# WHEELER RIVER PROJECT: BASELINE AQUATIC ENVIRONMENT STUDY

Report prepared for:

DENISON MINES CORPORATION
230 22nd Street East, Suite 200
Saskatoon, Saskatchewan
S7K 0E9

Report prepared by:

ECOMETRIX INCORPORATED
6800 Campobello Road
Mississauga, Ontario
L5N 2L8

Ref. 19-2589
March 2020

# WHEELER RIVER PROJECT: BASELINE AQUATIC ENVIRONMENT STUDY


Lynnae Dudley, M. Env.
Principal Investigator

Robert Eakins, Tech. Dipl. F&W
Principal Investigator

Fei Luo, Ph. D
Project Manager

Brian Fraser, M.Sc.
Project Principal and Reviewer

# ACKNOWLEDGEMENTS

Several people beyond the authors identified above contributed to the development and execution of this aquatic baseline study including: Janeen Tang (Project Manager), Goran Ivanis (Field Investigator), Carolyn Brown (Field Investigator), Karen Petersen (Field Crew Lead), Kristine Campbell (Hydrology Field Investigator), Nichole Wiemann (Field Investigator, Data Management), Amelia Porter (Data Management), Joseph Tetreault (Benthic Invertebrates), and Michael White (Statistics). The project team would like to acknowledge Jobie Daigneault and Jayme George-Eaglechild, residents of English River First Nation (ERFN) at Patuanak, SK, whose assistance with the field work program was invaluable. Bobby John of ERFN graciously shared his local land user knowledge of the study area, confirming findings and providing addition valuable information pertaining to aquatic resources, including fish spawning areas. The project team would also like to acknowledge the staff of Denison Mines Corporation both at the Project site and in Saskatoon for their support, including Pam Bennett, Clark Gamelin, Yongxing Liu, Lea Willemse and Dave Hamilton.

# EXECUTIVE SUMMARY

The Denison Mining Corp. (Denison) Wheeler River Project (Project) is located in north central Saskatchewan, in the eastern portion of the Athabasca Basin. It is situated approximately 35 kilometres northeast of Cameco Corporation's Key Lake Operation and 35 kilometres southwest of Cameco Corporation's McArthur River Operation. Baseline studies in the Project area are required to support pre-feasibility engineering studies, technical assessments and environmental approvals processes. EcoMetrix Incorporated (EcoMetrix) was retained by Denison to implement aquatic environment baseline studies over the period 2016 through 2019 and to synthesize these more recent data with existing aquatic environment information for the study area that dates back to 2011. The current understanding of aquatic environment in the study area based on the full complement of available data is provided herein.

Aquatic environment baseline field surveys were conducted in the fall of 2016, the spring of 2017, the winter and summer of 2018 that included hydrology, water quality, sediment quality, aquatic habitat and bathymetry, plankton community, benthic invertebrate community and tissue chemistry, and fish community, spawning and tissue chemistry. Additional hydrological and water quality data were collected during the summer and fall of 2019.

The 2016 to 2019 surveys build on previous hydrological and aquatic baseline work completed from 2011 to 2014. Data from the 2011 to 2014 baseline surveys are included in this report; however, the report focuses on the more recent 2016 to 2019 results.

## Hydrology

Water level elevations were surveyed at a number of lakes, streams and ponds within the study area. In September 2016-2019, lake and pond surface water elevations of the Icelander River Drainage ranged from 520.86 masl at the headwater lake to 487.94 masl at Russell Lake. Water level elevations at the stream locations ranged from 520.84 masl at the most upstream station, to 492.71 masl at the most downstream station. In the Williams Lake Drainage, water levels at stream locations ranged from 518.33 masl at the most upstream station, to 488.55 masl at the most downstream station during September 2016.

Manual stream flow measurements were recorded in September 2016, May 2017, June-July 2018, July 2019 and August-September 2019 in the Icelander River Drainage and in September 2016 in the Williams Lake Drainage at lotic watercourses. Measured flows at the most downstream station (SA-1) have ranged from 2.34 to 3.05 $m^3/s$ between September 2016 and August 2019.

Where possible, water level elevations were calculated for each location using the continuous water level data. For streams SA-1, SA-4, SA-5, SA-6 and SA-11, the water elevation data could be converted to flow using rating curve relationships. For other

streams including SA-8, SA-9 and SA-10 however, the manual flow measurements obtained to date were not sufficient to develop a rating curve for conversion from level to flow. Additional data collection is recommended to capture stage-discharge relationship at different discharge level to develop and validate rating curves for these lotic systems.

**Water Quality and Limnology**

Surface waters within the project study area are soft and have typically low levels of alkalinity, nutrients (nitrate and phosphorus), total dissolved solids and total suspended solids. The pH of surface waters within the study area is slightly acidic to neutral.

In general, the concentrations of metals and metalloids were similar throughout the study area. Radionuclide concentrations were low, with the majority of measurements lower than their respective laboratory detection limits. For parameters with water quality guidelines, most were below their respective guideline limits. Aluminum, cadmium and lead concentrations exceeded guideline values at some locations and appear to be naturally elevated in surface water in the study area. Elevated concentrations of iron and mercury were measured near the Kratchkowsky Lake bottom in lakes that exhibited thermal stratification when they were sampled.

A depth profile was recorded at the deepest location in each lake, measuring conductivity, pH, temperature and dissolved oxygen. Thermal stratification of the water column was not observed in most lakes during the fall 2016 survey. In winter and summer 2018, however, thermal stratification was observed in McGowan Lake and Kratchkowsky Lake. It was also observed in north basin of Whitefish Lake (LA-6) in winter 2018, but not during the summer survey in the same year. Surface water chemistry was also measured in-situ at all stream stations.

**Sediment Quality**

Surficial sediments were collected from depositional lake areas in 2016, and were largely comprised of silty-clays or sandy-silts. The proportion of total organic carbon in the sediments varied widely among sampling areas and ranged from 0.44% to 26%.

For parameters with sediment quality guidelines, all constituent concentrations were at or below the lowest applicable guideline value, suggesting that the benthic community would not be negatively influenced by the chemical characteristics of sediments within the study area.

**Aquatic Habitat and Bathymetry**

Aquatic habitat surveys were undertaken in September 2016, coincident with biological collections. In June 2018, aquatic habitat and bathymetry for McGowan Lake (LA-1) and the north basin of Whitefish Lake (LA-6) were assessed using high resolution bathymetric

models and bottom habitat imaging to provide high-resolution bathymetry and support water intake and discharge site selection. The typical shoreline vegetation for all lakes consisted of shrubs and black spruce with upland jack pine forests. Shorelines were generally characterized by rock and overhanging shrubs, transitioning from small boulder and cobble to a sand or silty bottom with patches of sandy beach and sparse emergent or submergent aquatic vegetation.

The stream habitats surveyed as part of the baseline study included 2nd and 3rd order streams in the Icelander River basin and Williams Lake drainage area.

Kratchkowsky Lake was the largest lake (323 ha) and the north basin of Whitefish Lake (LA-6) was the smallest lake (26 ha) in terms of surface area, of the lakes surveyed as part of the baseline study. Kratchkowsky Lake was also the largest lake (12,700,000 $m^3$), and the south basin of Whitefish Lake (LA-5) was the smallest lake (333,000 $m^3$), in terms of volume, of the lakes surveyed as part of the baseline study.

**Plankton Community**

Phytoplankton and zooplankton samples were collected in 2016 at six locations within the study area. At all locations, chlorophyll-a concentrations were below the laboratory method detection confirming that the lakes within the Wheeler River Project are oligotrophic.

The phytoplankton community within the study area consisted of 55 taxa from 7 classes. At least 6 classes were identified at each location. Diatoms (*Bacilliarophyceae*) were numerically dominant, based on measured biovolume, at most locations. The cryptophytes (*Cryptophyceae*), cyanophytes (*Cyanophyceae*), and dinoflagellates (*Dinophyceae*) were also numerically important, comprising > 10% of total phytoplankton biovolume, at some locations.

The zooplankton community within the study area consisted of 32 taxa from 10 classes. At least 7 classes were identified at each location. Branchiopods (*Branchiopoda*) were numerically dominant, based on measured biovolume, at all locations. The copepods (*Copepoda*) and rotifers (*Monogononta*) were also numerically important at some locations.

**Benthic Invertebrate Community and Tissue Chemistry**

Benthic invertebrate samples were collected in 2016 at ten lake locations and a total of 78 benthic invertebrate taxa from 38 major taxonomic groups (Families) were identified within the study area. Chironomids were prevalent across the study area and were the most numerically dominant taxon at most locations. Other taxonomic groups that represented more than 10% of the total benthic invertebrate density at a sampling location were detritus worms (*Naididae*), pill clams (*Pisidiidae*), water fleas from the families *Holopedidae* and *Macrothricidae*, and phantom midges (*Chaoboridae*). From a feeding group perspective, predatory taxa and those that feed on fine particulate organic matter

(collector-gatherers) were generally the most abundant groups in lakes within the study area.

Total invertebrate density ranged on average from less than 1,000 to greater than 10,000 animals/$m^2$ bottom surface area. On average invertebrate richness ranged from approximately 7 to 24 taxa within sampling areas. Simpson's Diversity Index (*D*) values suggested that the benthic communities were relatively diverse at all locations. Simpson's Evenness (*E*) values suggested that few taxa comprised a large proportion of total invertebrate density at any given sampling location.

Benthic invertebrate tissues (whole animals) from nine locations within the study area were analyzed for metals and radionuclide contents. Metal concentrations were generally similar at all locations, with concentrations within an order of magnitude of each other. Cobalt and nickel presented the greatest variability among stations. Benthic invertebrates from Russell Lake had the highest concentrations of some metals including aluminum, cobalt and uranium. Radionuclide levels were generally below the laboratory method detection limits.

**Fish Community, Spawning and Fish Tissue Chemistry**

A total of 13 species of fish were collected within the study area during baseline surveys. All waterbodies sampled, except one headwater pond, supported fish.

The list of fish species observed during baseline studies in the Project area was discussed with local land user and Indigenous commercial fisherman Bobby John. Bobby reviewed the list and concluded all fish species have been identified in the area, even 'those little ones with the spiny backs.'

Eleven fish species were collected within study area lakes including representative forage and sport fish species. The species captured included Lake Chub, Spottail Shiner, Longnose Sucker, White Sucker, Lake Whitefish, Lake Trout, Northern Pike, Burbot, Ninespine Stickleback, Yellow Perch and Walleye.

Eleven fish species were also collected at stream stations across the study area. These include Lake Chub, Spottail Shiner, Longnose Sucker, White Sucker, Arctic Grayling, Northern Pike, Burbot, Ninespine Stickleback, Slimy Sculpin, Yellow Perch and Walleye.

Large-bodied fish spawning surveys were undertaken during the fall of 2016 and spring of 2017 at selected lake and stream locations to determine the utilization of these areas for spawning.

Fall spawning species present within the study area include Lake Whitefish and Lake Trout. Lake Trout spawning habitat was identified in Russell Lake. Spawning habitat for Lake Whitefish is present within riverine habitats proximate to the lakes.

Spring spawning species present within the study area include Walleye, Northern Pike, Arctic Grayling, White Sucker, Longnose Sucker and Yellow Perch. Spawning habitats for Walleye and suckers were observed at most stream stations within the Icelander River basin. Northern Pike spawning habitats were present in nearly all study area lakes, as well as most stream stations. Tissue samples (muscle and bone) from Northern Pike and White Sucker collected in 2016 and 2017 were retained for chemical and radiological analyses. Guideline values for constituents in fish tissue are available for mercury and selenium, and fish tissues from the study area were below these guideline values.

In 2018, 22 water samples from McGowan Lake and LA-6 were collected for analysis of environmental DNA, to evaluate this cutting-edge technology as a value-added tool to characterize fish community. However, this study remains inconclusive, potentially due to inhibition factors in the lake water. Future sampling events are recommended to overcome the inhibition issues, and provide archivable samples for biodiversity analysis throughout different stage of the mine life cycle.

# TABLE OF CONTENTS

Page

**1.0 INTRODUCTION ..... 1.1**
1.1 Project Location and Setting ..... 1.1
1.1.1 Ecozone and Ecoregion Setting ..... 1.1
1.1.2 Regional and Local Hydrology ..... 1.2
1.1.3 Indigenous and Other Land Uses ..... 1.2
1.2 Background Aquatic Environment Information ..... 1.4
1.3 Scope of the 2016 to 2019 Baseline Studies ..... 1.5
1.3.1 Overview ..... 1.5
1.3.2 Study Area ..... 1.5
1.3.3 2016-19 Lentic Stations (Lakes and Ponds) Assessment Program ..... 1.6
1.3.4 2016-19 Lotic Stations (Streams) Assessment Program ..... 1.6
1.4 Indigenous Assistance ..... 1.6
1.5 Report Format ..... 1.6
**2.0 STUDY METHODOLOGY ..... 2.1**
2.1 Hydrology ..... 2.1
2.1.1 Water Elevation and Discharge ..... 2.1
2.1.2 Bathymetry ..... 2.4
2.2 Water Quality and Limnology ..... 2.4
2.3 Sediment Quality ..... 2.6
2.4 Aquatic Habitat ..... 2.7
2.4.1 General Aquatic Habitat Characterization ..... 2.7
2.4.2 Multibeam Sonar Bathymetry and Habitat Mapping ..... 2.8
2.5 Plankton Community ..... 2.8
2.6 Benthic Invertebrate Community ..... 2.9
2.6.1 Benthic Invertebrate Taxonomy ..... 2.9
2.6.2 Benthic Invertebrate Metrics ..... 2.10
2.7 Fish Community ..... 2.12
2.7.1 Fish Collections ..... 2.12
2.7.2 Fish Spawning ..... 2.12
2.7.3 Environmental DNA (eDNA) Analysis ..... 2.13
2.8 Tissue Chemistry ..... 2.14
2.8.1 Fish Tissue Chemistry ..... 2.14
2.8.2 Benthic Invertebrate Chemistry ..... 2.15
2.9 Quality Management ..... 2.15

2.9.1 Field QA ..... 2.15
2.9.2 Chain of Custody ..... 2.15
2.9.3 Laboratory Analysis ..... 2.16
2.9.4 Project Management and Documentation Controls ..... 2.16
**3.0 LAKE ASSESSMENT RESULTS ..... 3.1**
3.1 McGowan Lake (LA-1) ..... 3.2
3.1.1 Hydrology ..... 3.2
3.1.2 Water Quality ..... 3.3
3.1.3 Sediment Quality ..... 3.4
3.1.4 Aquatic Habitat ..... 3.4
3.1.5 Plankton Community ..... 3.4
3.1.6 Benthic Invertebrate Community ..... 3.5
3.1.7 Fish Community ..... 3.6
3.2 LA-2 ..... 3.7
3.2.1 Hydrology ..... 3.7
3.2.2 Water Quality ..... 3.7
3.3 LA-3 ..... 3.8
3.3.1 Hydrology ..... 3.8
3.3.2 Water Quality ..... 3.8
3.4 Mardoc Lake (LA-4) ..... 3.9
3.4.1 Hydrology ..... 3.9
3.4.2 Water Quality ..... 3.9
3.5 Whitefish Lake, South Basin (LA-5) ..... 3.10
3.5.1 Hydrology ..... 3.10
3.5.2 Water Quality ..... 3.10
3.5.3 Sediment Quality ..... 3.11
3.5.4 Aquatic Habitat ..... 3.11
3.5.5 Plankton Community ..... 3.11
3.5.6 Benthic Invertebrate Community ..... 3.12
3.5.7 Fish Community ..... 3.12
3.6 Whitefish Lake, North Basin (LA-6) ..... 3.13
3.6.1 Hydrology ..... 3.14
3.6.2 Water Quality ..... 3.14
3.6.3 Sediment Quality ..... 3.15
3.6.4 Aquatic Habitat ..... 3.16
3.6.5 Plankton Community ..... 3.16
3.6.6 Benthic Invertebrate Community ..... 3.17
3.6.7 Fish Community ..... 3.17

3.7 Kratchkowsky Lake (LA-7) ..... 3.18
3.7.1 General Description ..... 3.18
3.7.2 Hydrology ..... 3.18
3.7.3 Water Quality ..... 3.19
3.7.4 Sediment Quality ..... 3.20
3.7.5 Aquatic Habitat ..... 3.20
3.7.6 Plankton Community ..... 3.20
3.7.7 Benthic Invertebrate Community ..... 3.20
3.7.8 Fish Community ..... 3.21
3.8 Kratchkowsky Lake (LA-7A) ..... 3.22
3.8.1 Hydrology ..... 3.22
3.8.2 Water Quality ..... 3.23
3.8.3 Sediment Quality ..... 3.23
3.8.4 Aquatic Habitat ..... 3.24
3.8.5 Plankton Community ..... 3.24
3.8.6 Benthic Invertebrate Community ..... 3.25
3.8.7 Fish Community ..... 3.25
3.9 LA-8 ..... 3.26
3.9.1 Hydrology ..... 3.26
3.9.2 Water Quality ..... 3.26
3.9.3 Sediment Quality ..... 3.27
3.9.4 Aquatic Habitat ..... 3.27
3.9.5 Benthic Invertebrate Community ..... 3.27
3.9.6 Fish Community ..... 3.28
3.10 LA-9 ..... 3.28
3.10.1 Hydrology ..... 3.29
3.10.2 Water Quality ..... 3.29
3.10.3 Sediment Quality ..... 3.29
3.10.4 Aquatic Habitat ..... 3.30
3.10.5 Benthic Invertebrate Community ..... 3.30
3.10.6 Fish Community ..... 3.30
3.11 PA-2 ..... 3.31
3.11.1 Hydrology ..... 3.31
3.11.2 Water Quality ..... 3.31
3.11.3 Aquatic Habitat ..... 3.32
3.11.4 Fish Community ..... 3.32
3.12 PA-3 ..... 3.32
3.12.1 Hydrology ..... 3.32

3.12.2 Water Quality ..... 3.33
3.12.3 Aquatic Habitat ..... 3.33
3.12.4 Fish Community ..... 3.33
3.13 LB-1 ..... 3.33
3.13.1 Hydrology ..... 3.34
3.13.2 Water Quality ..... 3.34
3.14 LB-2 ..... 3.34
3.14.1 Hydrology ..... 3.34
3.14.2 Water Quality ..... 3.35
3.15 Williams Lake (LB-3) ..... 3.35
3.15.1 Hydrology ..... 3.35
3.15.2 Water Quality ..... 3.36
3.15.3 Sediment Quality ..... 3.37
3.15.4 Aquatic Habitat ..... 3.37
3.15.5 Benthic Community ..... 3.37
3.15.6 Fish Community ..... 3.38
3.16 Russell Lake (LAB-1) ..... 3.38
3.16.1 Hydrology ..... 3.39
3.16.2 Water Quality ..... 3.39
3.16.3 Sediment Quality ..... 3.40
3.16.4 Aquatic Habitat ..... 3.40
3.16.5 Plankton Community ..... 3.40
3.16.6 Benthic Invertebrate Community ..... 3.41
3.16.7 Fish Community ..... 3.41
3.17 Russell Lake (LAB-2) ..... 3.42
3.17.1 Hydrology ..... 3.42
3.17.2 Water Quality ..... 3.43
3.17.3 Sediment Quality ..... 3.43
3.17.4 Aquatic Habitat ..... 3.43
3.17.5 Plankton Community ..... 3.44
3.17.6 Fish Community ..... 3.45
**4.0 STREAM ASSESSMENT RESULTS ..... 4.1**
4.1 SA-1 ..... 4.1
4.1.1 Hydrology ..... 4.2
4.1.2 Water Quality ..... 4.2
4.1.3 Aquatic Habitat ..... 4.3
4.1.4 Fish Community ..... 4.3
4.2 SA-2 ..... 4.4

4.2.1 Hydrology ..... 4.4
4.2.2 Water Quality ..... 4.4
4.2.3 Aquatic Habitat ..... 4.5
4.2.4 Fish Community ..... 4.5
4.3 SA-3 ..... 4.6
4.3.1 Hydrology ..... 4.6
4.3.2 Water Quality ..... 4.7
4.4 SA-4 ..... 4.7
4.4.1 Hydrology ..... 4.7
4.4.2 Water Quality ..... 4.8
4.4.3 Aquatic Habitat ..... 4.8
4.4.4 Fish Community ..... 4.9
4.5 SA-5 ..... 4.10
4.5.1 Hydrology ..... 4.10
4.5.2 Water Quality ..... 4.11
4.5.3 Aquatic Habitat ..... 4.11
4.5.4 Fish Community ..... 4.11
4.6 SA-6 ..... 4.12
4.6.1 Hydrology ..... 4.13
4.6.2 Water Quality ..... 4.13
4.6.3 Aquatic Habitat ..... 4.14
4.6.4 Fish Community ..... 4.14
4.7 SA-7 ..... 4.15
4.7.1 Hydrology ..... 4.15
4.8 SA-8 ..... 4.15
4.8.1 Hydrology ..... 4.16
4.9 SA-9 ..... 4.16
4.9.1 General Description ..... 4.16
4.9.2 Hydrology ..... 4.16
4.10 SA-10 ..... 4.17
4.10.1 Hydrology ..... 4.17
4.11 SA-11 ..... 4.18
4.11.1 Hydrology ..... 4.18
4.12 RC-1 ..... 4.18
4.12.1 Hydrology ..... 4.19
4.12.2 Water Quality ..... 4.19
4.12.3 Aquatic Habitat ..... 4.19
4.12.4 Fish Community ..... 4.20

4.13 SB-1 ..... 4.20
4.13.1 Hydrology ..... 4.20
4.13.2 Water Quality ..... 4.21
4.13.3 Aquatic Habitat ..... 4.21
4.13.4 Fish Community ..... 4.21
4.14 SB-2 ..... 4.22
4.14.1 Hydrology ..... 4.22
4.14.2 Water Quality ..... 4.22
4.15 SB-3 ..... 4.22
4.15.1 Hydrology ..... 4.23
4.15.2 Water Quality ..... 4.23
4.16 SB-4 ..... 4.23
4.16.1 Hydrology ..... 4.24
4.16.2 Water Quality ..... 4.24
4.17 SB-5 ..... 4.24
4.17.1 Hydrology ..... 4.24
4.17.2 Water Quality ..... 4.25
**5.0 SUMMARY OF BASELINE AQUATIC ENVIRONMENT CONDITIONS FOR THE WHEELER RIVER MINE PROJECT AREA ..... 5.1**
5.1 Water Elevation and Stream Discharge ..... 5.1
5.2 Surface Water Quality and Limnology ..... 5.2
5.3 Lake Sediment Quality ..... 5.5
5.4 Aquatic Habitat and Bathymetry ..... 5.5
5.5 Lake Plankton Community ..... 5.6
5.6 Lake Benthic Invertebrate Community and Chemistry ..... 5.7
5.6.1 Benthic Invertebrate Community ..... 5.7
5.6.2 Benthic Invertebrate Tissue Chemistry ..... 5.8
5.7 Fish Community, Spawning and Fish Tissue Chemistry ..... 5.9
5.7.1 Fish Community ..... 5.9
5.7.2 Fish Spawning ..... 5.10
5.7.3 Fish Tissue Chemistry ..... 5.10
5.8 Incorporation of Local Land User Information into the Aquatic Resources Baseline Program ..... 5.11
**6.0 REFERENCES ..... 6.1**
**Appendix A Baseline Aquatic Environment Quality Data ..... A.1**
**Appendix B 2016-2018 Analytical Laboratory Reports ..... B.1**
**Appendix C Stream Station Photographs ..... C.1**
**Appendix D Fish species Photographs ..... D.1**

**Appendix E Special Collection Permits..... E.1**

**Appendix F Golder Associates Ltd. 2014. 2012-2014 Aquatic Baseline Summary Report F.1**

**Appendix G EcoMetrix Incorporated. 2019. 2011-2019 Hydrology Baseline Summary Report for Wheeler River Project ..... G.1**

**Appendix H Milne Technologies. 2018 Denison Mines (Wheeler River Site) Multibeam Sonar Bathymetry and Habitat Mapping Report..... H.1**

# LIST OF TABLES

Table 1-1: Summary of 2011 to 2014 Hydrological and Aquatic Baseline Data for the Wheeler River Project ..... 1.8
Table 1-2: 2016-19 Baseline Hydrological and Aquatic Study Assessment Locations ..... 1.9
Table 1-3: 2016-19 Hydrological and Aquatics Baseline Assessment Program Lakes and Ponds ..... 1.10
Table 1-4: 2016-19 Hydrological and Aquatics Baseline Assessment Program Streams 1.11
Table 3-1: Baseline Water Elevations ..... 3.46
Table 3-2: Baseline Lake Bathymetric Features Summary ..... 3.47
Table 3-3: Baseline Water Quality Summary ..... 3.48
Table 3-4: Baseline Sediment Grain Size Distribution Summary ..... 3.58
Table 3-5: Baseline Sediment Quality Summary ..... 3.66
Table 3-6: Baseline Plankton Community Biomass and Chlorophyll a Summary ..... 3.71
Table 3-7A: Baseline Benthic Invertebrate Community Summary ..... 3.72
Table 3-8: Baseline Benthic Invertebrate Chemistry Summary ..... 3.85
Table 3-9: Baseline Lake Fish Community Summary ..... 3.86
Table 3-10: Baseline Fish Tissue Chemistry Summary ..... 3.87
Table 4-1: Baseline Stream Water Elevations and Flow Measurements ..... 4.26
Table 4-2: Baseline Stream Water Quality Summary ..... 4.27
Table 4-3: Baseline Stream Water Chemistry 2016-2019 ..... 4.33
Table 4-4: Baseline Stream Fish Community Summary ..... 4.34
Table 4-5: Baseline Stream Fish Spawning Summary ..... 4.35

# LIST OF FIGURES

Figure 1-1: Site Location ..... 1.12
Figure 1-2: Overview of Site Drainage ..... 1.13
Figure 1-3: Regional Traditional Territories (Denison 2019) ..... 1.14
Figure 1-4: Traditional, Recreational, and Industrial Land Use Leases in Proximity to the Wheeler River Project Area (Denison 2019, Denison 2020) ..... 1.15
Figure 1-5 Regional Commercial Fishing Activities and Fish Spawning Area around Wheeler River Project Area (Denison 2020). ..... 1.16
Figure 1-6 Available Knowledge about Traditional Land Use Around Wheeler River Project Area ..... 1.17
Figure 1-7: 2016-19 Baseline Hydrological and Aquatic Study Lake and Pond Sampling Locations ..... 1.18
Figure 1-8: 2016-19 Baseline Hydrological and Aquatic Study Stream Sampling Locations ..... 1.19
Figure 3-1: McGowan Lake Bathymetry Characterized with Multibeam Sonar, June 2018 ..... 3.92
Figure 3-2: Limnological Profiles of Selected Lakes – September 2016. Coordinates of each sampling location is shown in Table A2. ..... 3.93
Figure 3-3: Limnological Profiles of Selected Lakes – March 2018. Coordinates of each sampling location is shown in Table A2. ..... 3.94
Figure 3-4: Limnological Profiles of Selected Lakes – July 2018. Coordinates of each sampling location is shown in Table A2. ..... 3.95
Figure 3-5: McGowan Lake Habitat Characterized with Multibeam Sonar, June 2018 ..... 3.96
Figure 3-6: Relative Abundance of Phytoplankton Classes for Selected Lakes ..... 3.97
Figure 3-7: Relative Abundance of Zooplankton Classes for Selected Lakes ..... 3.98
Figure 3-8: Relative Abundance of Benthic Invertebrate Feeding Groups for Selected Lakes ..... 3.99
Figure 3-9 Fish Spawning Area at the Wheeler River Project Area ..... 3.100
Figure 3-10: Whitefish Lake, North Basin (LA-6) Bathymetry Characterized with Multibeam Sonar, June 2018 ..... 3.101
Figure 3-11: Whitefish Lake, North Basin (LA-6) Habitat Characterized with Multibeam Sonar, June 2018 ..... 3.102
Figure 3-12: North Arm of Kratchkowsky Lake (LA-7A) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake. ..... 3.103
Figure 3-13: Lake LA-8 Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake. ..... 3.104
Figure 3-14: Lake LA-9 Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake. ..... 3.105
Figure 3-15: Pond-(PA-2) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake. ..... 3.106
Figure 3-16: Pond (PA-3) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake. ..... 3.107
Figure 3-17: Russell Lake (LAB-2) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake. ..... 3.108

# LIST OF APPENDICES

Appendix A: Baseline Aquatic Environment Data
- Table A-1: Baseline Water Quality Data
- Table A-2: Baseline Water Profile Data
- Table A-3: Baseline Sediment Grainsize Analysis
- Table A-4: Baseline Sediment Quality Data
- Table A-5: Baseline Phytoplankton Community Data Collected in September 2016
- Table A-6: Baseline Zooplankton Community Data Collected in September 2016
- Table A-7: Plant Pigments in Surface Water Collected in September 2016
- Table A-8: Baseline Benthic Invertebrate Community Collected in September 2016 Number of Individuals per Taxonomic Unit and Reference Median
- Table A-9: Baseline Benthic Invertebrate Community Collected in September 2016 Number of Individuals per Taxonomic Group
- Table A-10: Baseline Benthic Invertebrate Community Collected in September 2016 Percent Abundance per Taxonomic Group
- Table A-11: Baseline Benthic Invertebrate Community Collected in September 2016 Feeding Groups Summary
- Table A-12: Baseline Benthic Invertebrate Chemistry Collected September 2016
- Table A-13: Baseline Fish Catch Summary
- Table A-14: Key Baseline Lake Features
- Table A-15: Baseline Stream Spawning Habitat
- Table A-16: Baseline Fish Detailed Fish Collection Data
- Table A-17: Baseline Fish Flesh Chemistry
- Table A-18: Baseline Fish Bone Chemistry

Appendix B Analytical Laboratory Reports
- B-1: Lake Surface Water Quality
- B-2: Lake Sediment Grain Size Analysis
- B-3: Lake Sediment Quality
- B-4: Lake Plankton Community
- B-5: Benthic Taxonomy Data
- B-6: Benthic Invertebrate Chemistry
- B-7: Fish Flesh and Bone Chemistry
- B-8: Environmental DNA Laboratory Report
- B-9: Stream Water Quality Laboratory Report

Appendix C: Stream Station Photographs

Appendix D: Fish Species Photographs

Appendix E: Special Collection Permits

Appendix F: Golder Associates Ltd. 2014a. Denison Mines-Wheeler River Project. 2012-2014 Aquatic Baseline Summary Report. Prepared for Denison Mines Corporation. May.

Appendix G: EcoMetrix Incorporated. 2019. Denison Wheeler River Hydrology Baseline 2011 to 2019 Report

Appendix H: Milne Technologies. 2018 Denison Mines (Wheeler River Site) Multibeam Sonar Bathymetry and Habitat Mapping Report.

# ACRONYMS

| | |
|---|---|
| ALS | ALS Canada Ltd |
| B-C | Bray-Curtis Dissimilarity Index |
| BC MOE | British Columbia Ministry of Environment |
| Bq/L | Becquerel per Litre |
| CALA | Canadian Association for Laboratory Accreditation |
| CoC | Chain-of-custody |
| SEQG | Saskatchewan Environmental Quality Guidelines |
| $CaCO_3$ | Calcium carbonate |
| CCME | Canadian Council of Ministers of the Environment |
| CWQG | Canadian Water Quality Guidelines |
| CPUE | Catch per unit effort |
| D | Simpson's Diversity |
| DNA | Deoxyribonucleic Acid |
| DO | Dissolved oxygen |
| E | Evenness |
| eDNA | Environmental DNA |
| EEM | Environmental Effects Monitoring |
| ERFN | English River First Nation |
| dw | Dry weight |
| FPOM | Fine particulate organic matter |
| GPS | Global positioning system |
| ISO | International Organization for Standardization |
| ISQG | Interim Sediment Quality Guideline |
| LEL | Lowest effect level |
| masl | Meters above sea level |
| MDL | Method detection limit |
| $NO_3$ | Nitrate |
| NSF | National Science Foundation |
| PCR | Polymerase Chain Reaction |

| | |
|---|---|
| QA | Quality assurance |
| QC | Quality control |
| QMS | Quality Management System |
| REF | Reference |
| RPD | Relative percent difference |
| SOP | Standard Operation Protocol |
| SRC | Saskatchewan Research Council |
| SSWQO | Saskatchewan Surface Water Quality Objective |
| TDS | Total dissolved solids |
| TKN | Total Kjeldahl Nitrogen |
| TSS | Total suspended solids |
| USEPA | United States Environmental Protection Agency |
| ww | Wet (or fresh) weight |
| YOY | Young-of-the-year |

# 1.0 INTRODUCTION

## 1.1 Project Location and Setting

The Denison Mines Corp. (Denison) Wheeler River Project (Project) is located in north central Saskatchewan, in the eastern portion of the Athabasca Basin (**Figure 1-1)**. It is situated approximately 35 kilometres northeast of Cameco Corporation's Key Lake Operation and 35 kilometres southwest of Cameco Corporation's McArthur River Operation.

### 1.1.1 Ecozone and Ecoregion Setting

The Project area lies within the Boreal Shield ecozone (McLaughlan, 2010). Stretching 3,800 kilometres from Newfoundland to Alberta, the Boreal Shield includes parts of six provinces, covers more than 1.8 million square kilometres, and encompasses almost 20% of Canada's land mass and 10% of its fresh water. This ecozone is characterized as having thin acidic soils, cool temperatures, a short growing season, and frequent forest fires. The passage of forest fires has resulted in a mosaic of forests across the area characterized by different vegetation communities and successional stages. Historical scouring of the area by glaciers has left numerous localized areas of exposed bedrock colonized by lichen and ground hugging shrubs. The remainder of the area is covered by bogs, marshes and other wetlands.

The Athabasca Plain ecoregion of the Boreal Shield ecozone extends south from Lake Athabasca to Cree Lake (ESWG, 1996). This ecoregion is marked by short cool summers and very cold winters. The mean annual temperature is approximately -3.5°C. The mean summer temperature is 12°C and the mean winter temperature is -20.5°C. The mean annual precipitation ranges 350-450 mm. This ecoregion is classified as having a sub-humid high boreal ecoclimate. Stands of jack pine (*Pinus banksiana*) with an understory of ericaceous shrubs and lichen are dominant. Some paper birch (Betula papyrifera), white spruce (*Picea glauca*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*) and tamarack (*Larix laricina*) may also be found where conditions allow. Wildlife common in this area include moose (*Alces alces*), black bear (*Ursus americanus*), woodland caribou (*Rangifer tarandus caribou*), lynx (*Lynx canadensis*), wolf (*Canis lupis*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), snowshoe hare (*Lepus americanus*), waterfowl (including ducks, geese, common loon [*Gavia immer*], white pelican [*Pelecanus erythrorhynchos*], and sandhill crane [*Grus canadensis*]), spruce grouse (*Falcipennis canadensis*), and other birds (grey jay [*Perisoreus canadensis*], bald eagle [*Haliaeetus leucocephalus*] and American kestrel [*Falco sparverius*]). Large-bodied fish species commonly found in lakes and streams of northern Saskatchewan include Walleye (*Sander vitreus*), Yellow Perch (*Perca flavescens*), Northern Pike (*Esox lucius*), Lake Trout (*Salvelinus namaycush*), Arctic Grayling (*Thymallus arcticus*), Lake Whitefish (*Coregonus clupeaformis*), White Sucker

(*Catostomus commersonii*), Longnose Sucker (*Catostomus catostomus*), and Burbot (*Lota lota)* (SSRWS, 2010).

### 1.1.2 Regional and Local Hydrology

The Project site lies within the Wheeler River watershed, which is part of the Churchill River Basin. The Wheeler River has a watershed area of greater than 3,000 km$^2$.

Surface water on the Project site drains via two sub-basins of the Wheeler River, the Icelander River drainage and the Williams Lake drainage (**Figure 1-1**). Both drainages flow generally south into the northwest portion of Russell Lake. The estimated drainage areas of the Icelander River and Williams Lake drainage areas are 371 km$^2$ and 78 km$^2$, respectively (Golder, 2014). Downstream of Russell Lake, the Wheeler River flows into the Geikie River which subsequently discharges to Wollaston Lake.

### 1.1.3 Indigenous and Other Land Uses

The Wheeler River Project area lies within the traditional territories of English River First Nation (ERFN) and Kineepik Métis Local 9, as shown in **Figure 1-3**. **Figure 1-4** identifies traditional, recreational and industrial land uses in the Project area. **Figure 1-5** and **Figure** 1-6 provide information from an interview between Denison and a local resident who is a key local land/resource user (Bobby John) and is very knowledgeable about the local and regional ecology (Denison 2020). This information is also summarized below, along with other local and land user knowledge about this area.

#### 1.1.3.1 **Cabins and Recreational Properties**

A property belonging to Bobby John is situated in the southwest portion of Russell Lake: Property No 602377 (**Figure 1-4**). Bobby John's cabin is located upstream of Russell Lake, along the Wheeler River, near Brown Lake. This is his primary cabin, and he has secondary cabins on Russell Lake and Phillips Lake and a family cabin on Cree Lake (**Figure 1-5**)

A cabin on the northern end of Kratchkowsky Lake and evidence of a camp at Mardoc Lake were noted by EcoMetrix field staff during the fall 2016 and spring 2017 field studies.

Recreational properties are situated on the northeast portion of Russell Lake and along the Wheeler River to the northeast of Russell Lake. Bobby John mentioned in his interview that twenty-plus tourist cabins are located on Russell Lake (Denison 2020).

There is one recreational property located on the southwest portion of McGowan Lake: Property No 302586 (**Figure 1-4**).

Generally, it is noted that there have been more recreational leases granted and more cabins established within the area in the last five to ten years; though there is currently a hold on further leases. Most of the more recently established properties are used seasonally, with use limited to a few weeks in the summer.

#### 1.1.3.2 **Commercial Fishing**

Bobby John operates a commercial fishing business at Russell, McDougal, Moore, Kratchkowsky and Moon lakes (**Figure 1-5**). Generally, lakes are fished for one year and then left for the following two years.

Fish are targeted via netting and fishing occurs from late fall through April when the lakes are ice-covered. The preferred species is Walleye at this time based on price, but Northern Pike, Whitefish and trout are also collected. Fish are sold to the fish plant at Pinehouse, approximately 250 km south of the Project area.

#### 1.1.3.3 **Outfitting**

Bobby John has identified that there are two active outfitters in the area. The Russell Lake Lodge is located on the southeast end of Russell Lake with an outcamp on Kowalchuk Lake (**Figure 1-4**). The Russell Lake Lodge that has been active since the 1950s. The Wheeler River Lodge is located on Moore Lake. The most prevalent activity associated with the lodges is fishing.

#### 1.1.3.4 **Winter Trails, Trapping, Foraging and Recreational Fishing**

Two winter trails within or near the Project area have been identified: one passing through the Wheeler River Project area and the other passing south of the Wheeler River Project area (**Figure 1-3**). The first is identified as Bobby John's route, which is confirmed to be actively used. It runs southwest between LA-9 and LA-4, and continues southwest through Williams Lake (LB-3). The second is identified as Paul Sayzie's route. It follows the Wheeler River and crosses the southern portion of Russell Lake.

Trapping has been identified in the area southwest and south of Russell Lake (**Figure** 1-3). Trap lines are run from November through February. According to Mr. Bobby John, Marten is the preferred species based on recent fur prices but other fur bearers such as lynx, beaver and muskrat are also targeted. Generally, fur prices have been poor for the last number of years and therefore less effort has been expended on the trap lines.

Hunting and berry picking have been noted to the south of Russell Lake (**Figure 1-6**). Berry picking activities were also observed by EcoMetrix field staff during fall field work in 2016 when blueberries were noted throughout the Wheeler River Project area.

Recreational angling activities in the area occurs generally within the vicinity of established camps and cabins, and also is associated with the local outfitting operations. Recreational angling activities at Russell Lake were observed during fall field work in 2016. Access to Russell Lake by anglers was from boat launches situated within the northern embayment near the outlet of the Icelander River (LAB-1).

#### 1.1.3.5 Industrial Properties

An industrial property that belongs to Rio Tinto Exploration is also located to the south of McGowan Lake: Property No 303242 ().

Two industrial properties that belongs to Saskatchewan Power Corporation (Property No: 303329 and Property No: 303261) are located just southwest of Bobby John's property at Russell Lake.

There is an area at the northwest end of Kratchkowsky Lake with old core boxes (**Figure** 1-5).

There is an abandoned exploration camp located west of Hwy 914 on the road the Wheeler River Project site.

## 1.2 Background Aquatic Environment Information

Previous baseline hydrology and aquatics investigations for the Project are reported in:

- Golder Associates. Denison Mines-Wheeler River Project. 2012-2014 Aquatic Baseline Summary Report. Prepared for Denison Mines Corporation. May 2014 (**Appendix F**).
- Golder Associated. Denison Mines-Wheeler River Project. 2012-2014 Baseline Hydrology Summary Report. Prepared for Denison Mines Corporation. May 2014 (Part of **Appendix G**).

The 2014 baseline aquatic study report summarizes surface water chemistry and limnology profiles for selected streams surveyed during spring, summer and fall of 2012 and 2013 and the winter of 2014 and lakes surveyed during summer 2012 and winter 2014. Bathymetric surveys and fish habitat assessments of selected lakes were undertaken during the summer of 2012. Lake investigations were completed at McGowan Lake (LA-1), Whitefish Lake (LA-5, LA-6)[1], Williams Lake (LB-3) and in the south arm of Kratchkowsky Lake (LA-7)

[1] Herein lakes LA-5 and LA-6 have been identified as separate water bodies connected by a stream. A local resource user, Bobby John, considers these as two basins of one lake (Whitefish Lake) separated by a narrows.

and Russell Lake (LAB-1) at the inflow from Icelander River. Stream investigations were conducted at SA-1, SA-2, SA-3, SA-4, SA-5, SA-6, SB--1, SB-2, SB-3, SB-4, and SB-5.

The 2014 baseline hydrological study report summarized data from three field programs completed during open water seasons in 2011, 2012 and 2013, as well as one additional winter field program completed between March 22 and April 1, 2014. Staff gauge readings and elevation surveys were conducted at eleven lake stations (McGowan Lake, LA-2, LA-3, Mardoc Lake (LA-4), Whitefish Lake (LA-5, LA-6), LA-7, Russell Lake (LAB-1), LB-1, LB-2 and Williams Lake (LB-3). Instantaneous discharge measurements, continuous water level recordings and elevation surveys were conducted at nine stream stations (SA-1, SA-2, SA-3, SA-4, SA-5, SA-6, SB-1, SB-2 and SB-3).

## 1.3 Scope of the 2016 to 2019 Baseline Studies

### 1.3.1 Overview

The overall objective of the 2016 through 2019 baseline aquatic environment studies was to build upon and supplement information collected during the period 2011 through 2014. Together, the results of these studies will support engineering studies, technical assessments and environmental approvals processes for the Project.

The scope of work for the 2016 through 2019 aquatic baseline field studies included:

- water elevation measurements, instantaneous discharge measurements, and continuous water level recording;
- bathymetry and aquatic habitat assessments and mapping;
- limnological, water quality, and sediment quality evaluations;
- benthic invertebrate community and tissue characterization;
- phytoplankton and zooplankton surveys; and,
- fish community and spawning surveys and tissue chemistry analysis.

Sampling was repeated at locations that were part of the 2011 to 2014 studies and new sampling locations were established. New lake stations were established in the northern arm of Kratchkowsky Lake (LA-7A), lakes LA-8 and LA-9, Russell Lake near the inlet of the Williams Lake drainage area (LAB-2), and ponds PA-2, and PA-3. Several stream locations were surveyed for the first time, including several inlets to Kratchkowsky Lake (SA-7, SA-8, SA-11), the outlet of Kratchkowsky Lake (RC-1), the outlet of LA-8 (SA-9) and the inlet to LA-9 (SA-10).

### 1.3.2 Study Area

The study area comprises surface waterbodies, lakes, ponds and streams, within drainage the Icelander River drainage and the Williams Lake drainage, as well as portions of Russell Lake adjacent to the inflows from these two drainage areas. The study area and aquatic

monitoring locations are shown in **Figure 1-7**and **Figure 1-8**. Aquatic monitoring locations within the study area are described in **Table 1-2**.

### 1.3.3 2016-19 Lentic Stations (Lakes and Ponds) Assessment Program

Nine lakes and three ponds in the Icelander River drainage area, three lakes in the Williams Lake drainage area and two areas of Russell Lake were included in the 2016-19 baseline aquatic studies. The assessment program as it applies to each of these waterbodies is summarized in **Table 1-3.**

### 1.3.4 2016-19 Lotic Stations (Streams) Assessment Program

Twelve streams in the Icelander River drainage area and five streams in the Williams Lake drainage area were included in the 2016-19 aquatic baseline studies. The assessment program, as it applies to each of these waterbodies is summarized in **Table 1-4**.

## 1.4 Indigenous Assistance

In addition to the EcoMetrix team, Jobie Daigneault and Jayme George-Eaglechild, residents of the Eagle English River First Nation (ERFN) at Patuanak, SK, provided assistance during the field work program.

Jobie Daigneault participated in aquatic baseline studies undertaken in May-June 2017, March 2018, and June-July 2018. In spring 2017, Jobie provided assistance during a fish spawning survey. His responsibilities included safe operation of an ATV, setting and retrieving gillnets, length and weight measurement of fish, and collection of fish tissues for analysis. During the winter of 2018, Jobie assisted with limnological and hydrological studies involving measuring water chemistry and ice thickness, and collection of water samples from several lakes. His responsibilities included safe operation of a power ice auger and snowmobile. His experience with “trail breaking” in deep snow proved invaluable, enabling the EcoMetrix team to get work completed as efficiently as possible. During summer 2018, Jobie provided assistance with limnological and hydrological studies involving measuring water chemistry, flow discharge, water elevation, and collection of water samples for environmental DNA analysis from several lakes and streams. His responsibilities included safe operation of an ATV, surveying and collection of water.

Jayme George-Eaglechild participated in aquatic baseline studies undertaken in July 2019. He provided assistance with hydrological data collection including flow discharge measurements, water elevation surveys, and collection of water samples for analysis. His responsibilities included surveying and flow measurement.

## 1.5 Report Format

Following this introductory section, the remainder of the report is organized as follows. In **Section 2.0**, the methodology of each of the separate components of the 2016-19 baseline

program is outlined. Baseline data for lentic stations, lake and ponds, are provided in **Section 3.0**, including the results of the 2016-19 aquatic surveys, as well as previous work conducted at the site (**Appendix F,** part of **Appendix G**). Information is presented on a lake-by-lake basis, beginning with lake and then pond stations in the Icelander River Drainage, lake stations in the Williams Lake Drainage, and finally stations in Russell Lake. Baseline data for stream stations are provided in **Section 4.0**, including the results of the 2016-19 aquatic surveys, as well as previous work conducted at the site (**Appendix F,** part of **Appendix G**). Information is presented on a stream-by-stream basis, beginning with stations in the Icelander River drainage area and then transitioning to stations in the Williams Lake drainage area. **Section 5.0** provides a summary of baseline characteristics for the Wheeler River Project study area. References consulted in the preparation of this report are provided in **Section 6.0**. Throughout the report, data and input from Indigenous and Local Land Users has been highlighted and compared to results from baseline investigations.

The appendices to this report include:

Appendix A: Baseline Aquatic Environment Data

Appendix B Analytical Laboratory Reports

Appendix C: Stream Station Photographs

Appendix D: Fish Species Photographs

Appendix E: Special Collection Permits

Appendix F: Golder Associates Ltd. 2014a. 2012-2014 Aquatic Baseline Summary Report.

Appendix G: EcoMetrix Incorporated. 2019. Denison Wheeler River Hydrology Baseline 2011 to 2019 Report

Appendix H: Milne Technologies. 2018 Denison Mines (Wheeler River Site) Multibeam Sonar Bathymetry and Habitat Mapping Report.

# Tables

**Table 1-1: Summary of 2011 to 2014 Hydrological and Aquatic Baseline Data for the Wheeler River Project**

| Station Name | | Hydrological Study Data | | | | | | | | | | | | | | | | Aquatics Study Data | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Instantaneous Discharge Measurements | | | | Continuous Water Level Recording | | | | Staff Gauge | | | | Elevation Survey | | | | Limnology | | | Water Quality | | | | Bathymetry | Fish Habitat |
| Drainage | Station | 2011 | 2012 | 2013 | 2014 | 2011 | 2012 | 2013 | 2014 | 2011 | 2012 | 2013 | 2014 | 2011 | 2012 | 2013 | 2014 | 2012 | 2013 | 2014 | 2011 | 2012 | 2013 | 2014 | 2012 | 2012 |
| **Lentic Stations - Lakes and Ponds** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Icelander River Drainage Area | McGowan Lake (LA-1) | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | √ | · | √ | | √ | · | √ | √ | √ |
| | LA-2 | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | · | · | √ | | · | · | √ | · | · |
| | LA-3 | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | · | · | √ | | · | · | √ | · | · |
| | Mardoc Lake (LA-4) | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | · | · | √ | | · | · | √ | · | · |
| | Whitefish Lake (LA-5) | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | √ | · | √ | | √ | · | √ | √ | √ |
| | Whitefish Lake (LA-6) | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | √ | · | √ | | √ | · | √ | √ | √ |
| | Kratchkowsky Lake (LA-7) | · | · | · | · | · | √ | √ | · | √ | √ | √ | · | √ | √ | √ | √ | √ | · | √ | | √ | · | √ | √ | √ |
| Williams Lake Drainage Area | LB-1 | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | · | · | · | · | | · | · | · | · | · |
| | LB-2 | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | · | · | √ | | · | · | √ | · | · |
| | Williams Lake (LB-3) | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | √ | · | √ | | √ | · | √ | √ | √ |
| Russell Lake | LAB-1 (RL-A) | · | · | · | · | · | · | · | · | √ | √ | √ | · | √ | √ | √ | √ | √ | · | √ | | √ | · | √ | √ | √ |
| **Lotic Stations - Streams** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Icelander River Drainage Area | SA-1 | √ | √ | √ | √ | √ | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SA-2 | √ | √ | √ | √ | √ | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SA-3 | √ | √ | √ | √ | √ | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SA-4 | √ | √ | √ | √ | · | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SA-5 | √ | √ | √ | √ | · | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SA-6 | √ | √ | √ | √ | √ | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| Williams Lake Drainage Area | SB-1 | √ | √ | √ | √ | √ | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SB-2 | · | · | · | · | · | · | · | · | · | · | · | · | · | · | · | · | √ | √ | √ | | √ | √ | √ | · | · |
| | SB-3 | √ | √ | √ | √ | √ | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SB-4 | √ | √ | √ | √ | · | √ | √ | √ | · | · | · | · | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | · | · |
| | SB-5 | · | · | · | · | · | · | · | · | · | · | · | · | · | · | · | · | √ | √ | √ | | √ | √ | √ | · | · |

Notes:
√ - indicates that sampling occurred
· - indicates that no sampling occurred
Aquatic and hydrologic programs were conducted:
2011 - May 11 to May 16, July 27 to July 31 and October 27 to October 31.
2012 - May 3 to May 9, August 5 to August 8, and October 21 to October 25.
2013 - May 18 to May 24, August 12 to August 15, and October 16 to October 19.
2014 - March 22 to April 1.

