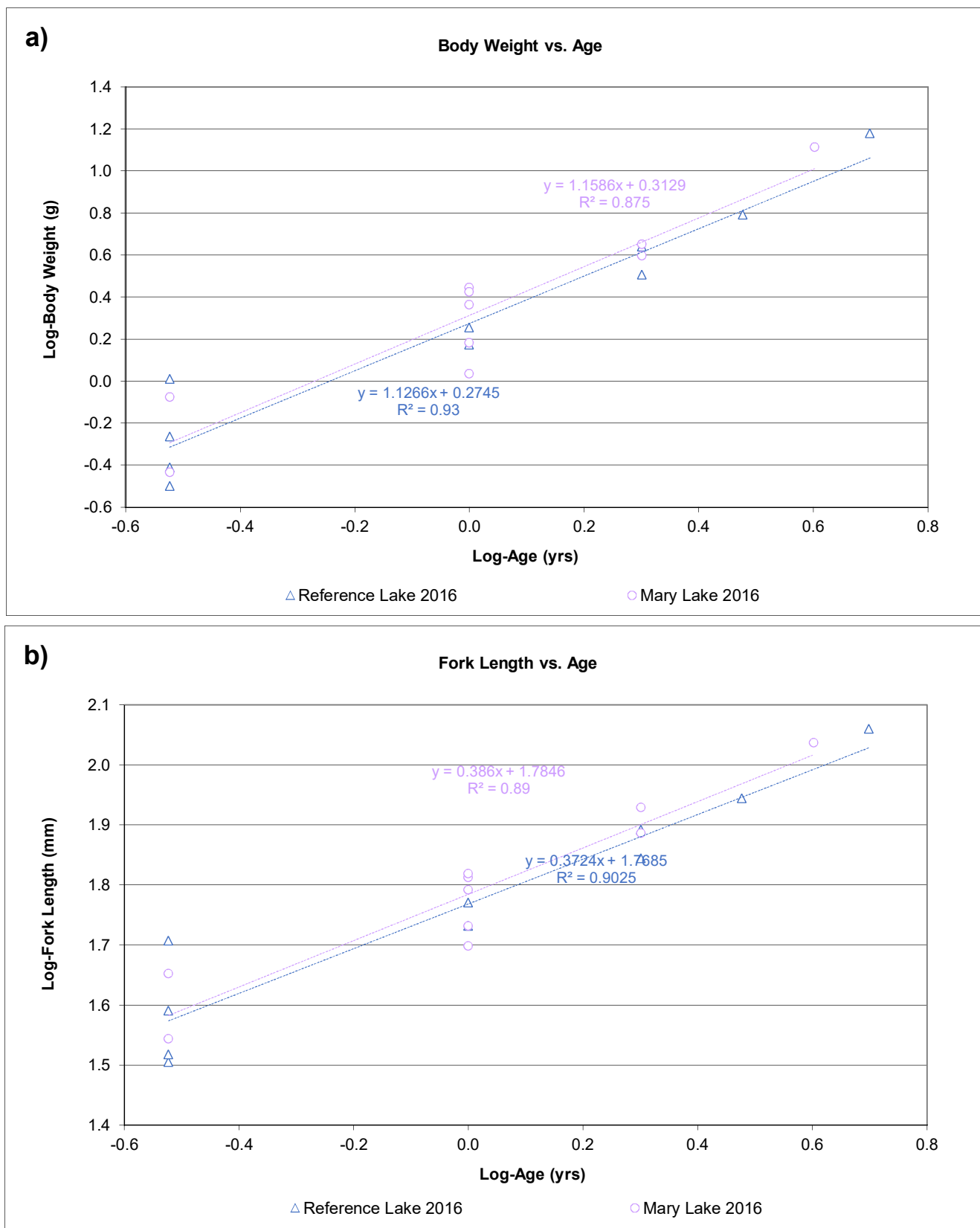


Figure G.21: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected at the nearshore area of Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2016.