**Table 1-2: 2016-19 Baseline Hydrological and Aquatic Study Assessment Locations**

| Drainage | Waterbody | Description |
|---|---|---|
| **Lake and Pond Stations** | | |
| Icelander River Drainage Area | McGowan Lake (LA-1) | Situated within drainage area A, upstream of Russell Lake (LAB-1) and downstream of lakes LA-2 (via SA-3) and LA-5 (via SA-2) |
| | LA-2 | Situated within the eastern sub-basin of drainage area A, upstream of lake LA-1 and downstream of lakes LA-3 and LA-4 |
| | LA-3 | Situated within the eastern sub-basin of drainage area A, upstream of LA-2 |
| | Mardoc Lake (LA-4) | Situated within the eastern sub-basin of drainage area A, upstream of LA-2 |
| | Whitefish Lake (LA-5) | Comprises of the southern basin of Whitefish Lake and is situated within drainage area A, upstream of lake LA-1 and downstream of lake LA-6 (via SA-6) |
| | Whitefish Lake (LA-6) | Comprises of the northern basin of Whitefish Lake and is situated within drainage area A, upstream of the south basin of Whitefish Lake and downstream of lakes LA-9 (via SA-5) and LA-7 (via SA-4) |
| | Kratchkowsky Lake (LA-7) | Comprises of the southeast portion of Kratchkowsky Lake and is situated within drainage area A, upstream of lake LA-6 |
| | Kratchkowsky Lake (LA-7A) | Comprises of the northwest portion of Kratchkowsky Lake and is situated within drainage area A, upstream of lake LA-6 |
| | LA-8 | Situated within drainage area A, upstream of lake LA-9 |
| | LA-9 | Situated within drainage area A, upstream of lake LA-6 and downstream of LA-8 (via SA-9 and SA-10) |
| | PA-2 | Headwater pond situated within drainage area A, upstream of pond PA-3 |
| | PA-3 | Situated within drainage area A, downstream of pond PA-2 and upstream of lake LA-6 |
| Williams Lake Drainage Area | LB-1 | Situated within drainage area B, upstream of Russell Lake (LAB-2) and downstream of lake LB-2 (via SB-3) |
| | LB-2 | Situated within drainage area B, upstream of lake LB-1 and downstream of Williams Lake (LB-3) (via SB-5) |
| | Williams Lake (LB-3) | Headwater lake situated within drainage area B, upstream of lake LB-2, known locally as Williams Lake |
| Russell Lake | LAB-1 (RL-A) | Comprises a small portion of Russell Lake and is situated within the northern embayment at the outlet of the Icelander River (drainage area A), downstream of SA-1. |
| | LAB-2 | Comprises a small portion of Russell Lake and is situated along the northwestern shore at the outlet of drainage area B, downstream of SB-1 |
| **Stream Stations** | | |
| Icelander River Drainage Area | SA-1 | Most downstream monitoring station in Drainage Area A |
| | SA-2 | Northwest tributary of lake LA-1 downstream of lake LA-6. |
| | SA-3 | Situated upstream of lake LA-1 and downstream of lake LA-2 |
| | SA-4 | Situated upstream of lake LA-6 and downstream of the outlet from of Kratchkowsky Lake (LA-7), and drainage from ponds PA-2 and PA-3 |
| | SA-5 | Situated upstream of lake LA-6 on the northeastern tributary that provides drainage from lakes LA-8 and LA-9 |
| | SA-6 | Situated downstream of lake LA-6 and upstream of lake LA-5 |
| | SA-7 | Situated on the southwestern inlet tributary to Kratchkowsky Lake (LA-7) |
| | SA-8 | Situated on the northwestern inlet tributary to Kratchkowsky Lake (LA-7) |
| | SA-9 | Situated on the southeastern outlet tributary of lake LA-8 |
| | SA-10 | Situated on the northern inlet tributary to lake LA-9 |
| | SA-11 | Situated on the northeastern inlet tributary to Kratchkowsky Lake (LA-7) |
| | RC-1 | Situated downstream of Kratchkowsky Lake (LA-7) and upstream of station SA-4 |
| Williams Lake Drainage Area | SB-1 | The most downstream station in Drainage Area B, situated at the Highway 914 Road crossing |
| | SB-2 | Situated on a tributary that drains from the west, joining the watercourse immediately upstream of the Highway 914 Road crossing at SB-1 |
| | SB-3 | Situated downstream of lake LB-2. |
| | SB-4 | Situated on the southwestern inlet tributary to Williams Lake (LB-3) |
| | SB-5 | Situated on the outlet tributary from Williams Lake (LB-3), upstream of lake LB-2 |

**Table 1-3: 2016-19 Hydrological and Aquatics Baseline Assessment Program Lakes and Ponds**

| Waterbody / Station Name | Water Elevation Survey | Bathymetry | Limnology | Water Quality | Sediment Chemistry | Benthic Invertebrate Community | Benthic Invertebrate Chemistry | Phytoplankton and Zooplankton | Fish Habitat | Fish Community[a] | Fish Spawning Survey | Fish Tissue Chemistry[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| McGowan Lake (LA-1) | 2016, 2018, 2019 | 2018 | 2018 | 2016, 2018 | 2016 | 2016 | 2016 | 2016 | - | 2016, 2018 | 2016, 2017 | 2016, 2017 |
| LA-2 | 2016 | - | - | 2016 | - | - | - | - | - | - | - | - |
| LA-3 | 2016 | - | - | 2016 | - | - | - | - | - | - | - | - |
| Mardoc Lake (LA-4) | 2016 | - | - | 2016 | - | - | - | - | - | - | - | - |
| Whitefish Lake (LA-5) | 2016 | - | - | 2016 | 2016 | 2016 | 2016 | 2016 | - | 2016 | 2016, 2017 | 2016, 2017 |
| Whitefish Lake (LA-6) | 2016, 2018, 2019 | 2018 | 2018 | 2016, 2018 | 2016 | 2016 | 2016 | 2016 | - | 2016, 2018 | 2016, 2017 | 2016, 2017 |
| Kratchkowsky Lake (LA-7) | 2016, 2017 | - | - | 2016 | 2016 | 2016 | 2016 | 2016 [a] | - | 2016[c] | 2016, 2017 | 2016, 2017[c] |
| Kratchkowsky Lake (LA-7A) | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | | 2016 | | 2016, 2017 | |
| LA-8 | 2016, 2017 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | - | 2016 | 2016 | - | - |
| LA-9 | 2016, 2017 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | - | 2016 | 2016 | - | - |
| LB-1 | 2016 | - | - | 2016 | - | - | - | - | - | - | - | - |
| LB-2 | 2016 | - | - | 2016 | - | - | - | - | - | - | - | - |
| Williams Lake (LB-3) | 2016 | - | - | 2016 | 2016 | 2016 | - | - | - | - | - | - |
| Russell Lake (LAB-1) | 2016 | - | - | 2016 | 2016 | 2016 | 2016 | 2016 | - | 2016[d] | 2016, 2017 | 2016, 2017[d] |
| Russell Lake (LAB-2) | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | 2016 | | 2016, 2017 | |
| PA-2 | 2016, 2017 | 2016 | 2016 | 2016 | - | - | - | - | 2016 | 2016 | - | - |
| PA-3 | 2016, 2017 | 2016 | 2016 | 2016 | - | - | - | - | 2016 | 2016 | - | - |

Notes:
"-" indicates that no sampling occurred
Aquatic and hydrologic programs were conducted: September 9-22, 2016; May 26-June 1, 2017; March 15-18, 2018; June 29-July 3, 2018; July 4-6, 2019; August 29-September 1, 2019
A – Included external health assessment on a sub-set of fish and eDNA analysis
b – Trace metal and radionuclide analysis in bone and flesh from n=5 predator fish (Northern Pike [*Esox lucius*]) and n=5 forage fish (White Sucker [*Catostomus commersonii*]) from each waterbody
c – For purposes of describing the fish community and fish tissue chemistry, Kratchkowsky Lake was considered a single study area and fish were collected throughout the lake
d – For purposes of describing the fish community and fish tissue chemistry, Russell Lake was considered a single study area and fish were collected from LAB-1 and LAB-2

**Table 1-4: 2016-19 Hydrological and Aquatics Baseline Assessment Program Streams**

| Station Name | Instantaneous Discharge Measurements[a] | Continuous Water Level Recording | Elevation Survey | Water Quality | Spawning Habitat Survey | Fish Community |
|---|---|---|---|---|---|---|
| SA-1 | 2016, 2017, 2018, 2019 | 2016[b], 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | 2019 | 2016, 2017 | 2016, 2017 |
| SA-2 | 2016, 2019 | 2016 | 2016, 2019 | 2019 | 2016, 2017 | 2016, 2017 |
| SA-3 | 2016, 2019 | 2016 | 2016, 2019 | 2019 | - | - |
| SA-4 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | 2019 | 2016, 2017 | 2016, 2017 |
| SA-5 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | 2019 | 2016, 2017 | 2016, 2017 |
| SA-6 | 2016, 2017, 2018, 2019 | 2016[c], 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | 2019 | 2016, 2017 | 2016, 2017 |
| SA-7 | 2016 | - | - | - | - | - |
| SA-8 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2017 | 2016, 2017, 2018, 2019 | - | - | - |
| SA-9 | 2016, 2017, 2019 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | - | - | - |
| SA-10 | 2016, 2017, 2019 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | - | - | - |
| SA-11 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | - | - | - |
| RC-1 | 2016, 2018, 2019 | - | 2016, 2019 | 2019 | 2017 | 2017 |
| SB-1 | 2016 | 2016[c] | 2016 | - | 2016 | 2016 |
| SB-2 | 2016 | 2016 | 2016 | - | - | - |
| SB-3 | 2016 | 2016 | 2016 | - | - | - |
| SB-4 | 2016 | 2016[b] | 2016 | - | - | - |
| SB-5 | 2016 | 2016 | 2016, 2017 | - | - | - |

Notes:

"-" indicates that no sampling occurred

Aquatic and hydrologic programs were conducted: September 9-22, 2016; May 26-June 1, 2017; March 15-18, 2018; June 29-July 3, 2018; July 4-6, 2019; August 29-September 1, 2019

a – multiple readings of instantaneous discharge were taken during each sampling event

b – level logger was not found or was not functional in 2016

c – level logger installed by Golder was retrieved in 2016

# Figures

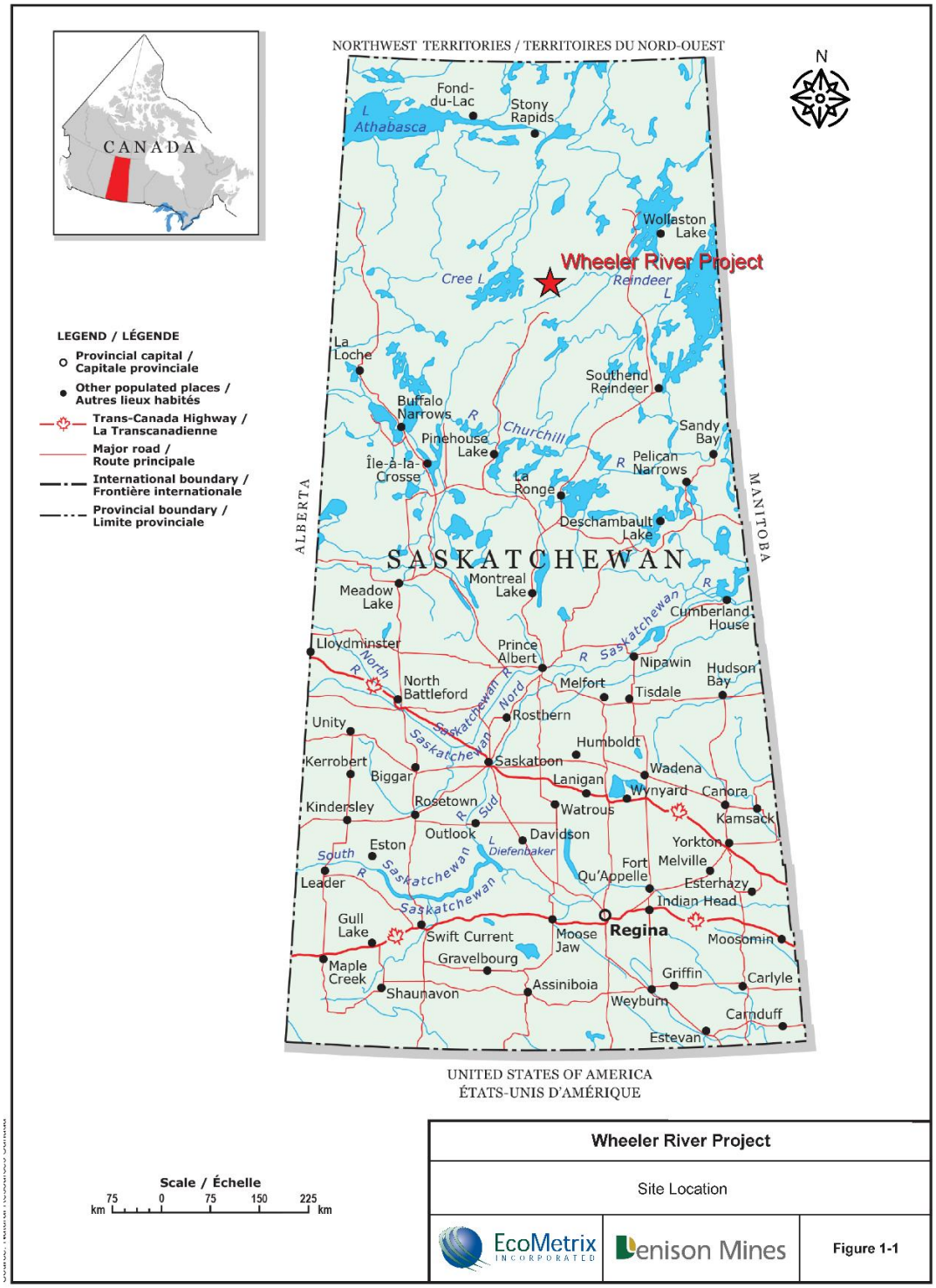



**Figure 1-1: Site Location**

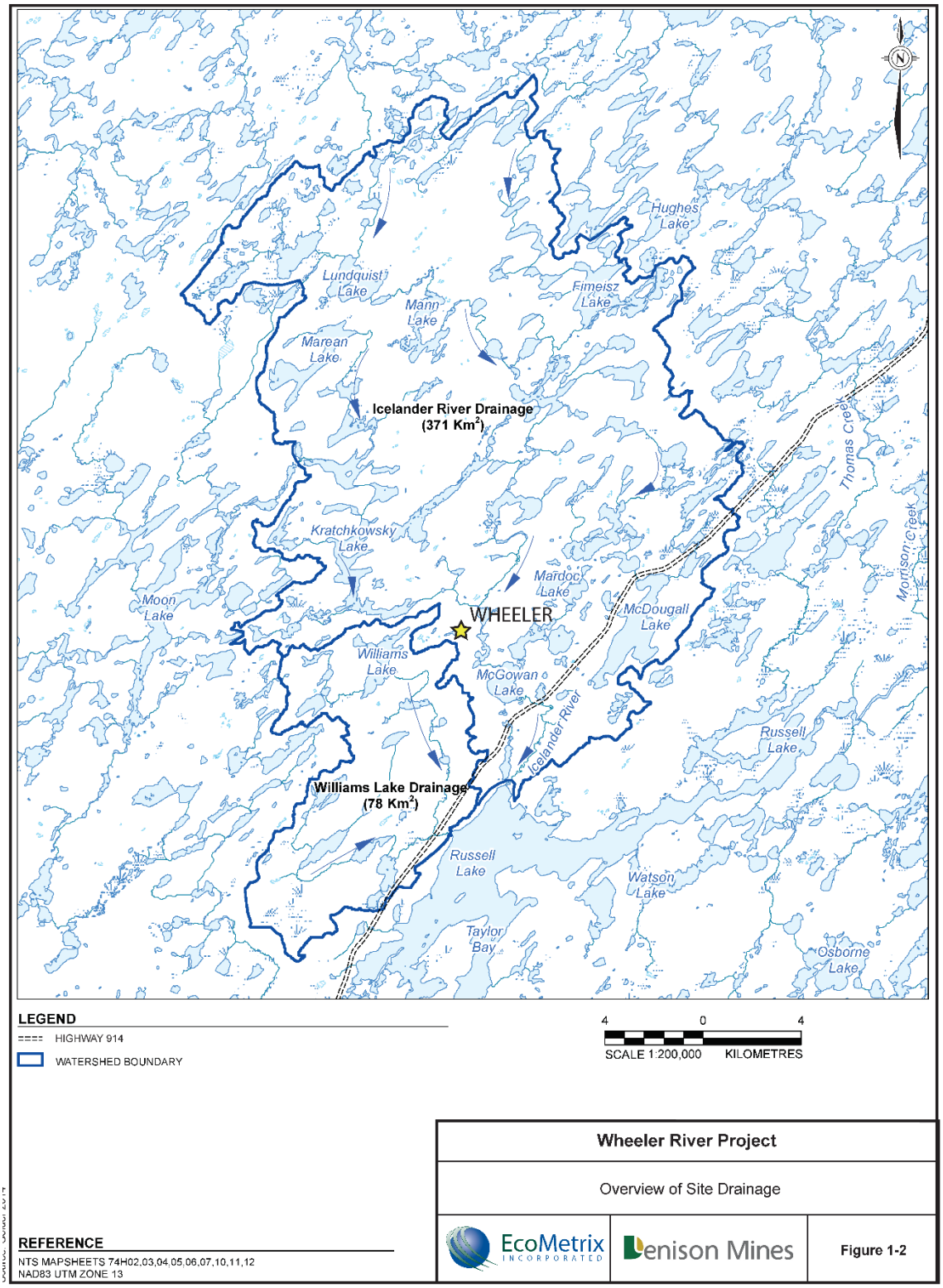



**Figure 1-2: Overview of Site Drainage**

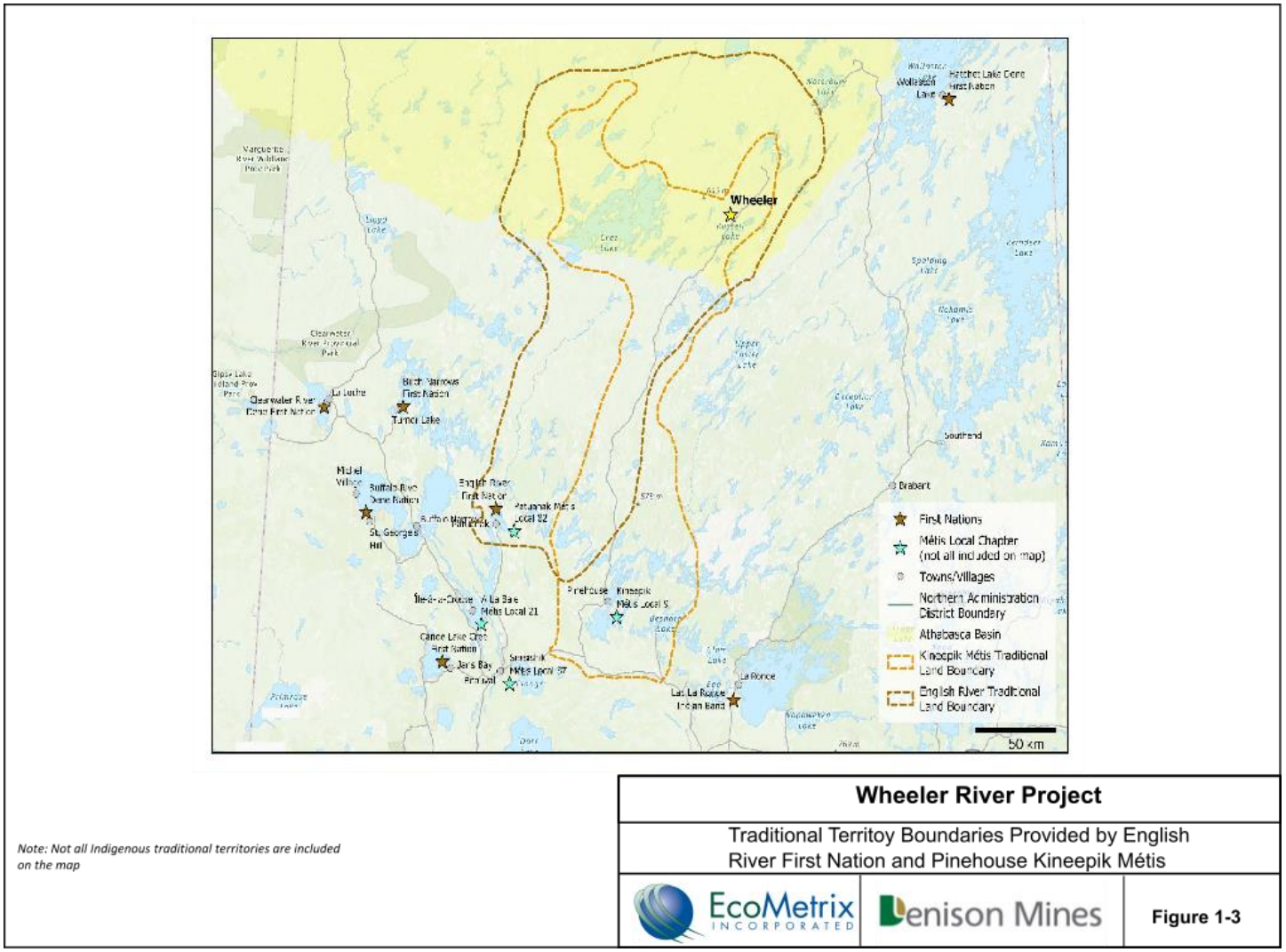



**Figure 1-3: Regional Traditional Territories (Denison 2019)**

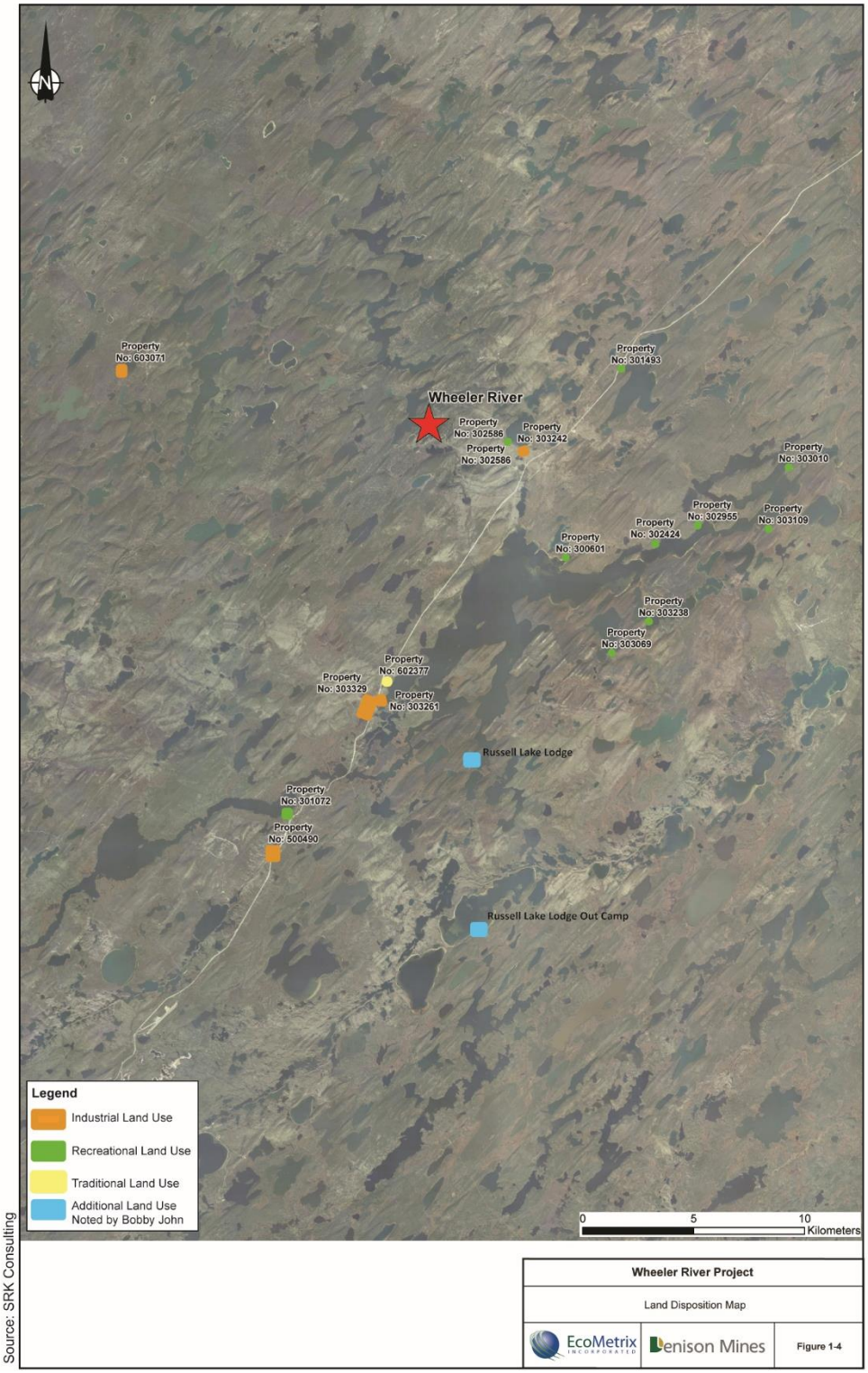



**Figure 1-4: Traditional, Recreational, and Industrial Land Use Leases in Proximity to the Wheeler River Project Area (Denison 2019, Denison 2020)**

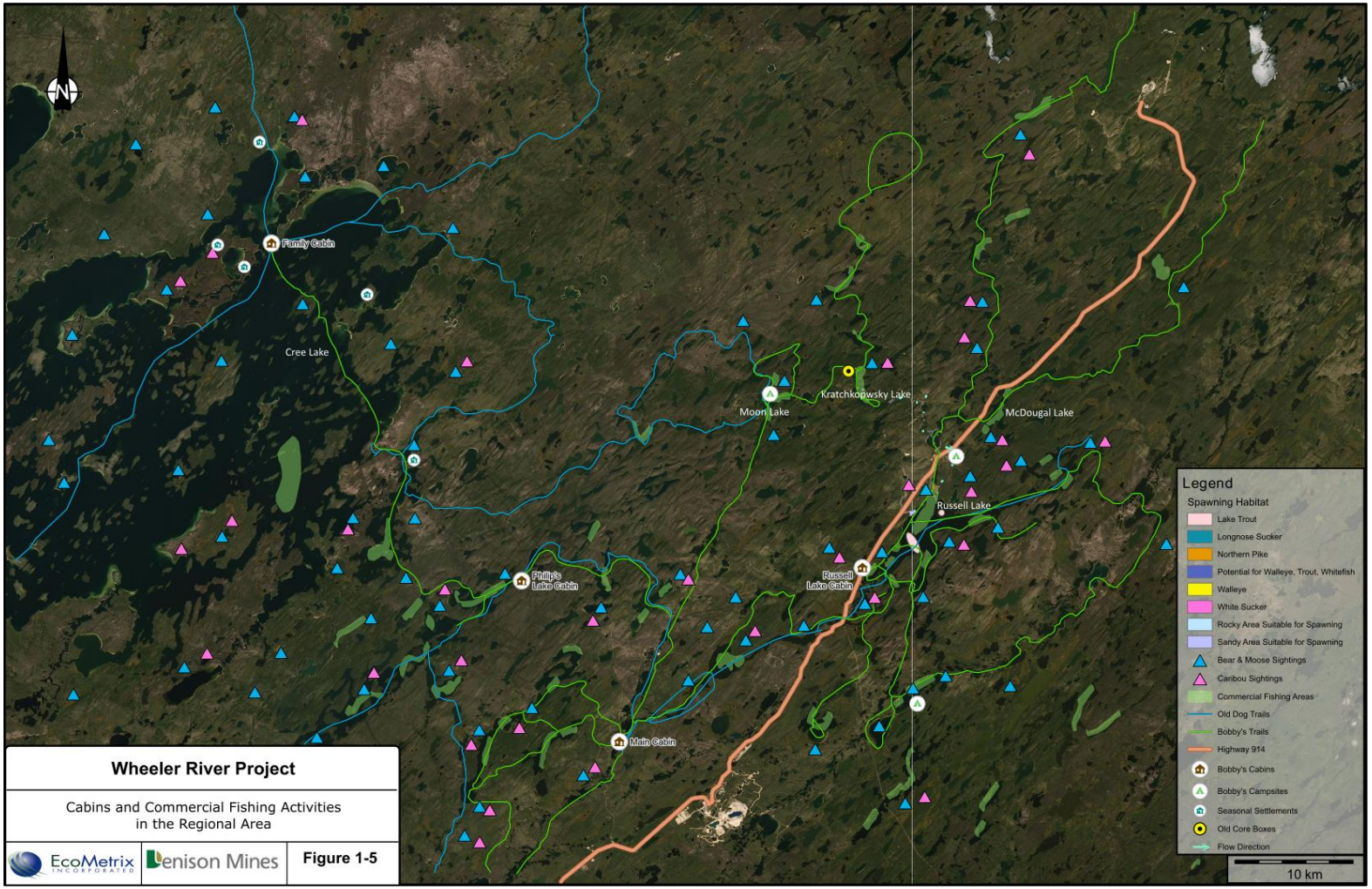



**Figure 1-5 Regional Commercial Fishing Activities and Fish Spawning Area around Wheeler River Project Area (Denison 2020).**

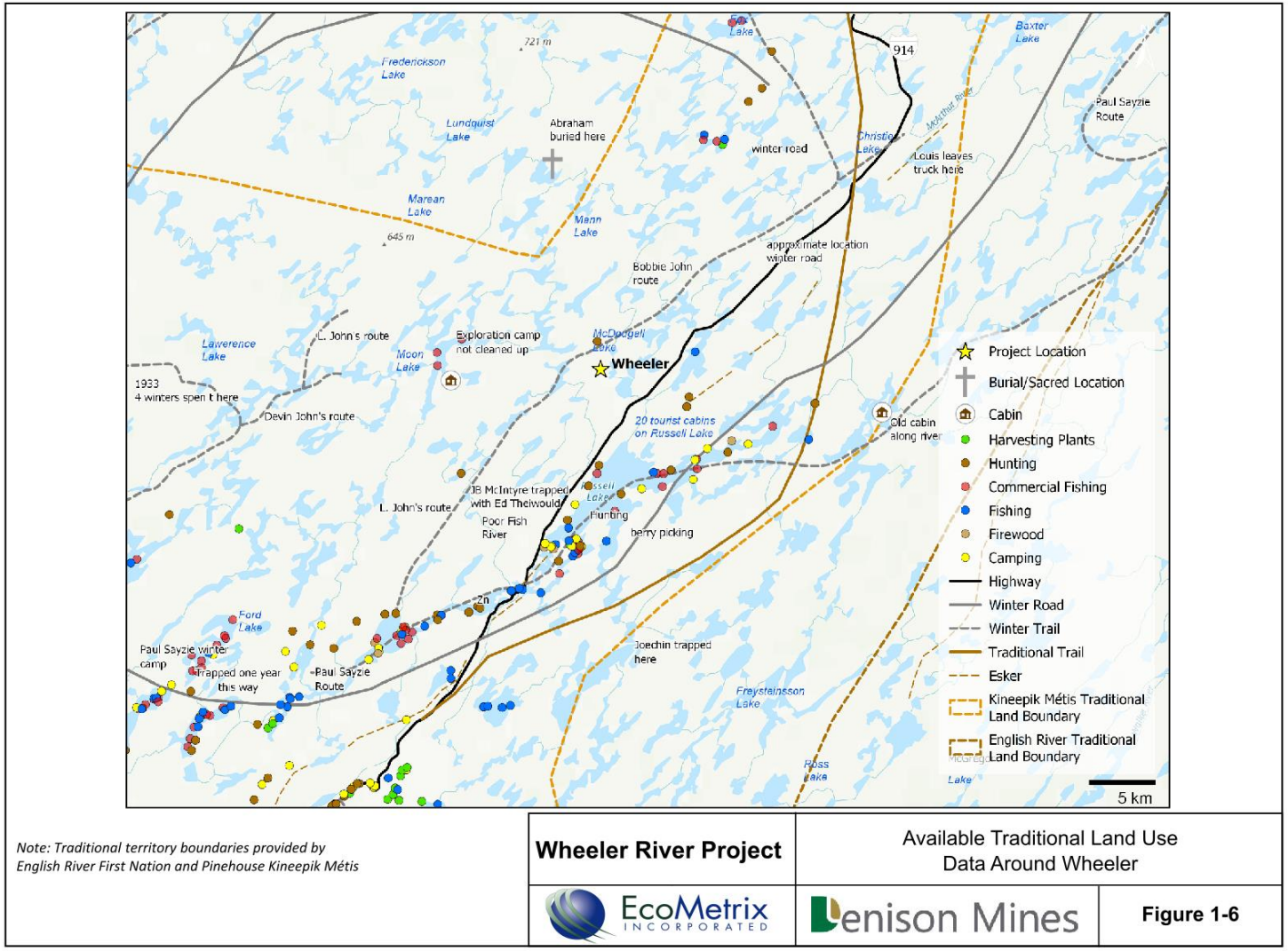



**Figure 1-6 Available Knowledge about Traditional Land Use Around Wheeler River Project Area**

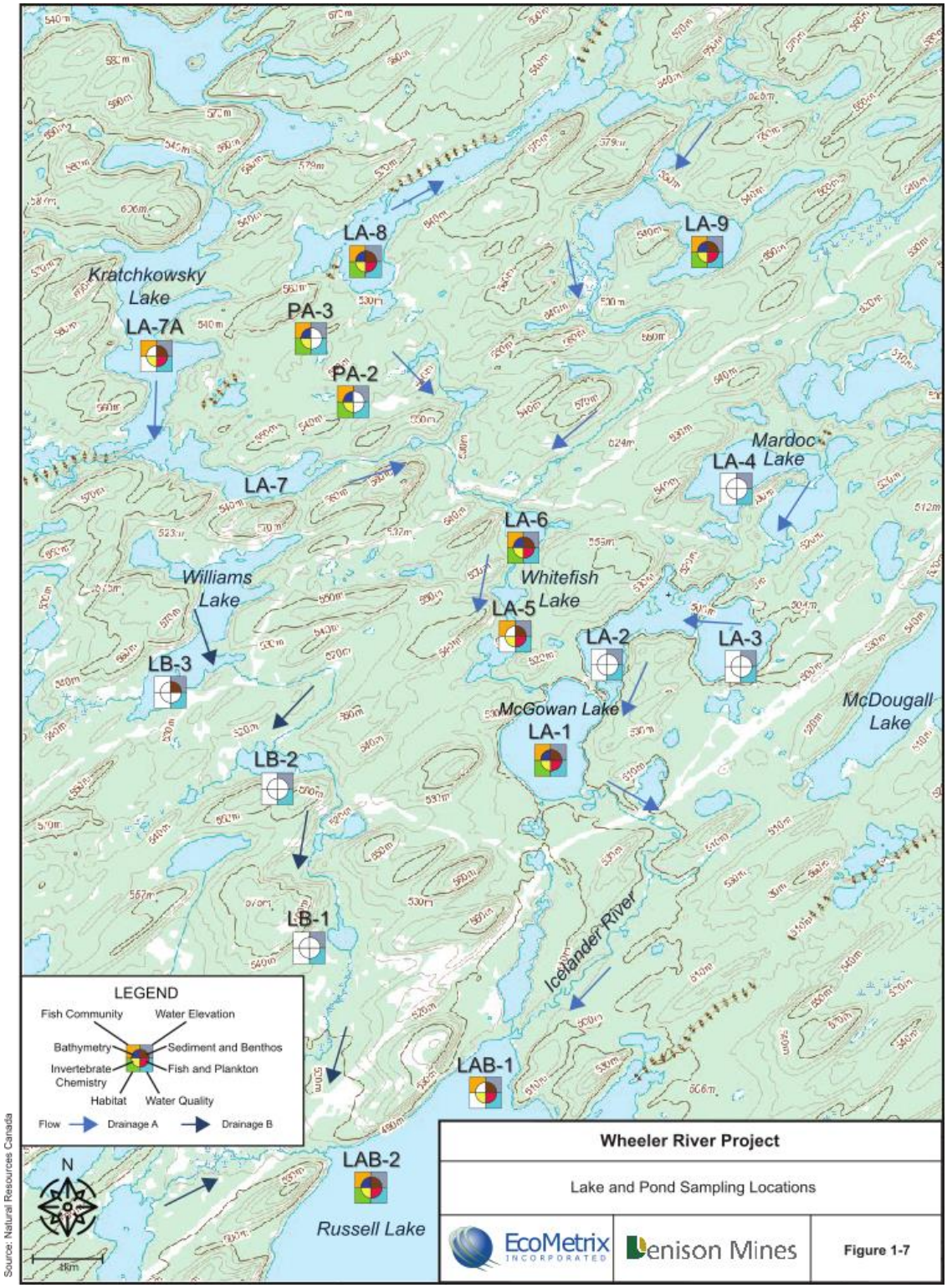



**Figure 1-7: 2016-19 Baseline Hydrological and Aquatic Study Lake and Pond Sampling Locations**

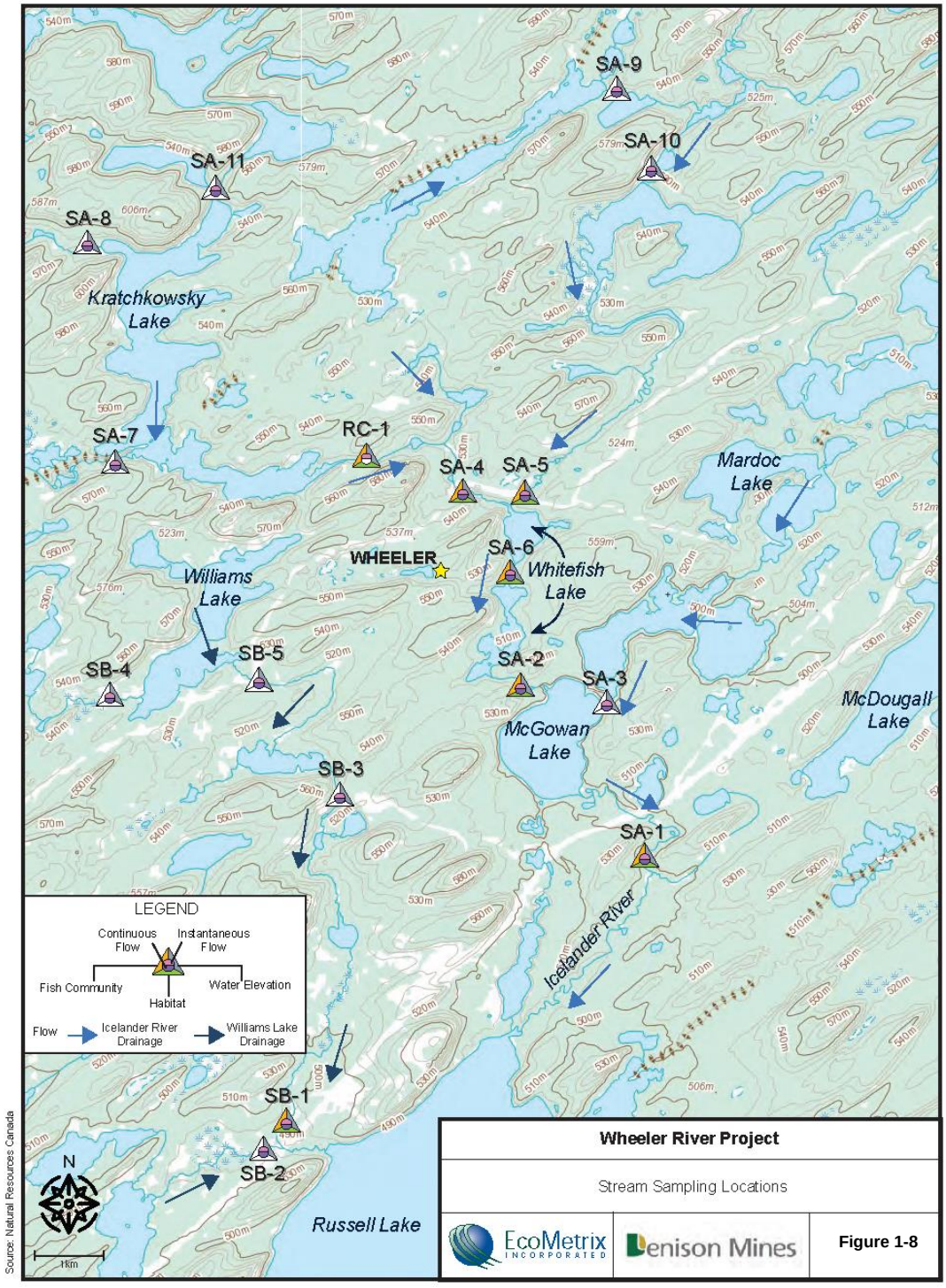



**Figure 1-8: 2016-19 Baseline Hydrological and Aquatic Study Stream Sampling Locations**

# 2.0 STUDY METHODOLOGY

The field and laboratory work that was conducted as part of the 2016 through 2019 baseline studies, as well as associated quality control and quality assurance procedures is discussed below. Where appropriate, sampling methodologies followed EcoMetrix Standard Operating Procedures, which are generally consistent with CCME (2011) *Protocols Manual for Water Quality Sampling in Canada,* as well as CCME (2016) *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 3: Suggested Operating Procedures*.

## 2.1 Hydrology

### 2.1.1 Water Elevation and Discharge

Water level elevations were surveyed at a number of lakes (13), streams (17) and ponds (2) within the study area. In addition, manual stream flow measurements were taken at 17 stream locations. Continuous stream flow monitoring equipment was installed at eight locations.

#### 2.1.1.1 **Water Elevation**

Water elevation surveys were undertaken between September 09 and 22, 2016; May 30 and June 1, 2017; March 15 and 18, 2018; June 29 and July 3, 2018, July 4 and 6, 2019 and August 28 and September 1, 2019. Where possible, water elevations were referenced to geodetic benchmarks established by Golder (**Appendix G**). New locations (LA-8, LA-9, PA-2 and PA-3) were referenced to temporary benchmarks, each with an assumed elevation of 100 masl, and subsequently converted to geodetic elevations using new benchmarks established in May 2017.

A description of how the geodetic elevations and benchmarks were established by Golder is presented in **Appendix G**.

#### 2.1.1.2 **Stream Flow Measurement**

Instantaneous Flow Measurements

Between 2016 and 2019, streamflow measurements were recorded at seventeen watercourses within the study area using the mid-section method as detailed in **Appendix G**. The mid-section method involves measuring the channel area and water velocities of a stream at a cross section. The channel is divided into a number of vertical subsections, adequate to characterize the irregular geometry of the channel. The depth and average velocity are measured at each subsection and are applied to a sub-area whose width extends half way to the preceding and following observation points. The area of each subsection is determined by directly measuring width and depth. The average water

velocity in each sub-section is estimated using the measured velocity at selected locations in the vertical. The total discharge within the stream is the sum of the individual subsection discharges.

Continuous Water Level Recording

Eight temporary stream flow monitoring stations (SA-1, SA-4, SA-5, SA-6, SA-8, SA-9, SA-10, and SA-11) were installed in the fall of 2016 (see **Appendix G**). The stream flow monitoring stations were established to obtain information on local watercourse flow characteristics.

The Solinst Levelogger instrumentation measures absolute pressure and therefore compensation is required for atmospheric pressure fluctuations. Barometric pressure compensation is achieved using an additional device (e.g., Barologger) to measure barometric pressure. A barologger was installed and deployed adjacent the SA-4 station. The data collected from the barologger was be used to apply barometric pressure compensation to data collected from the Solinst Levelogger instrumentation.

Loggers were installed by Golder in 2013 and left in place at the following locations: SB-1, SB-4, SA-1, and SA-6. In the fall of 2016, leveloggers were located and retrieved at SB-1 and SA-6; however, equipment was not found at SB-4 and SA-1. The logger at SA-6 was redeployed at SA-6 and the logger at SB-1 was redeployed at SA-1. Available data on the instruments included water level and temperature data from May 18, 2013 to August 30, 2015. As there were no manual measurements to calibrate the continuous flow measurements at SA-6 and SB-1 during this time period, the results for these locations are not included in this report.

Recorded data from the leveloggers deployed in the fall of 2016 at streams SA-1, SA-4, SA-5, SA-6, SA-8, SA-9 and SA-10 and the site barologgers were retrieved in the spring of 2017. All level data loggers were re-deployed after data downloading. Data were downloaded again in the summers of 2018 and 2019. Most level data loggers were re-deployed, except the logger at SA-6, which was replaced in 2019 due to depletion of battery life, and the logger at SA-8 was moved upstream to mitigate influence of backwater from the Kratchowsky Lake In July 2018, level data loggers were installed in McGowan Lake (LA-1) and Whitefish Lake (LA-6). In early October 2018, the level data logger was dislodged from McGowan Lake by ice, and hence was removed. The logger was reinstalled to LA-1 in August 2019. The level data logger installed in LA-6 was not located during the 2019 field survey.

Barometric compensation for the 2016-2019 field program was completed using the site barologger with any gaps filled using transformed data from the Key Lake Climate Station (Climate ID = 4063757) at 57°15'23.000" N, 105°37'03.000" W. Barometric compensation for the retrieved 2013 to 2015 data at SB-1 and SA-6 was completed using transformed data from the Key Lake Climate Station. The Key Lake Climate Station has an hourly

barometric pressure record at 57°15'23.000" N, 105°37'03.000" W. The data were linearly interpolated to 15 minute and 30 minute-intervals to develop the barometric compensation for the levelogger data. A relationship between the barometric pressure at the site barologger and the Key Lake station was developed using the May 2017 data. This relationship was used to compensate for the barometric pressure with the project levelogger data.

Rating Curve Development

Rating curves are used to transform results from level data loggers installed in water courses to discharge rates. Golder (2014) presented rating curves for the stream stations SA-1, SA-2, SA-3, SA-4, SA-5, SA-6, SB-1, SB-3, and SB-4, and the lake stations McGowan Lake (LA-1), LA-2, Whitefish Lake (LA-5, LA-6), Kratchkowsky Lake (LA-7) and LB-2. The manual flow measurements taken as part of the 2016 to 2019 field program were graphed along with Golder's measurements and rating curves were reviewed for suitability for use with the new installations. For lake stations, discharge at the outlet stream was used to correlate to the water elevation. In 2019, the monitored stream discharge was greater at a few locations within the Icelander River Drainage, and therefore, rating curves were adjusted accordingly. Rating curves are presented in **Appendix G**.

Based on the data, manual flow measurements at SA-2 and SA-6 recorded between 2011 and 2019 appear to fit into the stage-discharge relationships. In 2016, the SA-5 hydrometric was installed upstream of the 2011-2014 site, at a location with similar channel width and gradient. The rating curve for SA-5 was shifted upstream based on the five manual flow measurements taken between 2016 and 2019. In addition, the equation describing stage-discharge relationship at SA-1, SA-3 and SA-4 was adjusted in 2019 to accommodate higher flow observed in this year (**Appendix G**). A preliminary stage-discharge relationship was developed at SA-11 based on 2019 updates to the baseline hydrology report.

The stage-discharge relationship at hydrometric stations were used to process hydrographs to reflect discharge at stream stations within each open water season. As the emphasis of this study was on the long-term discharge of streams, all flow rates were averaged for each day of monitoring.

For stream stations SA-8, SA-9, and SA-10, the number of manual flow measurements obtained to date were not sufficient to develop a rating curve for conversion from level to flow. Additional manual measurements are required to capture low and high flow conditions. For these streams, elevations from leveloggers were reported as part of this baseline report, which could be converted to flow at a later date, once additional data are collected.

#### 2.1.1.3 Measurement of Ice Thickness

Ice thickness in McGowan Lake (LA-1), Whitefish Lake northern basin (LA-6) and Kratchkowsky Lake (LA-7) was measured between March 15 and 18, 2018, at the deepest point of the lake. An ice auger was used to drill through the ice and thickness was measured using a measuring tape.

### 2.1.2 Bathymetry

Detailed bathymetric surveys were undertaken on selected lakes and ponds in September 2016. Bathymetric surveys were completed following a standard method using an integrated recording depth sounder and global positioning system (GPS) with WAAS enabled receiver (HDS-8). A boat was operated along systematic transects to simultaneously collect depth and position data. Transects were appropriately spaced for the size of each of the waterbodies. The HDS-8 unit recorded GPS coordinates at the location of each depth measurement thereby providing a high degree of resolution of the bottom profile. Absolute positioning was accurate to within 2 to 3 m laterally, although relative positioning (i.e., the distance between point to point measurements) was accurate to within about 1 m.

Processing of the bathymetry data was completed using contouring and 3D surface mapping software (Surfer 10; Golden Software and Manifold 8) employing a kriging geostatistical technique to create bathymetric contours and to provide volume estimates for the lakes.

In June 2018, high resolution bathymetric surveys and bottom habitat imaging was conducted at McGowan Lake and Whitefish Lake north basin (LA-6) as described in **Section 2.4.2**.

## 2.2 Water Quality and Limnology

Surface water quality for each lake and pond (**Figure 1-7**, **Table 1-3**) was characterized by the measurement of both physical and chemical constituents obtained *in-situ* in the field and by laboratory analysis.

Field chemistry measurements at each lake station included:

- conductivity;
- pH;
- temperature;
- dissolved oxygen (DO); and
- water clarity.

A depth profile of these constituents was recorded in each lake, at its deepest location as identified during bathymetry investigations. Conductivity, pH, temperature and DO were measured at 1 m intervals from the surface to the bottom of the water column. These parameters were measured using a YSI 600 QS Sonde and YSI 650 MDS display-datalogger. The multimeter was calibrated to manufacturer's specifications prior to commencement of the study and calibration was verified periodically throughout the surveys. When necessary, re-calibration was undertaken. Water clarity at the lake profile location was assessed by measuring the Secchi Disk depth.

Samples were collected from McGowan Lake (LA-1), Whitefish Lake north basin (LA-6) and Kratchlowsky Lake (LA-7) for subsequent laboratory analysis of the following constituents:

- pH and conductivity;
- Total suspended solids (TSS) and total dissolved solids (TDS);
- Alkalinity, acidity and hardness;
- Nutrients (total and dissolved phosphorus, ammonia, and TKN);
- Total metals; and
- Radionuclides.

For each lake sampling location, a single surface water sample was collected for laboratory analysis from near the surface using a beta bottle. At stations where a distinct thermocline was observed at the time of the field sampling program (i.e., the water column was not well mixed), a second water sample was collected from below the thermocline using a beta bottle. These samples were named as "The name of the water body-"top" or "bottom". QA samples (field blank, trip blank, field duplicates) were collected as part of the sampling program.

Surface water quality for each stream (**Figure 1-8**, **Table 1-4**) was also characterized by the measurement of both physical and chemical constituents obtained in-situ in the field and by laboratory analysis. Field measurements at each stream station included:

- conductivity;
- pH;
- temperature; and
- dissolved oxygen.

These parameters were measured using a YSI 600 QS Sonde and YSI 650 MDS display-datalogger. The multimeter was calibrated to manufacturer's specifications prior to commencement of the study and calibration was verified periodically throughout the surveys. When necessary, re-calibration was undertaken.

Samples collected for subsequent laboratory analysis included the following constituents:

- pH and conductivity;
- Total suspended solids (TSS) and total dissolved solids (TDS);
- Alkalinity, acidity and hardness;
- Nutrients (total and dissolved phosphorus, ammonia, and TKN);
- Total metals; and
- Radionuclides.

Coordinates for each sampling location were obtained with a Garmin GPSmap 62s Global Positioning System (GPS). Coordinates were recorded at each sampling station and expressed as degrees, minutes and seconds (dd mm ss; World Geodetic System [WGS84] datum).

Water samples were conserved in laboratory prepared and labelled containers and the sampling location was inscribed on each container by the field staff. Water samples for dissolved constituents were filtered in the field by using 0.45-micron syringe filters. Water samples were stored in coolers until delivery to the camp site, and kept refrigerated until delivery to the laboratory for analysis.

Water samples were analyzed by Saskatchewan Research Council (SRC) Environmental Analytical Laboratories (Saskatoon, SK), a Canadian Association for Laboratory Accreditation Inc. (CALA) certified laboratories for the full series of constituents. Samples were analyzed with method detection limits at or below SSWQO and CWQG for each parameter.

## 2.3 Sediment Quality

Sediment samples were collected from selected lakes for analysis of metals, radionuclides, total organic carbon and particle size.

Sediment samples were collected coincident with benthic invertebrate sampling in depositional environments of selected lakes. Three replicate sediment samples were collected from each lake. Sampling location coordinates were obtained with a Global Positioning System (GPS). Coordinates were recorded at each sampling station and expressed as degrees, minutes and seconds (dd mm ss; WGS84 datum).

Wherever possible, surficial sediment samples were collected by coring. The surficial sediment (top 6 cm) of each core was sectioned into 2 cm increments with the 0-2 cm fraction sent for analysis. A minimum of 3 sectioned core samples were composited at each sampling location to ensure sufficient material for analysis. Where coring was not possible due to the nature of the sediments, surficial sediment samples were collected using a petit Ponar grab, and the top 0-2 cm was carefully collected manually for analysis. Sediments were stored in large Ziploc bags labelled with the date, depth fraction and

sample location. Excess air was removed from the bags and they were kept in coolers until delivery to the Wheeler Project camp where they were kept refrigerated or frozen.

Sediment samples were analyzed by SRC Environmental Analytical Laboratories (Saskatoon, SK) for the full series of constituents. Samples were analyzed with method detection limits (MDL) at or below the Canadian Sediment Quality Guidelines (CSQG) or other relevant sediment quality benchmark values. Sediment particle size distribution was determined using a Beckman Coulter LS Particle Size Analyzer.

## 2.4 Aquatic Habitat

### 2.4.1 General Aquatic Habitat Characterization

The assessment of aquatic habitats was conducted during the fish and benthic collections throughout the EcoMetrix surveys at selected lakes, ponds and streams. Data collected during these surveys were used to characterize aquatic habitat and/or to supplement existing information. Aquatic habitat surveys were undertaken in September 2016, coincident with biological sampling (fish and benthos) that were conducted at that time. Habitat surveys included the collection of bathymetric and water quality data, as well as observations of physical shoreline and lake/pond/stream substrate features, and aquatic vegetation, fish and benthic communities. Lake and pond habitat observations were recorded in field books, whereas stream habitat data were recorded on assessment forms.

At lake and pond locations, aquatic habitat data collected included bathymetry, adjacent land uses and terrain, aquatic, riparian and adjacent vegetation, shoreline features including locations and descriptions of inlets and outlets and substrate characterization. The distribution of aquatic macrophyte species in the lake was documented, with distinction being made between emergent, floating and submergent communities. Photographic documentation demonstrating the nature of the aquatic habitats present within the subject waterbodies was obtained. Aquatic habitat maps were prepared for lentic environments (i.e., lakes and ponds) and are discussed in **Section 3.0**. These maps depict aquatic habitat features including bathymetry, substrate, field measured water chemistry, observed fish community, aquatic macrophytes, riparian vegetation, and direction of flow, as well as photographs depicting shoreline features.

At stream locations, aquatic habitat characterization involved the assessment of physical, biological and chemical characteristics. Recorded data included mean channel width, depth and flow velocity, bank stability, stream morphology (i.e., pool, riffle, run, and flat), stream gradient, channel type, canopy cover, instream cover and substrate type. Additional notes were made on the surrounding terrain characteristics, dominant terrestrial vegetation, dominant aquatic vegetation, adjacent land use, amount of sediment overlaying substrates, and the amount of algae overlaying substrates. Weather conditions including recent and current precipitation, air temperature and cloud cover were also recorded. Finally, water colour and clarity were noted, as well as qualitative observations of benthic invertebrates

encountered during the fish survey. Water chemistry (see **Section 2.2**) was measured *in-situ* at all stations.

### 2.4.2 Multibeam Sonar Bathymetry and Habitat Mapping

High resolution bathymetric surveys and bottom habitat imaging were conducted at McGowan Lake (LA-1) and the north basin of Whitefish Lake (LA-6) in 2018 using a boat-mounted Kongsberg-Mesotech Ltd. $M^3$ multi-mode multibeam sonar system. These areas had been identified as potential locations for water intake and/or discharge locations for future mining operations and therefore it was deemed appropriate to gain more detailed and precise bathymetric and habitat information. A summary of these surveys is provided below and more detailed descriptions of survey and data analysis and interpretation methodologies are provided in **Appendix H**.

Bathymetric profiling and imaging were completed in “profiling mode” where the system delivers and subsequently receives sonar pulses on two independent transducers elements over a 120° swath of the water column. Post-processing of the survey data was completed to generate an XYZ surface using ArcGIS to develop a bathymetric model of the bottom as an ArcGIS GRID with a 30 cm by 30 cm grid size.

Bottom habitat imaging was collected in “eIQ imaging mode” whereby the unit translates the sonar data into high resolution images to illustrate lake bottom features (e.g., substrate types) and relief. In “eIQ imaging mode” sonar pulses were generated on four independent element arrays and received on a single transducer array over a 140° swath of the water column. Post-processing of the survey data was used to stitch the bottom image mosaic into a geo-referenced representation of the lake bottom identifying habitat types.

## 2.5 Plankton Community

Depth-integrated plankton samples were collected in selected lakes from the photic zone. Samples were collected at two locations within each sampling area and composited for biomass analysis.

Phytoplankton samples were collected with a bottle-sampler or tube sampler and preserved with Lugol`s solution. Zooplankton samples were collected via a vertical plankton tow net fitted with 63-micron mesh and preserved in the field with buffered formalin.

Depth-integrated water samples for analysis of chlorophyll α were collected coincident with the plankton samples. Chlorophyll α is a surrogate measure of primary productivity and complements the phytoplankton community data.

Phytoplankton and zooplankton taxonomy and biomass analysis and Chlorophyll α were conducted by ALS, Life Sciences Division (Saskatoon, SK).

## 2.6 Benthic Invertebrate Community

Benthic macroinvertebrate samples were collected from selected lakes for taxonomic analysis. Samples were collected at the same locations from which the sediment quality samples were collected. Supporting environmental/limnology measurements, including pH, water temperature, conductivity, Secchi depth, and general sediment descriptions, were recorded at each location. Sampling location coordinates were obtained with a GPS, and coordinates were recorded at each sampling station and expressed as degrees, minutes and seconds (dd mm ss; WGS84 datum).

Three to five replicate samples were collected, with each replicate sample comprised of a three-grab composite. Samples were collected using a petite Ponar, sieved through a 500 µm mesh and preserved in labelled (date, sampling area) containers to a level of 10% buffered formalin in the field. Collected samples were kept at ambient temperature until delivery to the taxonomic laboratory.

### 2.6.1 Benthic Invertebrate Taxonomy

Detailed taxonomic identification and enumeration were completed by Jack Zloty Ltd. (Summerland, BC), a laboratory which meets EEM QA/QC requirements for benthic invertebrate laboratory operations (Environment Canada, 2012).

Benthic invertebrate samples were processed according to standard protocols based on recommendations in Environment Canada (2002) and Gibbons *et al*. (1993). Benthic invertebrate samples were first washed through a 500-µm sieve to remove the preservative and fine sediments remaining after field sieving. Organic material was separated from inorganic material using elutriation, and the inorganic material was checked for any remaining shelled or cased invertebrates, which were removed and added to the organic material. The entire coarse fraction was sorted. Fine fractions of samples containing large amounts of detritus or large numbers of organisms were subsampled using the device described by Wrona *et a*l. (1982). As part of the QC program, the re-sorting of benthic sample residues was conducted on 10% of the samples to determine the level of sorting efficiency.

Invertebrates were identified to the levels recommended by Alberta Environment (1990) and Environment Canada (2010, 2012), typically genus for most invertebrates. Damaged organisms and early instar insects were identified to the lowest level possible, generally to family. The most common taxa should be distinguishable based on gross morphology and should require only a few slide mounts (five to ten) for verification. Organisms that required detailed microscopic examination for identification (i.e., Chironomidae and Oligocheata) were mounted on microscope slides using appropriate medium. All rare or less commonly occurring taxa were mounted on microscope slides for identification. Identifications were made using recognized taxonomic keys.

It is noted that Cladocera (water fleas) that were collected during benthic sampling, are not truly benthic organisms, but rather epi-benthic. However, they were reported by the taxonomist, and have been discussed within the report.

### 2.6.2 Benthic Invertebrate Metrics

The following benthic invertebrate community metrics were calculated:

- Total invertebrate density;
- Invertebrate richness;
- Simpson's Diversity (*D*);
- Bray-Curtis Dissimilarity Index (*B-C*);
- Evenness (*E*);
- Relative and absolute density of invertebrate taxa groups based on their feeding strategy (i.e., functional feeding groups);
- Density of major invertebrate taxonomic groups (sum of individuals are presented within each group); and,
- Relative density of major invertebrate taxonomic groups (proportion of individuals present within each group relative to the total).

Descriptive statistics (n, mean, median, maximum, minimum, standard error, standard deviation) were determined for each of the endpoints based on replicate samples collected in a defined sampling area (e.g., lake, pond).

Total invertebrate density was determined as the total number of individuals of all taxonomic categories collected at a location expressed per unit area (numbers/$m^2$).

Invertebrate richness was expressed as the total number of unique taxonomic categories (lowest practical level) collected at a sampling location.

Simpson's Diversity Index (*D*) is another measure of diversity within the benthic invertebrate community. This index places relatively little weight on rare taxa and more weight on common species (Krebs, 1994). Its values range from 0, indicating a low level of diversity, to a maximum of 1-1/*s*. *D* was calculated as follows:

$$D = 1 - \sum_{i=1}^{s} (p_i)^2$$

Where: $s$ = the total number of taxa (family) at the station;
$p_i$ = the proportion of the $i^{th}$ taxon (family) at the station.

Evenness is an expression of how equitably taxa are represented within a given sample. In some cases, disturbance or stress can create conditions whereby relatively few taxa are

favoured and those taxa become disproportionately abundant in that location. In this instance, the effect is manifested as relatively low evenness. Evenness ranges from zero to one (one representing a sample in which all taxa have the same abundance) and is calculated as in Smith and Wilson (1996):

$$E = 1/\sum_{i=1}^{s}(p_i)^2 / s$$

Where: $E$ = Evenness
$s$ = the total number of taxa (family) at the station
$p_i$ = the proportion of the ith taxon at the station

The Bray-Curtis Dissimilarity Index (*B-C*) measures the difference in community structure between two stations. Values range between 0 (stations have identical community structure) and 1 (stations have entirely different community structures) and is calculated as per Environment Canada (2012):

$$B\text{-}C = \frac{\sum_{i=1}^{n}|y_{i1} - y_{i2}|}{\sum_{i=1}^{n}(y_{i1} + y_{i2})}$$

Where: B-C = Bray-Curtis distance between sites 1 and 2
$Y_{i1}$ = count for taxon I at site 1
$Y_{i2}$ = count for taxon I at site 2
n = total number of taxa present at the two sites

For the Bray-Curtis Index calculations, lake stations were grouped according to size (surface area and volume). Small lakes included LA-5 and LA-6, and the remainder of the lakes – McGowan Lake (LA-1), Kratchkowsky Lake (LA-7, LA-7A), LA-8, LA-9, Williams Lake (LB-3), Russell Lake (LAB-1 and LAB-2) were classified as large lakes. Since all the locations were sampled pre-development, the median reference (**Table A-8**) condition values for each lake group (i.e., small and large) were based on the median of the taxon counts for each replicate for each lake within its group.

The benthic invertebrate community was also assessed based on the major functional feeding groups - that is, behavioural mechanisms of food acquisition. The major functional feeding groups are scrapers, shredders, collector-gatherers, collector-filterers, predators, and other (e.g., parasites). Scrapers graze off algae or biofilm that grows on bottom substrates. Shredders eat coarse particulate organic matter such as leaves. Collector-gatherers collect fine particulate organic matter (FPOM) on bottom substrates. Collector-filterers filter FPOM from the water column. Predators eat other benthic invertebrates. Mandaville (2002) was used as a guide to classify each benthic invertebrate taxon into a functional feeding group. The densities from each of the functional groups were summed

and the proportion of individuals present within each group relative to the total was determined.

## 2.7 Fish Community

### 2.7.1 Fish Collections

Fish community surveys were undertaken in each of the selected waterbodies to characterize fish species presence and community diversity. A variety of habitat types available within each waterbody were sampled. Fishing activities were undertaken by authority of Special Collection Permits (SCP-16-SC052; SCP17-INV04) issued by the Saskatchewan Ministry of Environment, Fish, Wildlife and Lands Branch (**Appendix E**).

In the lakes and ponds, offshore deeper areas were fished with short duration (4 to 8 hour) gill net sets. Where a distinct thermocline was evident (i.e., Kratchkowsky Lake) gill nets were set above and below the thermocline. Gill nets comprised varying mesh sizes, such that all types of fish and all age classes present could be collected. Nearshore fish collections were conducted by beach seines and/or minnow traps. Gear location coordinates were obtained with a GPS, and coordinates were recorded at each sampling station and expressed as degrees, minutes and seconds (dd mm ss; WGS84 datum). Fish were identified to species and assigned an age-class (i.e., young-of-year [YOY], juvenile or adult). Length (to nearest mm) and weight (to nearest 0.01 kg) were measured for all fish at each location. All fish, live or dead, were returned to the same waterbody in which they were captured, with the exception of specimens retained for fish tissue chemical analysis (see **Section 2.8.1**).

In streams, the fish community was surveyed using a backpack electrofisher (Smith-Root Model LR-24) and dip net. Up to 300 m of stream was fished at the selected locations and captured fish were retained in a 25-L pail until the completion of electrofishing within the reach. Upon completion of the reach, fish were identified to species and assigned an age-class (i.e., young-of-year (YOY), juvenile or adult), by an experienced biologist. Length (to nearest mm) and weight (to nearest 0.1 g) were measured for a subsample of each species at each location. With the exception of voucher specimens retained as a condition of the SCP, all fish were released to the same waterbody in which they were captured. Additional data were recorded including date, time, location (i.e., coordinates, map datum), electrofisher settings (i.e., frequency and volts), fishing effort (seconds), reach length, mean width, and water temperature. Data were recorded on Fish Collection Forms.

### 2.7.2 Fish Spawning

Large-bodied fish spawning surveys were undertaken during the fall of 2016 and spring of 2017 at selected lake and stream locations to determine the utilization of these areas for spawning. The fall survey was conducted during a period in which it was expected that fall

spawners would be sexually mature. The spring survey was timed to take place shortly after ice-out, a period when spring spawning was expected to be underway.

Fall spawning species present within the study area include Lake Whitefish and Lake Trout. Lake Trout spawning usually occurs over a large boulder or rubble bottom in lakes at depths of less than 12.2 m (Scott and Crossman, 1973). Lake Whitefish spawning typically occurs over rocky reefs in lakes or shallows of rivers, at depths of less than 7.6 m (McPhail and Lindsey, 1970).

Spring spawning species present within the study area include Walleye, Northern Pike, Arctic Grayling, White Sucker, Longnose Sucker and Yellow Perch. Spawning habitats for Walleye include rocky areas in fast flowing rivers or boulder, to coarse-gravel shoals of lakes (Scott and Crossman, 1973). Optimal spawning habitat for Northern Pike consists of flooded vegetation in shallow, sheltered areas (Casselman and Lewis, 1996). Arctic Grayling spawn coincident with ice-out on lakes, in streams over a gravel or rocky bottom. White Suckers spawn in inlet or outlet streams, usually with a gravel bottom, often in the same areas as, but later than, Longnose Sucker (McPhail and Lindsey, 1970). Yellow Perch spawning usually takes place in lake shallows, near rooted aquatic vegetation, submerged brush or fallen trees (Scott and Crossman, 1973).

It is noted that Burbot, which are present in the study area, spawn during late winter in streams or lake shallows under ice (McPhail and Lindsey, 1970), usually at a depth of 0.3 to 1.2 m over sand or gravel bottom in shallow bays, or on gravel shoals 1.5 to 3 m deep (Scott and Crossman, 1973). No specific spawning surveys targeted Burbot though potential spawning areas occur within the study area.

Fishing activities were conducted in a manner to maximize data collection and minimize incidental fish mortalities (i.e., visual when possible). If spawning activity was not directly observed, attempts to capture fish were undertaken to assess sexual condition (degree of ripeness) using the most effective method(s) for the habitat present, include electrofishing, angling, gillnetting, or seining. Gillnets were employed as seine nets to capture large-bodied fish observed at stream stations during the spring spawning survey. Captured fish were identified to species, sexed (if possible for live fish), assigned to an age class (i.e., juvenile, adult), assessed for spawning condition (i.e., immature, green (early or late development), ripe, partially spent, spent), measured (length to nearest mm, weight to nearest g) and released. Ageing structures were collected, sex was determined and sexual condition was verified from incidental mortalities. All fish, live or dead, were returned to the same waterbody.

### 2.7.3 Environmental DNA (eDNA) Analysis

Environmental DNA (eDNA) analysis was also used to investigate fish communities in McGowan Lake (LA-1) and the north basin of Whitefish Lake (LA-6) as a non-consumptive alternative to conventional fish survey. eDNA is DNA that has been shed from an

organism's body and can be in the form of scales, feces, mucous, eggs or other shed body parts. In eDNA analysis, water samples were collected instead of fish.

In McGowan and Whitefish Lakes, 200-400 ml water samples were passed through 0.45 µm cellulose nitrate filters. All filters were preserved in molecular grade ethanol and refrigerated before sending to Canadian Center for DNA Barcoding (CCDB) for analysis. In brief, DNA was extracted using QIAGEN DNEasy Power Water kit following manufacturer's instructions. The targeted fish genetic marker was amplified twice using polymerase chain reaction (PCR) to produce IonXpress MID-tag labeled libraries. The DNA library was pooled, purified, and diluted before being sequenced using Ion S5 system. The resulted DNA sequences were clustered using Uclust (Edgar 2010), and the representative sequence within each taxonomic unit was compared to publicly available marker gene sequences to identify fish species.

## 2.8 Tissue Chemistry

Fish tissue (flesh and bone) and benthic invertebrate tissue (whole body) samples were analyzed by SRC Environmental Analytical Laboratories (Saskatoon, SK) for the full series of constituents. Fifteen samples collected during September 2016 were destroyed at the laboratory during an ashing oven malfunction prior to radionuclide analyses. Additional fish tissue samples were collected during May-June 2017 and analyzed for both radionuclides and trace metals, to compensate for the lost samples.

### 2.8.1 Fish Tissue Chemistry

During the fish community assessment, five samples each from a predator species (Northern Pike) and from a forage species (White Sucker) were retained at the selected locations for the analysis of metals and radionuclides. In most cases each sample was comprised of a single fish; however, to ensure that a sufficient volume of tissues was retained for analysis, some samples were comprised of two or three fish. Lengths, weights and ages of fish comprising the samples are provided in **Appendix A**, **Table A-16**.

Fish were gutted at the location where they were collected and offal were returned to the waterbody. Flesh was removed from the bone by field staff either at the sampling location or at the camp the same day as capture. Flesh and bones were stored in individual Ziploc bags, labelled with the date, sampling location, fish species and specimen number and either "flesh" or "bone", and frozen until delivery to the analytical laboratory.

Constituent concentrations in fish tissues were determined on the "raw weight" basis, and compared to relevant guideline values. Guideline values for constituents in fish tissue are available for mercury (Health Canada, 2007) and selenium (BC MOE, 2014, and US EPA, 2016). Health Canada's standard of 0.5 µg/g ww is a human health risk-based maximum permissible concentration applied to most species of commercially-sold fish. The BC MOE (2014) guideline values of 4 µg/g dw and the US EPA (2016) criterion of 11.3 µg/g dw for

fish muscle provide fish tissue concentrations for selenium that are protective of the health of freshwater aquatic life.

### 2.8.2 Benthic Invertebrate Chemistry

Benthic invertebrate tissue samples were collected for analysis of metals and radionuclides at selected locations in September 2016. Composite samples of multiple organisms of a common order were collected for each of the selected waterbodies. Sufficient fresh weight tissue samples of abundant macroinvertebrates were collected to ensure sufficient mass for dry weight tissue analysis. Caddisfly larvae were collected from McGowan Lake (LA-1), Whitefish Lake (LA-5, LA-6), Kratchkowsky Lake (LA-7, LA-7A), Russell Lake (LAB-1, LAB-2), and dragonfly nymphs were collected from LA-8 and LA-9. For caddisflies, only larvae tissue was retained for analyses; casings were manually removed and discarded. Tissue samples were collected in re-sealable plastic bags and frozen until delivery to the analytical laboratory.

## 2.9 Quality Management

Quality assurance procedures employed by EcoMetrix included the proper training of field staff, use of standard operating procedures when collecting samples, appropriate handling and storage of samples, submission of samples to accredited laboratories according to requirements, and the use of data management systems. Quality control procedures used to assess the quality of data included identifying the potential field or laboratory contamination through the use of field blanks, trip blanks, and field duplicates.

### 2.9.1 Field QA

Quality control samples (field blank, trip blank) were collected as part of the water quality sampling program. Field blanks and trip blanks were provided for each sampling crew by the analytical laboratory. The laboratory reports are provided in **Appendix B**.

### 2.9.2 Chain of Custody

Chain-of-custody (CoC) forms were completed to track samples from the time of collection to reception by the laboratory and through reporting of results. The CoC mechanism identifies any issues that may arise because of retention times or sample condition (i.e. temperature) upon reception at the laboratory which could affect the analysis.

SRC Environmental Analytical Laboratory CoC forms were completed for each cooler of water, sediment, fish tissue and benthic invertebrate tissue samples. Coolers were hand delivered to SRC laboratory in Saskatoon (SK) by EcoMetrix staff or Denison Mines staff.

ALS Life Sciences Division CoC forms were completed for plankton samples. Coolers were shipped to the Winnipeg (MB) office and reception was confirmed.

Preserved benthic community samples were shipped to J. Zloty, Summerland, BC.

### 2.9.3 Laboratory Analysis

Quality control samples (field duplicates) were collected as part of the water quality sampling program. Sample duplicates were collected for 10% of all samples. The precision of analysis was considered adequate if the relative percent difference (RPD) between the sample and the duplicate was less than 20%, or 2-times the method detection limit (MDL) where a constituent concentration was less than 5-times MDL, and if concentrations in field blanks were less than 2-times MDL. Laboratory QA included the analysis of laboratory blanks, run duplicates and the analysis of standard reference materials. The results of the analyses of the QA samples are provided along with the laboratory reports in **Appendix B**.

Laboratory QC for fish and benthic invertebrate tissue chemistry analysis included the analysis of laboratory blanks, run duplicates and the analysis of standard reference materials. The results of the analyses of the QC samples are provided along with the laboratory reports in **Appendix B**.

The ALS Certificate of Analysis for plankton community analyses and the data sheets provided by SRC Environmental Analytical Laboratories for sediment analysis are provided in **Appendix B**.

As part of the benthic community analysis QC program conducted by J. Zloty, re-sorting of benthic sample residues was conducted on 10% of the samples to determine the level of sorting efficiency. The results of the analyses of the QC samples are provided along with the laboratory reports in **Appendix B**.

### 2.9.4 Project Management and Documentation Controls

EcoMetrix is ISO 9001:2015 certified by NSF International Strategic Registrations (NSF-ISR), a well-known Quality Management System (QMS) registrar. EcoMetrix' QMS is the framework for implementation of quality management policies.

Analyses (Certificate of Analyses, Datasheets) received directly from laboratories are handled following EcoMetrix SOP-00007 "*Sample Submission and Data QA/QC*". Briefly, the original data, received electronically or scanned from original hardcopy, are stored on a regularly backed up server in a dedicated folder within a project specific folder. The project specific folder is identified by a specific project number and name. The content of the original or 'raw' files are not modified to ensure that original files are maintained and any manipulations of the data are done on original content.

# 3.0 LAKE ASSESSMENT RESULTS

Results of the EcoMetrix aquatic baseline survey at lake monitoring locations are presented on a watershed-by-watershed basis. **Figure 1-2** displays the watersheds as defined for the baseline studies.

The Icelander River basin flows in a southerly direction, discharging into the northwest portion of Russell Lake at Station LAB-1. Three sub-basins of the Icelander River are included in the study area. The northern sub-basin includes LA-8 and LA- 9, and the western sub-basin includes Kratchkowsky Lake (LA-7, LA-7A). These two sub-basins meet at Whitefish Lake (LA-6, LA-5). The third, eastern, sub-basin includes, from upstream to downstream, Mardoc Lake (LA-4), LA-3 and LA-2. All three sub-basins join at McGowan Lake (LA-1) before flowing into the north western portion of Russell Lake at LAB-1. Two ponds were included in the study areas: PA-2 and PA-3 are two interconnected ponds that eventually flow into the Icelander River drainage downstream of Kratchkowsky Lake (LA-7).

The Williams Lake drainage is located to the southwest of the Icelander River Drainage. It flows in a southerly and easterly direction into Russell Lake at LAB-2, approximately 3 km southwest of the Icelander River outlet into the lake. The Williams Lake drainage consists of two sub-basins, the most northerly of which is part of the study area and includes, from upstream to downstream, Williams Lake (LB-3), LB-2 and LB-1.

New stations that were part of the 2016-19baseline study and were not assessed in the previous baseline studies, included, the north arm of Kratchkowsky Lake (LA-7A), LA-8, LA-9, PA-2, PA-3, and Russell Lake (LAB-2). **Figure 1-7**shows the location of the lakes and ponds, and an overview of the type of data collected at each lentic station within the Project area during the 2016-17 studies. Baseline data from 2016-18 are summarized along with historical baseline data from Golder (2014 a, b) in **Table 3-1** to **Table 3-10**. Bathymetry and fish habitat for the north arm of Kratchkowsky Lake (LA-7A), LA-8, LA-9, PA-2, PA-3, and Russell Lake (LAB-2) are provided in **Figure 3-12** to **Figure 3-17**. McGowan Lake (LA-1), LA-2, Whitefish Lake (LA-5, LA-6), Kratchkowsky Lake (LA-7), Williams Lake (LB-3) and LAB-1 were surveyed in August 2012 and bathymetry and fish habitat maps were prepared by Golder (see **Appendix F**). In 2018, high resolution bathymetry and habitat characterization was carried out in McGowan Lake (LA-1) and LA-6, which provide updates and additional information to the previous results. On Oct 29, 2019, Denison performed a key person interview with a local residence, Mr. Bobby John, who is familiar with local and regional ecology. EcoMetrix reviewed the meeting notes provided by Denison (Denison 2020), and compared comments provided by Bobby John to field observations documented herein and incorporated his local knowledge into this report.

## 3.1 McGowan Lake (LA-1)

McGowan Lake (LA-1) is situated within the Icelander River Drainage, upstream of Russell Lake (LAB-1) and downstream of lakes LA-2 (via SA-3) and LA-5 (via SA-2) (see **Figure 1-7**).

Historical and 2016-19 baseline data for McGowan Lake have been compiled in **Table 3-1** through **Table 3-10**.

### 3.1.1 Hydrology

#### 3.1.1.1 Water Elevation

Geodetic water levels at McGowan Lake were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for McGowan Lake varied by approximately 0.25 m, between 494.19 masl and 494.45 masl.

The water level elevation measured between September 2016 and August 2019 varied by approximately 0.17 m, between 494.344 masl and 494.515 masl. **Table 3-1** and **Appendix G** presents a summary of baseline water level elevations at all lake and pond locations.

#### 3.1.1.2 Ice Thickness

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014 (**Appendix G**). The ice thickness at the end of March was 0.97 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for McGowan Lake. The ice thickness was observed at 0.70 m at the same location between March 22 and April 1, 2018.

#### 3.1.1.3 Bathymetry

McGowan Lake bathymetry was assessed by Golder in August 2012 (**Appendix F**). At that time, the lake elevation was 494.39 masl. The total surface area of the lake was 148.55 ha and total volume was 8,189,320 $m^3$. Maximum and mean depths were 9.7 m and 5.5 m, respectively.

The bathymetry of the western portion of McGowan Lake was assessed via multibeam sonar in 2018 to gain a more precise representation of the lake bottom relief (**Figure 3-1**, Milne, 2018; **Appendix H**). Within the area surveyed the mean depth was 6.8 m and the maximum depth was 9.8 m. The nearshore area on the west side of McGowan Lake is characterized by a shallow sand shelf that extends 15 m to 133 m out from shore. The shelf is relatively narrow along the mid-section of the lake and wider to the north (towards the lake inlet) and to the south (towards the lake outlet). The edge of the sand shelf is steep, falling away to a broad flat basin with a depth of on the order of 8 m. Several shore

features and ridge-lines are apparent where depths are in the range of 2 to 4 m. Based on the 2018 survey results the shoal and ridge-line areas are more extensive and have a greater degree of connectivity than was indicated by the earlier bathymetry study.

### 3.1.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at McGowan Lake are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below their respective guideline limits. Annual baseline water quality data from 2012, 2014, 2016, and 2018 are provided in **Table 3-3, Table A-1**.

#### 3.1.2.1 **Limnology**

Temperature and dissolved oxygen profiles were undertaken during August 2012 and March 2014 by Golder (**Appendix F**). McGowan Lake was not stratified during either survey. The Secchi depth in August was 1.5 m. During late winter, dissolved oxygen steadily decreased below 5 m, but the water column did not become anoxic and the Secchi depth was 2.5 m.

On 14 September 2016, the surface water temperature was 11.7 °C. *In-situ* dissolved oxygen (DO) was 9.97 mg/L (92.3% saturation), conductivity was 13 µS/cm, and pH was 7.56. The Secchi depth was 2.1 m. A water chemistry depth profile is presented in **Figure** 3-2. Thermal stratification of the water column was not observed during the 2016 survey.

On 16 March 2018, the surface water temperature was 0.08 °C. *In-situ* dissolved oxygen (DO) was 12.43 mg/L (81.8 % saturation), conductivity was 13 µS/cm, and pH was 6.78. At a depth of 8.6 metres below surface, the water temperature was 4.86 °C. *In-situ* dissolved oxygen (DO) was 0.36 mg/L (3.1 % saturation), conductivity was 19 µS/cm, and pH was 6.58. A water chemistry depth profile is presented in **Figure 3-3**. During this late winter 2018 survey, temperature increased steadily from near freezing at the surface to approaching 5 °C near the lake bottom. Within the hypolimnion, dissolved oxygen conditions were near anoxic and conductivity peaked to 23 µS/cm.

On 2 July 2018, the surface water temperature was 18.6 °C. *In-situ* dissolved oxygen (DO) was 9.24 mg/L (98.9 % saturation), conductivity was 15 µS/cm, and pH was 7.22. At a depth of 9.5 metres below surface, the water temperature was 11.1 °C. *In-situ* dissolved oxygen (DO) was 0.04 mg/L (0.4 % saturation). Measured at a depth of 7.5 metres below surface, conductivity was 16 µS/cm, and pH was 6.51. A water chemistry depth profile is presented in **Figure 3-4**. Notable trends included a sharp decrease in dissolved oxygen conditions at approximately 6.0 metres below surface where the water became anoxic.

### 3.1.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at McGowan Lake.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from McGowan Lake. Three samples were analysed for grain size. The samples from McGowan Lake demonstrated similar distributions. The sediments were generally clay (78-82%) with a small proportion of silt (18-22%) and some sand (0.1-0.3%).

Summary statistics for sediment quality parameters collected during baseline studies at McGowan Lake are provided in **Table 3-5.**. The sediment samples had an average percentage of total organic carbon of 16%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below their respective REF, ISQG or LEL value.

### 3.1.4 Aquatic Habitat

An aquatic habitat assessment was undertaken by Golder in August 2012 (**Appendix F**). Shoreline vegetation at McGowan Lake mainly consisted of shrubs and black spruce with upland jack pine forests. The typical substrate observed for McGowan Lake was sand and boulders. Shoreline slopes ranged from shallow to steep with the presence of old and active erosional areas. Cover types for aquatic biota included emergent vegetation, interstitial spaces in coarse substrate, and overhanging vegetation. Observations made during the 2016-19 baseline studies were similar.

Bottom habitat features in offshore areas in the western portion of the lake were assessed via multibeam sonar imaging in 2018 to gain a more precise representation of the lake bottom habitat (**Figure 3-5**; Milne, 2018; **Appendix H**). Beyond nearshore sand areas, the substrates in the flat inner lake basin are mud and detritus. The shoal and ridgeline features were more acoustically reflective than the flat basin, indicating harder substrates such as gravel and small cobble with few large rocks. These areas may represent spawning habitats for fall spawning Lake Whitefish and Lake Trout (see **Section 3.1.7.1**). The sonar imaging revealed very low densities of submerged vegetation stems within the area surveyed within the main basin, as well as on the shallow sand beach shelf of the western portion of the lake.

### 3.1.5 Plankton Community

Chlorophyll a concentrations were below the laboratory detection limit (< 0.60 µg/L) (**Table** 3-6), reflecting the oligotrophic state of McGowan Lake.

Thirty-seven phytoplankton taxa belonging to seven classes were identified at McGowan Lake (**Table 3-6**). Based on total biovolume ($\mu m^3$), 89.7% of phytoplankton at McGowan

Lake belonged to the class Bacillariophyceae (diatoms), with *Planktosphaeria* sp. comprising the vast majority of the total biovolume. Phytoplankton from the classes Cyanophyceae (cyanophytes) and Chlorophyceae (chlorophytes) comprised approximately 5.4% and 3.3% of the total biovolume, respectively. The remaining 1.6% of the total biovolume consisted of phytoplankton from the classes Chrysophyceae (chrysophytes), Crytophyceae (cryptophytes), Dinophyceae (dinoflagellates), and Euglenophyceae.

Twenty zooplankton taxa were identified at McGowan Lake (**Table 3-6**). Based on total biovolume ($\mu m^3$), the vast majority (93.7%) of zooplankton present at McGowan Lake belonged to the class Branchiopoda (**Figure 3-7**), with *Holopedium* sp. being the dominant species. Zooplankton from the class Copepoda comprised 5.8% of total biovolume, and unidentified rotifers and individuals from the class Monogononta comprised the remaining biovolume.

### 3.1.6 Benthic Invertebrate Community

Three replicate samples were collected at McGowan Lake. The mean invertebrate density was 981 individuals/$m^2$ with a range of 886 to 1,014 individuals/$m^2$ (**Table 3-7A**). A total of 15 unique taxa were identified at McGowan Lake. The mean number of taxa present per replicate sample was 9, with a range of 7 to 11. Simpson's Diversity Index at McGowan Lake ranged from 0.72 to 0.79, with a mean of 0.76, indicating a high level of diversity. Mean Evenness was 0.44 with a range of 0.38 to 0.51, indicating that relatively few taxa accounted for most of the invertebrate density. The mean Bray-Curtis index for McGowan Lake was 0.50, with a range of 0.38 to 0.58, indicating that the benthic community composition at McGowan Lake has some similarities to the community composition compared to the median reference condition of the large lakes group.

A total of 12 major taxonomic groups (Families) were identified at McGowan Lake, with the mean density within these groups ranging from 5 to 433 individuals/$m^2$ (**Table 3-7B**). Chironomids and phantom midges (Chaoboridae) comprised on average 44% and 33% of total invertebrate density, respectively, at McGowan Lake, and water fleas from the family Holopedidae comprised 11% of total invertebrate density (**Table 3-7C**).

The benthic invertebrate community at McGowan Lake comprised four functional feeding groups: predators, collector-gatherers, collector-filterers, and shredders. The mean invertebrate density for each of these groups ranged from 33 to 476 individuals/$m^2$ (**Table 3-7D**). Predators were the most abundant and on average comprised nearly half (48%) of total invertebrate density at McGowan Lake (**Figure 3-8**).

#### 3.1.6.1 **Benthic Invertebrate Chemistry**

Radionuclide and metal concentrations for caddisfly larvae collected from McGowan Lake are presented in **Table 3-8**.

### 3.1.7 Fish Community

McGowan Lake was surveyed using a variety of gear including minnow traps, seine nets, gillnets and angling during the spring and fall. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Table A-13, A-16**. In total, 126 fish from 8 species were collected in McGowan Lake. Adult and juvenile Walleye, Northern Pike, Lake Whitefish and White Sucker were most abundant. Adult Spottail Shiner (*Notropis hudsonius*), adult and juvenile Yellow Perch, juvenile and adult Longnose Sucker and adult Lake Trout were less commonly collected. This list is reviewed by Bobby John, and is considered comprehensive.

No aquatic vertebrate DNA was identified in water samples collected from McGowan Lake during June 2018. This was likely due to organic compounds, for instance, humic acid in the water, which inhibited DNA being successfully sequenced.

#### 3.1.7.1 Fish Spawning

Spawning habitat for Northern Pike was observed in lake McGowan Lake, primarily along the northern shore in the vicinity of the (SA-3) tributary inlet and at the lake outlet, situated along the southeastern shore. Smaller patches of potential pike spawning habitat also occurred along the northwest shore (**Figure 3-9**).

Several rocky shoals are present within lake McGowan Lake, likely affording spawning habitats for fall spawning Lake Whitefish and Lake Trout. Spawning habitats for Walleye and White Sucker were observed within the inlet tributary (SA-2) from lake LA-5 (see **Section 4.2.4.1**).

The fish spawning area identified at McGowan Lake was reviewed by Bobby John, and the information that has been provided is considered comprehensive based on his experience.

#### 3.1.7.2 Fish Tissue Chemistry

Fish tissue chemistry results are presented in **Table 3-10**. Radionuclide levels in bones were typically below lab DLs for both Northern Pike and White Sucker. Concentrations of Polonium-210 were low but measurable in some samples of fish flesh and bone.

Mercury concentrations in Northern Pike (mean 0.17 ug/g ww) and White Sucker (0.038 ug/g ww) tissue were below the federal guideline of 0.5 ug/g ww. Mercury concentrations were higher in Northern Pike than in White Sucker reflecting bioaccumulation through the aquatic food chain.

Selenium concentrations in both Northern Pike (mean 1.00 ug/g dw) and White Sucker (1.29 ug/g dw) were below both BCMOE and USEPA fish tissue guideline values.

## 3.2 LA-2

Lake LA-2 is situated within the eastern sub-basin of the Icelander River Drainage, upstream of McGowan Lake and downstream of lakes LA-3 and Mardoc Lake (LA-4).

### 3.2.1 Hydrology

#### 3.2.1.1 Water Elevation

Geodetic water levels at LA-2 were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for LA-2 varied by approximately 0.19 m, between 494.47 masl and 494.65 masl.

The water level elevation measured in September 2016 was 494.58 masl. A summary of water level elevations at LA-2 is provided in **Table 3-1** and **Appendix G**.

#### 3.2.1.2 Ice Thickness

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014 (**Appendix G**). The ice thickness at the end of March 2014 was 0.76 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for LA-2.

### 3.2.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LA-2 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.2.2.1 Limnology

Temperature and dissolved oxygen profiles were undertaken during March 2014 by Golder (**Appendix F**). During late winter, dissolved oxygen steadily decreased with depth but the water did not become anoxic. The Secchi depth was 3.5 m. Thermal stratification of the lake was not observed at that time.

On 21 September 2016, the surface water temperature was 11.4 °C. *In-situ* DO was 10.64 mg/L (97.6% saturation), conductivity was 15 µS/cm and pH was 6.67. The Secchi depth was measured at 3.5 m. A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification of the lake was not observed at that time.

## 3.3 LA-3

Lake LA-3 is situated within the eastern sub-basin of the Icelander River drainage area, upstream of LA-2 (see **Figure 1-7**).

### 3.3.1 Hydrology

#### 3.3.1.1 Water Elevation

Geodetic water levels at LA-3 were measured during open water conditions between 2011 and 2014 (**Appendix F**). The measured water level for LA-3 varied by approximately 0.21 m, between 494.44 masl and 494.65 masl.

The water level elevation measured in September 2016 was 494.57 masl. A summary of water level elevations at LA-3 is provided in **Table 3-1** and **Appendix G**.

#### 3.3.1.2 Ice Thickness

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014 (**Appendix G**). The ice thickness at the end of March was 0.80 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for LA-3.

### 3.3.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LA-3 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.3.2.1 Limnology

A temperature and dissolved oxygen profile was undertaken during March 2014 by Golder (**Appendix F**). During late winter, dissolved oxygen steadily decreased with depth but the water did not become anoxic. The Secchi depth was 4.5 m. Thermal stratification was not apparent at that time.

On 21 September 2016, the surface water temperature was 11.7 °C. *In-situ* DO was 10.43 mg/L (96.2% saturation), conductivity was 15 µS/cm and pH was 6.60. The Secchi depth was 3.4 m. A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification of the lake was not observed at that time.

## 3.4 Mardoc Lake (LA-4)

Mardoc Lake is situated within the eastern sub-basin of the Icelander River drainage area, upstream of LA-2 (see **Figure 1-7**).

### 3.4.1 Hydrology

#### 3.4.1.1 Water Elevation

Geodetic water levels at Mardoc Lake were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for Mardoc Lake varied by approximately 0.14 m, between 498.51 masl and 498.65 masl.

The water level elevation measured in September 2016 was 498.62 masl. **Table 3-1** and **Appendix G** provide a summary of water level elevations at all lake and pond locations.

#### 3.4.1.2 Ice Thickness

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014 (**Appendix G**). The ice thickness at the end of March was 0.82 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for Mardoc Lake.

### 3.4.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at Mardoc Lake are provided in **Table 3-3**. For parameters where water quality guidelines (SEQG, CCME CWQG, and SSWQO) are available, all constituent concentrations were below guideline limits. Annual baseline water quality data from 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.4.2.1 Limnology

A temperature and dissolved oxygen profile were undertaken during March 2014 by Golder (**Appendix F**). During late winter, dissolved oxygen steadily decreased with depth but the water did not become anoxic. The Secchi depth was 3.5 m. Thermal stratification was not apparent at that time.

On 21 September 2016, the surface water temperature was 12.2 °C. *In-situ* DO was 9.42 mg/L (88.0% saturation), conductivity was 17 µS/cm, and pH was 6.83. The Secchi depth was 5.0 m. A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification of the lake was not observed at that time.

## 3.5 Whitefish Lake, South Basin (LA-5)

The south basin of Whitefish Lake (LA-5) is situated within the Icelander River drainage area, upstream of McGowan Lake and downstream of the north basin of Whitefish Lake (LA-6), via SA-6 (see **Figure 1-7**).

Historical and 2016-19 baseline data for LA-5 have been compiled in **Tables 3-1** to **3-10**.

### 3.5.1 Hydrology

#### 3.5.1.1 Water Elevation

Geodetic water levels at LA-5 were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for LA-5 varied by approximately 0.13 m, between 499.95 masl and 500.08 masl.

The water level elevation measured in September 2016 was 500.06 masl. **Table 3-1** and **Appendix G** provides a summary of water level elevations at all lake and pond locations.

#### 3.5.1.2 Ice Thickness

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014 (**Appendix G**). The ice thickness at the end of March was 0.70 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for LA-5.

#### 3.5.1.3 Bathymetry

The south Whitefish Lake basin (LA-5) bathymetry was assessed by Golder in August 2012 (**Table 3-2, Appendix F**). At that time, the lake elevation was 500.04 masl. The total surface area of the basin was 32.40 ha and total volume was 332,502 $m^3$. Maximum and mean depths were 4.1 m and 1.1 m, respectively.

### 3.5.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LA-5 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2012, 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.5.2.1 Limnology

Temperature and dissolved oxygen profiles were undertaken during August 2012 and March 2014 by Golder (**Appendix F**). Whitefish Lake (LA-5) was not thermally stratified during August. The Secchi depth was 2.2 m.

On 10 September 2016, the surface water temperature was 11.7 °C *in-situ* DO was 9.24 mg/L (85.2% saturation), conductivity was 13 µS/cm, and pH was 9. The Secchi depth was 1.8 m. A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification of the lake was not observed at that time.

### 3.5.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at LA-5 in **Table 3-4**. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

Three of the five samples from LA-5, LA-5-1, LA-5-3 and LA-5-4, were generally clay (76-82%) with a small proportion of silt (18-22%) and some sand (0.1-2%). The sediment samples obtained from LA-5-2 and LA-5-5 had a higher percentage of sand (73-77%) with smaller percentages of silt (13-15%) and clay (10-12%).

Summary statistics for sediment quality parameters collected during baseline studies at LA-5 are provided in **Table 3-5**. The mean TOC levels in the samples was 11%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below their respective REF, ISQG or LEL value.

### 3.5.4 Aquatic Habitat

An aquatic habitat assessment was undertaken by Golder in August 2012 (**Appendix F**). Shoreline vegetation at LA-5 consisted mainly of shrubs and black spruce with upland jack pine forest. The typical substrate observed for LA-5 was sand and organic matter. Shoreline slopes ranged from shallow to steep. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris. Observations made during the 2016-19 baseline studies were similar, confirming the earlier survey data.

### 3.5.5 Plankton Community

Chlorophyll *a* concentrations were below the laboratory detection limit (< 0.60 µg/L) (**Table 3-6**), reflecting the oligotrophic nature of LA-5

Thirty-four phytoplankton taxa belonging to six classes were identified at LA-5 (**Table 3-6**). Based on total biovolume ($\mu m^3$), approximately half (49.3%) of the phytoplankton belonged

to the class Bacillariophyceae (**Figure 3-6**), in particular by *Melosira* sp. Phytoplankton from the class Cyanophyceae comprised 29.2% – predominantly *Aphanothece* sp. – of the biovolume at LA-5. Phytoplankton belonging to the classes Dinophyceae, Chrysophyceae, Cryptophyceae, and Chlorophyceae comprised the remaining biovolume at LA-5.

Nineteen zooplankton taxa were identified at LA-5 (**Table 3-6**). Based on total biovolume ($\mu m^3$), approximately 90% of the zooplankton belonged to three classes: Branchiopoda (46.2%), unidentified rotifers (23.7%) and Monogononta (19.2%) (**Figure 3-7**). *Bosmina* sp. was the most abundant zooplankton from the class Branchiopoda and *Keratella* sp. was the most abundant zooplankton belonging to the class Monogononta.

## 3.5.6 Benthic Invertebrate Community

Five replicate samples were collected at LA-5. The mean invertebrate density was 9,597 individuals/$m^2$ with a range of 5,271 to 14,086 individuals/$m^2$ (**Table 3-7A**). A total of 46 unique taxa were identified at LA-5. The mean number of taxa present per replicate sample was 21, and ranged from 10 to 29. Simpson's Diversity Index at LA-5 ranged from 0.48 to 0.91, with a mean of 0.73, indicating a relatively high level of diversity. Mean Evenness was 0.23 with a range of 0.15 to 0.40, indicating that relatively few taxa accounted for most of the invertebrate density. The mean Bray-Curtis index for LA-5 was 0.39, with a range of 0.19 to 0.59, indicating that the benthic community composition at LA-5 has similarities to the to the median reference condition of the small lakes group.

A total of 22 major taxonomic groups (Families) were identified at LA-5, with the mean density within these groups ranging from 3 to 4,277 individuals/$m^2$ (**Table 3-7B**). *Chydoridae* comprised the majority (39%) of the benthic community composition, followed by *chironomids* (20%), and *Macrothricidae* (19%) (**Table 3-7C**).

The benthic invertebrate community at LA-5 comprised five functional feeding groups: collector-gatherers, predators, collector-filterers, shredders, and scrapers. The mean invertebrate density for these groups ranged from 11 to 6,886 individuals/$m^2$ (**Table 3-7D**). On average, collector-filterers were the most abundant, followed by collector-gatherers, comprising 66 and 26% of the community composition, respectively (**Figure 3-8**).

### 3.5.6.1 Benthic Invertebrate Chemistry

Radionuclide and metal concentrations for caddisfly larvae collected from LA-5 are presented in **Table 3-8**.

## 3.5.7 Fish Community

Whitefish Lake (LA-5) was surveyed using a variety of gear including minnow traps, seine nets, gillnets and angling during spring and fall seasons. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of

each species collected is presented in **Appendix A, Tables A-13, A-16.** In total 67 fish from six species were collected in LA-5. Adult and juvenile White Sucker, Northern Pike, Spottail Shiner and Walleye were most abundant. Juvenile Lake Whitefish and adult Ninespine Stickleback (*Pungitius pungitius*) were less commonly captured. This list has been reviewed by Bobby John, and is based on his local and regional knowledge is considered inclusive and comprehensive.

#### 3.5.7.1 Fish Spawning

Spawning habitat for Northern Pike was observed in south basin of Whitefish Lake, including along the northern shore in the vicinity of the (SA-6) tributary inlet or connection to the north basin of Whitefish Lake from LA-6 (see **Section 4.6.4.1**). Other small patches of potential pike spawning habitat also occurred along the eastern shore at the lake narrows, as well as within the large western embayment (**Figure 3-9**). The information provided by Bobby John, as well as his review of the spawning area map provided by EcoMetrix, confirmed these observations.

#### 3.5.7.2 Fish Tissue Chemistry

Fish tissue chemistry results are presented in **Table 3-10**. Radionuclide levels in bones were typically below lab DLs for both Northern Pike and White Sucker. Concentrations of Polonium-210 were low but measurable in some samples of fish flesh and bone.

Mercury concentrations in Northern Pike (mean 0.16 µg/g ww) and White Sucker (0.045 µg/g ww) tissue were below the federal guideline of 0.5 µg/g ww. Mercury concentrations were higher in Northern Pike than in White Sucker reflecting bioaccumulation through the aquatic food chain.

Selenium concentrations in both Northern Pike (mean 0.81 µg/g dw) and White Sucker (1.03 µg/g dw) were below both BCMOE and USEPA fish tissue guideline values.

## 3.6 Whitefish Lake, North Basin (LA-6)

Whitefish Lake north basin (LA-6) is situated within the Icelander River drainage area, upstream of Whitefish Lake south basin (LA-5) and downstream of lakes LA-9 (via SA-5) and Kratchkowsky Lake (via SA-4) (see **Figure 1-7**).

Historical and 2016-19 baseline data for LA-6 have been compiled in **Table 3-1** through **Table 3-10**.

### 3.6.1 Hydrology

#### 3.6.1.1 Water Elevation

Geodetic water levels at LA-6 were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for LA-6 varied by approximately 0.15 m, between 499.94 masl and 500.09 masl.

The water level elevation measured between September 2016 and August 2019 varied by approximately 0.05 m, between 500.07 masl and 500.118 masl. **Table 3-1** and **Appendix G** presents a summary of water level elevations at all lake and pond locations.

#### 3.6.1.2 Ice Thickness

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014. The ice thickness at the end of March was 0.94 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for LA-6. Between March 22 to April 1, 2018, ice thickness was observed at 0.71 m at the same location, representing the maximum development of ice thickness of winter 2017-18 for LA-6.

#### 3.6.1.3 Bathymetry

Whitefish Lake north basin (LA-6) bathymetry was assessed by Golder in August 2012 (**Table 3-2, Appendix F**). At that time, the lake elevation was 500.06 masl. The total surface area of the lake was 26.27 ha and total volume was 413,505 $m^3$. Maximum and mean depths were 2.7 m and 1.6 m, respectively.

The bathymetry of the LA-6 was assessed via multibeam sonar in 2018 to gain a more precise representation of the lake bottom relief (**Figure 3-10**; Milne, 2018; **Appendix H**). At the time that the 2018 survey was completed the mean depth was 1.7 m and the maximum depth was 2.3 m. Milne (2018) described the lake morphology as a “frying pan” shape, with a very shallow and flat bottom and a relatively short slope up to the shoreline. The lake basin bathymetry represented by the 2018 survey is similar to that of the previous work (**Appendix F**), and the difference in the maximum depth measured is interpreted as being reflective of normal lake level fluctuations.

### 3.6.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LA-6 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. Exceedances of CCME CWQG occurred for lead (1 of 3 samples), and one sample (of three) was below the CCME CWQG range for pH. One lead measurement (0.0012 mg/L) exceeded its guideline value of 0.001 mg/L. One of the pH measurements

was 5.71, which is lower than the lower range of the CCME CWQG guideline of 6.5. Annual baseline water quality data from 2012, 2014, 2016, and 2018 are provided in **Appendix A**, **Table A-1**.

#### 3.6.2.1 Limnology

Temperature and dissolved oxygen profiles were undertaken during August 2012 and March 2014 by Golder (**Appendix F**). The north basin of Whitefish Lake (LA-6) was not stratified during August and the Secchi depth was 2.0 m. During late winter, dissolved oxygen decreased below a water depth of 1.5 m but the water did not become anoxic. The Secchi depth was 2.0 m.

On 13 September 2016, the surface water temperature was 8.6 °C. *In-situ* DO was 10.78 mg/L (92.7% saturation), conductivity was 12 µS/cm, and pH was 6.85. The Secchi depth was 1.75 m. Thermal stratification of the lake was not observed at that time (**Figure 3-2**).

On 16 March 2018, the surface water temperature was 0.26 °C. *In-situ* dissolved oxygen (DO) was 11.09 mg/L (76.9 % saturation), conductivity was 9 µS/cm, and pH was 6.94. At a depth of 2.0 metres below surface, the water temperature was 1.8 °C, *in-situ* dissolved oxygen (DO) was 0.78 mg/L (5.81 % saturation), conductivity was 18 µS/cm, and pH was 6.89. During this survey, parameter measurements were obtained from near the surface (below the ice) and near the bottom. Near anoxic conditions were present at the bottom (**Figure 3-3**).

On 2 July 2018, the surface water temperature was 17.8 °C. *In-situ* dissolved oxygen (DO) was 9.22 mg/L (97.2 % saturation), conductivity was 18 µS/cm, and pH was 7.2. At a depth of 1.8 metres below surface, the water temperature was 17.5 °C, i*n-situ* dissolved oxygen (DO) was 0.19 mg/L (2.1 % saturation), conductivity was 24 µS/cm, and pH was 6.35. As such, thermal stratification was not observed during the summer 2018 survey as shown in **Figure 3-4**, however anoxic conditions were present within bottom waters. A sharp increase in conductivity at the lake bottom was also observed, reflecting potential groundwater discharge into the lake.

### 3.6.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at LA-6. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from LA-6. Five sediment samples were analysed for grain size. Four of the samples from LA-6, LA-6-1, LA-6-3, LA-6-4 and LA-6-4, were generally clay (64-79%) with a small proportion of silt (21-31%) and some sand (0.4-5%). The sediment sample obtained from LA-6-2 was generally silt (42%) and clay (46%) with a smaller percentage of sand (12%).

Summary statistics for sediment quality parameters collected during baseline studies at LA-6 are provided in **Table 3-5**. On average, the TOC level was 17%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below their respective REF, ISQG or LEL value.

### 3.6.4 Aquatic Habitat

An aquatic habitat assessment was undertaken by Golder in August 2012 (**Appendix F**). Shoreline vegetation at LA-6 mainly consisted of shrubs and black spruce with upland jack pine forest. The typical nearshore substrate observed for LA-6 was sand and organic matter. Shoreline slopes ranged from shallow to steep with active erosional areas. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris. Observations made during the 2016-19 baseline studies were similar.

Bottom habitat features of the lake were assessed via multibeam sonar imaging in 2018 to gain a more precise representation of the lake bottom habitat (**Figure 3-11**; Milne, 2018; **Appendix H**). The dark colour of the sonar mosaics within the main basin indicates a relatively low acoustic backscattering strength that is consistent with a mud or detritus bottom with high water content. The relative acoustic backscattering strength at the outer edge of the inlet delta and near the outflow was much higher than that of the main basin, likely indicating harder substrate types such as a sand-gravel mix and sand, respectively. Dense patches of long-stemmed submergent vegetation were observed near the inlet delta edge on the west side of the lake. Some sparse submergent vegetation stems were observed in the mid-basin, however the stem heights were only approximately 10 to 20 cm. Emergent vegetation was limited to the nearshore and shoreline areas.

### 3.6.5 Plankton Community

Chlorophyll a concentrations were below the laboratory detection limit (< 0.60 µg/L) (**Table 3-6**), reflecting the oligotrophic state of LA-6.

Twenty-seven phytoplankton taxa belonging to six classes were identified at LA-6 (**Table 3-6**). Based on total biovolume ($\mu m^3$), 70.1% of the phytoplankton belonged to the class Bacillariophyceae (**Figure 3-6**), in particular *Melosira* sp. Phytoplankton from the classes Cyanophyceae (predominantly *Anabeana* sp.) and Dinophyceae (*Peridinium* sp.) comprised approximately 20% of the total biovolume. Phytoplankton belonging to the classes Chlorophyceae, Chrysophyceae, and Cryptophyceae comprised the remaining biovolume at LA-6.

Fifteen zooplankton taxa were identified at LA-6 (**Table 3-6**). More than 90% of the total biovolume consists of zooplankton belonging to three classes: Branchiopoda (55.3%), unidentified rotifers (21.4%) and Monogononta (15.3%) (**Figure 3-7**). *Bosmina* sp., *Diaphanosoma* sp. and *Holopedium* sp. predominantly zooplankton from the class

Branchiopoda, whereas *Keratella* sp. and *Gastropus* sp. predominantly zooplankton belonging to the class Monogononta. The remaining total biovolume consisted of zooplankton from four classes.

## 3.6.6 Benthic Invertebrate Community

Five replicate samples were collected at LA-6. The mean invertebrate density was 10,163 individuals/$m^2$ with a range of 3,171 to 19,143 individuals/$m^2$ (**Table 3-7A**). A total of 30 unique taxa were identified at LA-6. The mean number of taxa present per replicate sample was 17, and ranged from 14 to 21. Simpson's Diversity Index at LA-6 ranged from 0.50 to 0.83, with a mean of 0.65, indicating a relatively high level of diversity. Mean Evenness was 0.18 with a range of 0.13 to 0.28, indicating that a few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LA-6 was 0.37, with a range of 0.13 to 0.47, indicating that the benthic community composition at LA-5 has similarities to the median reference condition of the small lakes group.

A total of 17 major taxonomic groups (Families) were identified at LA-6, with the mean density within these groups ranging from 3 to 5,434 individuals/$m^2$ (**Table 3-7B**). Chydoridae comprised the majority (54%) of the benthic community composition, followed by chironomids (16%), and Macrothricidae (11%) (**Table 3-7C**).

The benthic invertebrate community at LA-6 comprised four functional feeding groups: collector-gatherers, predators, collector-filterers, and shredders; the mean invertebrate density for these groups ranged from 63 to 7,563 individuals/$m^2$ (**Table 3-7D**). Collector-filterers were the most abundant, followed by collector-gatherers, comprising 75 and 21% of mean invertebrate density, respectively (**Figure 3-8**).

### 3.6.6.1 Benthic Invertebrate Chemistry

Radionuclide and metal concentrations for caddisfly larvae collected from LA-6 are presented in **Table 3-8**.

## 3.6.7 Fish Community

Whitefish Lake (LA-6) was surveyed using a variety of gear including minnow traps, gillnets and angling during spring and fall seasons. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. In total 78 fish from five species were collected in LA-6. Adult and juvenile White Sucker and Northern Pike were most abundant. Adult Spottail Shiner, adult Walleye and juvenile Lake Whitefish, were less commonly captured. This list of fish species was reviewed by Bobby John, and is considered inclusive and comprehensive.

No aquatic vertebrate DNA was identified in water samples from LA-6, likely due to organic compounds, for instance, humic acid in the water, which inhibited DNA being successfully sequenced.

#### 3.6.7.1 Fish Spawning

Spawning habitat for Northern Pike was observed in Whitefish Lake (LA-6), exclusively within the northwestern embayment associated with the (SA-5) tributary inlet and the adjacent shore (**Figure 3-9**). Spawning habitats for Walleye and suckers occurs within the inlet tributary (SA-5) from lake LA-9 (see **Section 4.5.4.1**). The information provided by Bobby John, as well as his review of the spawning area map provided by EcoMetrix, confirmed these observations.

#### 3.6.7.2 Fish Tissue Chemistry

Fish tissue chemistry results are presented in **Table 3-10**. Radionuclide levels in bones were typically below lab DLs for both Northern Pike and White Sucker. Concentrations of Polonium-210 were low but measurable in some samples of fish flesh and bone.

Mercury concentrations in Northern Pike (mean 0.19 µg/g ww) and White Sucker (0.04 µg/g ww) tissue were below the federal guideline of 0.5 µg/g ww. Mercury concentrations were higher in Northern Pike than in White Sucker reflecting bioaccumulation through the aquatic food chain.

Selenium concentrations in both Northern Pike (mean 0.92 µg/g dw) and White Sucker (0.97 µg/g dw) were below both BCMOE and USEPA fish tissue guideline values.

## 3.7 Kratchkowsky Lake (LA-7)

Monitoring location LA-7 is located in the southeast portion of Kratchkowsky Lake. Kratchkowsky Lake is situated within the Icelander River drainage area, upstream of lake LA-6 (see **Figure 1-7**).

Historical and 2016-19 baseline data for LA-7 have been compiled in **Table 3-1** through **Table 3-10**.

### 3.7.1 General Description

### 3.7.2 Hydrology

#### 3.7.2.1 Water Elevation

Geodetic water levels at LA-7 were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for Kratchkowsky Lake (LA-7) varied by approximately 0.11 m, between 520.42 masl and 520.54 masl.

The water level elevations measured in September 2016 and May 2017 were 520.53 masl on both occasions. **Table 3-1** and **Appendix G** presents a summary of water level elevations at all lake and pond locations.

#### 3.7.2.2 Ice Thickness

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014. The ice thickness at the end of March was 0.85 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for LA-7.

#### 3.7.2.3 Bathymetry

Bathymetry of the southeast portion of Kratchkowsky Lake (LA-7) was assessed by Golder in August 2012 (**Table 3-2**, **Appendix F**). At that time, the lake elevation was 520.48 masl. The total surface area of the lake was 79.59 ha and total volume was not reported. Maximum and mean depths were 6.8 m and 2.9 m, respectively.

### 3.7.3 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at Kratchkowsky Lake (LA-7) are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. Exceedances of SEQG guideline limits occurred for aluminum (1 of 3 samples). Ammonia was slightly above the conservatively calculated CCME CWQG of 0.103 mg/L during March 2014. Annual baseline water quality data from 2012, 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.7.3.1 Limnology

Temperature and dissolved oxygen profiles were undertaken during August 2012 and March 2014 by Golder (**Appendix F**). Kratchkowsky Lake (LA-7) was not stratified during August, although oxygen levels were decreased near the bottom. The Secchi depth was 1.75 m. During the late winter, dissolved oxygen steadily decreased with depth but did not become anoxic and the Secchi depth was 3.5 m.

On 10 September 2016, the surface water temperature was 12.8 °C. *In-situ* DO was 9.31 mg/L (88.0% saturation), conductivity was 15 µS/cm, and pH was 6.70. The Secchi depth was 1.8 m. A water chemistry depth profile during the September 2016 survey is presented in **Figure 3-2**. Thermal stratification was not observed at that time.

On 16 March 2018, the surface water temperature was 0.77 °C, *in-situ* dissolved oxygen (DO) was 11.3 mg/L (79.3 % saturation), conductivity was 12 µS/cm, and pH was 6.16. At a depth of 3.7 metres below surface, the water temperature was 4.52 °C, *in-situ* dissolved oxygen (DO) was 0.15 mg/L (1.1 % saturation), conductivity was 16 µS/cm, and pH was

6.0. Notable trends included a steady decrease in dissolved oxygen to anoxic conditions in bottom waters. Temperature increased slightly from near freezing at surface to approaching 5 °C at lake bottom. Conductivity fluctuated slightly with an overall increase within the bottom waters. A water chemistry depth profile during the March 2018 survey is presented in **Figure 3-3**.

### 3.7.4 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at LA-7. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from LA-7. Three sediment samples were analysed for grain size. Two of the three samples from LA-7, LA-7-1, and LA-7-2, were generally clay (57-68%) with a smaller proportion of silt (23-36%) and some sand (7-9%). The sediment sample obtained from LA-7-3 had a higher percentage of sand (49%) with smaller percentages of silt (30%) and clay (22%).

Summary statistics for sediment quality parameters collected during baseline studies at LA-7 are provided in **Table 3-5**. The three sediment samples had an average percentage of total organic carbon of 22%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below the REF, ISQG or LEL value.

### 3.7.5 Aquatic Habitat

An aquatic habitat assessment was undertaken by Golder in August 2012 (**Appendix F**). Shoreline vegetation at LA-7 mainly consisted of shrubs and black spruce with upland jack pine forest. The typical nearshore substrates observed for LA-7 were boulders and sand. Shoreline slopes ranged from shallow to steep. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris. Observations made during the 2016-19 baseline studies were similar, confirming the previous habitat characterization.

### 3.7.6 Plankton Community

Plankton community sampling was conducted in the north arm of Kratchkowsky Lake (LA-7A) and the results are reported in **Section 3.8.1.7**.

### 3.7.7 Benthic Invertebrate Community

Three replicate samples were collected at LA-7. The mean invertebrate density was 1848 individuals/$m^2$ with a range of 800 to 2529 individuals/$m^2$ (**Table 3-7A**). A total of 18 unique taxa were identified at LA-7. The mean number of taxa present per replicate was 11. Simpson's Diversity Index at LA-7 ranged from 0.60 to 0.84, with a mean of 0.69,

indicating a relatively high level of diversity. Mean Evenness was 0.31 with a range of 0.21 to 0.49, indicating that few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LA-7 was 0.57, with a range of 0.46 to 0.63, indicating that the benthic community composition at LA-7 has some similarities to the median reference condition of the large lakes group.