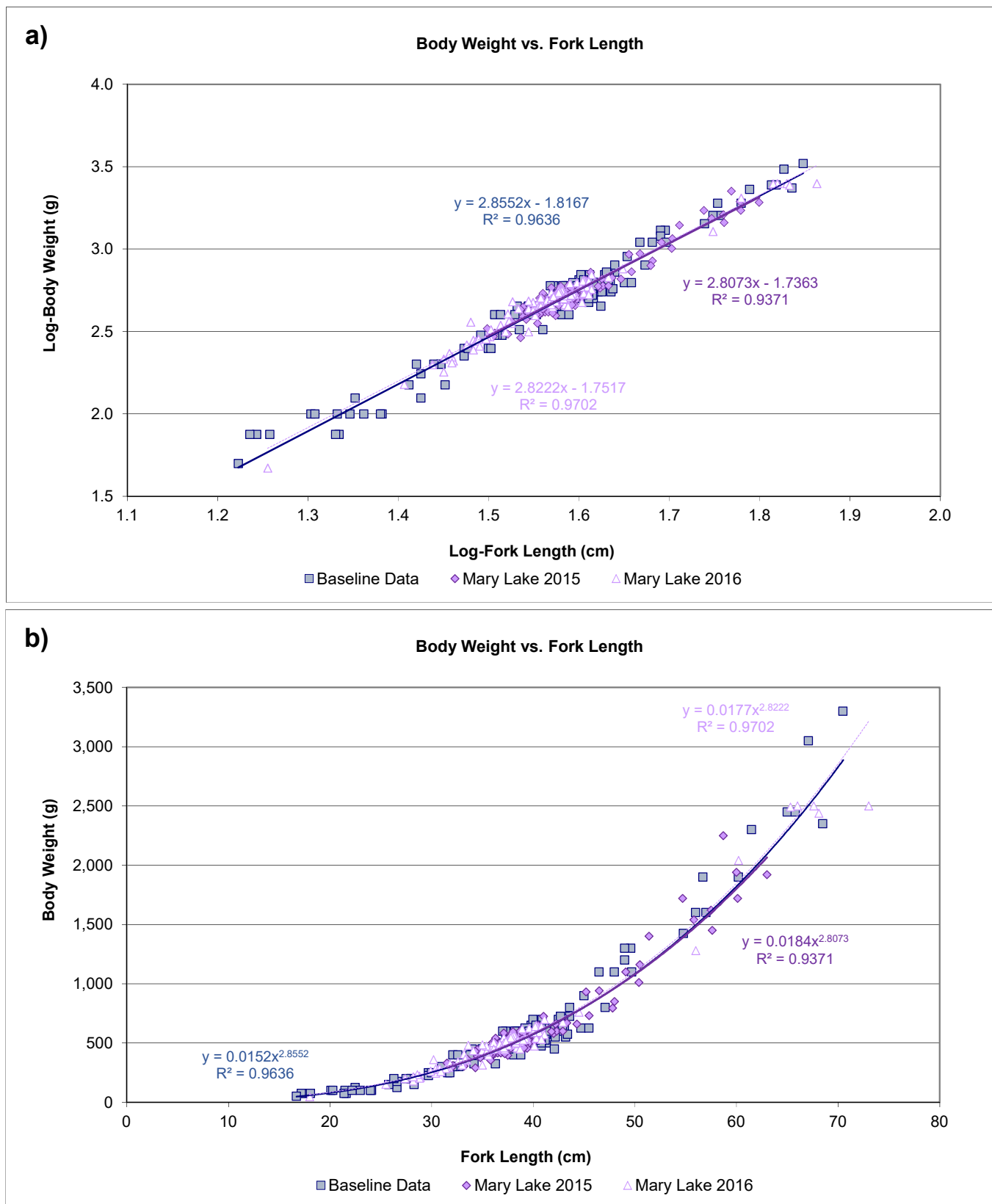
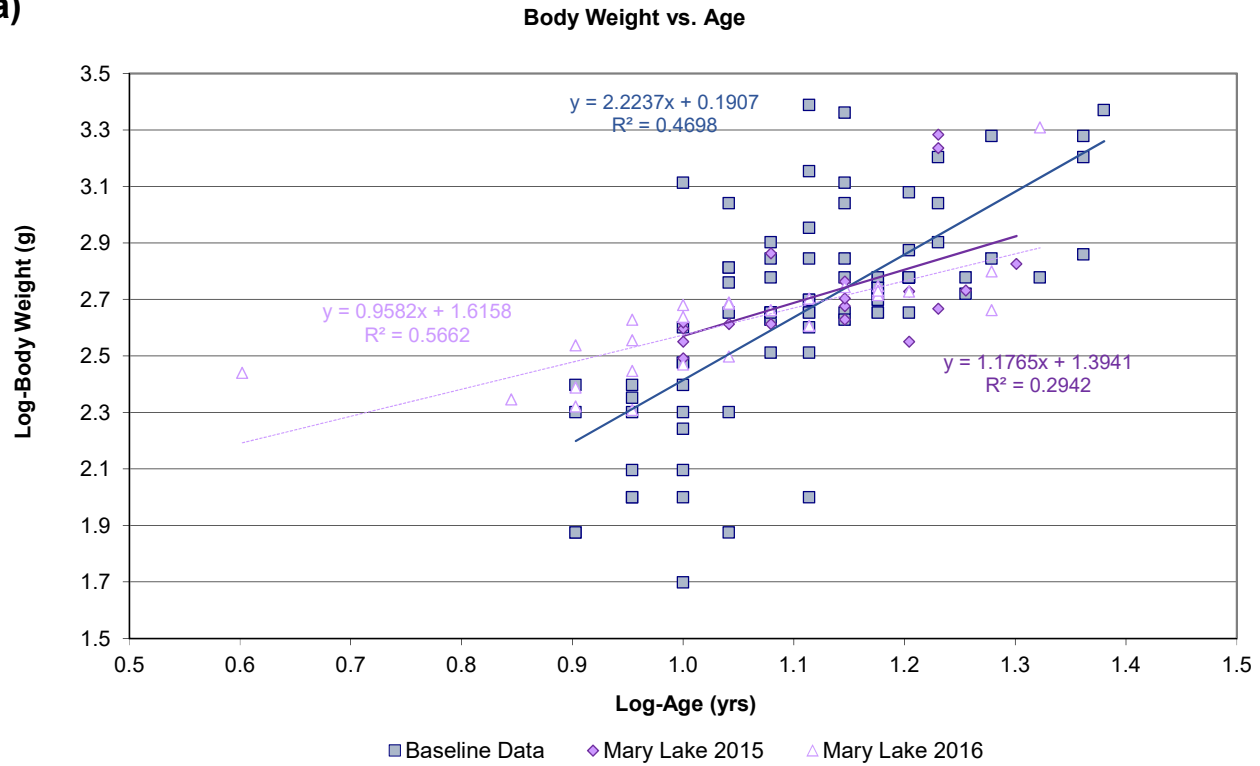