A total of 11 major taxonomic groups (Families) were identified at LA-7, with the mean density within these groups ranging from 5 to 1562 individuals/$m^2$ (**Table 3-7B**). Chironomids comprised the majority (81%) of the benthic community composition. Seed shrimps (Ostracoda) were the second-most abundant, comprising 8% of the community composition (**Table 3-7C)**.

The benthic invertebrate community at LA-7 comprised four functional feeding groups: collector-gatherers, predators, collector-filterers and shredders; the mean invertebrate density for these groups ranged from 100 to 1138 individuals/$m^2$ (**Table 3-7D**). Collector-gatherers were the most abundant, comprising 60% of the community, followed by shredders, comprising 21% of the community (**Figure 3-8**).

#### 3.7.7.1 Benthic Invertebrate Chemistry

Radionuclide and metal concentrations for caddisfly larvae collected from LA-7 are presented in **Table 3-8**.

### 3.7.8 Fish Community

For purposes of describing the fish community, Kratchkowsky Lake was considered a single study area and fish were collected throughout the lake. Kratchkowsky Lake was surveyed using a variety of gear including minnow traps, gillnets and angling during spring and fall seasons. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. In total seven species have been documented from Kratchkowsky Lake. Adult and juvenile White Sucker, Northern Pike and Lake Whitefish were most abundant. Adult and juvenile Spottail Shiner and Walleye were slightly less abundant. Ninespine Stickleback and Yellow Perch were observed in lake but not collected in any of the gear that was deployed. The list of fish species identified was reviewed by Bobby John, and is considered inclusive and comprehensive.

#### 3.7.8.1 Fish Spawning

Spawning habitat for Northern Pike was observed in Kratchkowsky Lake. Patches of emergent vegetation occurred in several areas, often associated with embayments including the north shores of the eastern embayments (LA-7A) (**Figure 3-12**), as well as south shore within the vicinity of access point (Kratchkowsky Lake) (**Appendix F**). Smaller

patches of potential pike spawning habitat also occurred along the north shore of the outlet embayment (**Figure 3-12**).

Several rocky shoals are present within Kratchkowsky Lake, likely affording spawning habitat for fall spawning Lake Whitefish. Spawning habitats for Walleye and White Sucker likely occurs within the north inlet tributary (SA-11). Bobby John is particularly familiar with this area as he fishes commercially in Kratchkowsky Lake. Based on his local knowledge he identified two specific rocky areas potentially suitable for fish spawning (**Figure 3-9**).

#### 3.7.8.2 **Fish Tissue Chemistry**

For purposes of collecting fish tissues for chemical analysis, Kratchkowsky Lake was considered a single study area and fish were collected throughout the lake.

Fish tissue chemistry results are presented in **Table 3-10**. Radionuclide levels in bones were typically below lab DLs for both Northern Pike and White Sucker. Concentrations of Polonium-210 were low but measurable in some samples of fish flesh and bone.

Mercury concentrations in Northern Pike (mean 0.15 µg/g ww) and White Sucker (0.019 µg/g ww) tissue were below the federal guideline of 0.5 µg/g ww. Mercury concentrations were higher in Northern Pike than in White Sucker reflecting bioaccumulation through the aquatic food chain.

Selenium concentrations in both Northern Pike (mean 0.89 µg/g dw) and White Sucker (0.97 µg/g dw) were below both BCMOE and USEPA fish tissue guideline values.

## 3.8 Kratchkowsky Lake (LA-7A)

Monitoring station LA-7A is located in the northwest portion of Kratchkowsky Lake (see **Figure 1-7**).

2016-19 baseline data for LA-7A have been compiled in **Table 3-1** to **Table 3-10**.

### 3.8.1 Hydrology

#### 3.8.1.1 **Water Elevation**

Kratchkowsky Lake water levels were measured in the southeast portion of the lake (LA-7) (see **Section 3.7.2.1**).

#### 3.8.1.2 **Bathymetry**

Bathymetry of the north basin of Kratchkowsky Lake (LA-7A) was assessed in September 2016 (**Table 3-2**). At that time, the lake elevation was 520.53 masl. The total surface area

of the lake was 243.34 ha and total volume was 12,712,684 $m^3$. Maximum and mean depths were 21.8 m and 5.2 m, respectively (see **Figure 3-12**).

## 3.8.2 Water Quality

The north basin of Kratchkowsky Lake (LA-7A) was stratified at the time of sampling in September 2016 (see **Section 3.8.3.1**). Thus, in addition to a water sample collected from the surface, a water sample was taken from below the thermocline near the bottom of the lake and analyzed separately. Summary statistics for all water quality parameters collected during baseline studies at LA-7A-top and LA-7A-bottom are provided in **Table 3-3**. Annual baseline water quality data from 2016 are provided in **Appendix A**, **Table A-1**.

All concentrations were below guideline limits for water collected at the surface (LA-7A-top), for parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO) (**Table 3-3**).

Most concentrations were within guideline values for water collected from below the thermocline (LA-7A-bottom), for parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), with the exception of iron, mercury, ammonia and pH (**Table 3-3**). Iron concentrations exceeded the SEQG guideline value by an order of magnitude whereas mercury concentrations exceeded the CCME CWQG limit by more than 2-times. Ammonia also exceeded the CCME CWQG by an order of magnitude. The pH (6.46) was marginally lower than the CCME CWQG lower limit of 6.5.

### 3.8.2.1 Limnology

On 10 September 2016, the water depth at the LA-7A at the profile location was approximately 17.7 m, and a thermocline was present at a depth of approximately 10 m. The Secchi depth was 2.2 m. Near surface conditions were characterized by a temperature of 12.5 °C, dissolved oxygen levels of 8.54 mg/L and 80.2 % saturation, conductivity of 15 µS/cm, and pH of 7.03.

In comparison, water below the thermocline, near the bottom of LA-7A, was characterized by a cooler temperature (6.4 °C), a reduced oxygen level (0.69 mg/L; 5.6 %), elevated conductivity (56 µS/cm) and lower pH (5.42). A water chemistry depth profile is presented in **Figure 3-2**.

## 3.8.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at LA-7A. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from LA-7A. Three sediment

samples were analysed for grain size. All samples from LA-7A had the same general grain size distribution. The sediments were generally clay (37-42%) and silt (44-48%) with some sand (12-18%).

Summary statistics for sediment quality parameters collected during baseline studies at LA-7A are provided in **Table 3-5**. The three sediment samples had an average percentage of total organic carbon of 26%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below the REF, ISQG or LEL value.

### 3.8.4 Aquatic Habitat

An aquatic habitat assessment was undertaken during September 2016 and maps were prepared. The shoreline generally consisted of rocks with overhanging shrubs, transitioning from small boulder and cobble to sand or silty bottom, with sparse emergent or submergent aquatic vegetation (see **Figure 3-12**). Within several embayments with tributary inlets, the nearshore consisted of sandy beach. Larger emergent and submergent macrophyte beds were also generally limited to embayments.

The aquatic habitat map prepared by EcoMetrix was reviewed by Bobby John, who identified two additional rocky areas that are potentially suitable for spawning (**Figure 3-9**).

### 3.8.5 Plankton Community

Chlorophyll a concentrations were below the laboratory detection limit (< 0.60 µg/L), reflecting the oligotrophic nature of Kratchkowsky Lake (**Table 3-6**).

Twenty-nine phytoplankton taxa belonging to seven classes were identified at LA-7A (**Table** 3-6). Based on total biovolume (µm3), more than 90% of the phytoplankton present belong to the classes Bacillariophyceae (40.5%, predominantly *Melosira* sp.), Cryptophyceae (22.2%, consisting of Cryptomonas sp.), Cyanophyceae (16.3%, predominantly *Aphanothece* sp.), and Dinophyceae (11.6%, predominantly *Gymnodinium* sp.) (**Figure** 3-2). Phytoplankton belonging to three other classes comprised the remaining biovolume at LA-7A.

Twenty-one zooplankton taxa were identified at LA-7A (**Table 3-6**). Based on total biovolume, 61.9% of zooplankton belong to the class Branchiopoda (predominantly *Holopedium* sp.), 29.3% belong to the class Copepoda (predominantly *Skistodiaptomus* sp.), and 8.4% by the class Monogononta (predominantly *Conochilus* sp.). Other zooplankton present included unidentified rotifers and those belonging to classes Ciliata, Euglenoidea, and Lobosa.

## 3.8.6 Benthic Invertebrate Community

Three replicate samples were collected at LA-7A. The mean invertebrate density was 800 individuals/$m^2$ with a range of 543 to 1,171 individuals/$m^2$ (**Table 3-7A**). A total of 11 unique taxa were identified at LA-7. The mean number of taxa present per replicate was 7, and ranged from 6 to 8. Simpson's Diversity Index at LA-7A ranged from 0.61 to 0.71, with a mean of 0.67, indicating a relatively high level of diversity. Mean Evenness was 0.43 with a range of 0.32 to 0.53, indicating that few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LA-7A was 0.36, with a range of 0.20 to 0.58, indicating that the benthic community composition at LA-7A has some similarities to the median reference condition of the large lakes group.

A total of 7 major taxonomic groups (Families) were identified at LA-7, with the mean density within these groups ranging from 5 to 6,522 individuals/$m^2$ (**Table 3-7B**). Chironomids comprised the majority (85%) of the benthic community composition. Copepoda-Cyclopoida were the second-most abundant, comprising 7% of the community composition (**Table 3-7C**).

The benthic invertebrate community at LA-7A comprised four functional feeding groups: collector-gatherers, predators, collector-filterers and shredders; the mean invertebrate density for these groups ranged from 105 to 319 individuals/$m^2$ (**Table 3-7B**). Collector-gatherers and predators were the dominant species comprising 33 and 35% of the community composition, respectively (**Table 3-7D**).

### 3.8.6.1 Benthic Invertebrate Chemistry

Radionuclide and metal concentrations for caddisfly larvae collected from LA-7A are presented in **Table 3-8**.

## 3.8.7 Fish Community

For purposes of describing the fish community, Kratchkowsky Lake was considered a single study area and fish were collected throughout the lake. See **Section 3.7.8** for a discussion of the Kratchkowsky Lake fish community.

### 3.8.7.1 Fish Spawning

For purposes of evaluating fish spawning, Kratchkowsky Lake was considered a single study area and spawning was assessed throughout the lake. See **Section 3.7.8.1** for a discussion of the Kratchkowsky Lake fish spawning habitat.

#### 3.8.7.2 Fish Tissue Chemistry

For purposes of collecting fish tissues for chemical analysis, Kratchkowsky Lake was considered a single study area and fish were collected throughout the lake. See **Section 3.7.8.2** for a discussion of the Kratchkowsky Lake fish tissue chemistry results.

## 3.9 LA-8

Lake LA-8 is situated within the Icelander River drainage area, upstream of lake LA-9 (see **Figure 1-7**).

2016-19 baseline data for LA-8 have been compiled in **Table 3-1** through **Table 3-9**.

### 3.9.1 Hydrology

#### 3.9.1.1 Water Elevation

The water level elevations measured in September 2016 and June 2017 were 520.86 and 530.80 masl, respectively. Please refer to **Appendix G** for a summary of water level elevations at all lake and pond locations.

#### 3.9.1.2 Bathymetry

Bathymetry of lake LA-8 was assessed in September 2016 (**Table 3-2**). At that time, the lake elevation was 520.86 masl. The total surface area of the lake was 208.21 ha and total volume was estimated to be 7,467,381 $m^3$. Maximum and mean depths were 10.2 m and 3.6 m, respectively (see **Figure 3-13**).

### 3.9.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LA-8 are provided in Table 3-3. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.9.2.1 Limnology

On 14 September 2016, the surface water temperature was 11.7 °C. *In-situ* DO was 9.65 mg/L (89.3% saturation), conductivity was 12 µS/cm, and pH was 6.72. The Secchi depth was 1.6 m. A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification was not observed at that time.

### 3.9.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at LA-8. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-2 and A-3**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from LA-8. Three sediment samples were analysed for grain size. Two of the three samples from LA-8, LA-8-2, and LA-8-3, were generally sand (33-40%) with a smaller proportion of silt (39-40%) and some clay (20-28%). The sediment sample obtained from LA-8-1 had a higher percentage of clay (73%) with smaller percentages of silt (26%) and sand (1%).

Summary statistics for sediment quality parameters collected during baseline studies at LA-8 are provided in **Table 3-5**. The three sediment samples had an average percentage of total organic carbon of 16%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below the REF, ISQG or LEL value.

### 3.9.4 Aquatic Habitat

An aquatic habitat assessment was undertaken during September 2016 and maps were prepared. Typical shoreline consisted of rocky shore with overhanging shrubs and submerged tree trunks, transitioning to soft organic silt bottom, with little to no aquatic vegetation (see **Figure 3-13**). Patches of sandy beach shoreline occurred in several areas throughout the lake and a large sandbar was present along the south shore. Emergent and submergent macrophyte beds were also patchy, distributed mainly along the north shore of the lake.

### 3.9.5 Benthic Invertebrate Community

Three replicate samples were collected at LA-8. The mean invertebrate density was 671 individuals/$m^2$ with a range of 557 to 843 individuals/$m^2$ (**Table 3-7A**). A total of 18 unique taxa were identified at LA-8. The mean number of taxa present per replicate was 10, and ranged from 7 to 12. Simpson's Diversity Index at LA-8 ranged from 0.69 to 0.75, with a mean of 0.72, indicating a relatively high level of diversity. Mean Evenness was 0.37 with a range of 0.25 to 0.54, indicating that few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LA-8 was 0.41, with a range of 0.34 to 0.50, indicating that the benthic community composition at LA-8 has some similarities to the median reference condition of the large lakes group.

A total of 9 major taxonomic groups (Families) were identified at LA-8, with the mean density within these groups ranging from 5 to 652 individuals/$m^2$ (**Table 3-4**). Chironomids comprised the majority (84%) of the benthic community composition, followed by phantom midges (Chaoboridae) (10%). (**Table 3-7C**).

The benthic invertebrate community at LA-8 comprised four functional feeding groups: collector-gatherers, predators, collector-filterers and shredders; the mean invertebrate density for these groups ranged from 24 to 286 individuals/$m^2$ (**Table 3-7D**). Predators and shredders were most abundant, comprising 42 and 41% of the community composition, respectively (**Figure 3-8**).

#### 3.9.5.1 Benthic Invertebrate Chemistry

Radionuclide and metal concentrations for dragonfly nymphs collected from LA-8 are presented in **Table 3-1**.

### 3.9.6 Fish Community

LA-8 was surveyed using gillnets during the fall season. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. In total 31 fish, from five species were documented from LA-8. Adult and juvenile Lake Whitefish and Northern Pike were most abundant. Juvenile White Sucker and adult Ninespine Stickleback were much less commonly captured. One juvenile Yellow Perch was visually observed. The list of fish species identified was reviewed by Bobby John, and is considered inclusive and comprehensive.

#### 3.9.6.1 Fish Spawning

Potential spawning habitat for Northern Pike was observed in lake LA-8. Patches of emergent vegetation occurred in several areas, including the north shore at the eastern end of the lake, as well as embayments at the western end of the lake (see **Figure 3-13**).

Rocky shoals, associated with an esker, likely afford spawning habitat for fall spawning Lake Whitefish. Spawning for White Sucker likely occurs within the inlet and outlet tributaries.

The information provided by Bobby John, as well as his review of the spawning area map provided by EcoMetrix, confirmed these observations.

## 3.10 LA-9

Lake LA-9 is situated within the Icelander River Drainage, upstream of lake LA-6 and downstream of LA-8 (via SA-9 and SA-10**) (Figure 1-7)**.

The 2016-19 baseline data for LA-9 have been compiled in **Table 3-1** through **Table 3-9**.

## 3.10.1 Hydrology

### 3.10.1.1 **Water Elevation**

The water level elevations measured in September 2016 and May 2017 were 514.25 and 514.28 masl, respectively. Please refer to **Appendix G** for a summary of water level elevations at all lake and pond locations.

### 3.10.1.2 **Bathymetry**

Bathymetry of lake LA-9 was assessed in September 2016 (**Table 3-2**). At that time, the lake elevation was 514.25 masl. The total surface area of the lake was 137.94 ha and total volume was 6,410,916 $m^3$. Maximum and mean depths were 11.2 m and 4.6 m, respectively (see **Figure 3-14**).

## 3.10.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LA-9 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2016 are provided in **Appendix A**, **Table A-1**.

### 3.10.2.1 **Limnology**

On 16 September 2016, the surface water temperature was 12.3 °C. *In-situ* DO was 9.31 mg/L (87.0% saturation), conductivity was 12 µS/cm, and pH was 6.97. The Secchi depth was 1.5 m. A water chemistry depth profile is presented in **Figure 3-14**. Thermal stratification was not observed at that time.

## 3.10.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at LA-9. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from LA-9. Three sediment samples were analysed for grain size. Two of the three samples from LA-9, LA-9-1, and LA-9-2, were generally silt (47-51%) with a smaller proportions of clay (25-28%) and sand (24-25%). The sediment sample obtained from LA-9-3 had a higher percentage of clay (77%) with smaller percentages of silt (21%) and sand (1%).

Summary statistics for sediment quality parameters collected during baseline studies at LA-9 are provided in **Table 3-5**. The three sediment samples had an average percentage

of total organic carbon of 12%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below the REF, ISQG or LEL value.

### 3.10.4 Aquatic Habitat

An aquatic habitat assessment was undertaken during September 2016 and habitat maps were prepared. Typical shoreline consisted of rocky shore with overhanging shrubs, quickly transitioning to sandy bottom, and shallow sandy beaches with patchy emergent vegetation nearshore and submergent aquatic beds on the deeper slopes (see **Figure 3-14**). The shoreline near the lake inlet and outlet, consisted of bog and most of the larger aquatic macrophyte beds occurred within the western (outlet) basin of the lake.

### 3.10.5 Benthic Invertebrate Community

Three replicate samples were collected at LA-9. The mean invertebrate density was 1,633 individuals/$m^2$ with a range of 1,386 to 1,986 individuals/$m^2$ (**Table 3-7A**). A total of 24 unique taxa were identified at LA-9. The mean number of taxa present per replicate was 11, and ranged from 6 to 21. Simpson's Diversity Index at LA-9 ranged from 0.63 to 0.79, with a mean of 0.69, indicating a relatively high level of diversity. Mean Evenness was 0.36 with a range of 0.23 to 0.45, indicating that few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LA-9 was 0.57, with a range of 0.53 to 0.63, indicating that the benthic community composition at LA-9 has some similarities to the median reference condition of the large lakes group.

A total of 14 major taxonomic groups (Families) were identified at LA-9, with the mean density within these groups ranging from 5 to 943 individuals/$m^2$ (**Table 3-2B**). Chironomids comprised the majority (56%) of the benthic community composition, followed by phantom midges (32%). (**Table 3-2C**).

The benthic invertebrate community at LA-9 comprised four functional feeding groups: collector-gatherers, predators, collector-filterers and shredders; the mean invertebrate density for these groups ranged from 24 to 986 individuals/$m^2$ (**Table 3-7D**). Predators and collector-gatherers were most abundant, comprising 61 and 30% of the community composition, respectively (**Figure 3-8**).

#### 3.10.5.1 **Benthic Invertebrate Chemistry**

Radionuclide and metal concentrations for caddisfly larvae collected from LA-9 are presented in **Table 3-8**.

### 3.10.6 Fish Community

LA-9 was surveyed using gillnets and dip nets during the fall season in 2016. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing

effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. In total 45 fish, from seven species were documented from LA-9. Adult and juvenile Lake Whitefish, Spottail Shiner and adult Ninespine Stickleback were most abundant. Adult and juvenile White Sucker and Walleye, and juvenile Yellow Perch and Northern Pike were less commonly captured. Bobby John confirmed that the fish species identified in baseline studies in LA-9 are those present in the lake based on his local knowledge.

#### 3.10.6.1 **Fish Spawning**

Potential spawning habitat for Northern Pike was observed in lake LA-9, primarily occurring within the outlet embayment at the southwest end of the lake (**Figure 3-14**). Emergent vegetation also occurred along the south shore of the eastern embayment.

Rocky shoals likely afford spawning habitat for fall spawning Lake Whitefish. Spawning habitats for Walleye and White Sucker may occur within the inlet tributaries. The information provided by Bobby John, as well as his review of the spawning area map (**Figure 3-9**) provided by EcoMetrix, confirmed these observations.

## 3.11 PA-2

Pond PA-2 is situated within Icelander River drainage area, downstream of pond PA-3 and upstream of lake LA-6 (see **Figure 1-7**).

The 2016-19 baseline data for PA-2 have been compiled in **Table 3-1, Table 3-2, Table 3-3** and **Table 3-9**.

### 3.11.1 Hydrology

#### 3.11.1.1 **Water Elevation**

The water level elevation measured in September 2016 was 510.46 masl. Please refer to **Table 3-1** and **Appendix G** for a summary of water level elevations at all lake and pond locations.

#### 3.11.1.2 **Bathymetry**

Bathymetry of pond PA-2 was assessed in September 2016 (**Table 3-2**). At that time, the pond elevation was 510.46 masl. The total surface area of the pond was 8.43 ha and total volume was 122,617 $m^3$. Maximum and mean depths were 3.2 m and 1.5 m, respectively (see **Figure 3-15**).

### 3.11.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies PA-2 are provided in **Table 3-3**. For parameters where water quality guidelines are available

(SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.11.2.1 **Limnology**

On 19 September 2016, the surface water temperature was 11.7 °C. *In-situ* DO was 9.31 mg/L (86.1% saturation), conductivity was 9 µS/cm, and pH was 6.84. The Secchi depth was bottom (2 m). A water chemistry depth profile is presented in **Figure 3-15**. Thermal stratification was not observed at that time.

### 3.11.3 Aquatic Habitat

An aquatic habitat assessment was undertaken during September 2016 and maps were prepared. Typical shoreline consisted of rocky shore with overhanging shrubs, transitioning to sandy or silt bottom (see **Figure 3-15**). Much of the nearshore supported emergent, submergent and floating aquatic macrophyte beds.

### 3.11.4 Fish Community

PA-2 was surveyed using gillnets during the fall season of 2016. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. In total 21 fish, from three species were documented from PA-2. Adult and juvenile Lake Whitefish were most abundant. Adult Northern Pike and White Sucker were less commonly captured.

## 3.12 PA-3

Pond PA-3 is a headwater pond situated within the Icelander River drainage area, upstream of pond PA-2 (see **Figure 1-7**).

The 2016-19 baseline data for PA-3 have been compiled in **Table 3-1, Table 3-2, Table 3-3** and **Table 3-9**.

### 3.12.1 Hydrology

#### 3.12.1.1 **Water Elevation**

The water level elevation measured in September 2016 was 517.36 masl. Please refer to **Table 3-1** and **Appendix G** for a summary of water level elevations at all lake and pond locations.

#### 3.12.1.2 **Bathymetry**

Bathymetry of pond PA-3 was assessed in September 2016 (**Table 3-2**). At that time, the pond elevation was 517.36 masl. The total surface area of the pond was 4.49 ha and total volume was 38,845 $m^3$. Maximum and mean depths were 2.7 m and 0.9 m, respectively (see **Figure 3-16**).

### 3.12.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies PA-3 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.12.2.1 **Limnology**

On 20 September 2016, the surface water temperature was 10.9 °C. *In-situ* DO was 9.22 mg/L (83.4% saturation), conductivity was 8 µS/cm, and pH was 6.56. The Secchi depth was 1.6 m. A water chemistry depth profile is presented in **Figure 3-16**. Thermal stratification was not observed at that time.

### 3.12.3 Aquatic Habitat

An aquatic habitat assessment was undertaken during September 2016 and maps were prepared. Typical shoreline consisted of rocky shore with overhanging shrubs, transitioning to silt bottom (see **Figure 3-16**). Nearly the entire waterbody supported emergent, submergent and floating aquatic macrophyte beds.

### 3.12.4 Fish Community

PA-3 was surveyed using gillnets during the fall season in 2016. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. No fish were collected.

## 3.13 LB-1

Lake LB-1 is situated within the Williams Lake drainage area, upstream of Russell Lake (LAB-2) and downstream of lake LB-2 (via SB-3) (see **Figure 1-7**).

Historical and 2016-19 baseline data for LB-1 have been compiled in **Table 3-1** and **Table** 3-3.

### 3.13.1 Hydrology

#### 3.13.1.1 **Water Elevation**

Geodetic water levels at LB-1 were measured during open water conditions between 2011 and 2013 (**Appendix G**). The measured water level for LB-1 varied by approximately 0.37 m, between 503.71 masl and 504.08 masl.

The water level elevation measured in September 2016 was 503.66 masl. Please refer to **Table 3-1** and **Appendix G** for a summary of water level elevations at all lake and pond locations.

### 3.13.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LB-1 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.13.2.1 **Limnology**

On 13 September 2016, the surface water temperature was 8.8 °C. *In-situ* DO was 9.22 mg/L (88.2% saturation), conductivity was 12 µS/cm, and pH was 8.0. The Secchi depth was bottom (2.1 m). A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification was not observed at that time

## 3.14 LB-2

Lake LB-2 is situated within the Williams Lake drainage area, upstream of lake LB-1 and downstream of Williams Lake (LB-3) (via SB-5) (see **Figure 1-7**).

Historical and 2016-19 baseline data for LB-2 have been compiled in **Table 3-1** and **Table** 3-3.

### 3.14.1 Hydrology

#### 3.14.1.1 **Water Elevation**

Geodetic water levels at LB-2 were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for LB-2 varied by approximately 0.18 m, between 510.39 masl and 510.57 masl.

The water level elevation measured in September 2016 was 510.54 masl (**Appendix G**). Please refer to **Table 3-1** and **Appendix G** for a summary of water level elevations at all lake and pond locations.

#### 3.14.1.2 Ice Thickness

Ice thickness was measured at the deepest point of the waterbody, between March 23 and April 1, 2014. The ice thickness at the end of March was 0.78 m and was considered to represent the maximum development of ice thickness of winter 2013-14.

### 3.14.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LB-2 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

#### 3.14.2.1 Limnology

Temperature and dissolved oxygen profiles were undertaken during April 2014 by Golder (**Appendix F**). During late winter, dissolved oxygen steadily decreased below 2 m but did not become anoxic and the Secchi depth was 2.5 m.

On 13 September 2016, the surface water temperature was 10.8 °C. In-situ DO was 9.47 mg/L (85.8% saturation), conductivity was 13 µS/cm, and pH was 7.13. The Secchi depth was 2.2 m. A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification was not observed at that time.

## 3.15 Williams Lake (LB-3)

Williams Lake (LB-3) is a headwater lake situated within the drainage area, upstream of lake LB-2 (see **Figure 1-7**).

Historical and 2016-19 baseline data for Williams Lake (LB-3) have been compiled in **Table** 3-1 through **Table 3-5**, **Table 3-7** and **Table 3-9**.

### 3.15.1 Hydrology

#### 3.15.1.1 Water Elevation

Geodetic water levels at Williams Lake (LB-3) were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for LB-3 varied by approximately 0.22 m, between 518.36 masl and 518.58 masl.

The water level elevation measured in September 2016 was 518.57 masl (**Appendix G**). Please refer to **Table 3-1** and **Appendix G** for a summary of water level elevations at all lake and pond locations.

#### 3.15.1.2 **Ice Thickness**

Ice thickness was observed at the deepest point of the waterbody, between March 23 and April 1, 2014. The ice thickness at the end of March was 0.82 m and was considered to represent the maximum development of ice thickness of winter 2013-14.

#### 3.15.1.3 **Bathymetry**

Williams Lake (LB-3) bathymetry was assessed by Golder (**Appendix F**) in August 2012 (**Table 3-2**). At that time, the lake elevation was 518.52 masl. The total surface area of the lake was 152.30 ha and total volume was 6,933,788 $m^3$. Maximum and mean depths were 17.8 m and 4.6 m, respectively.

### 3.15.2 Water Quality

Williams Lake (LB-3) was stratified at the time of sampling in September 2016 (see **Section 3.15.3.1**). Thus, in addition to a water sample collected from the surface, a water sample was taken from below the thermocline near the bottom of the lake and analyzed separately. Descriptive statistics for all water quality parameters at are provided in **Table 3-3**. Annual baseline water quality data from 2012, 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits for water collected at the surface of the water column.

For water collected at the lake bottom, most constituent concentrations were below guideline limits for parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO). There was an exceedance of the CCME CWQG ammonia guideline value by an order of magnitude and the pH concentration (6.42) was marginally lower than the CCME CWQG lower limit of 6.5 (**Table 3-3**). Iron concentrations exceeded the SEQG guideline value by an order of magnitude.

#### 3.15.2.1 **Limnology**

Temperature and dissolved oxygen profiles were undertaken during August 2012 and April 2014 by Golder (**Appendix F**). Williams Lake (LB-3) was stratified during August with oxygen and temperature rapidly decreasing below 6 m. Anoxia occurred below 11 m and the Secchi depth was 4.0 m. Dissolved oxygen conditions in bottom waters during April were similarly anoxic, and the Secchi depth was 4.0 m.

On 14 September 2016, the water depth at the Williams Lake (LB-3) profile location was 17 m and a thermocline was present at a depth of approximately 10 m. The Secchi depth was 3.5 m. Near surface conditions were characterized by a temperature of 14.2 °C, dissolved oxygen levels of 8.97 mg/L and 87.5 % saturation, conductivity of 13 µS/cm, and a pH of 6.80. In comparison, water below the thermocline, near the bottom, was characterized by a water temperature of 7.3 °C, a dissolved oxygen level 1.08 mg/L or 9.0% saturation, conductivity was 51 µS/cm, respectively, and a pH of 6.36. A water chemistry depth profile is presented in **Figure 3-2**.

### 3.15.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at Williams Lake (LB-3). Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from Williams Lake (LB-3). Three sediment samples were analysed for grain size. Two of the three samples from Williams Lake (LB-3-, LB-3-2, and LB-3-3), were generally silt (42-55%) with smaller proportions of clay (31-37%) and sand (14-22%). The sediment sample obtained from LB-3-1 had a higher percentage of clay (78%) with smaller percentages of silt (22%) and sand (0.3%).

Summary statistics for sediment quality parameters collected during baseline studies at Williams Lake (LB-3) are provided in **Table 3-5**. The three sediment samples had an average percentage of total organic carbon of 13%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below the REF, ISQG or LEL value.

### 3.15.4 Aquatic Habitat

An aquatic habitat assessment was undertaken by Golder in August 2012 (**Appendix F**). Shoreline vegetation at Williams Lake (LB-3) mainly consisted of shrubs and black spruce with upland jack pine forests. The typical substrate observed for LB-3 was boulder and sand. Shoreline slopes ranged from shallow to steep. Cover types for aquatic biota included emergent and submerged vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris.

### 3.15.5 Benthic Community

Three replicate samples were collected at Williams Lake (LB-3). The mean invertebrate density was 10,457 individuals/$m^2$ with a range of 3029 to 25,114 individuals/$m^2$ (**Table** 3-7**A**). A total of 26 unique taxa were identified at LB-3. The mean number of taxa present per replicate was 15, and ranged from 13 to 18. Simpson's Diversity Index at LB-3 ranged

from 0.45 to 0.79, with a mean of 0.68, indicating a relatively high level of diversity. Mean Evenness was 0.25 with a range of 0.09 to 0.35, indicating that few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LB-3 was 0.76, with a range of 0.64 to 0.95, indicating that the benthic community composition at LB-3 was relatively different compared to median reference condition of the large lakes group.

A total of 15 major taxonomic groups (Families) were identified at Williams Lake (LB-3), with the mean density within these groups ranging from 5 to 8643 individuals/$m^2$ (**Table 3-7B**). Chironomids comprised the majority (60%) of the benthic community composition, followed by Naididae (16%) (**Table 3-7C**).

The benthic invertebrate community at Williams Lake (LB-3) comprised five functional feeding groups: collector-gatherers, predators, collector-filterers, shredders, and scrapers; the mean invertebrate density for these groups ranged from 5 to 7019 individuals/$m^2$ (**Table 3-7B**). Collector-gatherers, predators and collector-filterers were almost equally abundant, comprising 97% of the community composition (**Table 3-7D**).

### 3.15.6 Fish Community

A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. Juvenile Northern Pike, juvenile and adult Yellow Perch, Spottail Shiner and Lake Chub (*Couesius plumbeus*) were observed in August 2012 (**Appendix F**). Adult Walleye and Northern Pike were captured by angling during May 2017.

Bobby John noted that he has attempted commercially fishing at Williams Lake, but based on his experience the lake has low Walleye numbers and consequently he does not fish there regularly.

## 3.16 Russell Lake (LAB-1)

Monitoring location LAB-1 comprises a small portion of Russell Lake and is situated within the northern embayment at the outlet of the Icelander River, downstream of SA-1.

Historical and 2016-19 baseline data for LAB-1 have been compiled in **Table 3-1** through **Table 3-10**.

## 3.16.1 Hydrology

### 3.16.1.1 **Water Elevation**

Geodetic water levels at LAB-1 were measured during open water conditions between 2011 and 2014 (**Appendix G**). The measured water level for LAB-1 varied by approximately 0.39 m, between 487.99 masl and 488.38 masl.

The water level elevation measured in September 2016 was 488.26 masl (**Appendix G**). Please refer to **Table 3-1** and **Appendix G** for a summary of water level elevations at all lake and pond locations.

### 3.16.1.2 **Ice Thickness**

Ice thickness was measured at the deepest point of the embayment, between March 23 and April 1, 2014. The ice thickness at the end of March was 0.83 m and was considered to represent the maximum development of ice thickness of winter 2013-14 for LAB-1.

### 3.16.1.3 **Bathymetry**

Bathymetry of Russell Lake near the inlet of the Icelander River was assessed by Golder in August 2012 (**Table 3-2, Appendix F**). At that time, the lake elevation was 488.17 masl. The total surface area of the LAB-1 study area was 75.15 ha and total volume was not reported. Maximum and mean depths were 18.8 m and 3.0 m, respectively.

## 3.16.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LAB-1 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were within guideline values. Annual baseline water quality data from 2012, 2014 and 2016 are provided in **Appendix A**, **Table A-1**.

### 3.16.2.1 **Limnology**

Temperature and dissolved oxygen profiles were undertaken during August 2012 and March 2014 by Golder (**Appendix F**). Russell Lake at LAB-1 was stratified during August with oxygen and temperature rapidly decreasing in the bottom 1.5 m. The Secchi depth was 3.5 m. During late winter, dissolved oxygen steadily decreased below 10 m but the water column did not become anoxic. Secchi depth was 3.5 m.

On 15 September 2016, the surface water temperature was 12.6 °C. *In-situ* DO was 9.67 mg/L (91.0% saturation), conductivity was 30 µS/cm, and pH was 7.02. The Secchi depth was 3.1 m. A water chemistry depth profile is presented in **Figure 3-2**. Thermal stratification was not observed at that time.

### 3.16.3 Sediment Quality

Sediment data are summarized for the top 0-2 cm of sediment collected at LAB-1. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for each individual sediment sample from LAB-1. Three sediment samples were analysed for grain size. Samples from LAB-1 were generally clay (70-78%) with a smaller proportion of silt (22-27%) and some sand (0.3-3%).

Summary statistics for sediment quality parameters collected during baseline studies at LAB-1 are provided in **Table 3-5**. The three sediment samples had an average percentage of total organic carbon of 14%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below the REF, ISQG or LEL value.

### 3.16.4 Aquatic Habitat

An aquatic habitat assessment was undertaken by Golder in August 2012 (**Appendix F**). Shoreline vegetation at LAB-1 mainly consisted of shrubs and black spruce with upland jack pine forests. The typical substrate observed for LAB-1 was sand and cobble. Shoreline slopes ranged from shallow to steep and active erosional areas were noted. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, and overhanging vegetation.

### 3.16.5 Plankton Community

Chlorophyll *a* concentrations were below the laboratory detection limit (< 0.60 µg/L) (**Table 3-6**), reflecting the oligotrophic state of LAB-1.

Twenty-nine phytoplankton taxa belonging to seven classes were identified at LAB-1 (**Table** 3-6). Based on total biovolume ($\mu m^3$), more than 95% of the phytoplankton present belong to the classes Cryptophyceae (36.6%, predominantly *Cryptomonas* sp.), Bacillariophyceae (33.0%, predominantly *Melosira* sp.), Dinophyceae (13.3%, predominantly *Gymnodinium* sp.), and Cyanophyceae (12.6%, predominantly *Gomphosphaeria* sp.) (**Figure 3-6**). Phytoplankton belonging to three other classes comprised the remaining biovolume at LAB-1.

Twenty-one zooplankton taxa were identified at LAB-1 (**Table 3-6**). Based on total biovolume, approximately half (46.5%) of zooplankton belong to the class Branchiopoda (predominantly *Chydorus* sp. *and Bosmina* sp.), 31.9% belong to the class Copepoda (predominantly those that are too young to be identified), and approximately 20% by unidentified rotifers and the class Monogononta (predominantly *Asplanchna* sp.) (**Figure** 3-7). Other zooplankton present included those belonging to classes Ciliata, Insecta, and Lobosa.

## 3.16.6 Benthic Invertebrate Community

Three replicate samples were collected at LAB-1. The mean invertebrate density was 3,505 individuals/$m^2$ with a range of 2,471 to 5,286 individuals/$m^2$ (**Table 3-7A**). A total of 30 unique taxa were identified at LAB-1. The mean number of taxa present per replicate was 19, and ranged from 15 to 24. Simpson's Diversity Index at LAB-1 ranged from 0.84 to 0.86, with a mean of 0.85, indicating a high level of diversity. Mean Evenness was 0.34 with a range of 0.28 to 0.40, indicating that few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LAB-1 was 0.71, with a range of 0.63 to 0.85, indicating that the benthic community composition at LAB-1 was relatively different compared to the median reference condition of the large lakes group.

A total of 16 major taxonomic groups (Families) were identified at LAB-1, with the mean density within these groups ranging from 5 to 2,190 individuals/$m^2$ (**Table 3-7B**). Chironomids comprised the majority (59%) of the benthic community composition, followed by Naididae (19%) (**Table 3-7C**).

The benthic invertebrate community at LAB-1 comprised five functional feeding groups: collector-gatherers, predators, collector-filterers, shredders, and scrapers; the mean invertebrate density for these groups ranged from 5 to 1,752 individuals/$m^2$ (**Table 3-7D**). Collector-gatherers were the most abundant, followed by collector-filterers, comprising 55 and 27% of the community composition, respectively (**Figure 3-8**).

### 3.16.6.1 **Benthic Invertebrate Chemistry**

Radionuclide and metal concentrations for caddisfly larvae collected from LAB-1 are presented in **Table 3-8**.

## 3.16.7 Fish Community

For the purposes of describing the fish community, Russell Lake was considered a single study area and fish were collected from monitoring locations LAB-1 and LAB-2 (see **Section 3.17**). Russell Lake was surveyed using gillnets during spring and fall seasons. A summary of the fish community is presented in **Table 3-9**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A Tables A-13, A-16**. In total 97 fish, from eight species were documented from Russell Lake. Adult and juvenile Walleye, Lake Whitefish and White Sucker, and adult Northern Pike were most abundant. Adult Spottail Shiner and Lake Trout were less abundant. Adult Ninespine Stickleback and juvenile Burbot were visually observed.

Bobby John noted in his interview that he has observed that some walleye in Russell Lake have large cysts.

#### 3.16.7.1 **Fish Spawning**

Spawning habitat for Northern Pike was observed in Russell Lake at LAB-1, within the embayment associated with the inlet of the Icelander River. Several adult pike were observed in this area during May 2017, shortly after ice-out.

Spawning habitats for fall spawning Lake Whitefish and Lake Trout were not observed within the LAB-1 area of Russell Lake. Spawning habitats for Walleye and suckers likely occur within the Icelander River (SA-1) (see **Section 4.1.4.1**).

In addition to the observations made by EcoMetrix, Bobby John identified a Lake Trout spawning area located south of baseline study area represented by LAB. The spawning area extends both north and south off an island in Russel Lake (Denison 2020).

#### 3.16.7.2 **Fish Tissue Chemistry**

For purposes of collecting fish tissues for chemical analysis, Russell Lake was considered a single study area and fish were collected at Russell Lake Stations LAB-1 and LAB-2.

Fish tissue chemistry results are presented in **Table 3-10**. Radionuclide levels in bones were typically below lab DLs for both Northern Pike and White Sucker. Concentrations of Polonium-210 were low but measurable in some samples of fish flesh and bone.

Mercury concentrations in Northern Pike (mean 0.27 µg/g ww) and White Sucker (0.027 µg/g ww) tissue were below the federal guideline of 0.5 µg/g ww. Mercury concentrations were higher in Northern Pike than in White Sucker reflecting bioaccumulation through the aquatic food chain.

Selenium concentrations in both Northern Pike (mean 1.62 µg/g dw) and White Sucker (2.15 µg/g dw) were below both BCMOE and USEPA fish tissue guideline values.

## 3.17 Russell Lake (LAB-2)

Monitoring location LAB-2 comprises a small portion of Russell Lake and is situated along the northwestern shore at the outlet of the Williams Lake drainage area, downstream of SB-1.

The 2016-19 baseline data for LAB-2 have been compiled in **Table 3-1** to **Table 3-8**.

### 3.17.1 Hydrology

#### 3.17.1.1 **Bathymetry**

Bathymetry of Russell Lake near the inlet of the Williams Lake drainage area (LAB-2) were assessed in September 2016 (**Table 3-1**). At that time, the lake elevation was 488.26 masl.

The total surface area of the LAB-2 study area was 151.66 ha and total volume was 6,079,370 $m^3$. Maximum and mean depths were 20.6 m and 4.0 m, respectively (see **Figure 3-17**).

## 3.17.2 Water Quality

Summary statistics for all water quality parameters collected during baseline studies at LAB-2 are provided in **Table 3-3**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Annual baseline water quality data from 2016 are provided in **Appendix A**, **Table A-1**.

### 3.17.2.1 **Limnology**

On 21 September 2016, the surface water temperature was 12.2 °C. *In-situ* DO was 9.47 mg/L (88.4% saturation), conductivity was 30 µS/cm, and pH was 6.90. The Secchi depth was 2.9 m. A water chemistry depth profile is presented in **Figure 3-17**. Thermal stratification was not observed at that time.

## 3.17.3 Sediment Quality

One sample was obtained at LAB-2 which allowed the top 0-2 cm of sediment to be collected for analysis. Sediment grain size and chemistry data are provided in **Appendix A**, **Tables A-3 and A-4**.

The sediment grain size distribution for sediments passing the 2000 µm sieve is summarized in **Table 3-4** for the sediment sample from LAB-2. The sediment sample from LAB-2 was generally clay (59%) with a smaller proportion of silt (38%) and some sand (3%).

Summary statistics for sediment quality parameters collected during baseline studies at LAB-2 are provided in **Table 3-5**. The sediment sample had a percentage of total organic carbon of 12%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below the REF, ISQG or LEL value.

## 3.17.4 Aquatic Habitat

An aquatic habitat assessment was undertaken during September 2016 and maps were prepared. Typical shoreline consisted of rocky shore with overhanging shrubs that quickly transitioned to sand bottom, with little to no emergent vegetation (see **Figure 3-17**). Submergent vegetation was sparse between 0.7 and 1 m depth, but formed dense mats on the bottom at depths greater 1 m.

## 3.17.5 Plankton Community

Chlorophyll a concentrations were below the laboratory detection limit (< 0.60 µg/L) (**Table** 3-6), reflecting the oligotrophic state of LAB-2.

Twenty-one phytoplankton taxa belonging to seven classes were identified at LAB-2 (**Table 3-6**). Based on total biovolume (µm$^3$), the majority of phytoplankton present belong to the classes Cryptophyceae (54.1%, predominantly *Cryptomonas* sp.), Bacillariophyceae (27.9%, predominantly *Melosira* sp.), and Dinophyceae (11.2%, predominantly *Gymnodinium* sp.) (**Figure 3-6**). Phytoplankton belonging to four other classes comprised the remaining biovolume at LAB-2.

Twenty-two zooplankton taxa were identified at LAB-2 (**Table 3-6**). Based on total biovolume, almost 90% of zooplankton at LAB-2 belong to the classes Monogononta (38.6%, predominantly *Asplanchna* sp.), Branchiopoda (30.9%, predominantly *Chydorus* sp. and *Bosmina* sp.), and Copepoda (18.8%, predominantly individuals that were too young to identify). Other zooplankton present included those belonging to classes Ciliata, Filosia, Heliozoa, and Insecta, as well as unidentified rotifers.

### 3.17.5.1 Benthic Invertebrate Community

Three replicate samples were collected at LAB-2. The mean invertebrate density was 5,295 individuals/m$^2$ with a range of 2,600 to 10,557 individuals/m$^2$ (**Table 3-7A**). A total of 40 unique taxa were identified at LAB-2. The mean number of taxa present per replicate was 24, and ranged from 20 to 27. Simpson's Diversity Index at LAB-2 ranged from 0.75 to 0.88, with a mean of 0.82, indicating a high level of diversity. Mean Evenness was 0.25 with a range of 0.14 to 0.31, indicating that few taxa comprised a large proportion of the total invertebrate abundance. The mean Bray-Curtis index for LAB-2 was 0.87, with a range of 0.77 to 0.93, indicating that the benthic community composition at LAB-2 is largely different than the median reference condition of the large lakes group.

A total of 21 major taxonomic groups (Families) were identified at LAB-2, with the mean density within these groups ranging from 5 to 2,190 individuals/m$^2$ (**Table 3-7B**). Chironomids comprised the majority (75%) of the benthic community composition, followed by Pisidiidae (13%) (**Table 3-7C**).

The benthic invertebrate community at LAB-1 comprised five functional feeding groups: collector-gatherers, predators, collector-filterers, shredders, and scrapers; the mean invertebrate density for these groups ranged from 14 to 2,500 individuals/m$^2$ (**Table 3-7D**). Collector-gatherers were the most abundant, followed by collector-filterers, comprising 59 and 29% of the community composition, respectively (**Figure 3-8**).

#### 3.17.5.2 **Benthic Invertebrate Chemistry**

Radionuclide and metal concentrations for caddisfly larvae collected from LAB-2 are presented in **Table 3-8**.

### 3.17.6 Fish Community

For purposes of describing the fish community, Russell Lake was considered a single study area and fish were collected at both LAB-1 and LAB-2. See **Section 3.16.8** for a discussion of the Russell Lake fish community.

#### 3.17.6.1 **Fish Spawning**

Potential spawning habitat for Northern Pike was observed in Russell Lake at LAB-2, within the small embayment associated with the inlet of the Williams Lake Drainage (SB-1) (**Figure 3-17**).

Potential spawning habitats for fall spawning Lake Whitefish and Lake Trout were not noted within the LAB-2 area of Russell Lake.

#### 3.17.6.2 **Fish Tissue Chemistry**

For purposes of collecting fish tissues for chemical analysis, Russell Lake was considered a single study area and fish were collected at LAB-1 and LAB-2. See **Section 3.16.7.2** for a discussion of the Russell Lake fish tissue chemistry results.

# Tables

**Table 3-1: Baseline Water Elevations**

| Waterbody | Date | Water Level (m) |
|---|---|---|
| McGowan Lake (LA-1) | September 16, 2016<br>July 2, 2018<br>July 5, 2019<br>August 30, 2019 | 494.39<br>494.344<br>494.515<br>494.476 |
| LA-2 | September 13, 2016 | 494.58 |
| LA-3 | September 18, 2016 | 494.57 |
| Mardoc Lake (LA-4) | September 13, 2016 | 498.62 |
| Whitefish Lake (LA-5) | September 12, 2016 | 500.06 |
| Whitefish Lake (LA-6) | September 12, 2016<br>June 30, 2018<br>August 29, 2019 | 500.07<br>500.106<br>500.118 |
| Kratchkowsky Lake (LA-7) | September 12, 2016<br>May 30, 2017 | 520.53<br>520.53 |
| LA-8 | September 13, 2016<br>June 1, 2017 | 520.86<br>520.80 |
| LA-9 | September 13, 2016<br>May 31, 2017 | 514.25<br>514.28 |
| PA-2 | September 15, 2016 | 510.46 |
| PA-3 | September 15, 2016 | 517.36 |
| LB-1 | September 11, 2016 | 503.66 |
| LB-2 | September 11, 2016 | 510.54 |
| Williams Lake (LB-3) | September 11, 2016 | 518.57 |
| Russell Lake (LAB-1) | September 22, 2016 | 488.26 |

Notes:

- Water level elevations are referenced to benchmarks with geodetic elevations established by Golder Associates, except for LA8, LA9, PA2 and PA3 which are referenced to geodetic elevations established as part of the 2016-2019 Wheeler River Project Baseline Study.
- Water level elevation surveys conducted for the 2016-2019 Wheeler River Project Baseline Study by Calder Engineering Ltd., Ecometrix Incorporated and Missinipi Water Solutions Inc.

**Table 3-2: Baseline Lake Bathymetric Features Summary**

| Location | Survey Date | Key Bathymetric Features | | | | |
|---|---|---|---|---|---|---|
| | | Lake Elevation (m) | Surface Area (ha) | Volume ($m^3$) | Maximum Depth (m) | Mean Depth (m) |
| McGowan Lake (LA-1) | 12-Aug-12 | 494.37 | 148.55 | 8,189,320 | 9.7 | 5.5 |
| Whitefish Lake (LA-5) | 13-Aug-12 | 500.04 | 32.40 | 332,502 | 4.1 | 1.1 |
| Whitefish Lake (LA-6) | 13-Aug-12 | 500.06 | 26.27 | 413,505 | 2.7 | 1.6 |
| Kratchkowsky Lake (LA-7) | 09-Aug-12 | 520.48 | 79.59 | - | 6.8 | 2.9 |
| Kratchkowsky Lake (LA-7A) | 11-Sep-16 | 520.53 | 243.34 | 12,712,684 | 21.8 | 5.2 |
| LA-8 | 15-Sep-16 | 520.86 | 208.21 | 7,647,381 | 10.2 | 3.6 |
| LA-9 | 17-Sep-16 | 514.25 | 137.94 | 6,410,916 | 11.2 | 4.6 |
| PA-2 | 19-Sep-16 | 510.46 | 8.43 | 122,617 | 3.2 | 1.5 |
| PA-3 | 20-Sep-16 | 517.36 | 4.49 | 38,845 | 2.7 | 0.9 |
| Williams Lake (LB-3) | 08-Aug-12 | 518.52 | 152.30 | 6,933,788 | 17.8 | 4.6 |
| Russell Lake (LAB-1)* | 12-Aug-12 | 488.17 | 75.15 | - | 18.8 | 3.0 |
| Russell Lake (LAB-2)* | 20-Sep-16 | 488.26 | 151.66 | 6,079,370 | 20.6 | 4.0 |

Notes:

* The summary of features pertain to the assessed portions of Russell Lake

## Table 3-3: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| McGowan Lake (LA-1) | Alkalinity | mg/L | | | 4 | 0 | 2 | 10 | 6.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 6 | 0 | 0.001 | 0.0051 | 0.0034 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 6 | 4 | <0.01 | 0.09 | <0.027 |
| | Antimony | mg/L | | | 6 | 6 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 6 | 3 | 0.0001 | 0.0001 | <0.0001 |
| | Barium | mg/L | | | 6 | 0 | 0.0023 | 0.0038 | 0.003 |
| | Beryllium | mg/L | | | 6 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 6 | 0 | 2 | 12 | 7.8 |
| | Boron | mg/L | 1.5 | CCME CWQG | 6 | 6 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 6 | 3 | <0.00001 | 0.00003 | <0.000015 |
| | Calcium | mg/L | | | 6 | 0 | 1.1 | 1.7 | 1.35 |
| | Carbonate | mg/L | | | 6 | 6 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 6 | 0 | 0.4 | 0.5 | 0.43 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 6 | 6 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 6 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 6 | 6 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 6 | 0 | 2 | 2.6 | 2.23 |
| | Dissolved Phosphorus | mg/L | | | 4 | 4 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 6 | 1 | <0.01 | 0.08 | <0.032 |
| | Hardness | mg/L | | | 4 | 0 | 5 | 6 | 5.5 |
| | Hydroxide | mg/L | | | 6 | 6 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 6 | 0 | 0.037 | 0.27 | 0.12 |
| | Lead | mg/L | 0.001 | CCME CWQG | 6 | 5 | <0.0001 | 0.0004 | <0.00015 |
| | Lead-210 | Bq/L | | | 6 | 6 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 6 | 0 | 0.3 | 0.5 | 0.42 |
| | Manganese | mg/L | | | 6 | 0 | 0.0039 | 0.029 | 0.016 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 6 | 5 | <0.0000001 | <0.00001 | <0.000006 |
| | Molybdenum | mg/L | 31 | SEQG | 6 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 6 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 5 | 3 | <0.04 | 0.49 | <0.18 |
| | P. Alkalinity | mg/L | | | 6 | 6 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 6 | 0 | 6.52 | 6.94 | 6.77 |
| | Phosphorus | mg/L | | | 6 | 6 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 6 | 6 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 6 | 0 | 0.2 | 0.5 | 0.37 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 6 | 6 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 6 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 6 | 6 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 6 | 0 | 1.4 | 1.8 | 1.5 |
| | Specific Conductivity | µS/cm | | | 6 | 0 | 9 | 24 | 16.8 |
| | Strontium | mg/L | | | 6 | 0 | 0.012 | 0.016 | 0.014 |
| | Sulphate | mg/L | 128 | SEQG | 6 | 0 | 0.7 | 0.8 | 0.75 |
| | Sum of Ions | | | | 6 | 0 | 6 | 18 | 12.5 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 6 | 6 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 6 | 6 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 6 | 4 | <0.0001 | 0.0013 | <0.0004 |
| | Titanium | mg/L | | | 6 | 6 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 6 | 0 | 18 | 26 | 22.167 |
| | Total Kjeldahl Nitrogen | mg/L | | | 6 | 0 | 0.17 | 0.38 | 0.27333 |
| | Total Organic Carbon | mg/L | | | 6 | 0 | 2.2 | 2.6 | 2.3667 |
| | Total Suspended Solids | mg/L | | | 6 | 2 | <1 | 4 | <2.5 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 6 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 6 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 6 | 5 | <0.0005 | 0.001 | <0.0006 |
| McGowan Lake (LA-1 Bottom) | Aluminum | mg/L | 0.1 | SEQG | 2 | 0 | 0.0034 | 0.004 | 0.0037 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 2 | 1 | <0.01 | 0.02 | <0.015 |
| | Antimony | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 2 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 2 | 0 | 0.0026 | 0.0031 | 0.00285 |
| | Beryllium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 2 | 0 | 5 | 6 | 5.5 |
| | Boron | mg/L | 1.5 | CCME CWQG | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 2 | 2 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 2 | 0 | 1.1 | 1.4 | 1.25 |
| | Carbonate | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 2 | 0 | 0.4 | 0.5 | 0.45 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 2 | 0 | 1.9 | 2.2 | 2.05 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 2 | 0 | 0.02 | 0.08 | 0.05 |
| | Hardness | mg/L | | | 2 | 0 | 4 | 5 | 4.5 |
| | Hydroxide | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 2 | 0 | 0.036 | 0.13 | 0.083 |
| | Lead | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 2 | 1 | <0.02 | 0.03 | <0.025 |
| | Magnesium | mg/L | | | 2 | 0 | 0.3 | 0.4 | 0.35 |
| | Manganese | mg/L | | | 2 | 0 | 0.0053 | 0.013 | 0.00915 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 2 | 0 | 0.0000009 | 0.000007 | 0.00000395 |
| | Molybdenum | mg/L | 31 | SEQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 1 | <0.04 | 0.6 | <0.32 |
| | P. Alkalinity | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 2 | 0 | 6.62 | 6.8 | 6.71 |
| | Phosphorus | mg/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 2 | 2 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 2 | 0 | 0.3 | 0.4 | 0.35 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 2 | 2 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 2 | 2 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 2 | 0 | 1.4 | 1.6 | 1.5 |
| | Specific Conductivity | µS/cm | | | 2 | 0 | 10 | 14 | 12 |
| | Strontium | mg/L | | | 2 | 0 | 0.013 | 0.014 | 0.0135 |
| | Sulphate | mg/L | 128 | SEQG | 2 | 0 | 0.7 | 0.8 | 0.75 |
| | Sum of Ions | | | | 2 | 0 | 9 | 12 | 10.5 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 2 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 2 | 0 | 22 | 24 | 23 |
| | Total Kjeldahl Nitrogen | mg/L | | | 2 | 0 | 0.14 | 0.23 | 0.185 |
| | Total Organic Carbon | mg/L | | | 2 | 0 | 2 | 2.2 | 2.1 |
| | Total Suspended Solids | mg/L | | | 2 | 1 | <1 | 2 | <1.5 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 2 | 0 | 0.0013 | 0.0016 | 0.00145 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| LA-2 | Alkalinity | mg/L | | | 3 | 0 | 4.0 | 12 | 8.3 |
| | Aluminum | mg/L | 0.1 | SEQG | 3 | 0 | 0.001 | 0.0024 | 0.0019 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 3 | 2 | <0.01 | 0.04 | <0.02 |
| | Antimony | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 3 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 3 | 0 | 0.0027 | 0.0043 | 0.0033 |
| | Beryllium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 3 | 0 | 5.0 | 15 | 10 |
| | Boron | mg/L | 1.5 | CCME CWQG | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 3 | 2 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 3 | 0 | 1.3 | 1.9 | 1.6 |
| | Carbonate | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 3 | 0 | 0.50 | 0.70 | 0.63 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 3 | 0 | 2.1 | 2.3 | 2.2 |
| | Dissolved Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 3 | 1 | <0.01 | 0.07 | <0.033 |
| | Hardness | mg/L | | | 3 | 0 | 5 | 7 | 5.6667 |
| | Hydroxide | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 3 | 0 | 0.054 | 0.081 | 0.066 |
| | Lead | mg/L | 0.001 | CCME CWQG | 3 | 2 | <0.0001 | 0.0002 | <0.00013 |
| | Lead-210 | Bq/L | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 3 | 0 | 0.40 | 0.60 | 0.47 |
| | Manganese | mg/L | | | 3 | 0 | 0.0064 | 0.030 | 0.014733 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 3 | 3 | <0.000000 | <0.000010 | <0.000007 |
| | Molybdenum | mg/L | 31 | SEQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 3 | 2 | <0.0001 | 0.0003 | <0.00017 |
| | Nitrate | mg/L | 13.29 | SEQG | 3 | 1 | <0.04 | 0.53 | <0.21 |
| | P. Alkalinity | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 3 | 0 | 6.9 | 7.19 | 7.03 |
| | Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 3 | 3 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 3 | 0 | 0.30 | 0.50 | 0.40 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 3 | 2 | <0.005 | 0.006 | <0.0053 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 3 | 3 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 3 | 0 | 1.5 | 1.8 | 1.6 |
| | Specific Conductivity | µS/cm | | | 3 | 0 | 18 | 25 | 22 |
| | Strontium | mg/L | | | 3 | 0 | 0.013 | 0.018 | 0.015333 |
| | Sulphate | mg/L | 128 | SEQG | 3 | 0 | 0.60 | 0.80 | 0.70 |
| | Sum of Ions | | | | 3 | 0 | 10 | 22 | 16 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 3 | 1 | <0.0001 | 0.0006 | <0.00037 |
| | Titanium | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 3 | 0 | 22 | 26 | 23 |
| | Total Kjeldahl Nitrogen | mg/L | | | 3 | 0 | 0.15 | 0.22 | 0.197 |
| | Total Organic Carbon | mg/L | | | 3 | 0 | 2.2 | 2.5 | 2.3 |
| | Total Suspended Solids | mg/L | | | 3 | 1 | <1 | 2.0 | <1.7 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 3 | 2 | <0.0005 | 0.0011 | <0.0007 |
| LA-3 | Alkalinity | mg/L | | | 3 | 0 | 3.0 | 10 | 6.7 |
| | Aluminum | mg/L | 0.1 | SEQG | 3 | 0 | 0.0014 | 0.0033 | 0.0023 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 3 | 2 | <0.01 | 0.04 | <0.02 |
| | Antimony | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 3 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 3 | 0 | 0.003 | 0.0041 | 0.0035 |
| | Beryllium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 3 | 0 | 4.0 | 12 | 8.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 3 | 3 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 3 | 0 | 1.2 | 1.8 | 1.5 |
| | Carbonate | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 3 | 0 | 0.7 | 0.9 | 0.8 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 3 | 0 | 2.2 | 2.7 | 2.4 |
| | Dissolved Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 3 | 1 | <0.01 | 0.07 | <0.033 |
| | Hardness | mg/L | | | 3 | 0 | 5.0 | 6.0 | 5.3 |
| | Hydroxide | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 3 | 0 | 0.066 | 0.19 | 0.11 |
| | Lead | mg/L | 0.001 | CCME CWQG | 3 | 2 | <0.0001 | 0.0007 | <0.0003 |
| | Lead-210 | Bq/L | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 3 | 0 | 0.40 | 0.50 | 0.43 |
| | Manganese | mg/L | | | 3 | 0 | 0.0086 | 0.014 | 0.0112 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 3 | 3 | <0.000000 | <0.000010 | <0.000007 |
| | Molybdenum | mg/L | 31 | SEQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 3 | 2 | <0.0001 | 0.0002 | <0.00013 |
| | Nitrate | mg/L | 13.29 | SEQG | 3 | 1 | <0.04 | 0.40 | <0.16 |
| | P. Alkalinity | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 3 | 0 | 6.9 | 7.2 | 7.0 |
| | Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 3 | 3 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 3 | 0 | 0.30 | 0.80 | 0.53 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 3 | 2 | <0.005 | 0.006 | <0.0053 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 3 | 3 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 3 | 0 | 1.5 | 1.8 | 1.6 |
| | Specific Conductivity | µS/cm | | | 3 | 0 | 20 | 24 | 22 |
| | Strontium | mg/L | | | 3 | 0 | 0.014 | 0.018 | 0.016 |
| | Sulphate | mg/L | 128 | SEQG | 3 | 0 | 0.60 | 0.90 | 0.80 |
| | Sum of Ions | | | | 3 | 0 | 9.0 | 19 | 14 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 3 | 1 | <0.0001 | 0.001 | <0.0005 |
| | Titanium | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 3 | 0 | 22 | 25 | 24 |
| | Total Kjeldahl Nitrogen | mg/L | | | 3 | 0 | 0.16 | 0.27 | 0.23 |
| | Total Organic Carbon | mg/L | | | 3 | 0 | 2.3 | 2.8 | 2.5 |
| | Total Suspended Solids | mg/L | | | 3 | 1 | <1 | 4.0 | <2.7 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 3 | 3 | <0.0001 | 0.0 | <0.0001 |
| | Vanadium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 3 | 1 | <0.0005 | <0.0005 | <0.0005 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| Mardoc Lake (LA-4) | Alkalinity | mg/L | | | 2 | 0 | 12 | 16 | 14 |
| | Aluminum | mg/L | 0.1 | SEQG | 2 | 0 | 0.0009 | 0.0017 | 0.0013 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 2 | 1 | <0.01 | 0.07 | <0.04 |
| | Antimony | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 2 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 2 | 0 | 0.003 | 0.0039 | 0.0035 |
| | Beryllium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 2 | 0 | 15 | 20 | 17.5 |
| | Boron | mg/L | 1.5 | CCME CWQG | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 2 | 1 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 2 | 0 | 1.4 | 2.0 | 1.7 |
| | Carbonate | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 2 | 0 | 0.6 | 0.6 | 0.6 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 2 | 0 | 1.4 | 1.6 | 1.5 |
| | Dissolved Phosphorus | mg/L | | | 2 | 1 | 0.01 | 0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 2 | 0 | 0.01 | 0.02 | 0.015 |
| | Hardness | mg/L | | | 2 | 0 | 5.0 | 7.0 | 6.0 |
| | Hydroxide | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 2 | 0 | 0.0087 | 0.02 | 0.01435 |
| | Lead | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 2 | 2 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 2 | 0 | 0.40 | 0.50 | 0.45 |
| | Manganese | mg/L | | | 2 | 0 | 0.025 | 0.029 | 0.027 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 2 | 2 | <0.0000001 | <0.000010 | <0.000005 |
| | Molybdenum | mg/L | 31 | SEQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 2 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 0 | 0.05 | 0.18 | 0.12 |
| | P. Alkalinity | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 2 | 0 | 7.0 | 7.2 | 7.1 |
| | Phosphorus | mg/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 2 | 2 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 2 | 0 | 0.5 | 0.6 | 0.55 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 2 | 2 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 2 | 2 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 2 | 0 | 1.7 | 2.0 | 1.9 |
| | Specific Conductivity | µS/cm | | | 2 | 0 | 24 | 26 | 25 |
| | Strontium | mg/L | | | 2 | 0 | 0.015 | 0.017 | 0.016 |
| | Sulphate | mg/L | 128 | SEQG | 2 | 0 | 1.3 | 1.3 | 1.3 |
| | Sum of Ions | | | | 2 | 0 | 21 | 27 | 24 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 2 | 1 | <0.0001 | 0.0012 | <0.00065 |
| | Titanium | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 2 | 0 | 26 | 36 | 31 |
| | Total Kjeldahl Nitrogen | mg/L | | | 2 | 0 | 0.08 | 0.24 | 0.16 |
| | Total Organic Carbon | mg/L | | | 2 | 0 | 1.4 | 1.5 | 1.5 |
| | Total Suspended Solids | mg/L | | | 2 | 1 | <1 | 3.0 | <2 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 2 | 2 | <0.0005 | <0.0005 | <0.0005 |
| Whitefish Lake (LA-5) | Alkalinity | mg/L | | | 3 | 0 | 3.0 | 13 | 7.7 |
| | Aluminum | mg/L | 0.1 | SEQG | 3 | 0 | 0.0048 | 0.0078 | 0.0061 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 3 | 1 | <0.01 | 0.07 | <0.043 |
| | Antimony | mg/L | | | 3 | 2 | <0.0002 | 0.0003 | <0.00023 |
| | Arsenic | mg/L | 0.005 | SEQG | 3 | 1 | 0.0001 | 0.0001 | <0.0001 |
| | Barium | mg/L | | | 3 | 0 | 0.0021 | 0.0032 | 0.0027 |
| | Beryllium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 3 | 0 | 4.0 | 16 | 9.3 |
| | Boron | mg/L | 1.5 | CCME CWQG | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 3 | 1 | <0.00001 | 0.00002 | <0.000013 |
| | Calcium | mg/L | | | 3 | 0 | 1.2 | 1.6 | 1.4 |
| | Carbonate | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 3 | 0 | 0.30 | 0.40 | 0.33 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 3 | 0 | 2.0 | 2.5 | 2.2 |
| | Dissolved Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 3 | 0 | 0.02 | 0.07 | 0.037 |
| | Hardness | mg/L | | | 3 | 0 | 5.0 | 6.0 | 5.3 |
| | Hydroxide | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 3 | 0 | 0.04 | 0.19 | 0.11 |
| | Lead | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 3 | 0 | 0.4 | 0.4 | 0.4 |
| | Manganese | mg/L | | | 3 | 0 | 0.0046 | 0.02 | 0.0142 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 3 | 3 | <0.000001 | <0.000010 | <0.000007 |
| | Molybdenum | mg/L | 31 | SEQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 1 | <0.04 | 0.26 | <0.15 |
| | P. Alkalinity | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 3 | 0 | 6.6 | 7.0 | 6.8 |
| | Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 3 | 1 | <0.005 | 0.008 | <0.006 |
| | Potassium | mg/L | | | 3 | 0 | 0.20 | 0.40 | 0.33 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 3 | 1 | <0.005 | 0.01 | <0.0077 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 3 | 2 | 0.00005 | 0.00005 | <0.00005 |
| | Sodium | mg/L | | | 3 | 0 | 1.4 | 1.7 | 1.5 |
| | Specific Conductivity | µS/cm | | | 3 | 0 | 16 | 22 | 19 |
| | Strontium | mg/L | | | 3 | 0 | 0.012 | 0.015 | 0.013 |
| | Sulphate | mg/L | 128 | SEQG | 3 | 0 | 0.60 | 0.70 | 0.63 |
| | Sum of Ions | | | | 3 | 0 | 8.0 | 22 | 14 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 3 | 2 | <0.01 | 0.02 | <0.013 |
| | Thorium-232 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 3 | 2 | <0.0001 | 0.0008 | <0.00033 |
| | Titanium | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 3 | 0 | 22 | 29 | 24 |
| | Total Kjeldahl Nitrogen | mg/L | | | 3 | 0 | 0.14 | 0.34 | 0.22 |
| | Total Organic Carbon | mg/L | | | 3 | 0 | 1.9 | 4.3 | 2.8 |
| | Total Suspended Solids | mg/L | | | 3 | 1 | <1 | 4 | <2.7 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| Whitefish Lake (LA-6) | Alkalinity | mg/L | | | 3 | 0 | 3 | 38 | 15 |
| | Aluminum | mg/L | 0.1 | SEQG | 5 | 0 | 0.005 | 0.073 | 0.0201 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 5 | 2 | <0.01 | 0.05 | <0.026 |
| | Antimony | mg/L | | | 5 | 5 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 5 | 1 | 0.0001 | 0.0001 | <0.0001 |
| | Barium | mg/L | | | 5 | 0 | 0.0024 | 0.0051 | 0.00328 |
| | Beryllium | mg/L | | | 5 | 5 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 5 | 0 | 4 | 46 | 13.4 |
| | Boron | mg/L | 1.5 | CCME CWQG | 5 | 4 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 5 | 4 | <0.00001 | 0.00004 | <0.000016 |
| | Calcium | mg/L | | | 5 | 0 | 1.1 | 1.5 | 1.24 |
| | Carbonate | mg/L | | | 5 | 5 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 5 | 0 | 0.3 | 0.4 | 0.32 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 5 | 5 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 5 | 5 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 5 | 4 | <0.0002 | 0.0004 | <0.00024 |
| | Dissolved Organic Carbon | mg/L | | | 5 | 0 | 2 | 2.5 | 2.22 |
| | Dissolved Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 5 | 0 | 0.02 | 0.08 | 0.042 |
| | Hardness | mg/L | | | 3 | 0 | 5 | 5 | 5 |
| | Hydroxide | mg/L | | | 5 | 5 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 5 | 0 | 0.031 | 0.21 | 0.1064 |
| | Lead | mg/L | 0.001 | CCME CWQG | 5 | 4 | <0.0001 | **0.0012** | <0.00032 |
| | Lead-210 | Bq/L | | | 5 | 5 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 5 | 0 | 0.2 | 0.4 | 0.36 |
| | Manganese | mg/L | | | 5 | 0 | 0.0024 | 0.019 | 0.01232 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 5 | 4 | <0.0000001 | <0.00001 | <0.000006 |
| | Molybdenum | mg/L | 31 | SEQG | 5 | 5 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 5 | 4 | <0.0001 | 0.0004 | <0.00016 |
| | Nitrate | mg/L | 13.29 | SEQG | 4 | 2 | <0.04 | 0.31 | <0.173 |
| | P. Alkalinity | mg/L | | | 5 | 5 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 5 | 0 | 5.71 | 6.79 | 6.502 |
| | Phosphorus | mg/L | | | 5 | 4 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 5 | 5 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 5 | 0 | 0.2 | 0.4 | 0.32 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 5 | 4 | 0.005 | 0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 5 | 5 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 5 | 5 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 5 | 0 | 1.4 | 1.8 | 1.52 |
| | Specific Conductivity | µS/cm | | | 5 | 0 | 9 | 21 | 15.2 |
| | Strontium | mg/L | | | 5 | 0 | 0.011 | 0.014 | 0.0126 |
| | Sulphate | mg/L | 128 | SEQG | 5 | 0 | 0.5 | 0.7 | 0.64 |
| | Sum of Ions | | | | 5 | 0 | 8 | 51 | 18 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 5 | 5 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 5 | 5 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 5 | 4 | <0.0001 | 0.0011 | <0.0003 |
| | Titanium | mg/L | | | 5 | 4 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 5 | 0 | 14 | 29 | 22.2 |
| | Total Kjeldahl Nitrogen | mg/L | | | 5 | 0 | 0.24 | 0.43 | 0.306 |
| | Total Organic Carbon | mg/L | | | 5 | 0 | 2.2 | 2.9 | 2.36 |
| | Total Suspended Solids | mg/L | | | 5 | 2 | <1 | 4 | <2 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 5 | 5 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 5 | 4 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 5 | 3 | <0.0005 | 0.02 | <0.00474 |
| Kratchkowsky Lake (LA-7) | Alkalinity | mg/L | | | 3 | 0 | 8.0 | 21 | 16 |
| | Aluminum | mg/L | 0.1 | SEQG | 3 | 0 | 0.0006 | 0.0051 | 0.0031 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 3 | 1 | <0.01 | **0.12** | <0.047 |
| | Antimony | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 3 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 3 | 0 | 0.0024 | 0.0038 | 0.0029 |
| | Beryllium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 3 | 0 | 10 | 26 | 20 |
| | Boron | mg/L | 1.5 | CCME CWQG | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 3 | 1 | <0.00001 | 0.00003 | <0.000017 |
| | Calcium | mg/L | | | 3 | 0 | 1.4 | 2.0 | 1.6 |
| | Carbonate | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 3 | 0 | 0.40 | 0.70 | 0.53 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 3 | 0 | 2.1 | 2.8 | 2.4 |
| | Dissolved Phosphorus | mg/L | | | 3 | 2 | 0.01 | 0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 3 | 0 | 0.02 | 0.06 | 0.033 |
| | Hardness | mg/L | | | 3 | 0 | 5.0 | 7.0 | 6.0 |
| | Hydroxide | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 3 | 0 | 0.13 | 0.15 | 0.14 |
| | Lead | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 3 | 0 | 0.40 | 0.50 | 0.47 |
| | Manganese | mg/L | | | 3 | 0 | 0.015 | 0.026 | 0.02 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 3 | 3 | <0.000001 | <0.000010 | <0.000007 |
| | Molybdenum | mg/L | 31 | SEQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 1 | <0.04 | 0.26 | <0.15 |
| | P. Alkalinity | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 3 | 0 | 6.7 | 7.1 | 6.9 |
| | Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 3 | 2 | 0.005 | 0.005 | <0.005 |
| | Potassium | mg/L | | | 3 | 0 | 0.20 | 0.50 | 0.37 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 3 | 3 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 3 | 3 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 3 | 0 | 1.6 | 2.0 | 1.7 |
| | Specific Conductivity | µS/cm | | | 3 | 0 | 18 | 26 | 22 |
| | Strontium | mg/L | | | 3 | 0 | 0.014 | 0.019 | 0.016 |
| | Sulphate | mg/L | 128 | SEQG | 3 | 0 | 0.40 | 0.60 | 0.50 |
| | Sum of Ions | | | | 3 | 0 | 14 | 32 | 25 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 3 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 3 | 2 | <0.0001 | 0.0009 | <0.00037 |
| | Titanium | mg/L | | | 3 | 1 | 0.0002 | 0.0003 | <0.00023 |
| | Total Dissolved Solids | mg/L | | | 3 | 0 | 22 | 29 | 26 |
| | Total Kjeldahl Nitrogen | mg/L | | | 3 | 0 | 0.32 | 0.44 | 0.37 |
| | Total Organic Carbon | mg/L | | | 3 | 0 | 2.0 | 3.2 | 2.5 |
| | Total Suspended Solids | mg/L | | | 3 | 1 | <1 | 4.0 | <2.6667 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 3 | 2 | 0.0001 | 0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| Kratchkowsky Lake (LA-7A-Bottom) | Alkalinity | mg/L | | | 1 | 0 | 13 | 13 | 13 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.0033 | 0.0033 | 0.0033 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 0 | **0.91** | **0.91** | **0.91** |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 0 | 0.0002 | 0.0002 | 0.0002 |
| | Barium | mg/L | | | 1 | 0 | 0.0036 | 0.0036 | 0.0036 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 16 | 16 | 16 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 1 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 1 | 0 | 2.1 | 2.1 | 2.1 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.6 | 0.6 | 0.6 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 2.6 | 2.6 | 2.6 |
| | Dissolved Phosphorus | mg/L | | | 1 | 0 | 0.1 | 0.1 | 0.1 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Hardness | mg/L | | | 1 | 0 | 7.0 | 7.0 | 7.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | **5.2** | **5.2** | **5.2** |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.5 | 0.5 | 0.5 |
| | Manganese | mg/L | | | 1 | 0 | 0.25 | 0.25 | 0.25 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 0 | **0.000068** | **0.000068** | **0.000068** |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 1 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 6.5 | 6.5 | 6.5 |
| | Phosphorus | mg/L | | | 1 | 0 | 0.11 | 0.11 | 0.11 |
| | Polonium-210 | Bq/L | | | 1 | 0 | 0.008 | 0.008 | 0.008 |
| | Potassium | mg/L | | | 1 | 0 | 0.2 | 0.2 | 0.2 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 0 | 0.01 | 0.01 | 0.01 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 0 | 0.0002 | 0.0002 | 0.0002 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.7 | 1.7 | 1.7 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 32 | 32 | 32 |
| | Strontium | mg/L | | | 1 | 0 | 0.018 | 0.018 | 0.018 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 0.5 | 0.5 | 0.5 |
| | Sum of Ions | | | | 1 | 0 | 23 | 23 | 23 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 29 | 29 | 29 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 1.2 | 1.2 | 1.2 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 2.6 | 2.6 | 2.6 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 13 | 13 | 13 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 0 | 0.0003 | 0.0003 | 0.0003 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 0 | 0.0014 | 0.0014 | 0.0014 |
| Kratchkowsky Lake (LA-7A-Top) | Alkalinity | mg/L | | | 1 | 0 | 6.0 | 6.0 | 6.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.0015 | 0.0015 | 0.0015 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 1 | 0 | 0.0025 | 0.0025 | 0.0025 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 7.0 | 7.0 | 7.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 1 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 1 | 0 | 1.4 | 1.4 | 1.4 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.6 | 0.6 | 0.6 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 2.1 | 2.1 | 2.1 |
| | Dissolved Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Hardness | mg/L | | | 1 | 0 | 5.0 | 5.0 | 5.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | 0.085 | 0.085 | 0.085 |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.4 | 0.4 | 0.4 |
| | Manganese | mg/L | | | 1 | 0 | 0.013 | 0.013 | 0.013 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 1 | <0.000001 | <0.000001 | <0.000001 |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 1 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 6.9 | 6.9 | 6.9 |
| | Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 1 | 0 | 0.2 | 0.2 | 0.2 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.7 | 1.7 | 1.7 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 21 | 21 | 21 |
| | Strontium | mg/L | | | 1 | 0 | 0.014 | 0.014 | 0.014 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 0.3 | 0.3 | 0.3 |
| | Sum of Ions | | | | 1 | 0 | 12 | 12 | 12 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 22 | 22 | 22 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 0.34 | 0.34 | 0.34 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 2.1 | 2.1 | 2.1 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 3.0 | 3.0 | 3.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| LA-8 | Alkalinity | mg/L | | | 1 | 0 | 2.0 | 2.0 | 2.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.0046 | 0.0046 | 0.0046 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 1 | 0 | 0.0029 | 0.0029 | 0.0029 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 2.0 | 2.0 | 2.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 0 | 1.00E-05 | 1.00E-05 | 1.00E-05 |
| | Calcium | mg/L | | | 1 | 0 | 1.2 | 1.2 | 1.2 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.3 | 0.3 | 0.3 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 2.0 | 2.0 | 2.0 |
| | Dissolved Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Hardness | mg/L | | | 1 | 0 | 5.0 | 5.0 | 5.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | 0.14 | 0.14 | 0.14 |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.40 | 0.40 | 0.40 |
| | Manganese | mg/L | | | 1 | 0 | 0.028 | 0.028 | 0.028 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 1 | <0.000001 | <0.000001 | <0.000001 |
| | Molybdenum | mg/L | 26 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 1 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 6.8 | 6.8 | 6.8 |
| | Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 1 | 0 | 0.20 | 0.20 | 0.20 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 0 | 0.01 | 0.01 | 0.01 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.3 | 1.3 | 1.3 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 17 | 17 | 17 |
| | Strontium | mg/L | | | 1 | 0 | 0.012 | 0.012 | 0.012 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 0.60 | 0.60 | 0.60 |
| | Sum of Ions | | | | 1 | 0 | 6.0 | 6.0 | 6.0 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 21 | 21 | 21 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 0.61 | 0.61 | 0.61 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 2.2 | 2.2 | 2.2 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 4.0 | 4.0 | 4.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| LA-9 | Alkalinity | mg/L | | | 1 | 0 | 4.0 | 4.0 | 4.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.0016 | 0.0016 | 0.0016 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 1 | 0 | 0.0024 | 0.0024 | 0.0024 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 5.0 | 5.0 | 5.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 0 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 1 | 0 | 1.1 | 1.1 | 1.1 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.20 | 0.20 | 0.20 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 2.1 | 2.1 | 2.1 |
| | Dissolved Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 0 | 0.01 | 0.01 | 0.01 |
| | Hardness | mg/L | | | 1 | 0 | 4.0 | 4.0 | 4.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | 0.071 | 0.071 | 0.071 |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.30 | 0.30 | 0.30 |
| | Manganese | mg/L | | | 1 | 0 | 0.011 | 0.011 | 0.011 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 1 | <0.000001 | <0.000001 | <0.000001 |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 0 | 0.0002 | 0.0002 | 0.0002 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 0 | 0.04 | 0.04 | 0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 6.9 | 6.9 | 6.9 |
| | Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 1 | 0 | 0.10 | 0.10 | 0.10 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.4 | 1.4 | 1.4 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 17 | 17 | 17 |
| | Strontium | mg/L | | | 1 | 0 | 0.011 | 0.011 | 0.011 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 0.60 | 0.60 | 0.60 |
| | Sum of Ions | | | | 1 | 0 | 9.0 | 9.0 | 9.0 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 11 | 11 | 11 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 0.28 | 0.28 | 0.28 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 2.2 | 2.2 | 2.2 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 3.0 | 3.0 | 3.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| PA-2 | Alkalinity | mg/L | | | 1 | 0 | 6.0 | 6.0 | 6.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.0096 | 0.0096 | 0.0096 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 1 | 0 | 0.0026 | 0.0026 | 0.0026 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 7.0 | 7.0 | 7.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 1 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 1 | 0 | 1.2 | 1.2 | 1.2 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.30 | 0.30 | 0.30 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 3.4 | 3.4 | 3.4 |
| | Dissolved Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 0 | 0.06 | 0.06 | 0.06 |
| | Hardness | mg/L | | | 1 | 0 | 5.0 | 5.0 | 5.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | 0.044 | 0.044 | 0.044 |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.40 | 0.40 | 0.40 |
| | Manganese | mg/L | | | 1 | 0 | 0.0026 | 0.0026 | 0.0026 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 1 | <0.0000001 | <0.0000001 | <0.0000001 |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 0 | 0.0002 | 0.0002 | 0.0002 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 0 | 0.04 | 0.04 | 0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 7.0 | 7.0 | 7.0 |
| | Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 1 | 0 | 0.007 | 0.007 | 0.007 |
| | Potassium | mg/L | | | 1 | 0 | 0.20 | 0.20 | 0.20 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.4 | 1.4 | 1.4 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 20 | 20 | 20 |
| | Strontium | mg/L | | | 1 | 0 | 0.012 | 0.012 | 0.012 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 1.1 | 1.1 | 1.1 |
| | Sum of Ions | | | | 1 | 0 | 12 | 12 | 12 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 22 | 22 | 22 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 0.22 | 0.22 | 0.22 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 3.4 | 3.4 | 3.4 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 2.0 | 2.0 | 2.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| PA-3 | Alkalinity | mg/L | | | 1 | 0 | 4.0 | 4.0 | 4.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.027 | 0.027 | 0.027 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 1 | 0 | 0.0026 | 0.0026 | 0.0026 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 5.0 | 5.0 | 5.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 1 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 1 | 0 | 1.0 | 1.0 | 1.0 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.4 | 0.4 | 0.4 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 8.4 | 8.4 | 8.4 |
| | Dissolved Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 0 | 0.02 | 0.02 | 0.02 |
| | Hardness | mg/L | | | 1 | 0 | 4.0 | 4.0 | 4.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | 0.098 | 0.098 | 0.098 |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.30 | 0.30 | 0.30 |
| | Manganese | mg/L | | | 1 | 0 | 0.0025 | 0.0025 | 0.0025 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 0 | 0.0000001 | 0.0000001 | 0.0000001 |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 0 | 0.0002 | 0.0002 | 0.0002 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 1 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 6.7 | 6.7 | 6.7 |
| | Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 1 | 0 | 0.50 | 0.50 | 0.50 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 0 | 0.006 | 0.006 | 0.006 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.3 | 1.3 | 1.3 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 18 | 18 | 18 |
| | Strontium | mg/L | | | 1 | 0 | 0.01 | 0.01 | 0.01 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 1.1 | 1.1 | 1.1 |
| | Sum of Ions | | | | 1 | 0 | 10 | 10 | 10 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 0 | 0.0003 | 0.0003 | 0.0003 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 29 | 29 | 29 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 0.33 | 0.33 | 0.33 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 8.4 | 8.4 | 8.4 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 2.0 | 2.0 | 2.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 0 | 0.0006 | 0.0006 | 0.0006 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| LB-1 | Alkalinity | mg/L | | | 1 | 0 | 4.0 | 4.0 | 4.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.011 | 0.011 | 0.011 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 1 | 0 | 0.0033 | 0.0033 | 0.0033 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 5.0 | 5.0 | 5.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 0 | 0.00002 | 0.00002 | 0.00002 |
| | Calcium | mg/L | | | 1 | 0 | 1.2 | 1.2 | 1.2 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.1 | 0.1 | 0.1 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 3.6 | 3.6 | 3.6 |
| | Dissolved Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 0 | 0.02 | 0.02 | 0.02 |
| | Hardness | mg/L | | | 1 | 0 | 5.0 | 5.0 | 5.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | 0.084 | 0.084 | 0.084 |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.40 | 0.40 | 0.40 |
| | Manganese | mg/L | | | 1 | 0 | 0.0044 | 0.0044 | 0.0044 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 1 | <0.000001 | <0.000001 | <0.000001 |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 1 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 6.7 | 6.7 | 6.7 |
| | Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 1 | 0 | 0.20 | 0.20 | 0.20 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.4 | 1.4 | 1.4 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 18 | 18 | 18 |
| | Strontium | mg/L | | | 1 | 0 | 0.013 | 0.013 | 0.013 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 0.70 | 0.70 | 0.70 |
| | Sum of Ions | | | | 1 | 0 | 9.0 | 9.0 | 9.0 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 19 | 19 | 19 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 0.28 | 0.28 | 0.28 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 3.4 | 3.4 | 3.4 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 2.0 | 2.0 | 2.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| LB-2 | Alkalinity | mg/L | | | 2 | 0 | 7.0 | 12 | 9.5 |
| | Aluminum | mg/L | 0.1 | SEQG | 2 | 0 | 0.0067 | 0.0096 | 0.0082 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 2 | 1 | <0.01 | 0.04 | <0.025 |
| | Antimony | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 2 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 2 | 0 | 0.0033 | 0.0046 | 0.0040 |
| | Beryllium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 2 | 0 | 8.0 | 15 | 12 |
| | Boron | mg/L | 1.5 | CCME CWQG | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 2 | 1 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 2 | 0 | 1.3 | 1.8 | 1.6 |
| | Carbonate | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 2 | 0 | 0.2 | 0.2 | 0.2 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 2 | 0 | 2.6 | 3.5 | 3.1 |
| | Dissolved Phosphorus | mg/L | | | 2 | 1 | <0.01 | 0.03 | <0.02 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 2 | 1 | <0.01 | 0.07 | <0.04 |
| | Hardness | mg/L | | | 2 | 0 | 5.0 | 6.0 | 5.5 |
| | Hydroxide | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 2 | 0 | 0.15 | 0.15 | 0.15 |
| | Lead | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 2 | 2 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 2 | 0 | 0.40 | 0.40 | 0.40 |
| | Manganese | mg/L | | | 2 | 0 | 0.0094 | 0.037 | 0.0232 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 2 | 2 | <0.000001 | <0.000010 | <0.000006 |
| | Molybdenum | mg/L | 31 | SEQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 2 | 0 | 0.0001 | 0.0002 | 0.00015 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 1 | <0.04 | 0.66 | <0.35 |
| | P. Alkalinity | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 2 | 0 | 6.7 | 6.8 | 6.8 |
| | Phosphorus | mg/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 2 | 2 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 2 | 0 | 0.20 | 0.40 | 0.30 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 2 | 1 | <0.005 | 0.008 | <0.0065 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 2 | 2 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 2 | 0 | 1.4 | 1.6 | 1.5 |
| | Specific Conductivity | µS/cm | | | 2 | 0 | 20 | 22 | 21 |
| | Strontium | mg/L | | | 2 | 0 | 0.013 | 0.016 | 0.0145 |
| | Sulphate | mg/L | 128 | SEQG | 2 | 0 | 0.50 | 0.80 | 0.65 |
| | Sum of Ions | | | | 2 | 0 | 12 | 21 | 16.5 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 2 | 1 | <0.0001 | 0.0008 | <0.00045 |
| | Titanium | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 2 | 0 | 19 | 30 | 24.5 |
| | Total Kjeldahl Nitrogen | mg/L | | | 2 | 0 | 0.13 | 0.35 | 0.24 |
| | Total Organic Carbon | mg/L | | | 2 | 0 | 2.7 | 3.6 | 3.2 |
| | Total Suspended Solids | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 2 | 1 | <0.0005 | 0.0018 | <0.00115 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| Williams Lake (LB-3-Bottom) | Alkalinity | mg/L | | | 1 | 0 | 14 | 14 | 14 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.0086 | 0.0086 | 0.0086 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 0 | **1.2** | **1.2** | **1.2** |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 0 | 0.0003 | 0.0003 | 0.0003 |
| | Barium | mg/L | | | 1 | 0 | 0.0095 | 0.0095 | 0.0095 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 17 | 17 | 17 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 0 | 0.00002 | 0.00002 | 0.00002 |
| | Calcium | mg/L | | | 1 | 0 | 1.8 | 1.8 | 1.8 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.80 | 0.80 | 0.80 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 0 | 0.0002 | 0.0002 | 0.0002 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 4.2 | 4.2 | 4.2 |
| | Dissolved Phosphorus | mg/L | | | 1 | 0 | 0.15 | 0.15 | 0.15 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 0 | 0.02 | 0.02 | 0.02 |
| | Hardness | mg/L | | | 1 | 0 | 6.0 | 6.0 | 6.0 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | **9.5** | **9.5** | **9.5** |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.50 | 0.50 | 0.50 |
| | Manganese | mg/L | | | 1 | 0 | 0.34 | 0.34 | 0.34 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 0 | 0.00001 | 0.00001 | 0.00001 |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 0 | 0.0003 | 0.0003 | 0.0003 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 1 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 6.4 | 6.4 | 6.4 |
| | Phosphorus | mg/L | | | 1 | 0 | 0.17 | 0.17 | 0.17 |
| | Polonium-210 | Bq/L | | | 1 | 0 | 0.02 | 0.02 | 0.02 |
| | Potassium | mg/L | | | 1 | 0 | 0.30 | 0.30 | 0.30 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 0 | 0.007 | 0.007 | 0.007 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.6 | 1.6 | 1.6 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 32 | 32 | 32 |
| | Strontium | mg/L | | | 1 | 0 | 0.016 | 0.016 | 0.016 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 0.50 | 0.50 | 0.50 |
| | Sum of Ions | | | | 1 | 0 | 24 | 24 | 24 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 33 | 33 | 33 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 1.6 | 1.6 | 1.6 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 4.4 | 4.4 | 4.4 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 23 | 23 | 23 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 0 | 0.0005 | 0.0005 | 0.0005 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 0 | 0.0029 | 0.0029 | 0.0029 |
| Williams Lake (LB-3-Top) | Alkalinity | mg/L | | | 3 | 0 | 6.0 | 14 | 9.3 |
| | Aluminum | mg/L | 0.1 | SEQG | 3 | 0 | 0.0016 | 0.0035 | 0.0023 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 3 | 1 | <0.01 | 0.04 | <0.023 |
| | Antimony | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 3 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 3 | 0 | 0.0028 | 0.0041 | 0.0035 |
| | Beryllium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 3 | 0 | 7.0 | 17 | 11.333 |
| | Boron | mg/L | 1.5 | CCME CWQG | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 3 | 2 | <1.00E-05 | 0.00002 | <0.000013 |
| | Calcium | mg/L | | | 3 | 0 | 1.3 | 1.7 | 1.5 |
| | Carbonate | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 3 | 0 | 0.20 | 0.20 | 0.20 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 3 | 0 | 2.6 | 2.9 | 2.8 |
| | Dissolved Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 3 | 0 | 0.02 | 0.07 | 0.037 |
| | Hardness | mg/L | | | 3 | 0 | 5.0 | 6.0 | 5.3 |
| | Hydroxide | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 3 | 0 | 0.045 | 0.24 | 0.12 |
| | Lead | mg/L | 0.001 | CCME CWQG | 3 | 2 | 0.0001 | 0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 3 | 0 | 0.40 | 0.40 | 0.40 |
| | Manganese | mg/L | | | 3 | 0 | 0.0025 | 0.028 | 0.014 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 3 | 2 | <0.0000010 | <0.0000100 | <0.0000070 |
| | Molybdenum | mg/L | 31 | SEQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 1 | <0.04 | 0.44 | <0.24 |
| | P. Alkalinity | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 3 | 0 | 6.6 | 7.1 | 6.9 |
| | Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 3 | 3 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 3 | 0 | 0.20 | 0.50 | 0.37 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 3 | 3 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 3 | 3 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 3 | 0 | 1.4 | 1.8 | 1.5 |
| | Specific Conductivity | µS/cm | | | 3 | 0 | 17 | 22 | 19 |
| | Strontium | mg/L | | | 3 | 0 | 0.011 | 0.015 | 0.013 |
| | Sulphate | mg/L | 128 | SEQG | 3 | 0 | 0.70 | 0.80 | 0.77 |
| | Sum of Ions | | | | 3 | 0 | 12 | 23 | 16 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 3 | 2 | <0.0001 | 0.0016 | <0.0006 |
| | Titanium | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 3 | 0 | 22 | 24 | 23 |
| | Total Kjeldahl Nitrogen | mg/L | | | 3 | 0 | 0.18 | 0.34 | 0.24 |
| | Total Organic Carbon | mg/L | | | 3 | 0 | 2.7 | 3.1 | 2.9 |
| | Total Suspended Solids | mg/L | | | 3 | 1 | <1 | 2.0 | <1.7 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | 0.007 | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 3 | 1 | <0.0005 | 0.0031 | <0.0019 |

## Table 3-3 Cont'd: Baseline Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| Russell Lake (LAB-1) | Alkalinity | mg/L | | | 3 | 0 | 2.0 | 14 | 7.7 |
| | Aluminum | mg/L | 0.1 | SEQG | 3 | 0 | 0.0023 | 0.0025 | 0.0024 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 3 | 2 | <0.01 | 0.05 | <0.023 |
| | Antimony | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 3 | 2 | 0.0001 | 0.0001 | <0.0001 |
| | Barium | mg/L | | | 3 | 0 | 0.0033 | 0.0039 | 0.0036 |
| | Beryllium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 3 | 0 | 2.0 | 17 | 9.0 |
| | Boron | mg/L | 1.5 | CCME CWQG | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 3 | 0 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 3 | 0 | 2.7 | 3.9 | 3.5 |
| | Carbonate | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 3 | 1 | <0.1 | 0.50 | <0.33 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 3 | 0 | 2.1 | 2.5 | 2.3 |
| | Dissolved Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 3 | 0 | 0.02 | 0.07 | 0.04 |
| | Hardness | mg/L | | | 3 | 0 | 9.0 | 13 | 11 |
| | Hydroxide | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 3 | 0 | 0.056 | 0.08 | 0.070667 |
| | Lead | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 3 | 0 | 0.50 | 0.70 | 0.60 |
| | Manganese | mg/L | | | 3 | 0 | 0.029 | 0.064 | 0.045 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 3 | 2 | <0.000001 | <0.000010 | <0.000007 |
| | Molybdenum | mg/L | 31 | SEQG | 3 | 0 | 0.0003 | 0.0013 | 0.00077 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 3 | 1 | 0.0001 | 0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 0 | 0.05 | 0.44 | 0.25 |
| | P. Alkalinity | mg/L | | | 3 | 3 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 3 | 0 | 6.7 | 7.0 | 6.9 |
| | Phosphorus | mg/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 3 | 3 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 3 | 0 | 0.30 | 0.60 | 0.50 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 3 | 2 | <0.005 | 0.006 | <0.0053 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 3 | 3 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 3 | 0 | 1.7 | 2.0 | 1.8 |
| | Specific Conductivity | µS/cm | | | 3 | 0 | 30 | 47 | 38 |
| | Strontium | mg/L | | | 3 | 0 | 0.017 | 0.018 | 0.017 |
| | Sulphate | mg/L | 128 | SEQG | 3 | 0 | 3.7 | 8.1 | 6.5 |
| | Sum of Ions | | | | 3 | 0 | 18 | 28 | 23 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 3 | 3 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 3 | 2 | <0.0001 | 0.001 | <0.0004 |
| | Titanium | mg/L | | | 3 | 3 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 3 | 0 | 30 | 35 | 32 |
| | Total Kjeldahl Nitrogen | mg/L | | | 3 | 0 | 0.14 | 0.22 | 0.17 |
| | Total Organic Carbon | mg/L | | | 3 | 0 | 2.2 | 2.6 | 2.4 |
| | Total Suspended Solids | mg/L | | | 3 | 1 | 1.0 | 1.0 | <1.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 3 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 3 | 3 | <0.0005 | <0.0005 | <0.0005 |
| Russell Lake (LAB-2) | Alkalinity | mg/L | | | 1 | 0 | 8.0 | 8.0 | 8.0 |
| | Aluminum | mg/L | 0.1 | SEQG | 1 | 0 | 0.0029 | 0.0029 | 0.0029 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 1 | 0 | 0.0001 | 0.0001 | 0.0001 |
| | Barium | mg/L | | | 1 | 0 | 0.0034 | 0.0034 | 0.0034 |
| | Beryllium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 1 | 0 | 10 | 10 | 10 |
| | Boron | mg/L | 1.5 | CCME CWQG | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 1 | 1 | <0.00001 | <0.00001 | <0.00001 |
| | Calcium | mg/L | | | 1 | 0 | 3.5 | 3.5 | 3.5 |
| | Carbonate | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 1 | 0 | 0.40 | 0.40 | 0.40 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 1 | 0 | 2.2 | 2.2 | 2.2 |
| | Dissolved Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 1 | 0 | 0.03 | 0.03 | 0.03 |
| | Hardness | mg/L | | | 1 | 0 | 12 | 12 | 12 |
| | Hydroxide | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 1 | 0 | 0.039 | 0.039 | 0.039 |
| | Lead | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 1 | 0 | 0.70 | 0.70 | 0.70 |
| | Manganese | mg/L | | | 1 | 0 | 0.019 | 0.019 | 0.019 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 1 | 1 | <0.0000001 | <0.0000001 | <0.0000001 |
| | Molybdenum | mg/L | 31 | SEQG | 1 | 0 | 0.0011 | 0.0011 | 0.0011 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 1 | 0 | 0.0003 | 0.0003 | 0.0003 |
| | Nitrate | mg/L | 13.29 | SEQG | 1 | 0 | 0.05 | 0.05 | 0.05 |
| | P. Alkalinity | mg/L | | | 1 | 1 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 1 | 0 | 7.2 | 7.2 | 7.2 |
| | Phosphorus | mg/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 1 | 1 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 1 | 0 | 0.80 | 0.80 | 0.80 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 1 | 0 | 0.007 | 0.007 | 0.007 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 1 | 1 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 1 | 0 | 1.7 | 1.7 | 1.7 |
| | Specific Conductivity | µS/cm | | | 1 | 0 | 42 | 42 | 42 |
| | Strontium | mg/L | | | 1 | 0 | 0.016 | 0.016 | 0.016 |
| | Sulphate | mg/L | 128 | SEQG | 1 | 0 | 8.3 | 8.3 | 8.3 |
| | Sum of Ions | | | | 1 | 0 | 25 | 25 | 25 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 1 | 1 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 1 | 1 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 1 | 0 | 35 | 35 | 35 |
| | Total Kjeldahl Nitrogen | mg/L | | | 1 | 0 | 0.29 | 0.29 | 0.29 |
| | Total Organic Carbon | mg/L | | | 1 | 0 | 2.2 | 2.2 | 2.2 |
| | Total Suspended Solids | mg/L | | | 1 | 0 | 4.0 | 4.0 | 4.0 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 1 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 1 | 1 | <0.0005 | <0.0005 | <0.0005 |

Notes:
Summary of baseline water quality data from 2011 to 2019

SEQG - Saskatchewan Environmental Quality Guideline - Water Quality Guideline for Freshwater Aquatic Life (Government of Saskachewan, 2019)
CCME CWQG - Canadian Water Quality Guideline for the Protection of Aquatic Life (CCME, 1999)
SSWQO - Saskatchewan Surface Water Quality Objective (Water Security Agency, 2015)
Mean values are indicated as "less than", "<", when one or more of the samples were below the analytical detection limit for the parameter
Ammonia guideline assumes a maximum pH of 8.5 and temperature of 25°C

## Table 3-4: Baseline Sediment Grain Size Distribution Summary

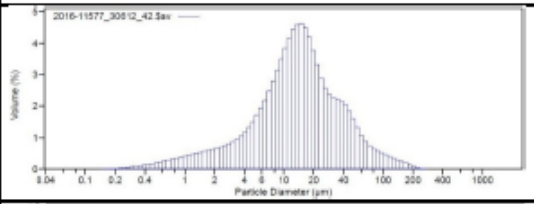
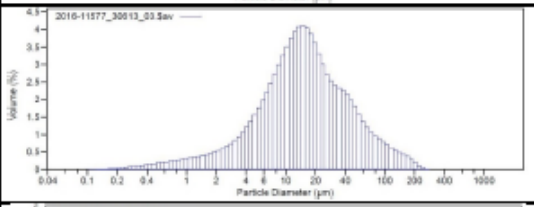
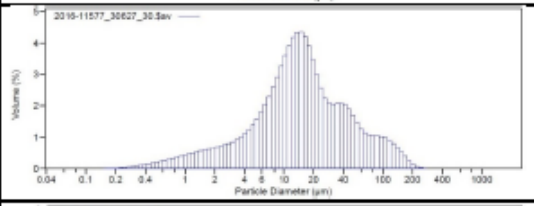
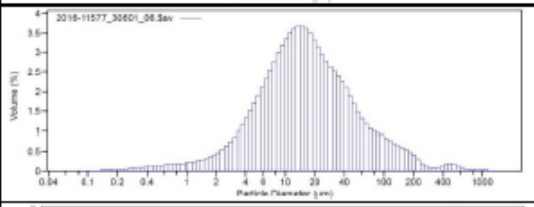
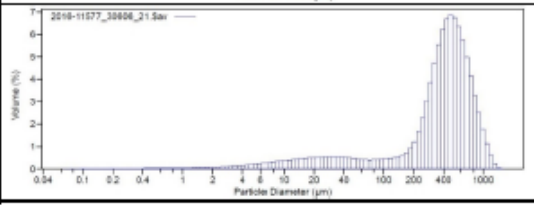
| Location | Lab ID | Particle Diameter | Percent Passing | Soil Classification | Percentage | Histogram |
|---|---|---|---|---|---|---|
| | | (µm) | % | | % | |
| McGowan Lake, LA-1-1 (0-2)' | 30612 | 0.04 | 13.2 | Gravel | 0.0 |  |
| | | 4 | 94.4 | Sand | 0.1 | |
| | | 63 | 99.9 | Silt | 17.7 | |
| | | 200 | 100.0 | Clay | 82.2 | |
| | | 2000 | 100.0 | | | |
| McGowan Lake, LA-1-2 (0-2) | 30613 | 0.04 | 11.7 | Gravel | 0.0 |  |
| | | 4 | 91.1 | Sand | 0.3 | |
| | | 63 | 99.7 | Silt | 20.6 | |
| | | 200 | 100.0 | Clay | 79.1 | |
| | | 2000 | 100.0 | | | |
| McGowan Lake, LA-1-3 (0-2) | 30627 | 0.04 | 13.5 | Gravel | 0.0 |  |
| | | 4 | 89.7 | Sand | 0.2 | |
| | | 63 | 99.8 | Silt | 21.6 | |
| | | 200 | 100.0 | Clay | 78.2 | |
| | | 2000 | 100.0 | | | |
| Whitefish Lake, LA-5-1 (0-2) | 30601 | 0.04 | 10.6 | Gravel | 0.0 |  |
| | | 4 | 87.9 | Sand | 2.1 | |
| | | 63 | 97.8 | Silt | 21.7 | |
| | | 200 | 100.1 | Clay | 76.3 | |
| | | 2000 | 100.1 | | | |
| Whitefish Lake , LA-5-2 (0-2) | 30606 | 0.04 | 1.8 | Gravel | 0.0 |  |
| | | 4 | 13.8 | Sand | 72.5 | |
| | | 63 | 20.5 | Silt | 15.4 | |
| | | 200 | 100.0 | Clay | 12.0 | |
| | | 2000 | 100.0 | | | |

**Table 3-4 Cont'd: Baseline Sediment Grain Size Distribution Summary**

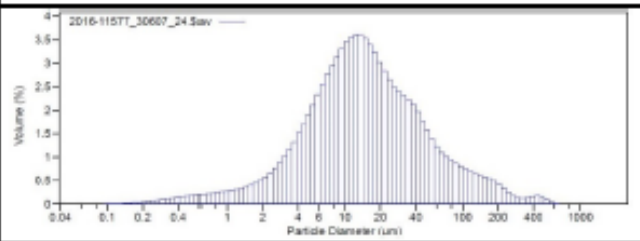
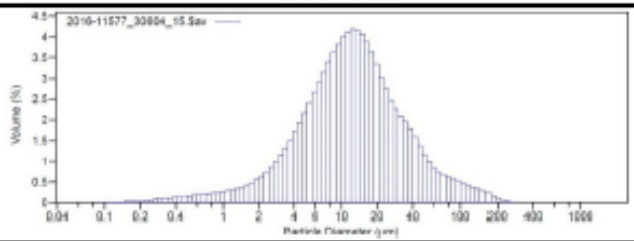
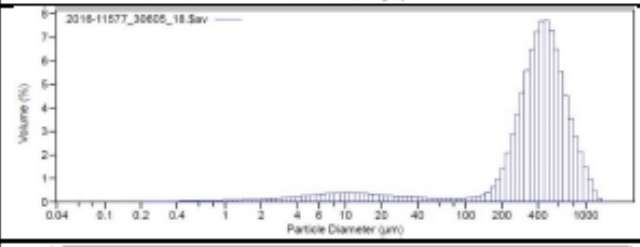
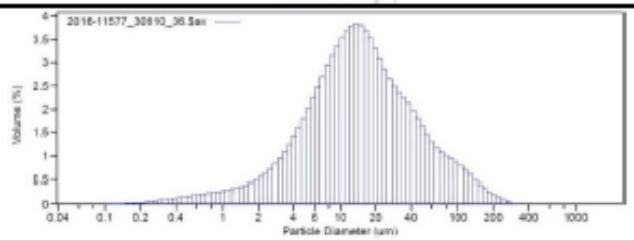
| Location | Lab ID | Particle Diameter (µm) | Percent Passing % | Soil Classification | Percentage % | Histogram |
|---|---|---|---|---|---|---|
| Whitefish Lake, LA-5-3 (0-2) | 30607 | 0.04 | 12.0 | Gravel | 0.0 |  |
| | | 4 | 88.0 | Sand | 1.9 | |
| | | 63 | 97.3 | Silt | 20.9 | |
| | | 200 | 99.4 | Clay | 76.6 | |
| | | 2000 | 99.4 | | | |
| Whitefish Lake, LA-5-4 (0-2) | 30604 | 0.04 | 13.4 | Gravel | 0.0 |  |
| | | 4 | 94.2 | Sand | 0.1 | |
| | | 63 | 99.8 | Silt | 17.8 | |
| | | 200 | 100.0 | Clay | 82.0 | |
| | | 2000 | 100.0 | | | |
| Whitefish Lake, LA-5-5 (0-2) | 30605 | 0.04 | 2.7 | Gravel | 0.0 |  |
| | | 4 | 11.3 | Sand | 77.2 | |
| | | 63 | 15.4 | Silt | 12.8 | |
| | | 200 | 100.0 | Clay | 10.0 | |
| | | 2000 | 100.0 | | | |
| Whtefish Lake, LA 6-1 (0-2) | 30610 | 0.04 | 12.2 | Gravel | 0.0 |  |
| | | 4 | 90.6 | Sand | 0.4 | |
| | | 63 | 99.5 | Silt | 20.8 | |
| | | 200 | 100.0 | Clay | 78.8 | |
| | | 2000 | 100.0 | | | |

**Table 3-4 Cont'd: Baseline Sediment Grain Size Distribution Summary**

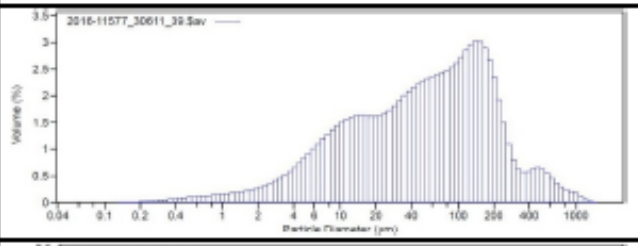
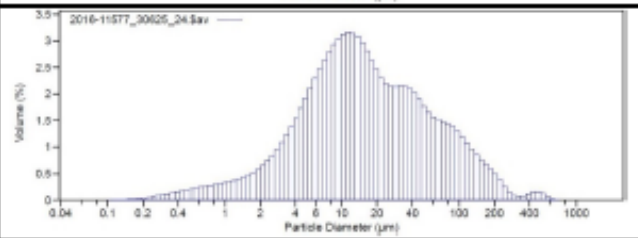
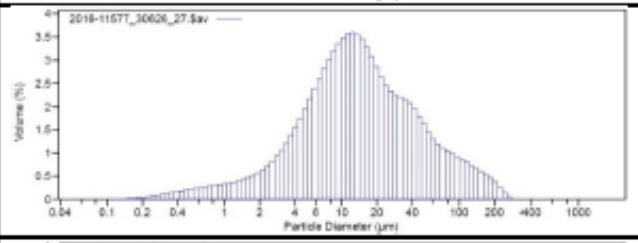
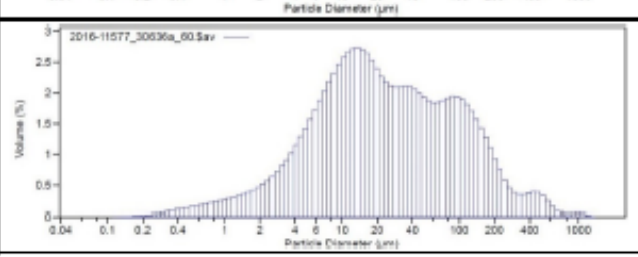
| Location | Lab ID | Particle Diameter (µm) | Percent Passing % | Soil Classification | Percentage % | Histogram |
|---|---|---|---|---|---|---|
| Whitefish Lake, LA-6-2 (0-2) | 30611 | 0.04 | 6.1 | Gravel | 0.0 |  |
| | | 4 | 53.3 | Sand | 12.0 | |
| | | 63 | 86.8 | Silt | 41.8 | |
| | | 200 | 100.0 | Clay | 46.2 | |
| | | 2000 | 100.0 | | | |
| Whitefish Lake, LA-6-3 (0-2) | 30625 | 0.04 | 14.0 | Gravel | 0.0 |  |
| | | 4 | 84.4 | Sand | 1.8 | |
| | | 63 | 98.0 | Silt | 24.4 | |
| | | 200 | 100.0 | Clay | 73.8 | |
| | | 2000 | 100.0 | | | |
| Whitefish Lake, LA-6-4 (0-2) | 30626 | 0.04 | 13.9 | Gravel | 0.0 |  |
| | | 4 | 89.2 | Sand | 0.7 | |
| | | 63 | 99.3 | Silt | 21.5 | |
| | | 200 | 100.1 | Clay | 77.9 | |
| | | 2000 | 100.1 | | | |
| Whitefish Lake, LA-6-5 (0-2) | 30636 | 0.04 | 10.5 | Gravel | 0.0 |  |
| | | 4 | 73.6 | Sand | 5.2 | |
| | | 63 | 94.3 | Silt | 30.7 | |
| | | 200 | 100.0 | Clay | 64.1 | |
| | | 2000 | 100.0 | | | |