Figure G.22: Comparison of condition (weight-at-fork length relationship) for Arctic charr collected in fall (August-September) at Mary Lake nearshore areas in 2016, 2015 and during the mine baseline period (2006, 2007) using log-transformed (a) and untransformed (b) data, Mary River Project CREMP.

a)



b)

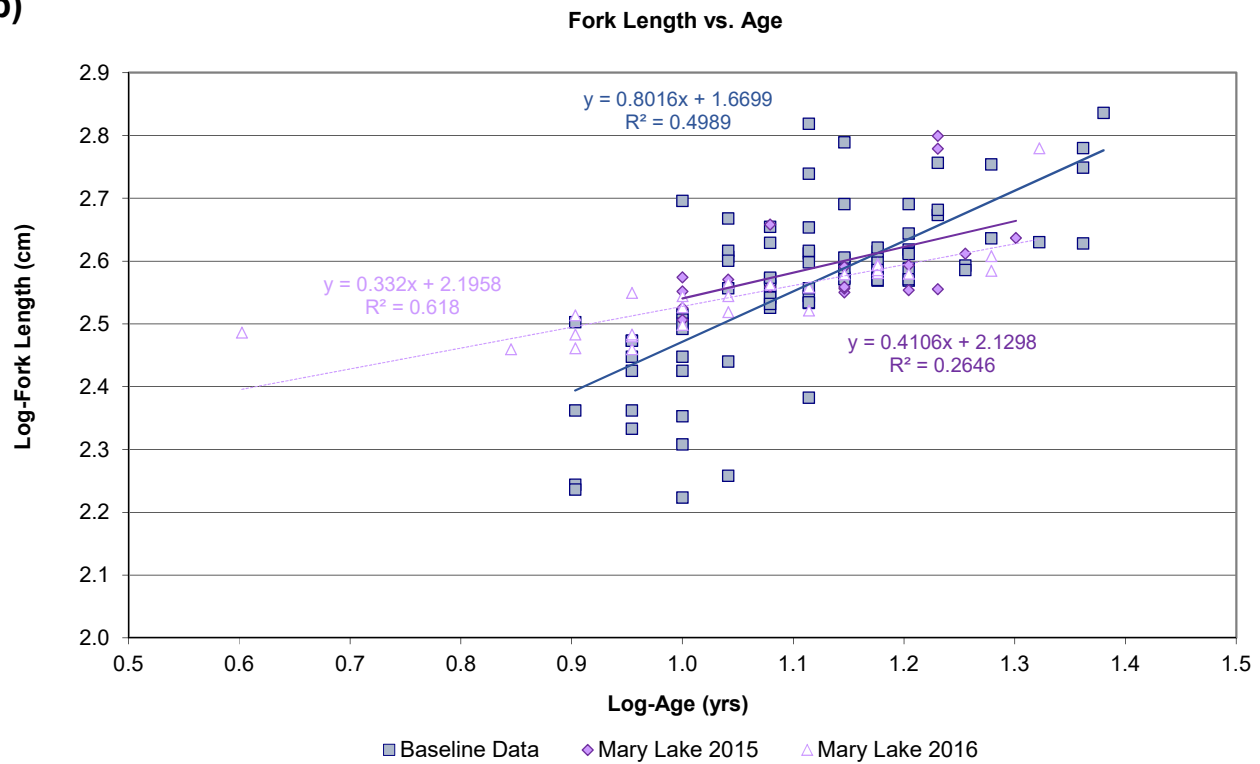


Figure G.23: Weight-at-age (a) and length-at-age (b) growth relationships for Arctic charr collected in fall (August-September) at Mary Lake nearshore areas in 2016, 2015 and during the baseline period (2006, 2007), Mary River Project CREMP.