**Table 3-4 Cont'd: Baseline Sediment Grain Size Distribution Summary**

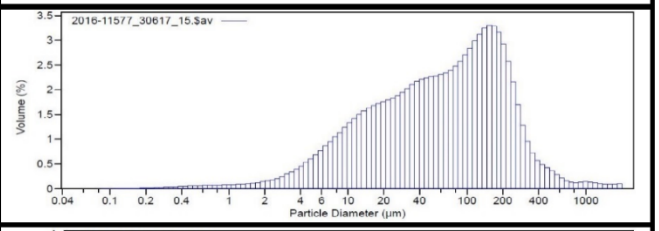
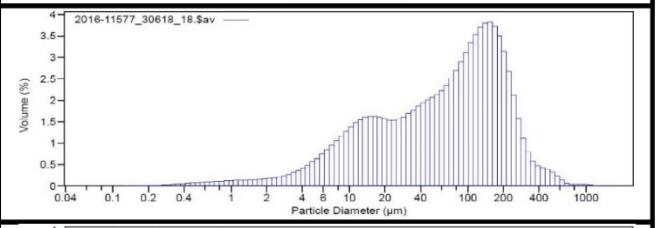
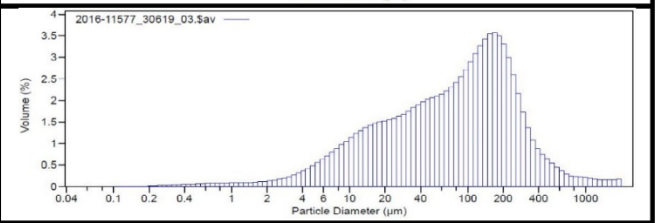
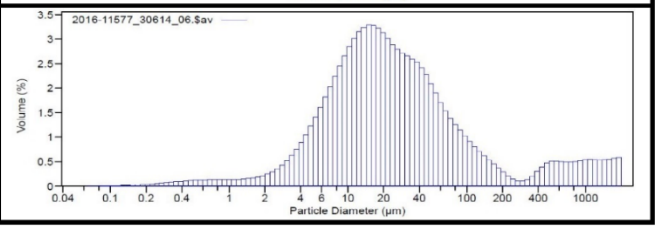
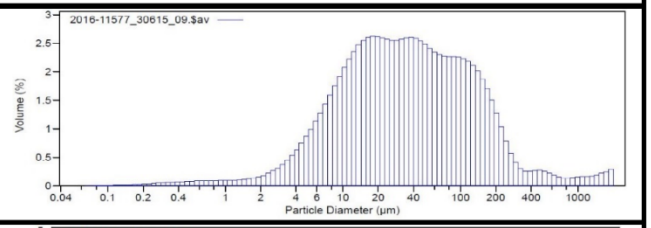
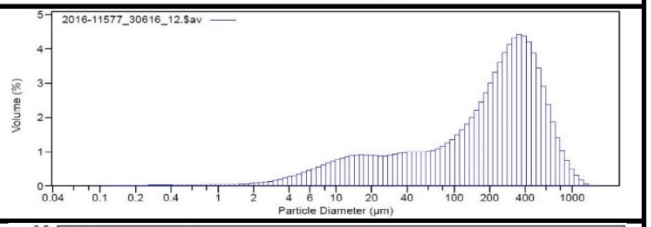
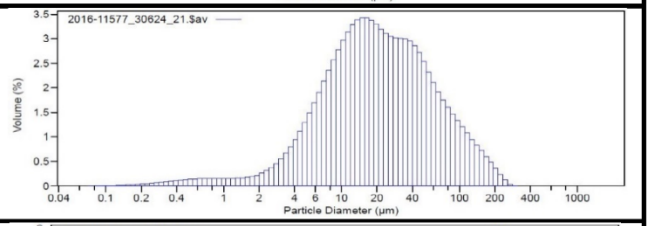
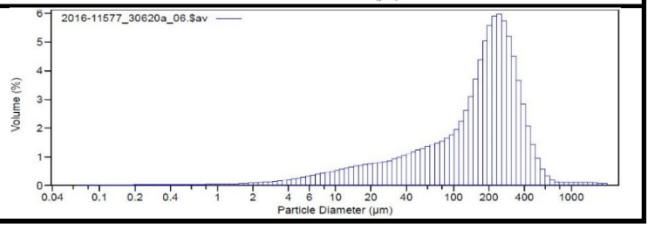
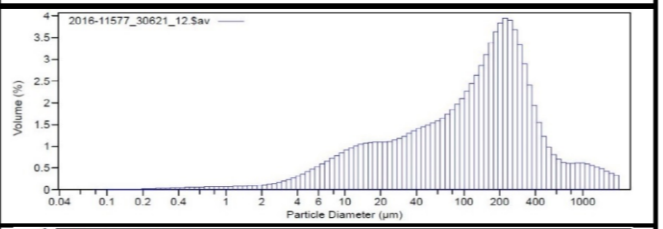
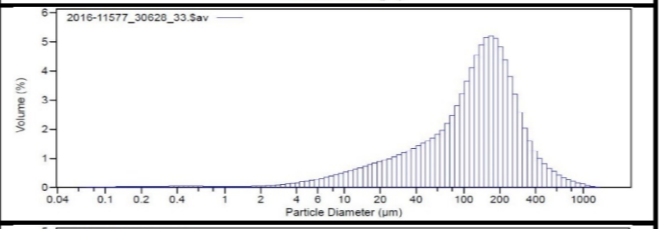
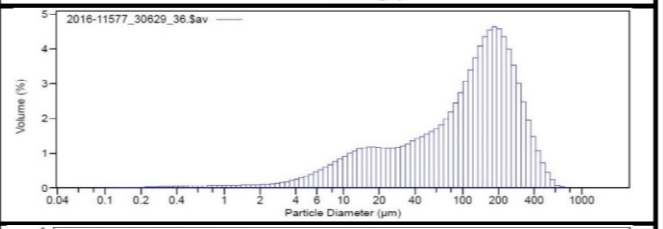
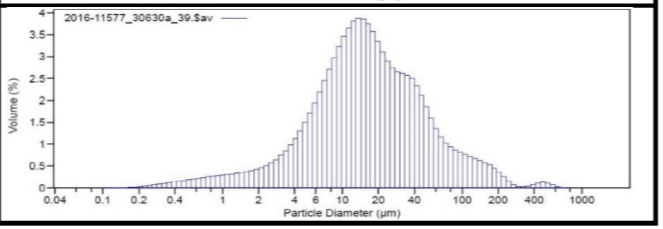
| Location | Lab ID | Particle Diameter | Percent Passing | Soil Classification | Percentage | Histogram |
|---|---|---|---|---|---|---|
| | | (µm) | % | | % | |
| Kratchowsky Lake, LA-7A-1 (0-2) | 30617 | 0.04 | 3.7 | Gravel | 0.0 |  |
| | | 4 | 49.3 | Sand | 13.9 | |
| | | 63 | 84.8 | Silt | 43.7 | |
| | | 200 | 100.0 | Clay | 42.4 | |
| | | 2000 | 100.0 | | | |
| Kratchowsky Lake, LA-7A-2 (0-2) | 30618 | 0.04 | 4.2 | Gravel | 0.0 |  |
| | | 4 | 46.5 | Sand | 12.2 | |
| | | 63 | 86.6 | Silt | 47.6 | |
| | | 200 | 100.0 | Clay | 40.2 | |
| | | 2000 | 100.0 | | | |
| Kratchowsky Lake, LA-7A-3 (0-2) | 30619 | 0.04 | 3.4 | Gravel | 0.0 |  |
| | | 4 | 43.2 | Sand | 18.4 | |
| | | 63 | 79.8 | Silt | 44.4 | |
| | | 200 | 100.0 | Clay | 37.2 | |
| | | 2000 | 100.0 | | | |
| Kratchowsky Lake, LA-7-1 (0-2) | 30614 | 0.04 | 6.8 | Gravel | 0.0 |  |
| | | 4 | 78.7 | Sand | 9.4 | |
| | | 63 | 89.7 | Silt | 22.7 | |
| | | 200 | 100.0 | Clay | 67.9 | |
| | | 2000 | 100.0 | | | |



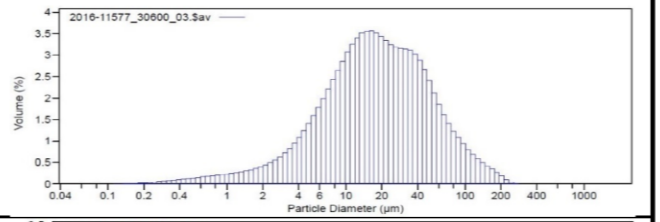
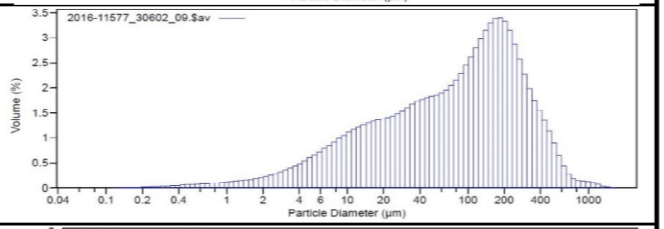
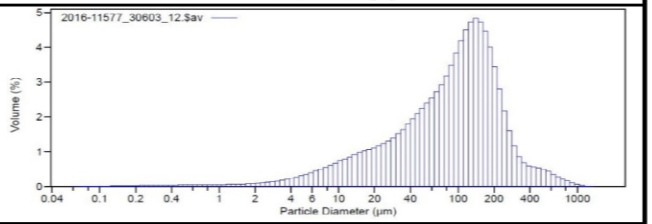
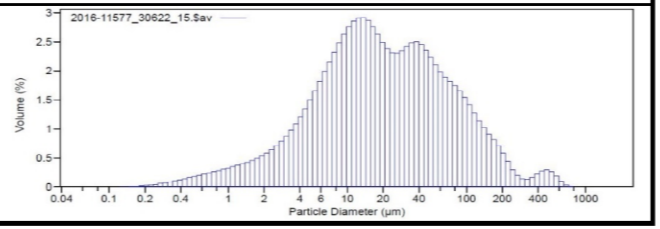
**Table 3-4 Cont'd: Baseline Sediment Grain Size Distribution Summary**

| Location | Lab ID | Particle Diameter (µm) | Percent Passing % | Soil Classification | Percentage % | Histogram |
|---|---|---|---|---|---|---|
| Kratchowsky Lake, LA-7-2 (0-2) | 30615 | 0.04 | 4.8 | Gravel | 0.0 |  |
| | | 4 | 66.7 | Sand | 7.1 | |
| | | 63 | 92.2 | Silt | 35.5 | |
| | | 200 | 100.0 | Clay | 57.3 | |
| | | 2000 | 100.0 | | | |
| Kratchowsky Lake, LA-7-3 (0-2) | 30616 | 0.04 | 2.3 | Gravel | 0.0 |  |
| | | 4 | 25.5 | Sand | 48.5 | |
| | | 63 | 46.8 | Silt | 29.5 | |
| | | 200 | 100.0 | Clay | 22.0 | |
| | | 2000 | 100.0 | | | |
| LA-8-1 (0-2) | 30620a | 0.04 | 7.2 | Gravel | 0.0 |  |
| | | 4 | 85.2 | Sand | 0.6 | |
| | | 63 | 99.4 | Silt | 26.0 | |
| | | 200 | 100.0 | Clay | 73.4 | |
| | | 2000 | 100.0 | | | |
| LA-8-2 (0-2) | 30620 | 0.04 | 2.2 | Gravel | 0.0 |  |
| | | 4 | 23.0 | Sand | 40.4 | |
| | | 63 | 55.7 | Silt | 39.7 | |
| | | 200 | 100.0 | Clay | 19.8 | |
| | | 2000 | 100.0 | | | |

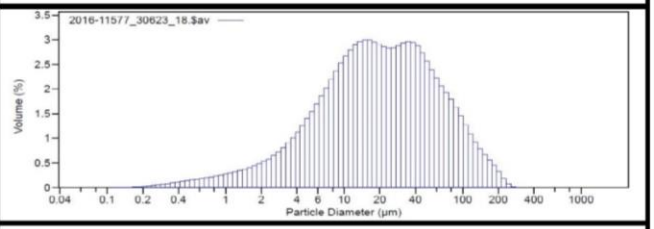
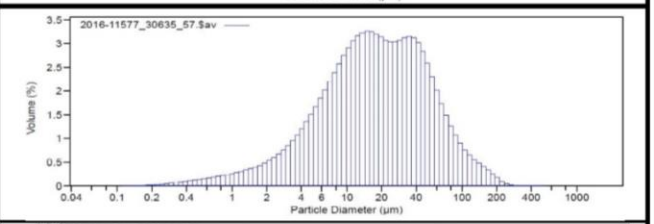
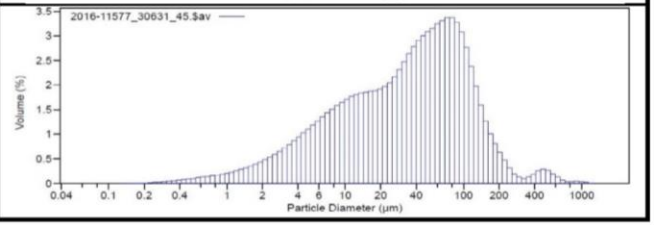
## Table 3-4 Cont'd: Baseline Sediment Grain Size Distribution Summary

| Location | Lab ID | Particle Diameter (µm) | Percent Passing % | Soil Classification | Percentage % | Histogram |
|---|---|---|---|---|---|---|
| LA-8-3 (0-2) | 30621 | 0.04 | 2.9 | Gravel | 0.0 |  |
| | | 4 | 32.6 | Sand | 33.3 | |
| | | 63 | 63.5 | Silt | 38.6 | |
| | | 200 | 100.0 | Clay | 28.1 | |
| | | 2000 | 100.0 | | | |
| LA-9-1 (0-2) | 30628 | 0.04 | 1.9 | Gravel | 0.0 |  |
| | | 4 | 26.3 | Sand | 24.5 | |
| | | 63 | 73.2 | Silt | 50.8 | |
| | | 200 | 100.0 | Clay | 24.7 | |
| | | 2000 | 100.0 | | | |
| LA-9-2 (0-2) | 30629 | 0.04 | 2.9 | Gravel | 0.0 |  |
| | | 4 | 32.9 | Sand | 24.3 | |
| | | 63 | 73.5 | Silt | 47.4 | |
| | | 200 | 100.1 | Clay | 28.3 | |
| | | 2000 | 100.1 | | | |
| LA-9-3 (0-2) | 30630 | 0.04 | 10.7 | Gravel | 0.0 |  |
| | | 4 | 89.1 | Sand | 1.3 | |
| | | 63 | 98.5 | Silt | 21.3 | |
| | | 200 | 99.9 | Clay | 77.3 | |
| | | 2000 | 99.9 | | | |

## Table 3-4 Cont'd: Baseline Sediment Grain Size Distribution Summary

| Location | Lab ID | Particle Diameter (µm) | Percent Passing % | Soil Classification | Percentage % | Histogram |
|---|---|---|---|---|---|---|
| Williams Lake, LB-3-1 (0-2) | 30600 | 0.04 | 9.4 | Gravel | 0.0 |  |
| | | 4 | 89.6 | Sand | 0.3 | |
| | | 63 | 99.7 | Silt | 22.1 | |
| | | 200 | 100.0 | Clay | 77.6 | |
| | | 2000 | 100.0 | | | |
| Williams Lake, LB-3-2 (0-2) | 30602 | 0.04 | 4.8 | Gravel | 0.0 |  |
| | | 4 | 42.3 | Sand | 22.0 | |
| | | 63 | 76.0 | Silt | 41.5 | |
| | | 200 | 100.1 | Clay | 36.6 | |
| | | 2000 | 100.1 | | | |
| Williams Lake, LB-3-3 (0-2) | 30603 | 0.04 | 2.7 | Gravel | 0.0 |  |
| | | 4 | 35.5 | Sand | 14.2 | |
| | | 63 | 84.4 | Silt | 55.2 | |
| | | 200 | 100.0 | Clay | 30.5 | |
| | | 2000 | 100.0 | | | |
| LAB-1-1 (0-2) | 30622 | 0.04 | 12.0 | Gravel | 0.0 |  |
| | | 4 | 80.7 | Sand | 2.8 | |
| | | 63 | 96.9 | Silt | 26.8 | |
| | | 200 | 100.0 | Clay | 70.4 | |
| | | 2000 | 100.0 | | | |

## Table 3-4 Cont'd: Baseline Sediment Grain Size Distribution Summary

| Location | Lab ID | Particle Diameter (µm) | Percent Passing % | Soil Classification | Percentage % | Histogram |
|---|---|---|---|---|---|---|
| Russell Lake, LAB-1-2 (0-2) | 30623 | 0.04 | 10.8 | Gravel | 0.0 |  |
| | | 4 | 84.5 | Sand | 0.5 | |
| | | 63 | 99.4 | Silt | 26.0 | |
| | | 200 | 99.9 | Clay | 73.4 | |
| | | 2000 | 99.9 | | | |
| LAB-1-3 (0-2) | 30635 | 0.04 | 10.9 | Gravel | 0.0 |  |
| | | 4 | 89.6 | Sand | 0.3 | |
| | | 63 | 99.7 | Silt | 22.0 | |
| | | 200 | 100.0 | Clay | 77.8 | |
| | | 2,000 | 100.0 | | | |
| Williams Lake, LAB-2-CORE (0-2) | 30631 | 0.04 | 9.0 | Gravel | 0.0 |  |
| | | 4 | 68.0 | Sand | 3.1 | |
| | | 63 | 96.7 | Silt | 37.9 | |
| | | 200 | 100.1 | Clay | 59.1 | |
| | | 2000 | 100.1 | | | |



Notes:
Analysis by Beckman Coulter LS Particle Size Analyser
Results on sediment fraction passing 2,000 µm seive

## Table 3-5: Baseline Sediment Quality Summary

| Location | Parameter | Unit | Sediment Quality Benchmarks | | | Total Count | Count Less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | REF/ISQG/ LEL | NE2/PEL/ SEL | Reference | | | | | |
| McGowan Lake (LA-1) | Moisture | % | | | | 3 | 0 | 97 | 97 | 97 |
| | Total Organic Carbon | % | | | | 3 | 0 | 13 | 17 | 16 |
| | Aluminum | µg/g | | | | 3 | 0 | 4010 | 4740 | 4397 |
| | Antimony | µg/g | | | | 3 | 0 | 0.20 | 0.30 | 0.23 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 3 | 0 | 5 | 5.7 | 5.3 |
| | Barium | µg/g | | | | 3 | 0 | 30 | 42 | 35 |
| | Beryllium | µg/g | | | | 3 | 0 | 0.20 | 0.30 | 0.27 |
| | Boron | µg/g | | | | 3 | 0 | 5.0 | 8.0 | 7.0 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 3 | 0 | 0.30 | 0.50 | 0.40 |
| | Chromium | µg/g | | | | 3 | 0 | 6.7 | 16 | 11 |
| | Cobalt | µg/g | | | | 3 | 0 | 1.6 | 2.3 | 2.0 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 3 | 0 | 2.7 | 4.6 | 3.6 |
| | Iron | µg/g | | | | 3 | 0 | 7800 | 12100 | 9933 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 3 | 0 | 8.2 | 10 | 8.9 |
| | Manganese | µg/g | | | | 3 | 0 | 140 | 170 | 153 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 3 | 0 | 0.80 | 2.0 | 1.2 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 3 | 0 | 6.0 | 12 | 8.9 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 3 | 0 | 1.0 | 1.5 | 1.3 |
| | Silver | µg/g | | | | 3 | 2 | <0.10 | 0.20 | 0.13 |
| | Strontium | µg/g | | | | 3 | 0 | 21 | 25 | 23 |
| | Thallium | µg/g | | | | 3 | 3 | <0.20 | <0.20 | <0.20 |
| | Tin | µg/g | | | | 3 | 0 | 0.20 | 0.20 | 0.20 |
| | Titanium | µg/g | | | | 3 | 0 | 200 | 280 | 243 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 3 | 0 | 0.70 | 0.80 | 0.77 |
| | Vanadium | µg/g | | | | 3 | 0 | 18 | 22 | 20 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 3 | 0 | 20 | 27 | 24 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 3 | 0 | 0.54 | 0.75 | 0.67 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 3 | 0 | 0.52 | 0.76 | 0.64 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 3 | 0 | 0.020 | 0.040 | 0.027 |
| | Thorium-228 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-230 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-232 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 3 | 0 | 1400 | 1600 | 1533 |
| | Magnesium | µg/g | | | | 3 | 0 | 690 | 830 | 767 |
| | Phosphorus | µg/g | | | | 3 | 0 | 1000 | 1400 | 1233 |
| | Postassium | µg/g | | | | 3 | 0 | 820 | 1000 | 933 |
| Whitefish Lake (LA-5) | Moisture | % | | | | 5 | 0 | 29 | 97 | 70 |
| | Total Organic Carbon | % | | | | 5 | 0 | 0.44 | 19 | 11 |
| | Aluminum | µg/g | | | | 5 | 0 | 1990 | 5800 | 4080 |
| | Antimony | µg/g | | | | 5 | 5 | <0.2 | <0.2 | <0.2 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 5 | 0 | 0.60 | 4.4 | 2.6 |
| | Barium | µg/g | | | | 5 | 0 | 33 | 49 | 43 |
| | Beryllium | µg/g | | | | 5 | 2 | <0.1 | 0.30 | 0.22 |
| | Boron | µg/g | | | | 5 | 2 | <1 | 6.0 | 3.0 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 5 | 1 | <0.1 | 0.40 | 0.30 |
| | Chromium | µg/g | | | | 5 | 0 | 1.0 | 11 | 7.4 |
| | Cobalt | µg/g | | | | 5 | 1 | <0.2 | 2.3 | 1.3 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 5 | 2 | <0.5 | 2.0 | 1.1 |
| | Iron | µg/g | | | | 5 | 0 | 1980 | 23500 | 12486 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 5 | 0 | 1.3 | 7.5 | 4.9 |
| | Manganese | µg/g | | | | 5 | 0 | 33 | 320 | 170 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 5 | 1 | <0.1 | 0.70 | 0.40 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 5 | 0 | 0.90 | 6.3 | 4.1 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 5 | 2 | <0.1 | 0.90 | 0.50 |
| | Silver | µg/g | | | | 5 | 3 | <0.1 | 0.70 | 0.24 |
| | Strontium | µg/g | | | | 5 | 0 | 19 | 33 | 26 |
| | Thallium | µg/g | | | | 5 | 5 | <0.2 | <0.2 | <0.2 |
| | Tin | µg/g | | | | 5 | 2 | <0.1 | 0.20 | 0.12 |
| | Titanium | µg/g | | | | 5 | 0 | 45 | 200 | 128 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 5 | 0 | 0.20 | 0.80 | 0.58 |
| | Vanadium | µg/g | | | | 5 | 0 | 1.3 | 20 | 12 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 5 | 1 | <0.5 | 28 | 16 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 5 | 2 | <0.04 | 0.43 | 0.23 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 5 | 0 | 0.020 | 0.52 | 0.26 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 5 | 1 | 0.010 | 0.030 | 0.024 |
| | Thorium-228 | Bq/g | | | | 5 | 4 | <0.02 | 0.020 | 0.020 |
| | Thorium-230 | Bq/g | | | | 5 | 5 | <0.02 | <0.02 | <0.02 |
| | Thorium-232 | Bq/g | | | | 5 | 5 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 5 | 0 | 270 | 2100 | 1186 |
| | Magnesium | µg/g | | | | 5 | 0 | 110 | 910 | 524 |
| | Phosphorus | µg/g | | | | 5 | 0 | 60 | 1600 | 800 |
| | Postassium | µg/g | | | | 5 | 0 | 840 | 1400 | 1068 |

## Table 3-5 Cont'd: Baseline Sediment Quality Summary

| Location | Parameter | Unit | Sediment Quality Benchmarks | | | Total Count | Count Less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | REF/ISQG/ LEL | NE2/PEL/ SEL | Reference | | | | | |
| Whitefish Lake (LA-6) | Moisture | % | | | | 5 | 0 | 96 | 97 | 96 |
| | Total Organic Carbon | % | | | | 5 | 0 | 16 | 19 | 17 |
| | Aluminum | µg/g | | | | 5 | 0 | 3820 | 5900 | 4842 |
| | Antimony | µg/g | | | | 5 | 1 | <0.2 | 0.20 | 0.20 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 5 | 0 | 3.1 | 4.2 | 3.6 |
| | Barium | µg/g | | | | 5 | 0 | 37 | 56 | 45 |
| | Beryllium | µg/g | | | | 5 | 0 | 0.30 | 0.30 | 0.30 |
| | Boron | µg/g | | | | 5 | 0 | 4.0 | 7.0 | 5.8 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 5 | 0 | 0.40 | 0.50 | 0.42 |
| | Chromium | µg/g | | | | 5 | 0 | 8 | 10 | 9 |
| | Cobalt | µg/g | | | | 5 | 0 | 1.4 | 2.1 | 1.7 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 5 | 0 | 1.4 | 3.0 | 2.0 |
| | Iron | µg/g | | | | 5 | 0 | 13200 | 22600 | 15900 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 5 | 0 | 7.0 | 8.5 | 7.8 |
| | Manganese | µg/g | | | | 5 | 0 | 140 | 390 | 226 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 5 | 0 | 0.40 | 0.70 | 0.50 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 5 | 0 | 4.2 | 6.4 | 5.1 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 5 | 0 | 0.80 | 0.90 | 0.84 |
| | Silver | µg/g | | | | 5 | 1 | <0.1 | 0.20 | 0.12 |
| | Strontium | µg/g | | | | 5 | 0 | 26 | 34 | 29 |
| | Thallium | µg/g | | | | 5 | 1 | <0.2 | 0.20 | 0.20 |
| | Tin | µg/g | | | | 5 | 0 | 0.20 | 0.20 | 0.20 |
| | Titanium | µg/g | | | | 5 | 0 | 180 | 310 | 254 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 5 | 0 | 0.60 | 0.70 | 0.66 |
| | Vanadium | µg/g | | | | 5 | 0 | 18 | 19 | 18 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 5 | 0 | 22 | 28 | 25 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 5 | 0 | 0.31 | 0.59 | 0.44 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 5 | 0 | 0.31 | 0.57 | 0.45 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 5 | 0 | 0.010 | 0.04 | 0.028 |
| | Thorium-228 | Bq/g | | | | 5 | 1 | <0.02 | 0.020 | 0.020 |
| | Thorium-230 | Bq/g | | | | 5 | 1 | <0.02 | 0.020 | 0.020 |
| | Thorium-232 | Bq/g | | | | 5 | 1 | <0.02 | 0.020 | 0.020 |
| | Calcium | µg/g | | | | 5 | 0 | 1700 | 2500 | 1960 |
| | Magnesium | µg/g | | | | 5 | 0 | 650 | 880 | 758 |
| | Phosphorus | µg/g | | | | 5 | 0 | 960 | 1500 | 1232 |
| | Postassium | µg/g | | | | 5 | 0 | 800 | 970 | 906 |
| Kratchkowsky Lake (LA-7) | Moisture | % | | | | 3 | 0 | 94 | 95 | 94 |
| | Total Organic Carbon | % | | | | 3 | 0 | 19 | 24 | 22 |
| | Aluminum | µg/g | | | | 3 | 0 | 3660 | 4530 | 4127 |
| | Antimony | µg/g | | | | 3 | 0 | 0.20 | 0.30 | 0.23 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 3 | 0 | 3.3 | 5.0 | 3.9 |
| | Barium | µg/g | | | | 3 | 0 | 33 | 38 | 35 |
| | Beryllium | µg/g | | | | 3 | 0 | 0.2 | 0.2 | 0.2 |
| | Boron | µg/g | | | | 3 | 0 | 5.0 | 6.0 | 5.7 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 3 | 0 | 0.4 | 0.4 | 0.4 |
| | Chromium | µg/g | | | | 3 | 0 | 7 | 10 | 8.8 |
| | Cobalt | µg/g | | | | 3 | 0 | 1.2 | 2.2 | 1.6 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 3 | 0 | 3.4 | 4.6 | 3.8 |
| | Iron | µg/g | | | | 3 | 0 | 6800 | 10000 | 8067 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 3 | 0 | 7.8 | 10 | 8.8 |
| | Manganese | µg/g | | | | 3 | 0 | 120 | 160 | 140 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 3 | 0 | 0.8 | 1.3 | 1.0 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 3 | 0 | 3.6 | 6.2 | 4.6 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 3 | 0 | 1.0 | 1.3 | 1.1 |
| | Silver | µg/g | | | | 3 | 3 | <0.1 | <0.1 | <0.1 |
| | Strontium | µg/g | | | | 3 | 0 | 30 | 36 | 33 |
| | Thallium | µg/g | | | | 3 | 3 | <0.2 | <0.2 | <0.2 |
| | Tin | µg/g | | | | 3 | 0 | 0.20 | 0.20 | 0.20 |
| | Titanium | µg/g | | | | 3 | 0 | 190 | 230 | 213 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 3 | 0 | 0.60 | 0.80 | 0.67 |
| | Vanadium | µg/g | | | | 3 | 0 | 16 | 24 | 19 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 3 | 0 | 22 | 23 | 23 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 3 | 0 | 0.35 | 0.44 | 0.40 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 3 | 0 | 0.38 | 0.51 | 0.42 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 3 | 2 | <0.01 | 0.030 | 0.017 |
| | Thorium-228 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-230 | Bq/g | | | | 3 | 2 | <0.02 | 0.020 | 0.020 |
| | Thorium-232 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 3 | 0 | 2100 | 3300 | 2700 |
| | Magnesium | µg/g | | | | 3 | 0 | 760 | 970 | 843 |
| | Phosphorus | µg/g | | | | 3 | 0 | 1200 | 1500 | 1333 |
| | Postassium | µg/g | | | | 3 | 0 | 920 | 1000 | 953 |

## Table 3-5 Cont'd: Baseline Sediment Quality Summary

| Location | Parameter | Unit | Sediment Quality Benchmarks | | | Total Count | Count Less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | REF/ISQG/ LEL | NE2/PEL/ SEL | Reference | | | | | |
| Kratchkowsky Lake (LA-7A) | Moisture | % | | | | 3 | 0 | 95 | 97 | 96 |
| | Total Organic Carbon | % | | | | 3 | 0 | 26 | 26 | 26 |
| | Aluminum | µg/g | | | | 3 | 0 | 3340 | 3860 | 3677 |
| | Antimony | µg/g | | | | 3 | 0 | 0.20 | 0.30 | 0.23 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 3 | 0 | 3.5 | 3.6 | 3.6 |
| | Barium | µg/g | | | | 3 | 0 | 36 | 43 | 38 |
| | Beryllium | µg/g | | | | 3 | 0 | 0.2 | 0.2 | 0.2 |
| | Boron | µg/g | | | | 3 | 0 | 6.0 | 7.0 | 6.3 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 3 | 0 | 0.3 | 0.4 | 0.4 |
| | Chromium | µg/g | | | | 3 | 0 | 7.3 | 21 | 12 |
| | Cobalt | µg/g | | | | 3 | 0 | 1.4 | 1.9 | 1.6 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 3 | 0 | 3.6 | 4.0 | 3.8 |
| | Iron | µg/g | | | | 3 | 0 | 6900 | 8500 | 7800 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 3 | 0 | 7.2 | 8.3 | 7.8 |
| | Manganese | µg/g | | | | 3 | 0 | 120 | 130 | 123 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 3 | 0 | 1.2 | 2.8 | 1.8 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 3 | 0 | 3.9 | 12 | 6.8 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 3 | 0 | 1.0 | 1.2 | 1.1 |
| | Silver | µg/g | | | | 3 | 3 | <0.1 | <0.1 | <0.1 |
| | Strontium | µg/g | | | | 3 | 0 | 31 | 38 | 36 |
| | Thallium | µg/g | | | | 3 | 3 | <0.2 | <0.2 | <0.2 |
| | Tin | µg/g | | | | 3 | 0 | 0.20 | 0.20 | 0.20 |
| | Titanium | µg/g | | | | 3 | 0 | 170 | 200 | 190 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 3 | 0 | 0.60 | 0.70 | 0.63 |
| | Vanadium | µg/g | | | | 3 | 0 | 15 | 16 | 16 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 3 | 0 | 22 | 29 | 27 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 3 | 0 | 0.29 | 0.55 | 0.38 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 3 | 0 | 0.30 | 0.56 | 0.40 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 3 | 1 | <0.01 | 0.020 | 0.017 |
| | Thorium-228 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-230 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-232 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 3 | 0 | 2900 | 3200 | 3067 |
| | Magnesium | µg/g | | | | 3 | 0 | 890 | 1000 | 937 |
| | Phosphorus | µg/g | | | | 3 | 0 | 1200 | 2500 | 1700 |
| | Postassium | µg/g | | | | 3 | 0 | 870 | 1300 | 1057 |
| LA-8 | Moisture | % | | | | 3 | 0 | 88 | 97 | 93 |
| | Total Organic Carbon | % | | | | 3 | 0 | 7.8 | 24 | 16 |
| | Aluminum | µg/g | | | | 3 | 0 | 1950 | 4470 | 3577 |
| | Antimony | µg/g | | | | 3 | 0 | 0.20 | 0.30 | 0.23 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 3 | 0 | 1.5 | 3.6 | 2.9 |
| | Barium | µg/g | | | | 3 | 0 | 20 | 39 | 30 |
| | Beryllium | µg/g | | | | 3 | 0 | 0.10 | 0.30 | 0.23 |
| | Boron | µg/g | | | | 3 | 0 | 3.0 | 8.0 | 5.0 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 3 | 0 | 0.30 | 0.40 | 0.37 |
| | Chromium | µg/g | | | | 3 | 0 | 1.6 | 8.0 | 5.6 |
| | Cobalt | µg/g | | | | 3 | 0 | 0.20 | 1.7 | 1.0 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 3 | 0 | 0.5 | 4.1 | 2.6 |
| | Iron | µg/g | | | | 3 | 0 | 9700 | 14500 | 11467 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 3 | 0 | 3.7 | 10 | 6.4 |
| | Manganese | µg/g | | | | 3 | 0 | 100 | 230 | 177 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 3 | 0 | 0.20 | 1.2 | 0.77 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 3 | 0 | 1.2 | 7.2 | 5.0 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 3 | 0 | 0.4 | 1.2 | 0.93 |
| | Silver | µg/g | | | | 3 | 0 | 0.10 | 0.20 | 0.13 |
| | Strontium | µg/g | | | | 3 | 0 | 20 | 29 | 25 |
| | Thallium | µg/g | | | | 3 | 0 | 0.20 | 0.20 | 0.20 |
| | Tin | µg/g | | | | 3 | 0 | 0.10 | 0.20 | 0.17 |
| | Titanium | µg/g | | | | 3 | 0 | 80 | 250 | 193 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 3 | 0 | 0.30 | 0.80 | 0.60 |
| | Vanadium | µg/g | | | | 3 | 0 | 7.3 | 20 | 16 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 3 | 0 | 10 | 30 | 22 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 3 | 0 | 0.17 | 0.58 | 0.32 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 3 | 0 | 0.21 | 0.44 | 0.30 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 3 | 0 | 0.010 | 0.020 | 0.013 |
| | Thorium-228 | Bq/g | | | | 3 | 0 | 0.020 | 0.020 | 0.020 |
| | Thorium-230 | Bq/g | | | | 3 | 0 | 0.020 | 0.020 | 0.020 |
| | Thorium-232 | Bq/g | | | | 3 | 0 | 0.020 | 0.020 | 0.020 |
| | Calcium | µg/g | | | | 3 | 0 | 900 | 2500 | 1733 |
| | Magnesium | µg/g | | | | 3 | 0 | 330 | 890 | 613 |
| | Phosphorus | µg/g | | | | 3 | 0 | 480 | 1700 | 987 |
| | Postassium | µg/g | | | | 3 | 0 | 530 | 1000 | 763 |

## Table 3-5 Cont'd: Baseline Sediment Quality Summary

| Location | Parameter | Unit | Sediment Quality Benchmarks | | | Total Count | Count Less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | REF/ISQG/ LEL | NE2/PEL/ SEL | Reference | | | | | |
| LA-9 | Moisture | % | | | | 3 | 0 | 66 | 95 | 85 |
| | Total Organic Carbon | % | | | | 3 | 0 | 2.6 | 17 | 12 |
| | Aluminum | µg/g | | | | 3 | 0 | 1860 | 4410 | 3507 |
| | Antimony | µg/g | | | | 3 | 1 | <0.2 | 0.30 | 0.27 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 3 | 0 | 0.90 | 3.8 | 2.8 |
| | Barium | µg/g | | | | 3 | 0 | 20 | 36 | 30 |
| | Beryllium | µg/g | | | | 3 | 1 | <0.1 | 0.30 | 0.20 |
| | Boron | µg/g | | | | 3 | 1 | <1 | 6.0 | 4.3 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 3 | 0 | 0.20 | 0.50 | 0.37 |
| | Chromium | µg/g | | | | 3 | 0 | 1.1 | 8.5 | 6.0 |
| | Cobalt | µg/g | | | | 3 | 1 | <0.2 | 1.4 | 0.93 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 3 | 1 | <0.5 | 3.5 | 2.3 |
| | Iron | µg/g | | | | 3 | 0 | 2670 | 6100 | 4523 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 3 | 0 | 1.5 | 10 | 7.2 |
| | Manganese | µg/g | | | | 3 | 0 | 51 | 160 | 117 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 3 | 1 | <0.1 | 1.1 | 0.7 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 3 | 1 | <0.1 | 6.8 | 4.3 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 3 | 0 | 0.20 | 1.3 | 0.9 |
| | Silver | µg/g | | | | 3 | 0 | 0.10 | 0.40 | 0.2 |
| | Strontium | µg/g | | | | 3 | 0 | 16 | 27 | 23 |
| | Thallium | µg/g | | | | 3 | 3 | <0.2 | <0.2 | <0.2 |
| | Tin | µg/g | | | | 3 | 1 | <0.1 | 0.20 | 0.17 |
| | Titanium | µg/g | | | | 3 | 0 | 230 | 290 | 260 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 3 | 0 | 0.30 | 0.70 | 0.57 |
| | Vanadium | µg/g | | | | 3 | 0 | 5.5 | 23 | 16 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 3 | 0 | 4.3 | 28 | 20 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 3 | 1 | <0.04 | 0.58 | 0.36 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 3 | 0 | 0.040 | 0.54 | 0.34 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 3 | 0 | 0.030 | 0.050 | 0.037 |
| | Thorium-228 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-230 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-232 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 3 | 0 | 600 | 2000 | 1500 |
| | Magnesium | µg/g | | | | 3 | 0 | 260 | 780 | 583 |
| | Phosphorus | µg/g | | | | 3 | 0 | 120 | 1100 | 773 |
| | Postassium | µg/g | | | | 3 | 0 | 610 | 940 | 800 |
| Williams Lake (LB-3) | Moisture | % | | | | 3 | 0 | 68 | 94 | 85 |
| | Total Organic Carbon | % | | | | 3 | 0 | 2.6 | 20 | 13 |
| | Aluminum | µg/g | | | | 3 | 0 | 2790 | 7800 | 5630 |
| | Antimony | µg/g | | | | 3 | 0 | 0.20 | 0.40 | 0.30 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 3 | 0 | 1.5 | 6.5 | 4.3 |
| | Barium | µg/g | | | | 3 | 0 | 27 | 57 | 43 |
| | Beryllium | µg/g | | | | 3 | 0 | 0.10 | 0.50 | 0.33 |
| | Boron | µg/g | | | | 3 | 1 | <1 | 9.0 | 5.3 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 3 | 0 | 0.30 | 0.60 | 0.47 |
| | Chromium | µg/g | | | | 3 | 0 | 8.4 | 17 | 12 |
| | Cobalt | µg/g | | | | 3 | 0 | 1.2 | 3.8 | 2.8 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 3 | 1 | 0.5 | 8.4 | 5.1 |
| | Iron | µg/g | | | | 3 | 0 | 5700 | 24800 | 15967 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 3 | 0 | 2.4 | 12 | 7.7 |
| | Manganese | µg/g | | | | 3 | 0 | 58 | 160 | 119 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 3 | 0 | 0.30 | 1.2 | 0.90 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 3 | 0 | 4.2 | 13 | 10 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 3 | 0 | 0.30 | 1.8 | 1.1 |
| | Silver | µg/g | | | | 3 | 2 | <0.1 | 0.20 | 0.13 |
| | Strontium | µg/g | | | | 3 | 0 | 16 | 32 | 26 |
| | Thallium | µg/g | | | | 3 | 3 | <0.2 | <0.2 | <0.2 |
| | Tin | µg/g | | | | 3 | 0 | 0.10 | 0.30 | 0.20 |
| | Titanium | µg/g | | | | 3 | 0 | 130 | 270 | 210 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 3 | 0 | 0.30 | 1.0 | 0.73 |
| | Vanadium | µg/g | | | | 3 | 0 | 7.9 | 33 | 22 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 3 | 0 | 12 | 43 | 31 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 3 | 0 | 0.04 | 0.61 | 0.34 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 3 | 0 | 0.05 | 0.50 | 0.30 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 3 | 0 | 0.01 | 0.04 | 0.02 |
| | Thorium-228 | Bq/g | | | | 3 | 2 | <0.02 | 0.020 | 0.020 |
| | Thorium-230 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Thorium-232 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 3 | 0 | 680 | 2000 | 1527 |
| | Magnesium | µg/g | | | | 3 | 0 | 350 | 870 | 647 |
| | Phosphorus | µg/g | | | | 3 | 0 | 150 | 1300 | 817 |
| | Postassium | µg/g | | | | 3 | 0 | 720 | 1100 | 910 |

## Table 3-5 Cont'd: Baseline Sediment Quality Summary

| Location | Parameter | Unit | Sediment Quality Benchmarks | | | Total Count | Count Less than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | REF/ISQG/ LEL | NE2/PEL/ SEL | Reference | | | | | |
| Russell Lake (LAB-1) | Moisture | % | | | | 3 | 0 | 93 | 95 | 94 |
| | Total Organic Carbon | % | | | | 3 | 0 | 13 | 15 | 14 |
| | Aluminum | µg/g | | | | 3 | 0 | 4810 | 9200 | 7137 |
| | Antimony | µg/g | | | | 3 | 1 | <0.2 | 0.30 | 0.23 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 3 | 0 | 2.6 | 5.6 | 4.3 |
| | Barium | µg/g | | | | 3 | 0 | 45 | 71 | 59 |
| | Beryllium | µg/g | | | | 3 | 0 | 0.30 | 0.4 | 0.33 |
| | Boron | µg/g | | | | 3 | 0 | 7.0 | 11 | 10 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 3 | 0 | 0.30 | 0.5 | 0.43 |
| | Chromium | µg/g | | | | 3 | 0 | 8.0 | 15 | 12 |
| | Cobalt | µg/g | | | | 3 | 0 | 1.4 | 2.7 | 2.0 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 3 | 0 | 1.7 | 5.0 | 3.2 |
| | Iron | µg/g | | | | 3 | 0 | 11900 | 33000 | 23967 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 3 | 0 | 5.4 | 13 | 9.1 |
| | Manganese | µg/g | | | | 3 | 0 | 290 | 360 | 317 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 3 | 0 | 6.3 | 13 | 10 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 3 | 0 | 6.5 | 12 | 9 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 3 | 0 | 1.0 | 1.6 | 1.3 |
| | Silver | µg/g | | | | 3 | 2 | <0.1 | 0 | 0 |
| | Strontium | µg/g | | | | 3 | 0 | 28 | 42 | 35 |
| | Thallium | µg/g | | | | 3 | 1 | <0.2 | <0.2 | <0.2 |
| | Tin | µg/g | | | | 3 | 0 | 0.30 | 0.40 | 0.37 |
| | Titanium | µg/g | | | | 3 | 0 | 380 | 480 | 437 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 3 | 0 | 1.1 | 1.5 | 1.3 |
| | Vanadium | µg/g | | | | 3 | 0 | 16 | 27 | 22 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 3 | 0 | 18 | 44 | 31 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 3 | 0 | 0.55 | 0.63 | 0.58 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 3 | 0 | 0.55 | 0.68 | 0.59 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 3 | 0 | 0.030 | 0.050 | 0.040 |
| | Thorium-228 | Bq/g | | | | 3 | 2 | <0.02 | 0.020 | 0.020 |
| | Thorium-230 | Bq/g | | | | 3 | 2 | <0.02 | 0.030 | 0.023 |
| | Thorium-232 | Bq/g | | | | 3 | 3 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 3 | 0 | 2800 | 3500 | 3100 |
| | Magnesium | µg/g | | | | 3 | 0 | 960 | 1200 | 1087 |
| | Phosphorus | µg/g | | | | 3 | 0 | 820 | 1200 | 993 |
| | Postassium | µg/g | | | | 3 | 0 | 960 | 1400 | 1153 |
| Russell Lake (LAB-2) | Moisture | % | | | | 1 | 0 | 93 | 93 | 93 |
| | Total Organic Carbon | % | | | | 1 | 0 | 12 | 12 | 12 |
| | Aluminum | µg/g | | | | 1 | 0 | 9300 | 9300 | 9300 |
| | Antimony | µg/g | | | | 1 | 1 | <0.20 | <0.20 | <0.20 |
| | Arsenic | µg/g | 21 | 522 | REF and NE2 | 1 | 0 | 7.2 | 7.2 | 7.2 |
| | Barium | µg/g | | | | 1 | 0 | 100 | 100 | 100 |
| | Beryllium | µg/g | | | | 1 | 0 | 0.50 | 0.5 | 0.50 |
| | Boron | µg/g | | | | 1 | 0 | 12.0 | 12 | 12 |
| | Cadmium | µg/g | 0.6 | 3.5 | ISQG and PEL | 1 | 0 | 0.60 | 0.6 | 0.60 |
| | Chromium | µg/g | | | | 1 | 0 | 13.0 | 13 | 13 |
| | Cobalt | µg/g | | | | 1 | 0 | 3.8 | 3.8 | 3.8 |
| | Copper | µg/g | 22 | 269 | LEL and SEL | 1 | 0 | 3.9 | 3.9 | 3.9 |
| | Iron | µg/g | | | | 1 | 0 | 91300 | 91300 | 91300 |
| | Lead | µg/g | 37 | 412 | LEL and SEL | 1 | 0 | 10.0 | 10 | 10.0 |
| | Manganese | µg/g | | | | 1 | 0 | 1270 | 1270 | 1270 |
| | Molybdenum | µg/g | 23 | 245 | REF and NE2 | 1 | 0 | 12 | 12 | 12 |
| | Nickel | µg/g | 21 | 326 | REF and NE2 | 1 | 0 | 9.9 | 10 | 10 |
| | Selenium | µg/g | 3.6 | 30 | REF and NE2 | 1 | 0 | 1.3 | 1.3 | 1.3 |
| | Silver | µg/g | | | | 1 | 0 | 0.1 | 0.1 | 0.1 |
| | Strontium | µg/g | | | | 1 | 0 | 40 | 40 | 40 |
| | Thallium | µg/g | | | | 1 | 1 | <0.2 | <0.2 | <0.2 |
| | Tin | µg/g | | | | 1 | 0 | 0.40 | 0.40 | 0.40 |
| | Titanium | µg/g | | | | 1 | 0 | 360 | 360 | 360 |
| | Uranium | µg/g | 97 | 2296 | REF and NE2 | 1 | 0 | 1.4 | 1.4 | 1.4 |
| | Vanadium | µg/g | | | | 1 | 0 | 30 | 30 | 30 |
| | Zinc | µg/g | 123 | 315 | ISQG and PEL | 1 | 0 | 62 | 62 | 62 |
| | Lead-210 | Bq/g | 0.9 | 20.8 | LEL and SEL | 1 | 0 | 0.45 | 0.45 | 0.45 |
| | Polonium-210 | Bq/g | 0.8 | 12.1 | LEL and SEL | 1 | 0 | 0.42 | 0.42 | 0.42 |
| | Radium-226 | Bq/g | 0.6 | 14.4 | LEL and SEL | 1 | 0 | 0.050 | 0.050 | 0.050 |
| | Thorium-228 | Bq/g | | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Thorium-230 | Bq/g | | | | 1 | 0 | 0.020 | 0.020 | 0.020 |
| | Thorium-232 | Bq/g | | | | 1 | 1 | <0.02 | <0.02 | <0.02 |
| | Calcium | µg/g | | | | 1 | 0 | 2800 | 2800 | 2800 |
| | Magnesium | µg/g | | | | 1 | 0 | 1000 | 1000 | 1000 |
| | Phosphorus | µg/g | | | | 1 | 0 | 1400 | 1400 | 1400 |
| | Postassium | µg/g | | | | 1 | 0 | 1200 | 1200 | 1200 |

Notes:

Chemical analysis is reported on a dry weight basis

Sediment samples are composites of 3 or more 0-2 cm fraction core samples

REF and NE2 values are from: Burnett-Seidel and Liber (2013) - Sediment quality values derived for application at Saskatchewan uranium operations; reference (REF) values based on reference sites unaffected by mining and milling (representing background), and no-effect level (NE2) values based on sites with no significant difference in benthic invertebrate community effects criteria of abundance, richness and evenness between reference and exposure locations.

LEL and SEL values are from: Thompson et al. (2005) – Sediment quality guidelines derived for application to uranium ore bearing regions of northern Saskatchewan and Ontario; lowest effect levels (LELs) and severe effect levels (SELs) from the "weighted method".

ISQG and PEL values are from: Canadian Council of Ministers of the Environment (CCME) – Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 1999; updated September 2007; accessed June 2017: http://ceqg-rcqe.ccme.ca/). ISQG are Interim Sediment Quality Guidelines, PEL are Probable Effects Levels.

Mean values are indicated as "less than", "<", when one or more of the samples were below the analytical detection limit for the parameter

**Table 3-6: Baseline Plankton Community Biomass and Chlorophyll a Summary**

| Class | Location | | | | | |
|---|---|---|---|---|---|---|
| | **McGowan Lake (LA-1)** | **Whitefish Lake (LA-5)** | **Whitefish Lake (LA-6)** | **Kratchkowsky Lake (LA-7)** | **Russell Lake (LAB-1)** | **Russell Lake (LAB-2)** |
| | **14-Sep-16** | **10-Sep-16** | **13-Sep-16** | **12-Sep-16** | **15-Sep-16** | **21-Sep-16** |
| **Phytoplankton** | | | | | | |
| Chlorophyll a | | | | | | |
| µg/L | <0.60 | <0.60 | <0.60 | <0.60 | <0.60 | <0.60 |
| Biovolume (µm³/L) by Class | | | | | | |
| Bacillariophyceae | 12,554,840,000 | 512,790,000 | 486,690,000 | 455,440,000 | 621,090,000 | 429,210,000 |
| Chlorophyceae | 465,610,000 | 36,264,000 | 30,886,000 | 79,848,000 | 23,936,000 | 5,584,000 |
| Chrysophyceae | 10,832,000 | 58,424,000 | 23,804,000 | 21,924,000 | 29,888,000 | 11,228,000 |
| Cryptophyceae | 152,226,000 | 42,444,000 | 17,388,000 | 249,750,000 | 688,200,000 | 834,144,000 |
| Cyanophyceae | 753,000,000 | 303,840,000 | 75,600,000 | 183,346,000 | 236,880,000 | 61,200,000 |
| Dinophyceae | 46,875,000 | 87,000,000 | 60,000,000 | 130,000,000 | 250,000,000 | 172,500,000 |
| Euglenophyceae | 9,000,000 | - | - | 4,500,000 | 31,500,000 | 27,000,000 |
| **Total** | **13,992,383,000** | **1,040,762,000** | **694,368,000** | **1,124,808,000** | **1,881,494,000** | **1,540,866,000** |
| Percentage of Total Biovolume by Class | | | | | | |
| Bacillariophyceae | 90% | 49% | 70% | 40% | 33% | 28% |
| Chlorophyceae | 3.3% | 3.5% | 4.4% | 7.1% | 1.3% | 0.4% |
| Chrysophyceae | 0.1% | 5.6% | 3.4% | 1.9% | 1.6% | 0.7% |
| Cryptophyceae | 1.1% | 4.1% | 2.5% | 22% | 37% | 54% |
| Cyanophyceae | 5.4% | 29% | 11% | 16% | 13% | 4.0% |
| Dinophyceae | 0.3% | 8.4% | 8.6% | 12% | 13% | 11% |
| Euglenophyceae | 0.1% | 0.0% | 0.0% | 0.4% | 1.7% | 1.8% |
| **Total** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** |
| **Zooplankton** | | | | | | |
| Biovolume (µm³/L) by Class | | | | | | |
| Unidentified Rotifers | 1,556,000,000 | 3,700,000,000 | 2,140,000,000 | 584,000,000 | 12,240,000,000 | 14,200,000,000 |
| Branchiopoda | 2,071,112,000,000 | 7,204,000,000 | 5,516,000,000 | 389,320,000,000 | 68,760,000,000 | 98,900,000,000 |
| Ciliata | 7,170,000,000 | 529,200,000 | 260,000,000 | 1,128,400,000 | 2,988,000,000 | 14,017,600,000 |
| Copepoda | 128,900,000,000 | 680,000,000 | 162,000,000 | 184,440,000,000 | 47,180,000,000 | 60,160,000,000 |
| Euglenoidea | - | - | - | 21,600,000 | - | - |
| Filosia | 90,000,000 | 11,260,000 | 101,400,000 | 0 | 0 | 172,800,000 |
| Heliozoa | - | 36,400,000 | - | - | - | 346,000,000 |
| Insecta | - | 260,000,000 | - | - | 260,000,000 | 8,560,000,000 |
| Lobosa | 312,000,000 | 187,000,000 | 277,400,000 | 212,000,000 | 81,000,000 | - |
| Monogononta | 2,192,400,000 | 2,996,200,000 | 1,524,000,000 | 52,862,000,000 | 16,464,000,000 | 123,372,000,000 |
| **Total** | **2,211,332,400,000** | **15,604,060,000** | **9,980,800,000** | **628,568,000,000** | **147,973,000,000** | **319,728,400,000** |
| Percentage of Total Biovolume by Class | | | | | | |
| Unidentified Rotifers | 0.1% | 24% | 21% | 0.1% | 8.3% | 4.4% |
| Branchiopoda | 94% | 46% | 55% | 62% | 46% | 31% |
| Ciliata | 0.3% | 3.4% | 2.6% | 0.2% | 2.0% | 4.4% |
| Copepoda | 5.8% | 4.4% | 1.6% | 29% | 32% | 19% |
| Euglenoidea | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Filosia | 0.0% | 0.1% | 1.0% | 0.0% | 0.0% | 0.1% |
| Heliozoa | 0.0% | 0.2% | 0.0% | 0.0% | 0.0% | 0.1% |
| Insecta | 0.0% | 1.7% | 0.0% | 0.0% | 0.2% | 2.7% |
| Lobosa | 0.0% | 1.2% | 2.8% | 0.0% | 0.1% | 0.0% |
| Monogononta | 0.1% | 19% | 15% | 8.4% | 11% | 39% |
| **Total** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** |

Note:
Coloured cells indicate the most abundant class observed

**Table 3-7A: Baseline Benthic Invertebrate Community Summary**

**Benthic Invertebrate Community Metrics**

| Location | Metric | Mean | Median | Maximum | Minimum | SE | SD |
|---|---|---|---|---|---|---|---|
| McGowan Lake (LA-1) | *Density* | 981 | 1,014 | 1,043 | 886 | 39 | 68 |
| | Taxa Richness | 9 | 10 | 11 | 7 | 1 | 2 |
| | Simpson's Evenness | 0.44 | 0.43 | 0.51 | 0.38 | 0.03 | 0.05 |
| | Simpson's Diversity | 0.76 | 0.76 | 0.79 | 0.72 | 0.02 | 0.03 |
| | Bray-Curtis Dissimilarity | 0.50 | 0.53 | 0.58 | 0.38 | 0.05 | 0.08 |
| Whitefish Lake (LA-5) | Density | 9,597 | 9,929 | 14,086 | 5,271 | 1,289 | 2,882 |
| | Taxa Richness | 21 | 22 | 29 | 10 | 3 | 7 |
| | Simpson's Evenness | 0.23 | 0.17 | 0.40 | 0.15 | 0.04 | 0.09 |
| | Simpson's Diversity | 0.73 | 0.74 | 0.91 | 0.48 | 0.07 | 0.16 |
| | Bray-Curtis Dissimilarity | 0.39 | 0.40 | 0.59 | 0.19 | 0.08 | 0.17 |
| Whitefish Lake (LA-6) | Density | 10,163 | 8,571 | 19,143 | 3,171 | 2,335 | 5,222 |
| | Taxa Richness | 17 | 16 | 21 | 14 | 1 | 3 |
| | Simpson's Evenness | 0.18 | 0.15 | 0.28 | 0.13 | 0.02 | 0.05 |
| | Simpson's Diversity | 0.65 | 0.64 | 0.83 | 0.50 | 0.05 | 0.11 |
| | Bray-Curtis Dissimilarity | 0.37 | 0.44 | 0.47 | 0.13 | 0.06 | 0.12 |
| Kratchkowsky Lake (LA-7) | Density | 1,848 | 2,214 | 2,529 | 800 | 434 | 752 |
| | Taxa Richness | 11 | 11 | 11 | 11 | 0 | 0 |
| | Simpson's Evenness | 0.31 | 0.23 | 0.49 | 0.21 | 0.07 | 0.13 |
| | Simpson's Diversity | 0.69 | 0.63 | 0.84 | 0.60 | 0.06 | 0.11 |
| | Bray-Curtis Dissimilarity | 0.57 | 0.62 | 0.63 | 0.46 | 0.04 | 0.08 |
| Kratchkowsky Lake (LA-7A) | Density | 800 | 686 | 1,171 | 543 | 155 | 269 |
| | Taxa Richness | 7 | 8 | 8 | 6 | 1 | 1 |
| | Simpson's Evenness | 0.43 | 0.43 | 0.53 | 0.32 | 0.05 | 0.08 |
| | Simpson's Diversity | 0.67 | 0.68 | 0.71 | 0.61 | 0.02 | 0.04 |
| | Bray-Curtis Dissimilarity | 0.36 | 0.31 | 0.58 | 0.20 | 0.09 | 0.16 |
| LA-8 | Density | 671 | 614 | 843 | 557 | 71 | 123 |
| | Taxa Richness | 10 | 11 | 12 | 7 | 1 | 2 |
| | Simpson's Evenness | 0.37 | 0.34 | 0.54 | 0.25 | 0.07 | 0.12 |
| | Simpson's Diversity | 0.72 | 0.73 | 0.75 | 0.69 | 0.02 | 0.03 |
| | Bray-Curtis Dissimilarity | 0.41 | 0.40 | 0.50 | 0.34 | 0.04 | 0.07 |
| LA-9 | Density | 1,633 | 1,529 | 1,986 | 1,386 | 148 | 256 |
| | Taxa Richness | 11 | 6 | 21 | 6 | 4 | 7 |
| | Simpson's Evenness | 0.36 | 0.41 | 0.45 | 0.23 | 0.06 | 0.10 |
| | Simpson's Diversity | 0.69 | 0.66 | 0.79 | 0.63 | 0.04 | 0.07 |
| | Bray-Curtis Dissimilarity | 0.57 | 0.56 | 0.63 | 0.53 | 0.02 | 0.04 |
| Williams Lake (LB-3) | Density | 10,457 | 3,229 | 25,114 | 3,029 | 5,984 | 10,364 |
| | Taxa Richness | 15 | 14 | 18 | 13 | 1 | 2 |
| | Simpson's Evenness | 0.25 | 0.31 | 0.35 | 0.09 | 0.07 | 0.11 |
| | Simpson's Diversity | 0.68 | 0.79 | 0.79 | 0.45 | 0.09 | 0.16 |
| | Bray-Curtis Dissimilarity | 0.76 | 0.69 | 0.95 | 0.64 | 0.08 | 0.14 |
| Russell Lake (LAB-1) | Density | 3,505 | 2,757 | 5,286 | 2,471 | 730 | 1,265 |
| | Taxa Richness | 19 | 19 | 24 | 15 | 2 | 4 |
| | Simpson's Evenness | 0.34 | 0.33 | 0.40 | 0.28 | 0.03 | 0.05 |
| | Simpson's Diversity | 0.85 | 0.85 | 0.86 | 0.84 | 0.00 | 0.01 |
| | Bray-Curtis Dissimilarity | 0.71 | 0.64 | 0.85 | 0.63 | 0.06 | 0.10 |
| Russell Lake (LAB-2) | Density | 5,295 | 2,729 | 10,557 | 2,600 | 2,148 | 3,721 |
| | Taxa Richness | 24 | 26 | 27 | 20 | 2 | 3 |
| | Simpson's Evenness | 0.25 | 0.29 | 0.31 | 0.14 | 0.04 | 0.08 |
| | Simpson's Diversity | 0.82 | 0.85 | 0.88 | 0.75 | 0.03 | 0.05 |
| | Bray-Curtis Dissimilarity | 0.87 | 0.91 | 0.93 | 0.77 | 0.04 | 0.07 |

Notes:
SE - Standard Error
SD - Standard deviation

## Table 3-7B: Baseline Benthic Invertebrate Community Summary
## Abundance of Major Taxonomic Groups

| Location | Major Taxonomic Groups | | Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| McGowan Lake (LA-1) | Nematoda | Nematoda | 0 | 0 | 0 | 0 | 0 | 0 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 14 | 0 | 43 | 0 | 12 | 20 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Unionicolidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ostracoda | Ostracoda | 19 | 29 | 29 | 0 | 8 | 13 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 48 | 57 | 71 | 14 | 14 | 24 |
| | Cladocera | Holopedidae | 110 | 57 | 257 | 14 | 61 | 106 |
| | Cladocera | Chydoridae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Macrothricidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Polyphemidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Cladocera | Sididae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Ephemeridae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Trichoptera | Hydroptilidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chaoboridae | 324 | 343 | 371 | 257 | 28 | 49 |
| | Diptera | Chironomidae | 433 | 457 | 543 | 300 | 58 | 101 |
| Whitefish Lake (LA-5) | Nematoda | Nematoda | 17 | 0 | 71 | 0 | 12 | 28 |
| | Microturbellaria | Microturbellaria | 6 | 0 | 14 | 0 | 3 | 7 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 40 | 29 | 114 | 0 | 19 | 43 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 11 | 0 | 57 | 0 | 10 | 23 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 391 | 214 | 1071 | 43 | 171 | 383 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 6 | 0 | 14 | 0 | 3 | 7 |
| | Acari - Hydrachnidia | Hygrobaetidae | 37 | 0 | 171 | 0 | 30 | 67 |
| | Acari - Hydrachnidia | Lebertiidae | 11 | 0 | 57 | 0 | 10 | 23 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 17 | 0 | 71 | 0 | 12 | 28 |
| | Acari - Hydrachnidia | Unionicolidae | 31 | 14 | 114 | 0 | 19 | 43 |
| | Ostracoda | Ostracoda | 280 | 257 | 571 | 57 | 74 | 166 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 311 | 229 | 586 | 114 | 80 | 180 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 4277 | 4186 | 9871 | 771 | 1476 | 3301 |
| | Cladocera | Ilyocryptidae | 46 | 0 | 114 | 0 | 25 | 56 |
| | Cladocera | Macrothricidae | 1877 | 2171 | 3214 | 571 | 421 | 940 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 34 | 0 | 114 | 0 | 20 | 46 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 3 | 0 | 14 | 0 | 3 | 6 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 357 | 400 | 686 | 0 | 114 | 254 |
| | Ephemeroptera | Ephemeridae | 109 | 0 | 271 | 0 | 59 | 133 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 11 | 0 | 57 | 0 | 10 | 23 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 26 | 29 | 43 | 0 | 7 | 17 |
| | Diptera | Chaoboridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chironomidae | 1697 | 1429 | 3414 | 1057 | 392 | 877 |

## Table 3-7B Cont'd: Baseline Benthic Invertebrate Community Summary
## Abundance of Major Taxonomic Groups

| Location | Major Taxonomic Groups | | Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| Whitefish Lake (LA-6) | Nematoda | Nematoda | 43 | 43 | 114 | 0 | 19 | 42 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 106 | 0 | 343 | 0 | 62 | 139 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 174 | 143 | 357 | 29 | 50 | 112 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 23 | 14 | 71 | 0 | 12 | 26 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 17 | 0 | 86 | 0 | 15 | 34 |
| | Acari - Hydrachnidia | Unionicolidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ostracoda | Ostracoda | 706 | 371 | 2514 | 57 | 410 | 917 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 174 | 114 | 343 | 0 | 64 | 142 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 5434 | 4357 | 10871 | 2214 | 1442 | 3225 |
| | Cladocera | Ilyocryptidae | 117 | 14 | 343 | 0 | 64 | 142 |
| | Cladocera | Macrothricidae | 1143 | 1029 | 1943 | 57 | 309 | 690 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 26 | 0 | 114 | 0 | 20 | 45 |
| | Amphipoda | Gammaridae | 114 | 0 | 571 | 0 | 102 | 229 |
| | Amphipoda | Hyalellidae | 3 | 0 | 14 | 0 | 3 | 6 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 569 | 143 | 2443 | 0 | 420 | 939 |
| | Ephemeroptera | Ephemeridae | 14 | 14 | 43 | 0 | 7 | 16 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 3 | 0 | 14 | 0 | 3 | 6 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chaoboridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chironomidae | 1497 | 1157 | 2829 | 671 | 341 | 762 |
| Kratchkowsky Lake (LA-7) | Nematoda | Nematoda | 0 | 0 | 0 | 0 | 0 | 0 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 29 | 29 | 43 | 14 | 7 | 12 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Unionicolidae | 10 | 14 | 14 | 0 | 4 | 7 |
| | Ostracoda | Ostracoda | 129 | 100 | 243 | 43 | 49 | 84 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 29 | 14 | 57 | 14 | 12 | 20 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 48 | 43 | 86 | 14 | 17 | 29 |
| | Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Macrothricidae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ephemeroptera | Ephemeridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chaoboridae | 14 | 14 | 29 | 0 | 7 | 12 |
| | Diptera | Chironomidae | 1562 | 2000 | 2143 | 543 | 417 | 723 |

**Table 3-7B Cont'd: Baseline Benthic Invertebrate Community Summary**
**Abundance of Major Taxonomic Groups**

| Location | Major Taxonomic Groups | | Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| Kratchkowsky Lake (LA-7A) | Nematoda | Nematoda | 5 | 0 | 14 | 0 | 4 | 7 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Unionicolidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ostracoda | Ostracoda | 24 | 0 | 71 | 0 | 19 | 34 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 76 | 29 | 200 | 0 | 51 | 88 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Macrothricidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 24 | 14 | 57 | 0 | 14 | 24 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Ephemeridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chaoboridae | 14 | 14 | 14 | 14 | 0 | 0 |
| | Diptera | Chironomidae | 652 | 629 | 814 | 514 | 71 | 124 |
| LA-8 | Nematoda | Nematoda | 0 | 0 | 0 | 0 | 0 | 0 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 10 | 14 | 14 | 0 | 4 | 7 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Unionicolidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ostracoda | Ostracoda | 0 | 0 | 0 | 0 | 0 | 0 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Macrothricidae | 10 | 14 | 14 | 0 | 4 | 7 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ephemeroptera | Ephemeridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chaoboridae | 67 | 71 | 86 | 43 | 10 | 18 |
| | Diptera | Chironomidae | 562 | 500 | 714 | 471 | 63 | 108 |

## Table 3-7B Cont'd: Baseline Benthic Invertebrate Community Summary Abundance of Major Taxonomic Groups

| Location | Major Taxonomic Groups | | Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| LA-9 | Nematoda | Nematoda | 0 | 0 | 0 | 0 | 0 | 0 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 19 | 0 | 57 | 0 | 16 | 27 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 10 | 14 | 14 | 0 | 4 | 7 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Acari - Hydrachnidia | Pionidae | 19 | 0 | 57 | 0 | 16 | 27 |
| | Acari - Hydrachnidia | Unionicolidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ostracoda | Ostracoda | 62 | 0 | 186 | 0 | 51 | 88 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 43 | 57 | 57 | 14 | 12 | 20 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Macrothricidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 14 | 0 | 43 | 0 | 12 | 20 |
| | Ephemeroptera | Ephemeridae | 14 | 0 | 43 | 0 | 12 | 20 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Diptera | Ceratopogonidae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Diptera | Chaoboridae | 476 | 586 | 729 | 114 | 152 | 262 |
| | Diptera | Chironomidae | 943 | 914 | 1314 | 600 | 169 | 292 |
| Williams Lake (LB-3) | Nematoda | Nematoda | 0 | 0 | 0 | 0 | 0 | 0 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 543 | 400 | 1100 | 129 | 236 | 409 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Pelecypoda | Pisidiidae | 476 | 343 | 971 | 114 | 209 | 362 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 38 | 0 | 114 | 0 | 31 | 54 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 38 | 0 | 114 | 0 | 31 | 54 |
| | Acari - Hydrachnidia | Unionicolidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ostracoda | Ostracoda | 43 | 14 | 114 | 0 | 29 | 51 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 57 | 57 | 114 | 0 | 27 | 47 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 38 | 0 | 114 | 0 | 31 | 54 |
| | Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Macrothricidae | 38 | 0 | 114 | 0 | 31 | 54 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ephemeroptera | Ephemeridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chaoboridae | 514 | 200 | 1143 | 200 | 257 | 444 |
| | Diptera | Chironomidae | 8643 | 1500 | 23229 | 1200 | 5955 | 10314 |

**Table 3-7B Cont'd: Baseline Benthic Invertebrate Community Summary**
**Abundance of Major Taxonomic Groups**

| Location | Major Taxonomic Groups | | Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| Russell Lake (LAB-1) | Nematoda | Nematoda | 57 | 43 | 129 | 0 | 31 | 53 |
| | Microturbellaria | Microturbellaria | 5 | 0 | 14 | 0 | 4 | 7 |
| | Hirudinea | Erpobdellidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Oligochaeta | Naididae | 586 | 586 | 686 | 486 | 47 | 82 |
| | Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 438 | 386 | 671 | 257 | 100 | 173 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 5 | 0 | 14 | 0 | 4 | 7 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 14 | 14 | 14 | 14 | 0 | 0 |
| | Acari - Hydrachnidia | Unionicolidae | 19 | 14 | 29 | 14 | 4 | 7 |
| | Ostracoda | Ostracoda | 29 | 14 | 57 | 14 | 12 | 20 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 129 | 157 | 200 | 29 | 42 | 73 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Illyocryptidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Cladocera | Macrothricidae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Caenidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Ephemeridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Molannidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chaoboridae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Diptera | Chironomidae | 2190 | 1643 | 3814 | 1114 | 675 | 1168 |
| Russell Lake (LAB-2) | Nematoda | Nematoda | 86 | 100 | 129 | 29 | 24 | 42 |
| | Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 |
| | Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Oligochaeta | Naididae | 52 | 71 | 71 | 14 | 16 | 27 |
| | Gastropoda | Lymnaeidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pelecypoda | Pisidiidae | 524 | 543 | 771 | 257 | 121 | 210 |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Hygrobaetidae | 29 | 29 | 57 | 0 | 13 | 23 |
| | Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Acari - Hydrachnidia | Pionidae | 10 | 14 | 14 | 0 | 4 | 7 |
| | Acari - Hydrachnidia | Unionicolidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ostracoda | Ostracoda | 5 | 0 | 14 | 0 | 4 | 7 |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 33 | 43 | 57 | 0 | 14 | 24 |
| | Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Chydoridae | 14 | 0 | 43 | 0 | 12 | 20 |
| | Cladocera | Illyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Macrothricidae | 19 | 0 | 57 | 0 | 16 | 27 |
| | Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cladocera | Sididae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ephemeroptera | Baetiscidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ephemeroptera | Caenidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Ephemeroptera | Ephemeridae | 176 | 100 | 429 | 0 | 106 | 183 |
| | Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Trichoptera | Lepidosomatidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Trichoptera | Leptoceridae | 43 | 29 | 71 | 29 | 12 | 20 |
| | Trichoptera | Molannidae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Trichoptera | Phryganeidae | 5 | 0 | 14 | 0 | 4 | 7 |
| | Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Ceratopogonidae | 10 | 0 | 29 | 0 | 8 | 13 |
| | Diptera | Chaoboridae | 0 | 0 | 0 | 0 | 0 | 0 |
| | Diptera | Chironomidae | 4248 | 1986 | 9014 | 1743 | 1947 | 3372 |

Notes:
SE - Standard Error
SD - Standard deviation

## Table 3-7C: Baseline Benthic Invertebrate Community Summary
## Percent Relative Abundance of Major Taxonomic Groups

| Location | Major Taxonomic Groups | | Percent Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| McGowan Lake (LA-1) | Nematoda | Nematoda | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Microturbellaria | Microturbellaria | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 1.6% | 0.0% | 4.8% | 0.0% | 1.3% | 2.3% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 0.9% | 0.0% | 2.7% | 0.0% | 0.7% | 1.3% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Unionicolidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ostracoda | Ostracoda | 1.9% | 2.7% | 2.8% | 0.0% | 0.8% | 1.3% |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 5.0% | 5.5% | 8.1% | 1.4% | 1.6% | 2.7% |
| | Cladocera | Holopedidae | 11.1% | 6.5% | 25.4% | 1.4% | 6.0% | 10.3% |
| | Cladocera | Chydoridae | 0.5% | 0.0% | 1.4% | 0.0% | 0.4% | 0.7% |
| | Cladocera | Ilyocryptidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Macrothricidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Polyphemidae | 0.5% | 0.0% | 1.4% | 0.0% | 0.4% | 0.7% |
| | Cladocera | Sididae | 0.5% | 0.0% | 1.4% | 0.0% | 0.4% | 0.7% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Ephemeridae | 0.5% | 0.0% | 1.4% | 0.0% | 0.4% | 0.6% |
| | Trichoptera | Hydroptilidae | 0.5% | 0.0% | 1.4% | 0.0% | 0.4% | 0.6% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chaoboridae | 32.8% | 32.9% | 36.6% | 29.0% | 1.8% | 3.1% |
| | Diptera | Chironomidae | 44.4% | 51.6% | 52.1% | 29.6% | 6.1% | 10.5% |
| Whitefish Lake (LA-5) | Nematoda | Nematoda | 0.2% | 0.0% | 0.7% | 0.0% | 0.1% | 0.3% |
| | Microturbellaria | Microturbellaria | 0.1% | 0.0% | 0.2% | 0.0% | 0.0% | 0.1% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 0.5% | 0.5% | 1.1% | 0.0% | 0.2% | 0.4% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.1% | 0.0% | 0.7% | 0.0% | 0.1% | 0.3% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 5.3% | 2.0% | 13.0% | 0.3% | 2.4% | 5.3% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.1% | 0.0% | 0.2% | 0.0% | 0.0% | 0.1% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.5% | 0.0% | 2.1% | 0.0% | 0.4% | 0.8% |
| | Acari - Hydrachnidia | Lebertiidae | 0.1% | 0.0% | 0.7% | 0.0% | 0.1% | 0.3% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.3% | 0.0% | 1.4% | 0.0% | 0.2% | 0.5% |
| | Acari - Hydrachnidia | Unionicolidae | 0.3% | 0.1% | 0.8% | 0.0% | 0.1% | 0.3% |
| | Ostracoda | Ostracoda | 2.9% | 2.9% | 4.3% | 0.7% | 0.6% | 1.3% |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 4.2% | 2.2% | 11.1% | 0.8% | 1.6% | 3.7% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 38.6% | 40.0% | 70.1% | 14.2% | 9.8% | 21.9% |
| | Cladocera | Ilyocryptidae | 0.4% | 0.0% | 1.1% | 0.0% | 0.2% | 0.5% |
| | Cladocera | Macrothricidae | 18.8% | 15.4% | 30.7% | 10.8% | 3.3% | 7.4% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 0.4% | 0.0% | 1.4% | 0.0% | 0.2% | 0.5% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.1% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 4.9% | 4.9% | 13.0% | 0.0% | 2.0% | 4.5% |
| | Ephemeroptera | Ephemeridae | 1.7% | 0.0% | 5.1% | 0.0% | 1.0% | 2.1% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.1% | 0.0% | 0.7% | 0.0% | 0.1% | 0.3% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.4% | 0.3% | 0.8% | 0.0% | 0.1% | 0.3% |
| | Diptera | Chaoboridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chironomidae | 20.2% | 14.3% | 41.4% | 7.7% | 5.6% | 12.5% |

**Table 3-7C Cont'd: Baseline Benthic Invertebrate Community Summary**
**Percent Relative Abundance of Major Taxonomic Groups**

| Location | Major Taxonomic Groups | | Percent Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| Whitefish Lake (LA-6) | Nematoda | Nematoda | 0.5% | 0.6% | 1.4% | 0.0% | 0.2% | 0.5% |
| | Microturbellaria | Microturbellaria | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 0.8% | 0.0% | 2.2% | 0.0% | 0.4% | 1.0% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 1.8% | 1.3% | 3.1% | 0.7% | 0.4% | 1.0% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.3% | 0.1% | 0.8% | 0.0% | 0.1% | 0.3% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.1% | 0.0% | 0.4% | 0.0% | 0.1% | 0.2% |
| | Acari - Hydrachnidia | Unionicolidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ostracoda | Ostracoda | 5.2% | 4.3% | 13.1% | 1.0% | 1.9% | 4.3% |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 1.9% | 1.8% | 4.0% | 0.0% | 0.6% | 1.3% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 54.1% | 56.8% | 69.8% | 30.3% | 6.0% | 13.4% |
| | Cladocera | Ilyocryptidae | 1.1% | 0.5% | 4.0% | 0.0% | 0.7% | 1.5% |
| | Cladocera | Macrothricidae | 10.6% | 10.1% | 21.5% | 1.8% | 2.9% | 6.4% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 0.4% | 0.0% | 1.3% | 0.0% | 0.2% | 0.5% |
| | Amphipoda | Gammaridae | 0.6% | 0.0% | 3.0% | 0.0% | 0.5% | 1.2% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.1% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 6.4% | 0.9% | 28.5% | 0.0% | 5.0% | 11.1% |
| | Ephemeroptera | Ephemeridae | 0.1% | 0.1% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.1% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chaoboridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chironomidae | 16.2% | 13.5% | 24.8% | 9.5% | 2.6% | 5.8% |
| Kratchkowsky Lake (LA-7) | Nematoda | Nematoda | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Microturbellaria | Microturbellaria | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 2.4% | 1.1% | 5.4% | 0.6% | 1.2% | 2.1% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.2% | 0.0% | 0.6% | 0.0% | 0.2% | 0.3% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Unionicolidae | 0.8% | 0.6% | 1.8% | 0.0% | 0.4% | 0.7% |
| | Ostracoda | Ostracoda | 8.0% | 9.6% | 12.5% | 1.9% | 2.6% | 4.5% |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 2.8% | 0.6% | 7.1% | 0.6% | 1.8% | 3.1% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 2.5% | 1.8% | 3.9% | 1.7% | 0.6% | 1.0% |
| | Cladocera | Ilyocryptidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Macrothricidae | 0.4% | 0.0% | 1.1% | 0.0% | 0.3% | 0.5% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 1.2% | 0.0% | 3.6% | 0.0% | 1.0% | 1.7% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 0.2% | 0.0% | 0.6% | 0.0% | 0.2% | 0.3% |
| | Ephemeroptera | Ephemeridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chaoboridae | 0.6% | 0.6% | 1.3% | 0.0% | 0.3% | 0.5% |
| | Diptera | Chironomidae | 81.0% | 84.7% | 90.3% | 67.9% | 5.5% | 9.6% |

**Table 3-7C Cont'd: Baseline Benthic Invertebrate Community Summary**
**Percent Relative Abundance of Major Taxonomic Groups**

| Location | Major Taxonomic Groups | | Percent Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| Kratchkowsky Lake (LA-7A) | Nematoda | Nematoda | 0.4% | 0.0% | 1.2% | 0.0% | 0.3% | 0.6% |
| | Microturbellaria | Microturbellaria | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 0.9% | 0.0% | 2.6% | 0.0% | 0.7% | 1.2% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Unionicolidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ostracoda | Ostracoda | 2.0% | 0.0% | 6.1% | 0.0% | 1.7% | 2.9% |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 7.1% | 4.2% | 17.1% | 0.0% | 4.2% | 7.3% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Ilyocryptidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Macrothricidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 2.3% | 2.1% | 4.9% | 0.0% | 1.2% | 2.0% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Ephemeridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chaoboridae | 2.0% | 2.1% | 2.6% | 1.2% | 0.3% | 0.6% |
| | Diptera | Chironomidae | 85.3% | 91.7% | 94.7% | 69.5% | 6.5% | 11.2% |
| LA-8 | Nematoda | Nematoda | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Microturbellaria | Microturbellaria | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 0.6% | 0.0% | 1.7% | 0.0% | 0.5% | 0.8% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 1.3% | 1.7% | 2.3% | 0.0% | 0.6% | 1.0% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.8% | 0.0% | 2.3% | 0.0% | 0.6% | 1.1% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Unionicolidae | 0.9% | 0.0% | 2.6% | 0.0% | 0.7% | 1.2% |
| | Ostracoda | Ostracoda | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Copepoda-Cyclopoida | Copepoda-Cyclopoida | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 0.6% | 0.0% | 1.7% | 0.0% | 0.5% | 0.8% |
| | Cladocera | Ilyocryptidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Macrothricidae | 1.4% | 1.7% | 2.6% | 0.0% | 0.6% | 1.1% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 0.9% | 0.0% | 2.6% | 0.0% | 0.7% | 1.2% |
| | Ephemeroptera | Ephemeridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chaoboridae | 10.0% | 8.5% | 14.0% | 7.7% | 1.6% | 2.8% |
| | Diptera | Chironomidae | 83.6% | 84.6% | 84.7% | 81.4% | 0.9% | 1.5% |

**Table 3-7C Cont'd: Baseline Benthic Invertebrate Community Summary**
**Percent Relative Abundance of Major Taxonomic Groups**

| Location | Major Taxonomic Groups | | Percent Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| LA-9 | Nematoda | Nematoda | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Microturbellaria | Microturbellariɛ | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 1.0% | 0.0% | 2.9% | 0.0% | 0.8% | 1.4% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 0.6% | 0.7% | 0.9% | 0.0% | 0.2% | 0.4% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.5% | 0.0% | 1.4% | 0.0% | 0.4% | 0.7% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.2% | 0.0% | 0.7% | 0.0% | 0.2% | 0.3% |
| | Acari - Hydrachnidia | Pionidae | 1.0% | 0.0% | 2.9% | 0.0% | 0.8% | 1.4% |
| | Acari - Hydrachnidia | Unionicolidae | 0.2% | 0.0% | 0.7% | 0.0% | 0.2% | 0.3% |
| | Ostracoda | Ostracoda | 3.1% | 0.0% | 9.4% | 0.0% | 2.5% | 4.4% |
| | Copepoda-Cyclopoidɛ | Copepoda-Cyclopoidɛ | 2.6% | 2.9% | 4.1% | 0.9% | 0.8% | 1.3% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Ilyocryptidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Macrothricidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 0.7% | 0.0% | 2.2% | 0.0% | 0.6% | 1.0% |
| | Ephemeroptera | Ephemeridae | 0.7% | 0.0% | 2.2% | 0.0% | 0.6% | 1.0% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.2% | 0.0% | 0.7% | 0.0% | 0.2% | 0.3% |
| | Diptera | Ceratopogonidae | 0.5% | 0.0% | 1.4% | 0.0% | 0.4% | 0.7% |
| | Diptera | Chaoboridae | 32.2% | 38.3% | 52.6% | 5.8% | 11.3% | 19.6% |
| | Diptera | Chironomidae | 56.4% | 59.8% | 66.2% | 43.3% | 5.6% | 9.6% |
| Williams Lake (LB-3) | Nematoda | Nematoda | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Microturbellaria | Microturbellariɛ | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 15.9% | 13.2% | 34.1% | 0.5% | 8.0% | 13.8% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Pelecypoda | Pisidiidae | 6.1% | 3.9% | 10.6% | 3.8% | 1.9% | 3.2% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Acari - Hydrachnidia | Unionicolidae | 0.1% | 0.0% | 0.4% | 0.0% | 0.1% | 0.2% |
| | Ostracoda | Ostracoda | 0.3% | 0.5% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Copepoda-Cyclopoidɛ | Copepoda-Cyclopoidɛ | 1.8% | 1.8% | 3.8% | 0.0% | 0.9% | 1.5% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Cladocera | Ilyocryptidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Macrothricidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 0.3% | 0.0% | 0.9% | 0.0% | 0.3% | 0.4% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Ephemeridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Molannidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.1% | 0.0% | 0.4% | 0.0% | 0.1% | 0.2% |
| | Diptera | Ceratopogonidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chaoboridae | 14.9% | 6.2% | 37.7% | 0.8% | 9.4% | 16.3% |
| | Diptera | Chironomidae | 59.5% | 46.5% | 92.5% | 39.6% | 13.6% | 23.5% |

**Table 3-7C Cont'd: Baseline Benthic Invertebrate Community Summary**
**Percent Relative Abundance of Major Taxonomic Groups**

| Location | Major Taxonomic Groups | | Percent Relative Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Major Taxon | Family | Mean | Median | Maximum | Minimum | SE | SD |
| Russell Lake (LAB-1) | Nematoda | Nematoda | 1.4% | 1.7% | 2.4% | 0.0% | 0.6% | 1.0% |
| | Microturbellaria | Microturbellariɛ | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Hirudinea | Erpobdellidae | 0.1% | 0.0% | 0.3% | 0.0% | 0.1% | 0.1% |
| | Oligochaeta | Naididae | 19.4% | 21.2% | 27.7% | 9.2% | 4.4% | 7.7% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 12.5% | 12.7% | 15.6% | 9.3% | 1.5% | 2.6% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.1% | 0.0% | 0.3% | 0.0% | 0.1% | 0.1% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.5% | 0.5% | 0.6% | 0.3% | 0.1% | 0.1% |
| | Acari - Hydrachnidia | Unionicolidae | 0.6% | 0.5% | 1.2% | 0.3% | 0.2% | 0.4% |
| | Ostracoda | Ostracoda | 0.7% | 0.6% | 1.1% | 0.5% | 0.1% | 0.3% |
| | Copepoda-Cyclopoidɛ | Copepoda-Cyclopoidɛ | 4.7% | 6.4% | 7.3% | 0.5% | 1.7% | 3.0% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Ilyocryptidae | 0.2% | 0.0% | 0.6% | 0.0% | 0.2% | 0.3% |
| | Cladocera | Macrothricidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.3% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 0.2% | 0.0% | 0.6% | 0.0% | 0.2% | 0.3% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Caenidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Ephemeridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Leptoceridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Molannidae | 0.1% | 0.0% | 0.3% | 0.0% | 0.1% | 0.1% |
| | Trichoptera | Phryganeidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chaoboridae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Diptera | Chironomidaɛ | 58.9% | 59.6% | 72.2% | 45.1% | 6.4% | 11.1% |
| Russell Lake (LAB-2) | Nematoda | Nematoda | 2.0% | 1.2% | 3.7% | 1.1% | 0.7% | 1.2% |
| | Microturbellaria | Microturbellariɛ | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Hirudinea | Erpobdellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Oligochaeta | Naididae | 1.8% | 2.6% | 2.7% | 0.1% | 0.7% | 1.2% |
| | Gastropoda | Lymnaeidae | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.1% |
| | Gastropoda | Planorbidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Gastropoda | Valvatidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Pelecypoda | Pisidiidae | 12.5% | 9.4% | 20.9% | 7.3% | 3.4% | 6.0% |
| | Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Arenuridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Hygrobaetidae | 1.1% | 1.0% | 2.2% | 0.0% | 0.5% | 0.9% |
| | Acari - Hydrachnidia | Lebertiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Limnesiidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Oxidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Acari - Hydrachnidia | Pionidae | 0.2% | 0.1% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Acari - Hydrachnidia | Unionicolidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.3% |
| | Ostracoda | Ostracoda | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Copepoda-Cyclopoidɛ | Copepoda-Cyclopoidɛ | 0.7% | 0.5% | 1.6% | 0.0% | 0.4% | 0.7% |
| | Cladocera | Holopedidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Chydoridae | 0.5% | 0.0% | 1.6% | 0.0% | 0.4% | 0.7% |
| | Cladocera | Ilyocryptidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Macrothricidae | 0.7% | 0.0% | 2.1% | 0.0% | 0.6% | 1.0% |
| | Cladocera | Polyphemidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Cladocera | Sididae | 0.3% | 0.0% | 1.0% | 0.0% | 0.3% | 0.5% |
| | Amphipoda | Gammaridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Amphipoda | Hyalellidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Ephemeroptera | Baetiscidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.3% |
| | Ephemeroptera | Caenidae | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.1% |
| | Ephemeroptera | Ephemeridae | 2.6% | 3.8% | 4.1% | 0.0% | 1.1% | 1.9% |
| | Trichoptera | Hydroptilidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Trichoptera | Lepidosomatidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Trichoptera | Leptoceridae | 0.9% | 1.0% | 1.1% | 0.7% | 0.1% | 0.2% |
| | Trichoptera | Molannidae | 0.3% | 0.0% | 1.0% | 0.0% | 0.3% | 0.5% |
| | Trichoptera | Phryganeidae | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Megaloptera | Sialidae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Ceratopogonidae | 0.1% | 0.0% | 0.3% | 0.0% | 0.1% | 0.1% |
| | Diptera | Chaoboridae | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Diptera | Chironomidae | 75.1% | 72.8% | 85.4% | 67.0% | 4.4% | 7.7% |

Notes:
SE - Standard Error
SD - Standard deviation

**Table 3-7D: Baseline Benthic Invertebrate Community Summary**
**Absolute and Relative Abundance of Functional Feeding Groups**

| Location | Benthic Invertebrate Functional Feeding Group | Abundance | | | | | |
|---|---|---|---|---|---|---|---|
| | | Mean | Median | Maximum | Minimum | SE | SD |
| McGowan Lake (LA-1) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 205 | 143 | 343 | 129 | 56 | 98 |
| | Collector-Gatherer | 267 | 200 | 414 | 186 | 60 | 105 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 476 | 471 | 629 | 329 | 71 | 123 |
| | Scraper | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | 33 | 0 | 100 | 0 | 27 | 47 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 20.8% | 16.1% | 33.8% | 12.3% | 5.4% | 9.4% |
| | Collector-Gatherer | 28.1% | 19.7% | 46.8% | 17.8% | 7.6% | 13.2% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 47.9% | 46.5% | 60.3% | 37.1% | 5.5% | 9.5% |
| | Scraper | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Shredder | 3.2% | 0.0% | 9.6% | 0.0% | 2.6% | 4.5% |
| Whitefish Lake (LA-5) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 6886 | 8357 | 12271 | 2286 | 1682 | 3761 |
| | Collector-Gatherer | 2037 | 1343 | 4157 | 886 | 540 | 1207 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 540 | 471 | 814 | 343 | 72 | 162 |
| | Scraper | 11 | 0 | 57 | 0 | 10 | 23 |
| | Shredder | 123 | 57 | 271 | 0 | 55 | 123 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 66.5% | 79.9% | 87.1% | 35.7% | 10.0% | 22.3% |
| | Collector-Gatherer | 25.9% | 11.6% | 50.4% | 8.9% | 8.7% | 19.5% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 6.1% | 5.9% | 9.9% | 3.2% | 1.0% | 2.2% |
| | Scraper | 0.1% | 0.0% | 0.7% | 0.0% | 0.1% | 0.3% |
| | Shredder | 1.4% | 1.1% | 3.3% | 0.0% | 0.6% | 1.3% |
| Whitefish Lake (LA-6) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 7563 | 7000 | 15014 | 2643 | 1888 | 4223 |
| | Collector-Gatherer | 2169 | 2314 | 3743 | 357 | 573 | 1281 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 369 | 386 | 514 | 157 | 52 | 116 |
| | Scraper | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | 63 | 14 | 229 | 0 | 38 | 85 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 74.6% | 78.4% | 83.3% | 54.7% | 4.7% | 10.5% |
| | Collector-Gatherer | 20.6% | 19.6% | 38.7% | 11.3% | 4.3% | 9.7% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 4.2% | 4.5% | 6.0% | 2.0% | 0.6% | 1.4% |
| | Scraper | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Shredder | 0.7% | 0.5% | 2.0% | 0.0% | 0.3% | 0.7% |
| Kratchkowsky Lake (LA-7) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 100 | 100 | 114 | 86 | 7 | 12 |
| | Collector-Gatherer | 1138 | 1200 | 1786 | 429 | 321 | 556 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 210 | 200 | 300 | 129 | 41 | 70 |
| | Scraper | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | 395 | 357 | 700 | 129 | 136 | 235 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 7.1% | 5.2% | 12.7% | 3.4% | 2.3% | 4.0% |
| | Collector-Gatherer | 59.8% | 54.5% | 70.6% | 54.2% | 4.4% | 7.7% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 12.4% | 11.9% | 16.4% | 9.0% | 1.7% | 3.0% |
| | Scraper | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Shredder | 20.7% | 16.4% | 31.6% | 14.1% | 4.5% | 7.8% |
| Kratchkowsky Lake (LA-7A) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 105 | 57 | 257 | 0 | 64 | 110 |
| | Collector-Gatherer | 319 | 129 | 757 | 71 | 179 | 311 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 233 | 271 | 300 | 129 | 43 | 75 |
| | Scraper | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | 143 | 114 | 286 | 29 | 62 | 107 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 10.1% | 8.3% | 22.0% | 0.0% | 5.2% | 9.0% |
| | Collector-Gatherer | 32.9% | 23.7% | 64.6% | 10.4% | 13.3% | 23.1% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 35.3% | 39.6% | 55.3% | 11.0% | 10.6% | 18.3% |
| | Scraper | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Shredder | 21.7% | 21.1% | 41.7% | 2.4% | 9.3% | 16.0% |

**Table 3-7D Cont'd: Baseline Benthic Invertebrate Community Summary**
**Absolute and Relative Abundance of Functional Feeding Groups**

| Location | Benthic Invertebrate Functional Feeding Group | Abundance | | | | | |
|---|---|---|---|---|---|---|---|
| | | Mean | Median | Maximum | Minimum | SE | SD |
| LA-8 | **Absolute Density** | | | | | | |
| | Collector-Filterer | 24 | 29 | 43 | 0 | 10 | 18 |
| | Collector-Gatherer | 95 | 114 | 129 | 43 | 22 | 37 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 262 | 229 | 329 | 229 | 27 | 47 |
| | Scraper | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | 286 | 257 | 457 | 143 | 75 | 130 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 3.4% | 5.1% | 5.3% | 0.0% | 1.4% | 2.4% |
| | Collector-Gatherer | 14.1% | 13.6% | 20.9% | 7.9% | 3.1% | 5.3% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 41.6% | 37.2% | 60.5% | 27.1% | 8.1% | 14.0% |
| | Scraper | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Shredder | 40.8% | 41.9% | 54.2% | 26.3% | 6.6% | 11.4% |
| LA-9 | **Absolute Density** | | | | | | |
| | Collector-Filterer | 138 | 57 | 329 | 29 | 78 | 135 |
| | Collector-Gatherer | 486 | 429 | 657 | 371 | 71 | 123 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 986 | 957 | 1157 | 843 | 75 | 130 |
| | Scraper | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | 24 | 0 | 71 | 0 | 19 | 34 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 7.5% | 4.1% | 16.5% | 1.9% | 3.7% | 6.5% |
| | Collector-Gatherer | 30.5% | 26.8% | 43.0% | 21.6% | 5.3% | 9.1% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 60.8% | 58.3% | 69.1% | 55.1% | 3.4% | 6.0% |
| | Scraper | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Shredder | 1.2% | 0.0% | 3.6% | 0.0% | 1.0% | 1.7% |
| Williams Lake (LB-3) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 7019 | 171 | 20714 | 171 | 5591 | 9684 |
| | Collector-Gatherer | 1662 | 2043 | 2100 | 843 | 335 | 580 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 1600 | 1786 | 2100 | 914 | 290 | 502 |
| | Scraper | 5 | 0 | 14 | 0 | 4 | 7 |
| | Shredder | 171 | 214 | 257 | 43 | 53 | 93 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 31.2% | 5.7% | 82.5% | 5.3% | 21.0% | 36.3% |
| | Collector-Gatherer | 33.7% | 27.8% | 65.0% | 8.1% | 13.6% | 23.6% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 31.9% | 28.3% | 59.0% | 8.4% | 12.0% | 20.8% |
| | Scraper | 0.2% | 0.0% | 0.5% | 0.0% | 0.1% | 0.2% |
| | Shredder | 3.1% | 1.3% | 7.1% | 1.0% | 1.6% | 2.8% |
| Russell Lake (LAB-1) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 1129 | 500 | 2514 | 371 | 567 | 981 |
| | Collector-Gatherer | 1752 | 1757 | 1857 | 1643 | 51 | 88 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 376 | 414 | 414 | 300 | 31 | 54 |
| | Scraper | 5 | 0 | 14 | 0 | 4 | 7 |
| | Shredder | 242.9 | 200.0 | 485.7 | 42.9 | 105.8 | 183.3 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 26.9% | 18.1% | 47.6% | 15.0% | 8.5% | 14.7% |
| | Collector-Gatherer | 55.1% | 63.7% | 66.5% | 35.1% | 8.2% | 14.2% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 11.8% | 10.9% | 16.8% | 7.8% | 2.1% | 3.7% |
| | Scraper | 0.1% | 0.0% | 0.3% | 0.0% | 0.1% | 0.1% |
| | Shredder | 6.1% | 7.3% | 9.2% | 1.7% | 1.8% | 3.2% |
| Russell Lake (LAB-2) | **Absolute Density** | | | | | | |
| | Collector-Filterer | 2243 | 557 | 5843 | 329 | 1471 | 2547 |
| | Collector-Gatherer | 2500 | 2029 | 3786 | 1686 | 531 | 920 |
| | Omnivore | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | 519 | 414 | 900 | 243 | 161 | 278 |
| | Scraper | 14 | 14 | 29 | 0 | 7 | 12 |
| | Shredder | 19 | 14 | 43 | 0 | 10 | 18 |
| | **Relative Density** | | | | | | |
| | Collector-Filterer | 29.5% | 20.4% | 55.3% | 12.6% | 10.7% | 18.6% |
| | Collector-Gatherer | 58.6% | 61.8% | 78.0% | 35.9% | 10.0% | 17.4% |
| | Omnivore | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | Predator | 11.0% | 9.3% | 15.2% | 8.5% | 1.7% | 3.0% |
| | Scraper | 0.4% | 0.1% | 1.0% | 0.0% | 0.3% | 0.5% |
| | Shredder | 0.6% | 0.1% | 1.6% | 0.0% | 0.4% | 0.7% |

Notes:
SE - Standard Error
SD - Standard deviation

**Table 3-8: Baseline Benthic Invertebrate Chemistry Summary**

| Parameters | Unit | Location | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | McGowan Lake (LA-1) | Whitefish Lake (LA-5) | Whitefish Lake (LA-6) | Kratchkowsky Lake (LA-7) | Kratchkowsky Lake (LA-7A) | LA-8 | LA-9 | Russell Lake (LAB-1) | Russell Lake (LAB-2) |
| Moisture | % | 91 | 87 | 87 | 87 | 89 | 84 | 82 | 89 | 89 |
| Aluminum | µg/g | 93 | 120 | 140 | 78 | 150 | 39 | 62 | 250 | 220 |
| Antimony | µg/g | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Arsenic | µg/g | 1.8 | 1.5 | 2.6 | 0.74 | 1.2 | 0.43 | 0.68 | 0.9 | 0.81 |
| Barium | µg/g | 142 | 85 | 167 | 49 | 80 | 4.7 | 4.8 | 111 | 164 |
| Beryllium | µg/g | 0.01 | <0.01 | 0.02 | <0.01 | 0.01 | <0.01 | <0.01 | 0.03 | 0.01 |
| Boron | µg/g | 4.0 | 1.0 | 3.0 | 2.0 | 3.0 | <1 | 1.0 | 6.0 | 7.0 |
| Cadmium | µg/g | 0.19 | 0.18 | 0.25 | 0.13 | 0.22 | 0.13 | 0.1 | 0.16 | 0.2 |
| Chromium | µg/g | <0.5 | 0.6 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Cobalt | µg/g | 0.99 | 0.48 | 0.68 | 0.16 | 0.44 | 0.12 | 0.18 | 2 | 3.7 |
| Copper | µg/g | 7.1 | 6.3 | 5.3 | 6.9 | 8.5 | 15 | 14 | 6.8 | 6.6 |
| Iron | µg/g | 1300 | 1000 | 1800 | 410 | 1200 | 390 | 500 | 1800 | 1400 |
| Lead | µg/g | 0.17 | 0.34 | 0.33 | 0.08 | 0.2 | 0.05 | 0.06 | 0.16 | 0.13 |
| Manganese | µg/g | 1900 | 790 | 1030 | 146 | 385 | 88 | 57 | 1850 | 1710 |
| Molybdenum | µg/g | 0.5 | 0.4 | 0.6 | 0.5 | 0.6 | 0.1 | 0.2 | 1.2 | 0.7 |
| Nickel | µg/g | 2.7 | 0.75 | 1.3 | 0.19 | 0.85 | 0.17 | 0.2 | 2.3 | 2.7 |
| Selenium | µg/g | 0.53 | 0.5 | 0.52 | 0.5 | 0.67 | 0.91 | 1 | 0.37 | 0.36 |
| Silver | µg/g | 0.02 | 0.06 | 0.03 | 0.05 | 0.05 | 0.12 | 0.11 | 0.02 | 0.03 |
| Strontium | µg/g | 10 | 11 | 10 | 7.5 | 11 | 3.6 | 5.3 | 14 | 20 |
| Thallium | µg/g | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Tin | µg/g | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Titanium | µg/g | 2.6 | 3.0 | 4.1 | 3.0 | 9.1 | 1.0 | 1.4 | 5.6 | 6.4 |
| Uranium | µg/g | 0.081 | 0.062 | 0.087 | 0.023 | 0.08 | 0.012 | 0.014 | 0.099 | 0.16 |
| Vanadium | µg/g | 0.4 | 0.4 | 0.4 | 0.2 | 0.5 | 0.1 | 0.2 | 0.7 | 0.7 |
| Zinc | µg/g | 150 | 150 | 110 | 150 | 160 | 91 | 92 | 150 | 190 |
| Lead-210 | Bq/g | <0.05 | <0.04 | <0.02 | <0.04 | <0.06 | <0.02 | <0.02 | 0.03 | <0.04 |
| Polonium-210 | Bq/g | 0.06 | 0.09 | 0.061 | 0.08 | 0.12 | 0.06 | 0.1 | 0.06 | 0.03 |
| Radium-226 | Bq/g | 0.02 | 0.01 | 0.015 | <0.01 | <0.01 | <0.005 | 0.008 | 0.02 | 0.02 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.009 | <0.02 | <0.03 | <0.01 | <0.01 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.009 | <0.02 | <0.03 | <0.01 | <0.01 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.009 | <0.02 | <0.03 | <0.01 | <0.01 | <0.02 | <0.02 |

Notes:
Results are for one sample per lake assessed.
Samples were collected between September 18 and 21, 2016.
Results are on a dry weight basis.

**Table 3-9: Baseline Lake Fish Community Summary**

| Fish Species | Station | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | McGowan Lake (LA-1) | Whitefish Lake (LA-5) | Whitefish Lake (LA-6) | Kratchkowsky Lake (LA-7, LA-7A) | LA-8 | LA-9 | PA-2 | PA-3 | Williams Lake (LB-3) | Russell Lake (LAB-1) | Russell Lake (LAB-2) |
| Lake Chub | - | - | - | - | - | - | - | - | x | - | - |
| Spottail Shiner | x | x | x | x | - | x | - | - | x | x | - |
| Longnose Sucker | x | - | - | - | - | - | - | - | - | - | - |
| White Sucker | x | x | x | x | x | x | x | - | - | x | x |
| Lake Whitefish | x | x | x | x | x | x | x | - | - | x | x |
| Lake Trout | x | - | - | - | - | - | - | - | - | x | x |
| Northern Pike | x | x | x | x | x | x | x | - | x | x | x |
| Burbot | - | - | - | - | - | - | - | - | - | - | x |
| Ninespine Stickleback | - | x | - | x | x | x | - | - | - | x | x |
| Yellow Perch | x | - | - | x | x | x | - | - | x | - | - |
| Walleye | x | x | x | x | - | x | - | - | x | - | x |

Notes:
Results presented herein are only from traditional fish survey. No eDNA analysis results are included.
x indicates that the species was either captured or observed
- indicates that the species was neither captured nor observed

## Table 3-10: Baseline Fish Tissue Chemistry Summary

| Location/ Species/ Tissue | Aluminum | | | | | Antimony | | | | | Arsenic | | | | | Barium | | | | | Beryllium | | | | | Boron | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) |
| McGowan Lake (LA-1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 9 | 5 | 0.5 | 1.3 | 0.7 | 9 | 9 | 0.05 | 0.05 | 0.05 | 9 | 7 | 0.02 | 0.03 | 0.02 | 9 | 0 | 2.2 | 9.8 | 4.9 | 9 | 9 | 0.01 | 0.01 | 0.01 | 9 | 9 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 9 | 6 | 0.5 | 1.0 | 0.6 | 9 | 9 | 0.02 | 0.02 | 0.02 | 9 | 9 | 0.01 | 0.01 | 0.01 | 9 | 1 | 0.01 | 0.1 | 0.03 | 9 | 9 | 0.002 | 0.002 | 0.002 | 9 | 9 | 0.2 | 0.2 | 0.2 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 2 | 0.5 | 1.4 | 0.8 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 5 | 0.02 | 0.03 | 0.02 | 6 | 0 | 3.2 | 7.3 | 4.8 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 6 | 3 | 0.5 | 0.8 | 0.6 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 1 | 0.01 | 0.05 | 0.03 | 6 | 0 | 0.06 | 0.25 | 0.14 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 6 | 0.2 | 0.2 | 0.2 |
| Whitefish Lake (LA-5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 2 | 0.5 | 1.3 | 0.8 | 5 | 5 | 0.05 | 0.05 | 0.05 | 5 | 0 | 0.02 | 0.03 | 0.02 | 5 | 0 | 6.4 | 7.2 | 6.9 | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 5 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 5 | 1 | 0.5 | 1.3 | 0.7 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 4 | 0.01 | 0.01 | 0.01 | 5 | 3 | 0.01 | 0.06 | 0.02 | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 5 | 0.2 | 0.2 | 0.2 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 0.7 | 1.7 | 1.1 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 0 | 0.02 | 0.06 | 0.05 | 6 | 0 | 3 | 8.5 | 5.6 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 7 | 2 | 0.5 | 0.9 | 0.6 | 7 | 7 | 0.02 | 0.02 | 0.02 | 7 | 0 | 0.02 | 0.04 | 0.03 | 7 | 1 | 0.01 | 0.17 | 0.07 | 7 | 7 | 0.002 | 0.002 | 0.002 | 7 | 7 | 0.2 | 0.2 | 0.2 |
| Whitefish Lake (LA-6) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 0.8 | 1.5 | 1.1 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 2 | 0.02 | 0.03 | 0.02 | 6 | 0 | 2.9 | 8 | 5.8 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 6 | 1 | 0.5 | 1.1 | 0.8 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 5 | 0.01 | 0.02 | 0.01 | 6 | 0 | 0.01 | 0.09 | 0.05 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 6 | 0.2 | 0.2 | 0.2 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 1 | 0.5 | 1.0 | 0.8 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 1 | 0.02 | 0.07 | 0.05 | 6 | 0 | 3.6 | 5.6 | 4.5 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 6 | 1 | 0.5 | 0.9 | 0.7 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 0.02 | 0.06 | 0.04 | 6 | 0 | 0.02 | 0.05 | 0.04 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 6 | 0.2 | 0.2 | 0.2 |
| Kratchowsky Lake (LA-7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 8 | 2 | 0.5 | 0.9 | 0.7 | 8 | 8 | 0.05 | 0.05 | 0.05 | 8 | 7 | 0.02 | 0.02 | 0.02 | 8 | 0 | 3.4 | 6.5 | 4.6 | 8 | 8 | 0.01 | 0.01 | 0.01 | 8 | 8 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 8 | 4 | 0.5 | 1.0 | 0.6 | 8 | 8 | 0.02 | 0.02 | 0.02 | 8 | 8 | 0.01 | 0.01 | 0.01 | 8 | 0 | 0.01 | 0.1 | 0.05 | 8 | 8 | 0.002 | 0.002 | 0.002 | 8 | 8 | 0.2 | 0.2 | 0.2 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 7 | 2 | 0.5 | 1.6 | 0.8 | 7 | 7 | 0.05 | 0.05 | 0.05 | 7 | 2 | 0.02 | 0.04 | 0.02 | 7 | 0 | 2.6 | 5.2 | 4.1 | 7 | 7 | 0.01 | 0.01 | 0.01 | 7 | 7 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 7 | 5 | 0.5 | 0.5 | 0.5 | 7 | 7 | 0.02 | 0.02 | 0.02 | 7 | 0 | 0.02 | 0.05 | 0.04 | 7 | 0 | 0.03 | 0.24 | 0.11 | 7 | 7 | 0.002 | 0.002 | 0.002 | 7 | 7 | 0.2 | 0.2 | 0.2 |
| Russell Lake (LAB) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 0.8 | 1.3 | 1.1 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 3 | 0.02 | 0.05 | 0.03 | 6 | 0 | 1.9 | 3.7 | 2.8 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 6 | 6 | 0.5 | 0.5 | 0.5 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 1 | 0.01 | 0.02 | 0.02 | 6 | 2 | 0.01 | 0.18 | 0.06 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 6 | 0.2 | 0.2 | 0.2 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 1 | 0.5 | 1.4 | 0.8 | 5 | 5 | 0.05 | 0.05 | 0.05 | 5 | 3 | 0.02 | 0.03 | 0.02 | 5 | 0 | 1.3 | 2.4 | 2.1 | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 5 | 0.5 | 0.5 | 0.5 |
| **Flesh** | 5 | 5 | 0.5 | 0.5 | 0.5 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 1 | 0.01 | 0.05 | 0.03 | 5 | 0 | 0.02 | 0.04 | 0.03 | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 5 | 0.2 | 0.2 | 0.2 |

## Table 3-10 Cont'd: Baseline Fish Tissue Chemistry Summary

| Location/ Species/ Tissue | Cadmium | | | | | Chromium | | | | | Cobalt | | | | | Copper | | | | | Iron | | | | | Lead | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) |
| McGowan Lake (LA-1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 9 | 9 | 0.01 | 0.01 | 0.01 | 9 | 9 | 0.2 | 0.2 | 0.2 | 9 | 0 | 0.05 | 0.16 | 0.09 | 9 | 0 | 0.16 | 0.82 | 0.46 | 9 | 0 | 2.7 | 7.7 | 5.1 | 9 | 3 | 0.01 | 0.04 | 0.022 |
| **Flesh** | 9 | 9 | 0.002 | 0.002 | 0.002 | 9 | 9 | 0.1 | 0.2 | 0.1 | 9 | 6 | 0.002 | 0.005 | 0.003 | 9 | 0 | 0.14 | 0.55 | 0.28 | 9 | 0 | 1.9 | 6.4 | 3.5 | 9 | 7 | 0.002 | 0.003 | 0.0021 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.2 | 0.2 | 0.2 | 6 | 0 | 0.06 | 0.14 | 0.09 | 6 | 0 | 0.27 | 0.46 | 0.40 | 6 | 0 | 4.1 | 9.8 | 7.4 | 6 | 2 | 0.01 | 0.03 | 0.013 |
| **Flesh** | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 5 | 0.1 | 0.2 | 0.1 | 6 | 4 | 0.002 | 0.014 | 0.005 | 6 | 0 | 0.17 | 0.62 | 0.28 | 6 | 0 | 2.2 | 4.6 | 3.2 | 6 | 1 | 0.002 | 0.009 | 0.0038 |
| Whitefish Lake (LA-5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 5 | 0.2 | 0.2 | 0.2 | 5 | 0 | 0.06 | 0.10 | 0.09 | 5 | 0 | 0.08 | 0.16 | 0.10 | 5 | 0 | 1.4 | 11 | 4.8 | 5 | 2 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 5 | 0.1 | 0.1 | 0.1 | 5 | 2 | 0.002 | 0.014 | 0.007 | 5 | 0 | 0.09 | 0.14 | 0.11 | 5 | 0 | 0.8 | 2.3 | 1.2 | 5 | 4 | 0.002 | 0.004 | 0.002 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.2 | 0.2 | 0.2 | 6 | 0 | 0.05 | 0.17 | 0.11 | 6 | 0 | 0.26 | 1.6 | 0.99 | 6 | 0 | 6.7 | 18 | 10 | 6 | 0 | 0.01 | 0.09 | 0.05 |
| **Flesh** | 7 | 7 | 0.002 | 0.002 | 0.002 | 7 | 7 | 0.1 | 0.1 | 0.1 | 7 | 2 | 0.002 | 0.009 | 0.004 | 7 | 0 | 0.16 | 0.42 | 0.32 | 7 | 0 | 2.3 | 6.2 | 4.0 | 7 | 1 | 0.002 | 0.006 | 0.003 |
| Whitefish Lake (LA-6) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.2 | 0.2 | 0.2 | 6 | 0 | 0.04 | 0.13 | 0.10 | 6 | 0 | 0.26 | 0.63 | 0.52 | 6 | 0 | 3.3 | 8.6 | 5.1 | 6 | 1 | 0.01 | 0.03 | 0.02 |
| **Flesh** | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 6 | 0.1 | 0.1 | 0.1 | 6 | 5 | 0.002 | 0.01 | 0.003 | 6 | 0 | 0.15 | 0.23 | 0.17 | 6 | 0 | 1.4 | 2.4 | 1.6 | 6 | 2 | 0.002 | 0.004 | 0.002 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.2 | 0.2 | 0.2 | 6 | 0 | 0.06 | 0.13 | 0.10 | 6 | 0 | 0.42 | 0.93 | 0.75 | 6 | 0 | 4 | 16 | 9.3 | 6 | 1 | 0.01 | 0.04 | 0.03 |
| **Flesh** | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 6 | 0.1 | 0.1 | 0.1 | 6 | 1 | 0.002 | 0.056 | 0.02 | 6 | 0 | 0.2 | 0.42 | 0.30 | 6 | 0 | 1.7 | 3.5 | 2.7 | 6 | 3 | 0.002 | 0.003 | 0.002 |
| Kratchowsky Lake (LA-7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 8 | 8 | 0.01 | 0.01 | 0.01 | 8 | 7 | 0.2 | 0.4 | 0.2 | 8 | 0 | 0.07 | 0.14 | 0.10 | 8 | 0 | 0.21 | 0.43 | 0.30 | 8 | 0 | 3.5 | 13 | 6.8 | 8 | 4 | 0.01 | 0.02 | 0.01 |
| **Flesh** | 8 | 8 | 0.002 | 0.002 | 0.002 | 8 | 8 | 0.1 | 0.1 | 0.1 | 8 | 5 | 0.002 | 0.034 | 0.007 | 8 | 0 | 0.18 | 0.5 | 0.27 | 8 | 0 | 1 | 4.2 | 2.7 | 8 | 4 | 0.002 | 0.011 | 0.005 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 7 | 7 | 0.01 | 0.01 | 0.01 | 7 | 7 | 0.2 | 0.2 | 0.2 | 7 | 0 | 0.05 | 0.15 | 0.07 | 7 | 0 | 0.2 | 0.5 | 0.35 | 7 | 0 | 6.4 | 150 | 45 | 7 | 5 | 0.01 | 0.02 | 0.01 |
| **Flesh** | 7 | 7 | 0.002 | 0.002 | 0.002 | 7 | 7 | 0.1 | 0.1 | 0.1 | 7 | 5 | 0.002 | 0.004 | 0.002 | 7 | 0 | 0.17 | 0.66 | 0.31 | 7 | 0 | 2.2 | 5.3 | 3.3 | 7 | 4 | 0.002 | 0.005 | 0.003 |
| Russell Lake (LAB) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.2 | 0.2 | 0.2 | 6 | 0 | 0.12 | 0.18 | 0.14 | 6 | 0 | 0.06 | 0.44 | 0.26 | 6 | 0 | 3.3 | 150 | 29 | 6 | 3 | 0.01 | 0.03 | 0.01 |
| **Flesh** | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 6 | 0.1 | 0.1 | 0.1 | 6 | 5 | 0.002 | 0.008 | 0.003 | 6 | 0 | 0.08 | 0.46 | 0.18 | 6 | 0 | 0.8 | 4.7 | 2.3 | 6 | 4 | 0.002 | 0.002 | 0.002 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 5 | 0.2 | 0.2 | 0.2 | 5 | 0 | 0.05 | 0.13 | 0.09 | 5 | 0 | 0.38 | 0.66 | 0.51 | 5 | 0 | 6.8 | 12 | 9.3 | 5 | 1 | 0.01 | 0.1 | 0.03 |
| **Flesh** | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 5 | 0.1 | 0.1 | 0.1 | 5 | 3 | 0.002 | 0.018 | 0.007 | 5 | 0 | 0.16 | 0.32 | 0.23 | 5 | 0 | 1.3 | 2.3 | 1.9 | 5 | 5 | 0.002 | 0.002 | 0.002 |

## Table 3-10 Cont'd: Baseline Fish Tissue Chemistry Summary

| Location/ Species/ Tissue | Manganese | | | | | Mercury | | | | | Molybdenum | | | | | Nickel | | | | | Selenium | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | wet weight | | | dry weight | | |
| | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | Min (ug/g) | Max (ug/g) | Average (ug/g) |
| McGowan Lake (LA-1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 9 | 0 | 5.7 | 20 | 15 | 9 | 0 | 0.02 | 0.2 | 0.06 | 9 | 9 | 0.05 | 0.05 | 0.05 | 9 | 4 | 0.02 | 0.09 | 0.04 | 9 | 0 | 0.12 | 0.2 | 0.16 | 0.30 | 0.53 | 0.41 |
| **Flesh** | 9 | 0 | 0.08 | 0.13 | 0.10 | 9 | 0 | 0.075 | 0.43 | 0.17 | 9 | 9 | 0.02 | 0.02 | 0.02 | 9 | 7 | 0.01 | 0.03 | 0.01 | 9 | 0 | 0.19 | 0.25 | 0.22 | 0.85 | 1.16 | 1.00 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 10 | 35 | 23 | 6 | 1 | 0.01 | 0.02 | 0.02 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 3 | 0.02 | 0.12 | 0.04 | 6 | 0 | 0.13 | 0.26 | 0.19 | 0.27 | 0.59 | 0.45 |
| **Flesh** | 6 | 0 | 0.12 | 1.1 | 0.36 | 6 | 0 | 0.022 | 0.068 | 0.038 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 4 | 0.01 | 0.11 | 0.03 | 6 | 0 | 0.21 | 0.3 | 0.27 | 0.88 | 1.48 | 1.29 |
| Whitefish Lake (LA-5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 0 | 12 | 17 | 14 | 5 | 0 | 0.02 | 0.06 | 0.04 | 5 | 5 | 0.05 | 0.05 | 0.05 | 5 | 4 | 0.02 | 0.03 | 0.02 | 5 | 0 | 0.09 | 0.17 | 0.11 | 0.22 | 0.41 | 0.28 |
| **Flesh** | 5 | 0 | 0.08 | 0.12 | 0.11 | 5 | 0 | 0.047 | 0.23 | 0.16 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 3 | 0.01 | 0.02 | 0.01 | 5 | 0 | 0.15 | 0.19 | 0.17 | 0.71 | 0.9 | 0.81 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 18 | 38 | 26 | 6 | 1 | 0.01 | 0.03 | 0.02 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 2 | 0.02 | 0.07 | 0.05 | 6 | 0 | 0.14 | 0.23 | 0.19 | 0.29 | 0.50 | 0.41 |
| **Flesh** | 7 | 0 | 0.12 | 0.70 | 0.23 | 7 | 0 | 0.014 | 0.076 | 0.045 | 7 | 7 | 0.02 | 0.02 | 0.02 | 7 | 1 | 0.01 | 0.03 | 0.02 | 7 | 0 | 0.17 | 0.28 | 0.22 | 0.83 | 1.27 | 1.03 |
| Whitefish Lake (LA-6) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 6 | 15 | 11 | 6 | 0 | 0.03 | 0.08 | 0.05 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 4 | 0.02 | 0.09 | 0.04 | 6 | 0 | 0.11 | 0.16 | 0.14 | 0.22 | 0.41 | 0.31 |
| **Flesh** | 6 | 0 | 0.08 | 0.23 | 0.13 | 6 | 0 | 0.074 | 0.3 | 0.19 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 5 | 0.01 | 0.02 | 0.01 | 6 | 0 | 0.19 | 0.23 | 0.21 | 0.85 | 1.04 | 0.92 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 17 | 36 | 26 | 6 | 0 | 0.02 | 0.03 | 0.02 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 1 | 0.02 | 0.08 | 0.04 | 6 | 0 | 0.15 | 0.22 | 0.18 | 0.32 | 0.52 | 0.40 |
| **Flesh** | 6 | 0 | 0.09 | 0.28 | 0.16 | 6 | 0 | 0.024 | 0.07 | 0.04 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 3 | 0.01 | 0.08 | 0.03 | 6 | 0 | 0.18 | 0.24 | 0.22 | 0.84 | 1.12 | 0.97 |
| Kratchowsky Lake (LA-7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 8 | 0 | 5.4 | 11 | 7.8 | 8 | 0 | 0.01 | 0.07 | 0.04 | 8 | 8 | 0.05 | 0.05 | 0.05 | 8 | 5 | 0.02 | 0.13 | 0.04 | 8 | 0 | 0.12 | 0.15 | 0.13 | 0.27 | 0.42 | 0.3 |
| **Flesh** | 8 | 0 | 0.07 | 0.15 | 0.11 | 8 | 0 | 0.067 | 0.31 | 0.15 | 8 | 8 | 0.02 | 0.02 | 0.02 | 8 | 6 | 0.01 | 0.07 | 0.02 | 8 | 0 | 0.17 | 0.23 | 0.20 | 0.75 | 1.03 | 0.89 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 7 | 0 | 6.4 | 16 | 12 | 7 | 4 | 0.01 | 0.02 | 0.01 | 7 | 7 | 0.05 | 0.05 | 0.05 | 7 | 5 | 0.02 | 0.13 | 0.04 | 7 | 0 | 0.15 | 0.2 | 0.18 | 0.34 | 0.46 | 0.42 |
| **Flesh** | 7 | 0 | 0.09 | 0.33 | 0.17 | 7 | 0 | 0.012 | 0.027 | 0.019 | 7 | 7 | 0.02 | 0.02 | 0.02 | 7 | 6 | 0.01 | 0.01 | 0.01 | 7 | 0 | 0.15 | 0.23 | 0.20 | 0.75 | 1.12 | 0.97 |
| Russell Lake (LAB) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 0 | 17 | 41 | 26 | 6 | 0 | 0.02 | 0.14 | 0.05 | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 4 | 0.02 | 0.06 | 0.03 | 6 | 0 | 0.2 | 0.27 | 0.23 | 0.39 | 0.69 | 0.52 |
| **Flesh** | 6 | 0 | 0.08 | 0.2 | 0.13 | 6 | 0 | 0.14 | 0.48 | 0.27 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 0 | 0.25 | 0.53 | 0.35 | 1.32 | 2.34 | 1.62 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 0 | 41 | 68 | 54 | 5 | 4 | 0.01 | 0.02 | 0.01 | 5 | 0 | 0.13 | 0.23 | 0.18 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 0 | 0.32 | 0.59 | 0.44 | 0.81 | 1.51 | 1.16 |
| **Flesh** | 5 | 0 | 0.16 | 0.42 | 0.24 | 5 | 0 | 0.021 | 0.043 | 0.027 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 0 | 0.33 | 0.56 | 0.44 | 1.69 | 2.15 | 2.66 |

## Table 3-10 Cont'd: Baseline Fish Tissue Chemistry Summary

| Location/ Species/ Tissue | Silver | | | | | Strontium | | | | | Thallium | | | | | Tin | | | | | Titanium | | | | | Uranium | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) |
| McGowan Lake (LA-1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 9 | 9 | 0.01 | 0.01 | 0.01 | 9 | 0 | 41 | 173 | 112 | 9 | 9 | 0.02 | 0.02 | 0.02 | 9 | 9 | 0.02 | 0.02 | 0.02 | 9 | 0 | 0.02 | 0.33 | 0.14 | 9 | 9 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 9 | 8 | 0.002 | 0.002 | 0.002 | 9 | 0 | 0.07 | 0.58 | 0.23 | 9 | 9 | 0.01 | 0.01 | 0.01 | 9 | 9 | 0.01 | 0.01 | 0.01 | 9 | 0 | 0.01 | 0.04 | 0.02 | 9 | 9 | 0.001 | 0.001 | 0.001 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 5 | 0.01 | 0.02 | 0.01 | 6 | 0 | 111 | 188 | 138 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 0.04 | 0.52 | 0.19 | 6 | 6 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 6 | 5 | 0.002 | 0.018 | 0.005 | 6 | 0 | 0.22 | 2.5 | 0.85 | 6 | | 0.01 | 0.01 | 0.01 | 6 | | 0.01 | 0.01 | 0.01 | 6 | 0 | 0.01 | 0.03 | 0.02 | 6 | 6 | 0.001 | 0.001 | 0.001 |
| Whitefish Lake (LA-5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 0 | 121 | 162 | 150 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 0 | 0.03 | 0.06 | 0.05 | 5 | 5 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 0 | 0.1 | 0.37 | 0.21 | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 4 | 0.01 | 0.04 | 0.02 | 5 | 5 | 0.001 | 0.001 | 0.001 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 0 | 87 | 211 | 149 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 0.02 | 0.25 | 0.07 | 6 | 6 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 7 | 7 | 0.002 | 0.002 | 0.002 | 7 | 0 | 0.06 | 2.5 | 0.57 | 7 | 7 | 0.01 | 0.01 | 0.01 | 7 | 7 | 0.01 | 0.01 | 0.01 | 7 | 2 | 0.01 | 0.07 | 0.02 | 7 | 6 | 0.001 | 0.006 | 0.002 |
| Whitefish Lake (LA-6) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 0 | 50 | 128 | 106 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 0.02 | 0.24 | 0.08 | 6 | 6 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 0 | 0.09 | 1.1 | 0.39 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 0 | 0.01 | 0.02 | 0.02 | 6 | 5 | 0.001 | 0.002 | 0.001 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 0 | 92 | 165 | 127 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 0.03 | 0.23 | 0.07 | 6 | 6 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 0 | 0.12 | 0.68 | 0.30 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 3 | 0.01 | 0.02 | 0.01 | 6 | 6 | 0.001 | 0.001 | 0.001 |
| Kratchowsky Lake (LA-7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 8 | 8 | 0.01 | 0.01 | 0.01 | 8 | 0 | 97 | 149 | 125 | 8 | 8 | 0.02 | 0.02 | 0.02 | 8 | 7 | 0.02 | 0.05 | 0.02 | 8 | 0 | 0.03 | 0.33 | 0.115 | 8 | 8 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 8 | 8 | 0.002 | 0.002 | 0.002 | 8 | 0 | 0.07 | 1.1 | 0.34 | 8 | 8 | 0.01 | 0.01 | 0.01 | 8 | 7 | 0.01 | 0.02 | 0.01 | 8 | 0 | 0.01 | 0.04 | 0.0225 | 8 | 8 | 0.001 | 0.001 | 0.001 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 7 | 7 | 0.01 | 0.01 | 0.01 | 7 | 0 | 67 | 172 | 128 | 7 | 7 | 0.02 | 0.02 | 0.02 | 7 | 6 | 0.02 | 0.02 | 0.02 | 7 | 1 | 0.02 | 1.7 | 0.342857143 | 7 | 7 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 7 | 7 | 0.002 | 0.002 | 0.002 | 7 | 0 | 0.14 | 0.61 | 0.29 | 7 | 7 | 0.01 | 0.01 | 0.01 | 7 | 7 | 0.01 | 0.01 | 0.01 | 7 | 2 | 0.01 | 0.02 | 0.012857143 | 7 | 7 | 0.001 | 0.001 | 0.001 |
| Russell Lake (LAB) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 0 | 39 | 100 | 72 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 0.02 | 0.46 | 0.148333333 | 6 | 6 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 0 | 0.04 | 0.43 | 0.15 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 6 | 0.01 | 0.01 | 0.01 | 6 | 4 | 0.01 | 0.02 | 0.013333333 | 6 | 6 | 0.001 | 0.001 | 0.001 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 0 | 40 | 75 | 63 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 0 | 0.03 | 0.11 | 0.062 | 5 | 4 | 0.01 | 0.01 | 0.01 |
| **Flesh** | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 0 | 0.05 | 0.33 | 0.14 | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 5 | 0.01 | 0.01 | 0.01 | 5 | 3 | 0.01 | 0.02 | 0.012 | 5 | 5 | 0.001 | 0.001 | 0.001 |

## Table 3-10 Cont'd: Baseline Fish Tissue Chemistry Summary

| Location/ Species/ Tissue | Vanadium | | | | | Zinc | | | | | Lead-210 | | | | | Polonium-210 | | | | | Radium-226 | | | | | Thorium-230 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (ug/g) | Max (ug/g) | Average (ug/g) | n | #DL | Min (Bq/g) | Max (Bq/g) | Mean (Bq/g) | n | #DL | Min (Bq/g) | Max (Bq/g) | Mean (Bq/g) | n | #DL | Min (Bq/g) | Max (Bq/g) | Mean (Bq/g) | n | #DL | Min (Bq/g) | Max (Bq/g) | Mean (Bq/g) |
| McGowan Lake (LA-1) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 9 | 9 | 0.05 | 0.05 | 0.05 | 9 | 0 | 32 | 64 | 48 | 9 | 9 | 0.002 | 0.002 | 0.002 | 9 | 2 | 0.0005 | 0.001 | 0.0007 | 9 | 9 | 0.0007 | 0.001 | 0.0009 | 9 | 9 | 0.001 | 0.003 | 0.002 |
| **Flesh** | 9 | 9 | 0.02 | 0.02 | 0.02 | 9 | 0 | 3.5 | 9.7 | 6.5 | 9 | 8 | 0.001 | 0.001 | 0.001 | 9 | 1 | 0.0002 | 0.0015 | 0.0008 | 5 | 4 | 0.00006 | 0.0002 | 0.0001 | 5 | 5 | 0.0001 | 0.0004 | 0.00022 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 0 | 16 | 21 | 19 | 6 | 5 | 0.002 | 0.007 | 0.003 | 6 | 0 | 0.001 | 0.004 | 0.003 | 6 | 6 | 0.0009 | 0.001 | 0.001 | 6 | 6 | 0.002 | 0.002 | 0.002 |
| **Flesh** | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 3.6 | 4.9 | 4.2 | 6 | 5 | 0.001 | 0.001 | 0.001 | 6 | 0 | 0.0006 | 0.0015 | 0.001 | 5 | 5 | 0.00008 | 0.0002 | 0.0001 | 5 | 5 | 0.0002 | 0.0003 | 0.00022 |
| Whitefish Lake (LA-5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 5 | 0.05 | 0.05 | 0.05 | 5 | 0 | 30 | 54 | 39 | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 1 | 0.0005 | 0.003 | 0.0012 | 5 | 4 | 0.0008 | 0.002 | 0.001 | 5 | 5 | 0.002 | 0.002 | 0.002 |
| **Flesh** | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 0 | 3.1 | 4.4 | 3.6 | 5 | 5 | 0.001 | 0.001 | 0.001 | 5 | 0 | 0.0002 | 0.0021 | 0.0007 | 5 | 5 | 0.00006 | 0.0002 | 0.0001 | 5 | 5 | 0.0001 | 0.0002 | 0.0001 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 0 | 15 | 33 | 23 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 0 | 0.001 | 0.003 | 0.002 | 6 | 5 | 0.0008 | 0.001 | 0.001 | 6 | 6 | 0.002 | 0.002 | 0.002 |
| **Flesh** | 7 | 7 | 0.02 | 0.02 | 0.02 | 7 | 0 | 2.8 | 6.5 | 4.5 | 7 | 7 | 0.001 | 0.001 | 0.001 | 7 | 0 | 0.0006 | 0.0016 | 0.001 | 6 | 6 | 0.00006 | 0.00009 | 0.00008 | 6 | 6 | 0.0001 | 0.0002 | 0.0002 |
| Whitefish Lake (LA-6) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 0 | 34 | 56 | 42 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 1 | 0.0005 | 0.002 | 0.001 | 6 | 6 | 0.0009 | 0.001 | 0.001 | 6 | 6 | 0.002 | 0.003 | 0.002 |
| **Flesh** | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 3.1 | 4.6 | 4.0 | 6 | 6 | 0.001 | 0.001 | 0.001 | 6 | 0 | 0.0006 | 0.0026 | 0.001 | 5 | 5 | 0.00006 | 0.00009 | 0.00007 | 5 | 4 | 0.0001 | 0.0002 | 0.0002 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 0 | 16 | 22 | 19 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 0 | 0.002 | 0.004 | 0.003 | 6 | 6 | 0.0008 | 0.001 | 0.001 | 6 | 5 | 0.002 | 0.003 | 0.002 |
| **Flesh** | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 3 | 4.3 | 3.6 | 6 | 6 | 0.001 | 0.001 | 0.001 | 6 | 0 | 0.0008 | 0.0018 | 0.001 | 5 | 5 | 0.00006 | 0.0001 | 0.00008 | 5 | 5 | 0.0001 | 0.0002 | 0.0002 |
| Kratchowsky Lake (LA-7) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 8 | 8 | 0.05 | 0.05 | 0.05 | 8 | 0 | 31 | 85 | 54 | 8 | 7 | 0.002 | 0.002 | 0.002 | 8 | 1 | 0.0005 | 0.002 | 0.0009 | 8 | 6 | 0.0006 | 0.003 | 0.001 | 8 | 8 | 0.001 | 0.003 | 0.002 |
| **Flesh** | 8 | 8 | 0.02 | 0.02 | 0.02 | 8 | 0 | 4.2 | 7.4 | 5.5 | 8 | 8 | 0.001 | 0.001 | 0.001 | 8 | 0 | 0.0006 | 0.0015 | 0.001 | 5 | 5 | 0.00007 | 0.0002 | 0.0001 | 5 | 5 | 0.0001 | 0.0003 | 0.0002 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 7 | 7 | 0.05 | 0.05 | 0.05 | 7 | 0 | 11 | 22 | 18 | 7 | 6 | 0.002 | 0.005 | 0.002 | 7 | 0 | 0.001 | 0.007 | 0.004 | 7 | 6 | 0.0009 | 0.001 | 0.0010 | 7 | 7 | 0.002 | 0.002 | 0.002 |
| **Flesh** | 7 | 7 | 0.02 | 0.02 | 0.02 | 7 | 0 | 2.7 | 5.8 | 4.0 | 7 | 7 | 0.001 | 0.002 | 0.001 | 7 | 0 | 0.0008 | 0.0025 | 0.002 | 5 | 5 | 0.00007 | 0.00008 | 0.00008 | 5 | 5 | 0.0001 | 0.0002 | 0.0002 |
| Russell Lake (LAB) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Northern Pike | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 6 | 6 | 0.05 | 0.05 | 0.05 | 6 | 0 | 31 | 75 | 54 | 6 | 6 | 0.002 | 0.002 | 0.002 | 6 | 0 | 0.0005 | 0.001 | 0.0008 | 6 | 6 | 0.0007 | 0.001 | 0.0010 | 6 | 6 | 0.001 | 0.003 | 0.002 |
| **Flesh** | 6 | 6 | 0.02 | 0.02 | 0.02 | 6 | 0 | 3.7 | 9.8 | 6.1 | 6 | 6 | 0.001 | 0.001 | 0.001 | 6 | 0 | 0.001 | 0.003 | 0.002 | 5 | 4 | 0.00003 | 0.001 | 0.0002 | 5 | 5 | 0.00006 | 0.0002 | 0.0001 |
| White Sucker | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Bone** | 5 | 5 | 0.05 | 0.05 | 0.05 | 5 | 0 | 16 | 26 | 22 | 5 | 5 | 0.002 | 0.002 | 0.002 | 5 | 1 | 0.0005 | 0.005 | 0.003 | 5 | 5 | 0.0008 | 0.001 | 0.0009 | 5 | 5 | 0.002 | 0.002 | 0.002 |
| **Flesh** | 5 | 5 | 0.02 | 0.02 | 0.02 | 5 | 0 | 3 | 3.9 | 3.4 | 5 | 4 | 0.001 | 0.001 | 0.001 | 5 | 0 | 0.0008 | 0.0021 | 0.001 | 4 | 3 | 0.00007 | 0.0004 | 0.0002 | 4 | 4 | 0.0001 | 0.0002 | 0.0002 |

**Notes:**

Results are presented on a wet weight basis, except where indicated otherwise.

Dry weight selenium concentrations in fish flesh and bone were calculated from wet weight concentrations for individual samples, as follows: ww concentration*(100/(100-% moisture content))

Health Canada (2007) human health standard applied to commercially-sold fish 0.5 µg/g ww

BC MOE (2014) guideline 4 µg/g dw and US EPA (2016) criterion of 11.3 µg/g dw for selenium in fish muscle

## Figures

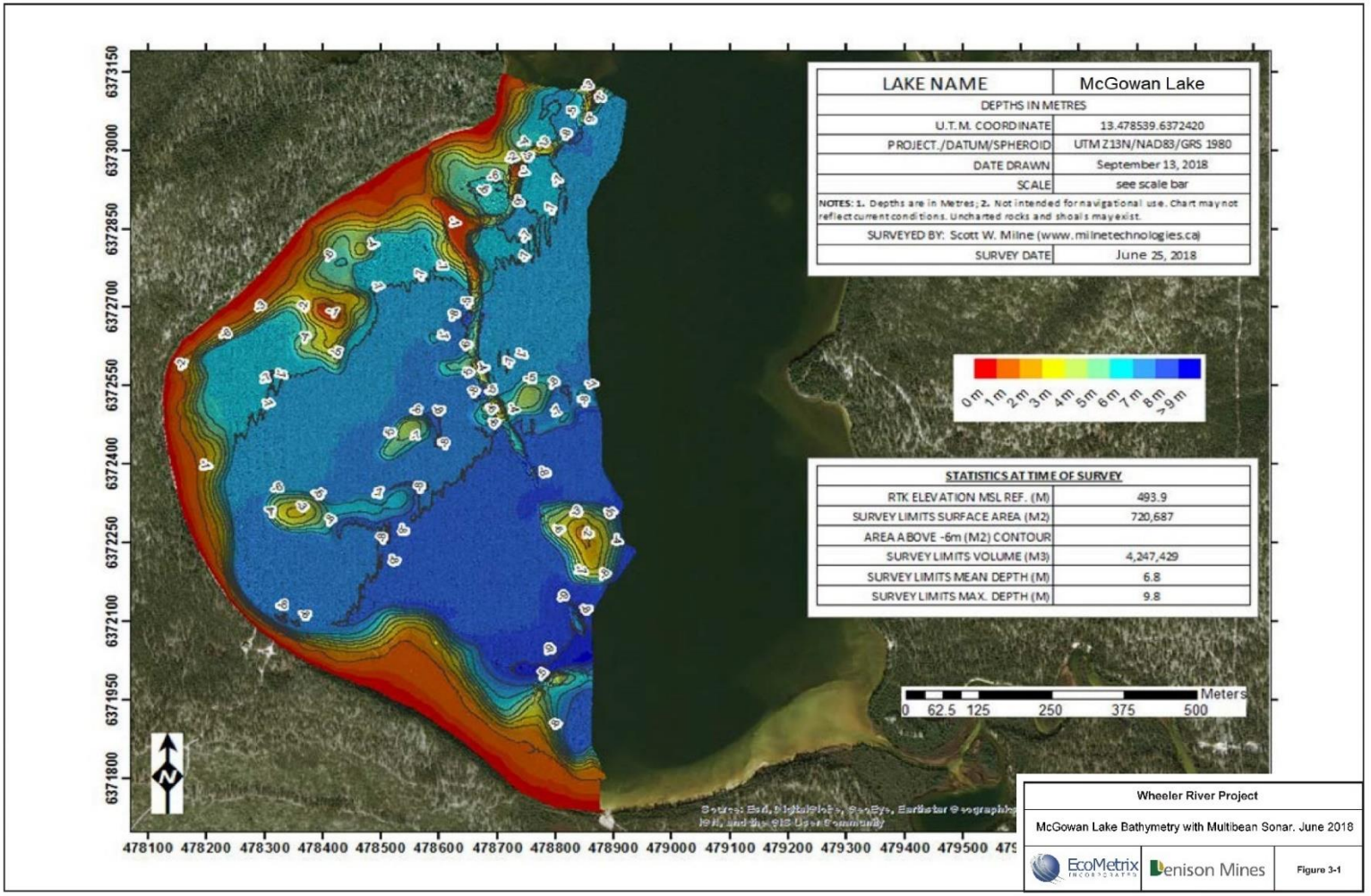



**Figure 3-1: McGowan Lake Bathymetry Characterized with Multibeam Sonar, June 2018**

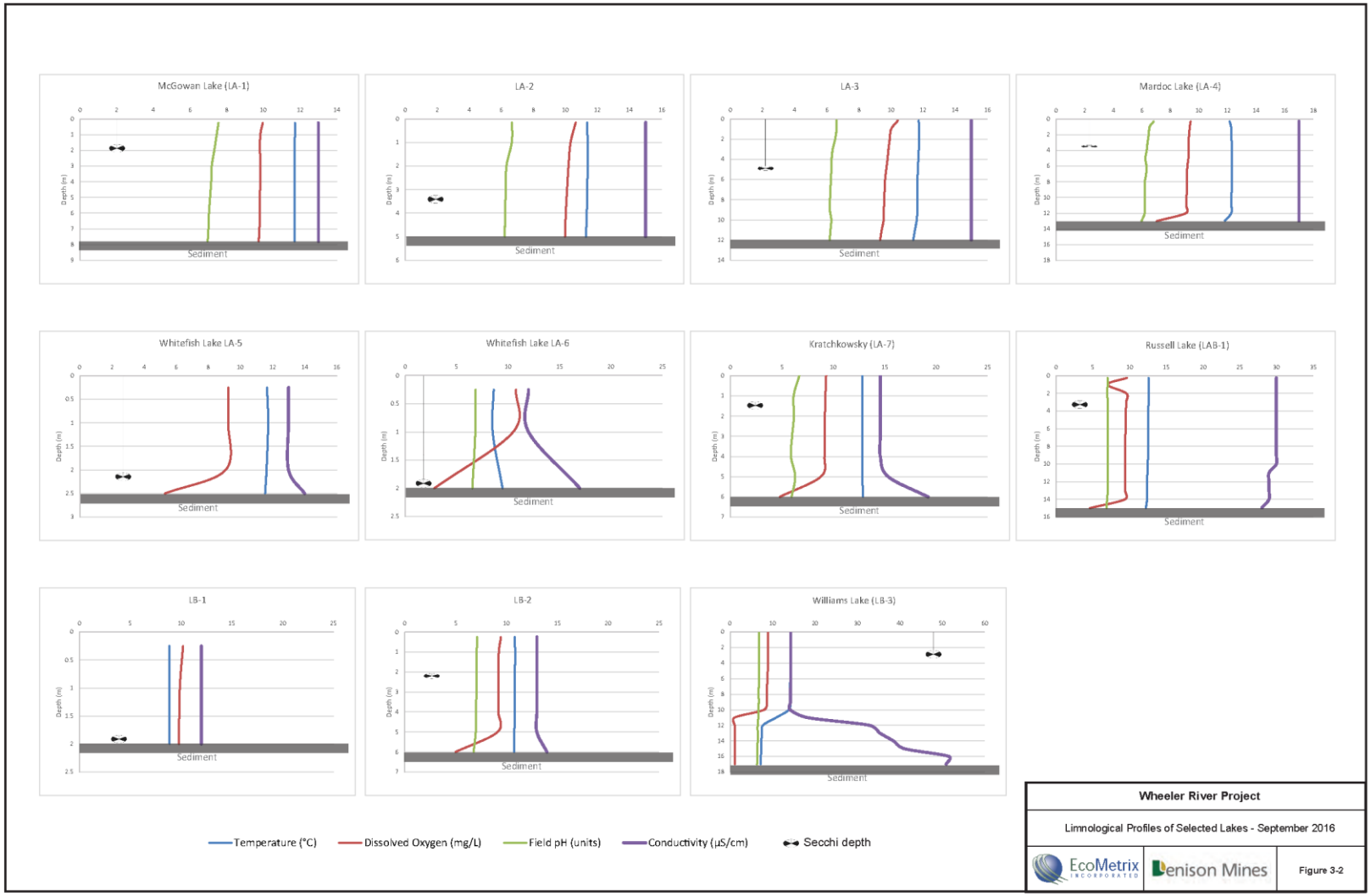



**Figure 3-2: Limnological Profiles of Selected Lakes – September 2016. Coordinates of each sampling location is shown in Table A2.**

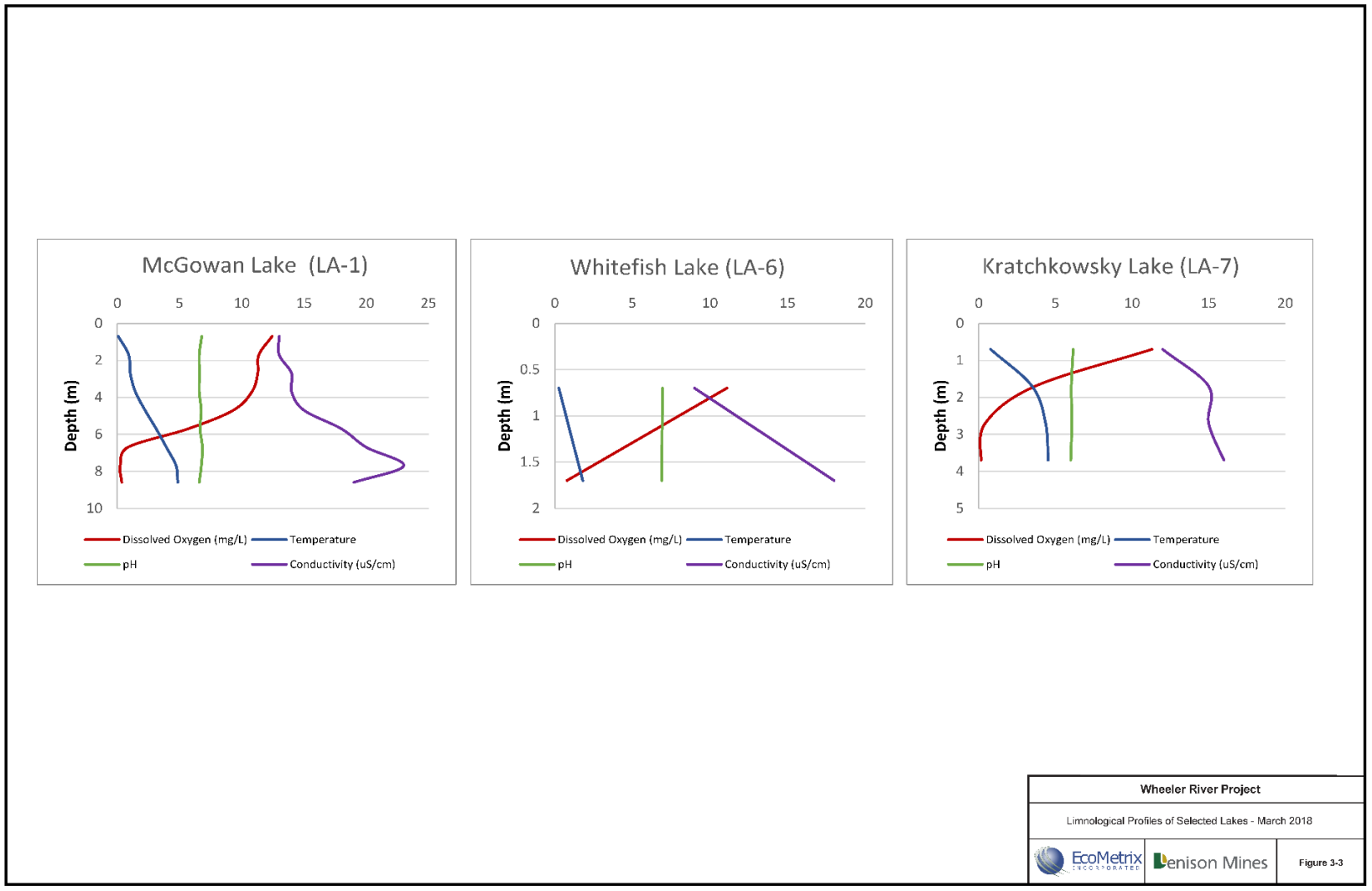



**Figure 3-3: Limnological Profiles of Selected Lakes – March 2018. Coordinates of each sampling location is shown in Table A2.**

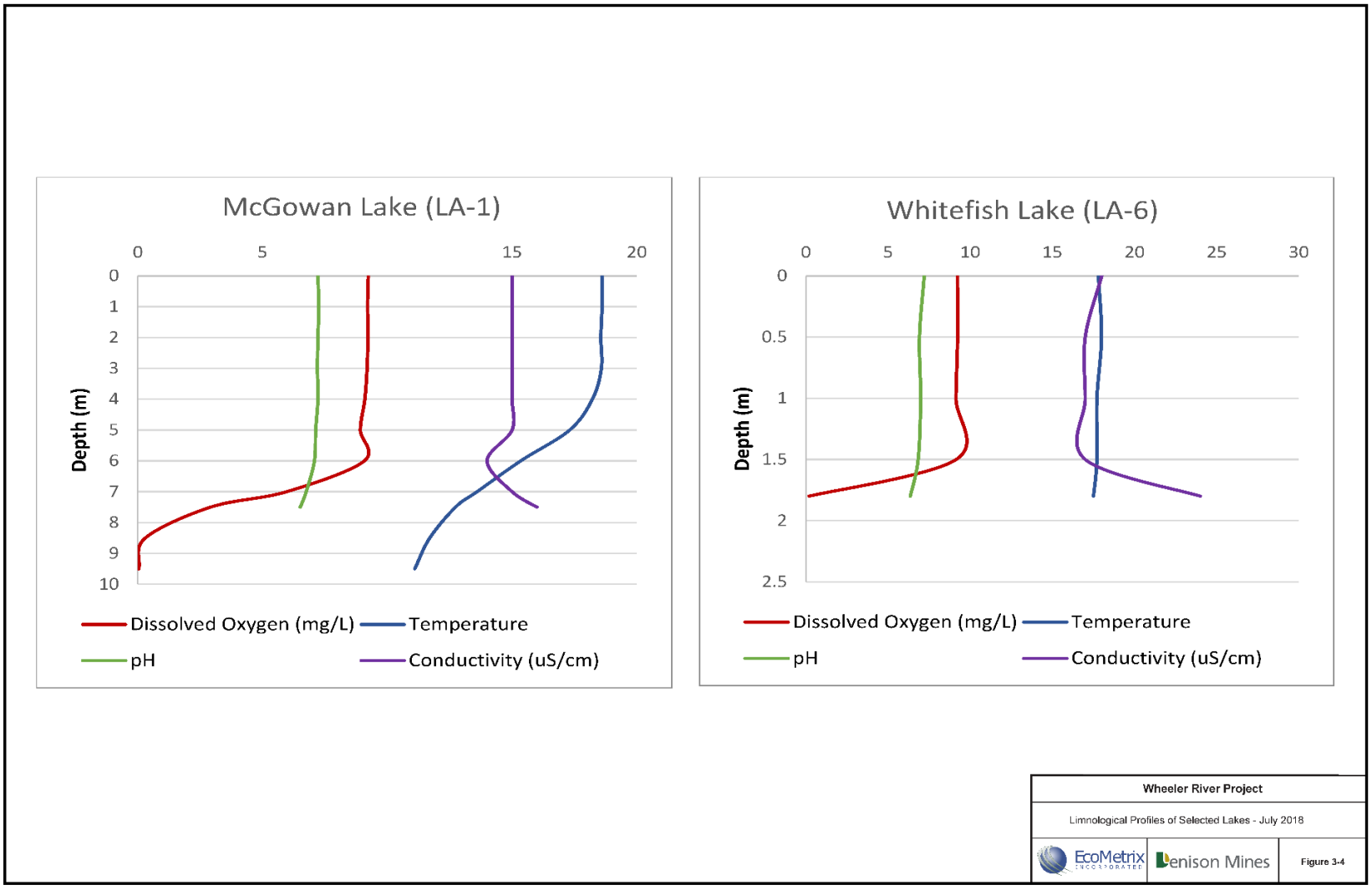



**Figure 3-4: Limnological Profiles of Selected Lakes – July 2018. Coordinates of each sampling location is shown in Table A2.**

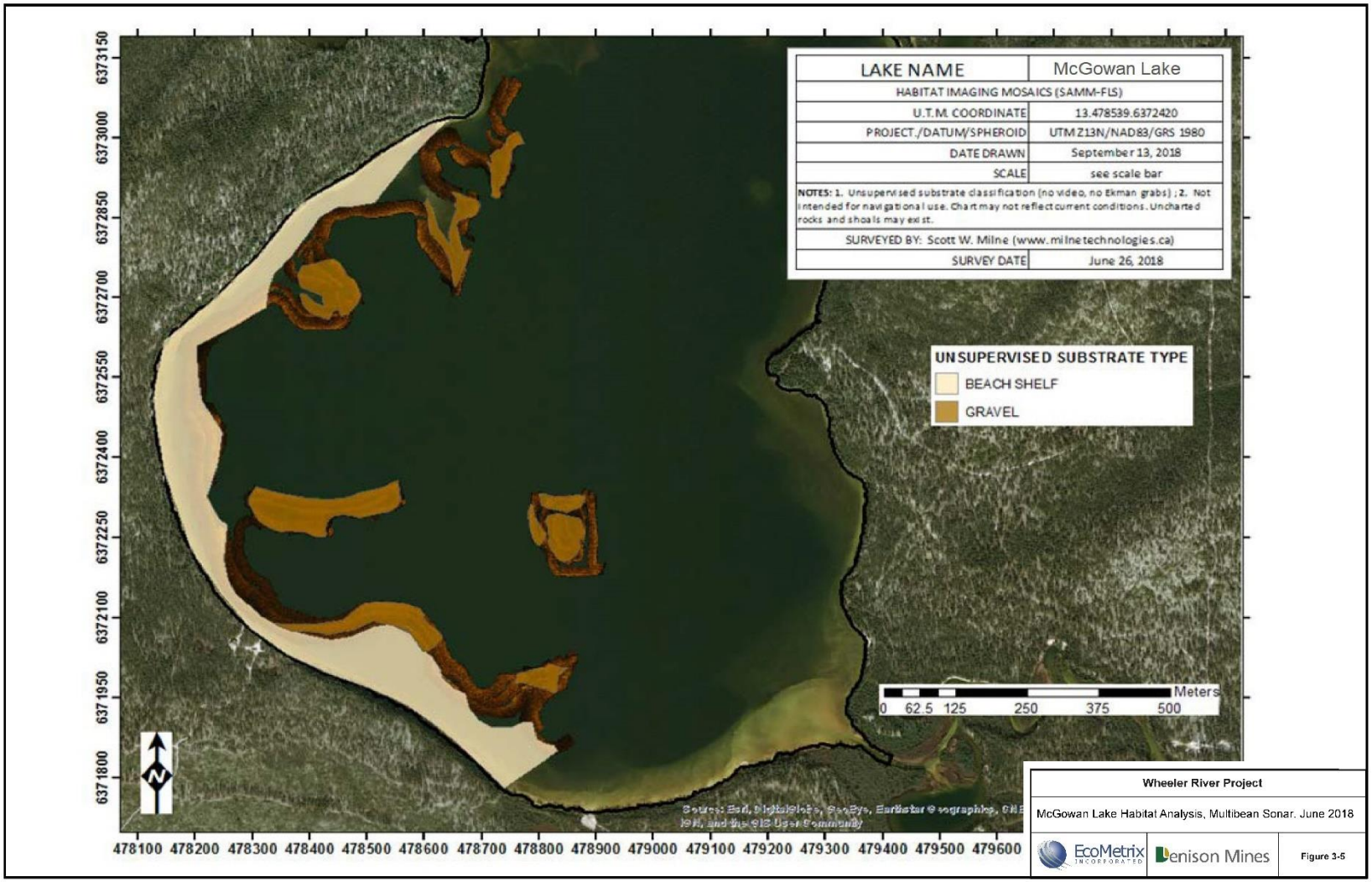



**Figure 3-5: McGowan Lake Habitat Characterized with Multibeam Sonar, June 2018**

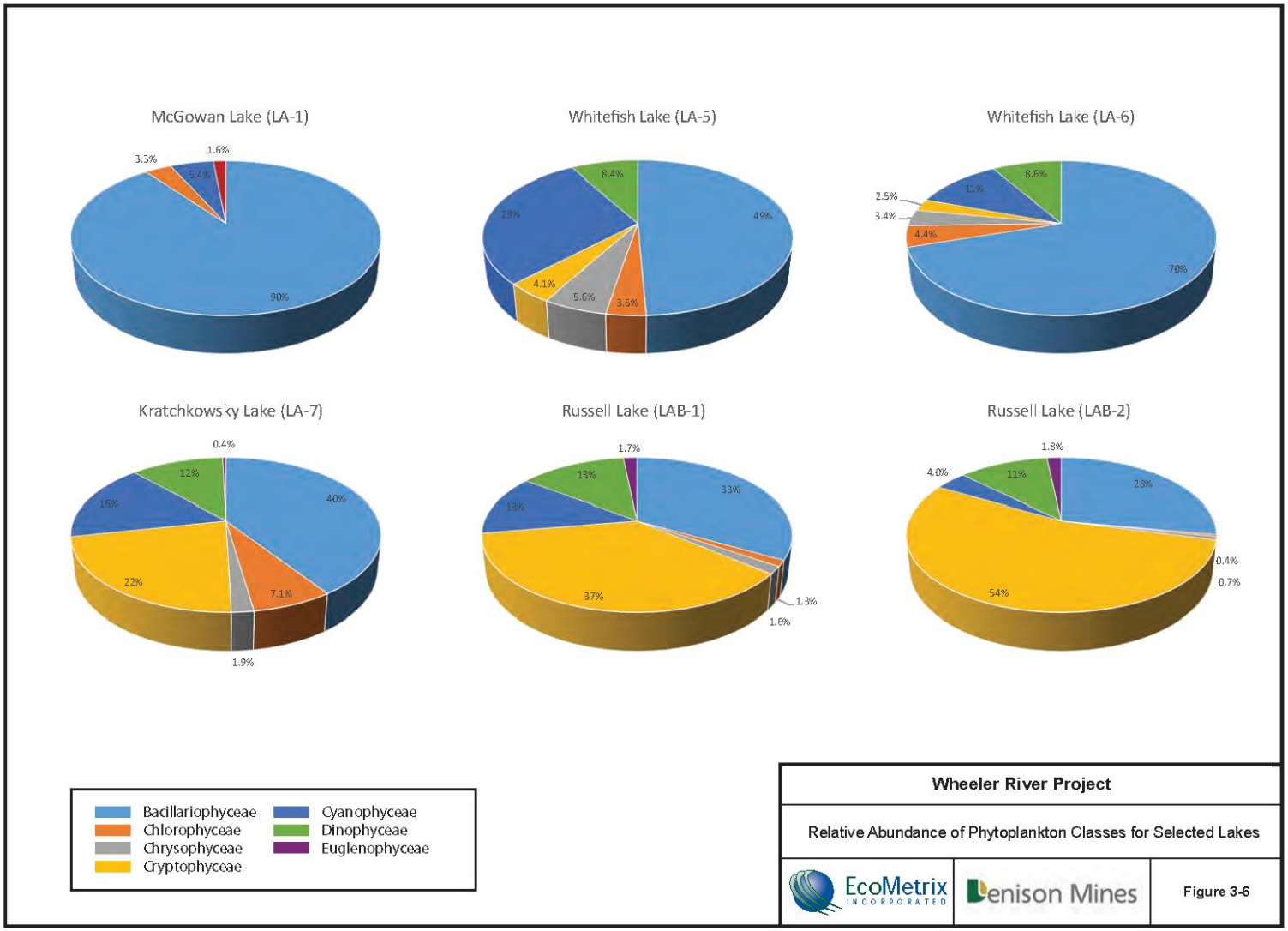



**Figure 3-6: Relative Abundance of Phytoplankton Classes for Selected Lakes**

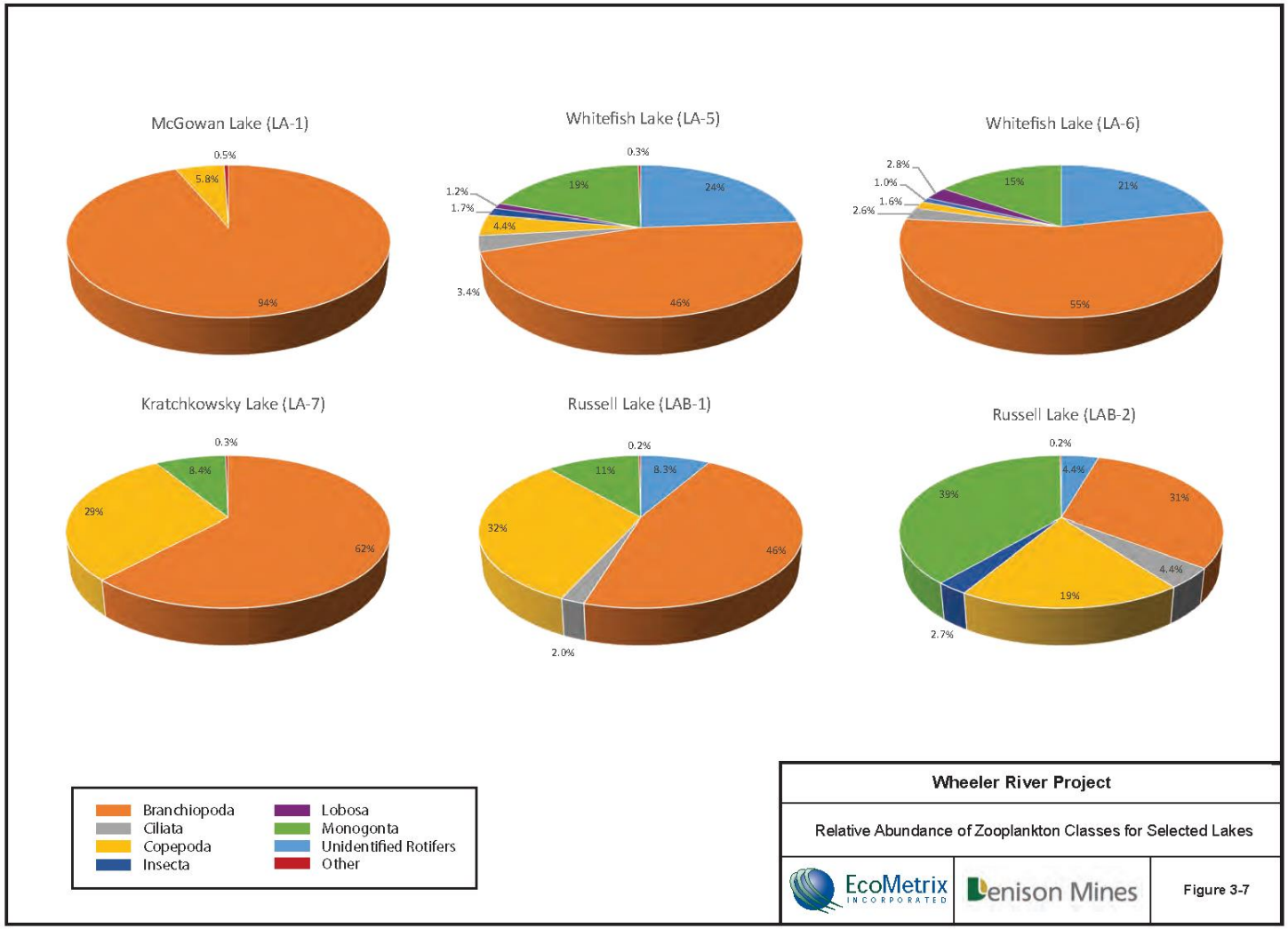



**Figure 3-7: Relative Abundance of Zooplankton Classes for Selected Lakes**

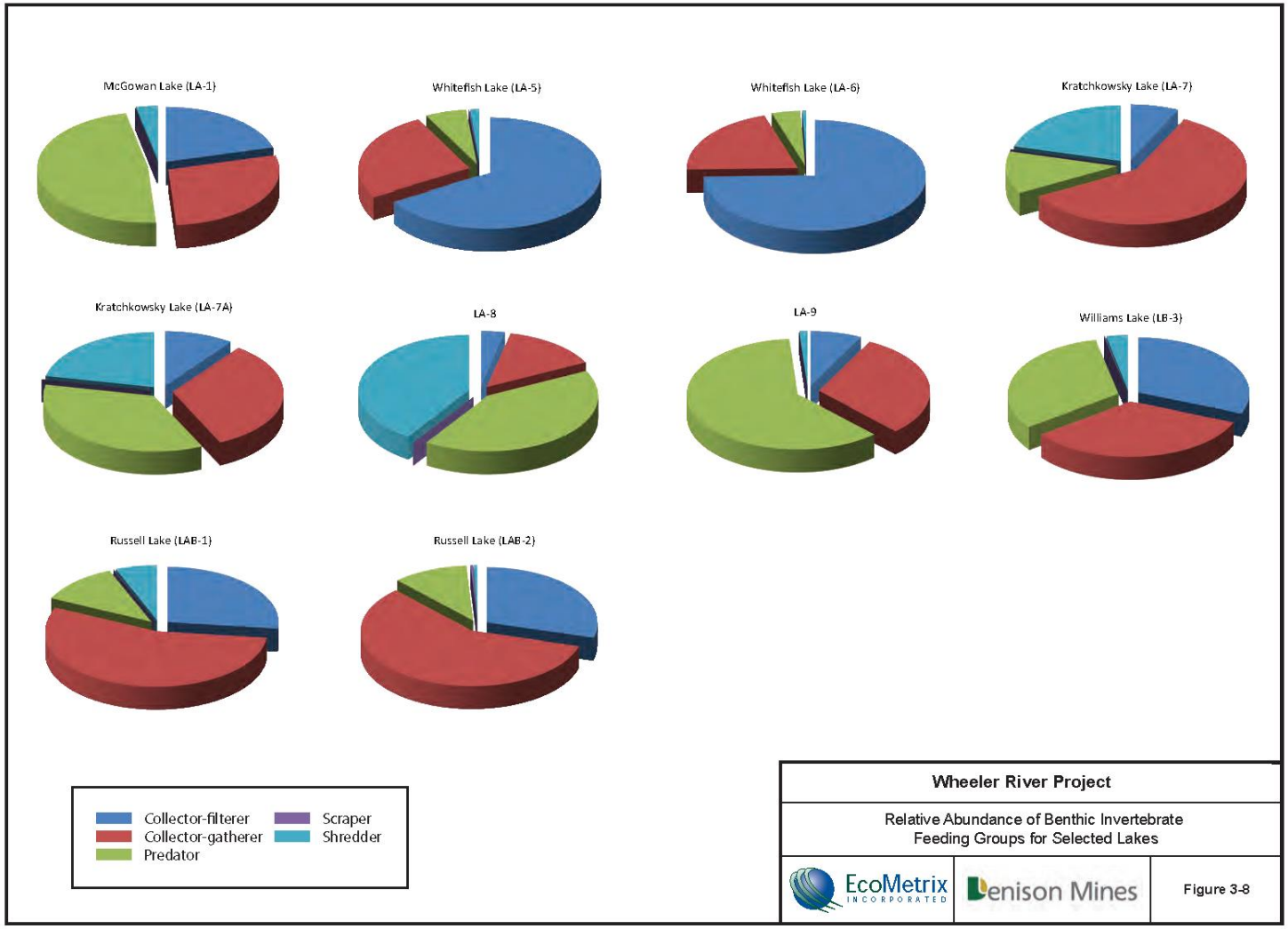



**Figure 3-8: Relative Abundance of Benthic Invertebrate Feeding Groups for Selected Lakes**

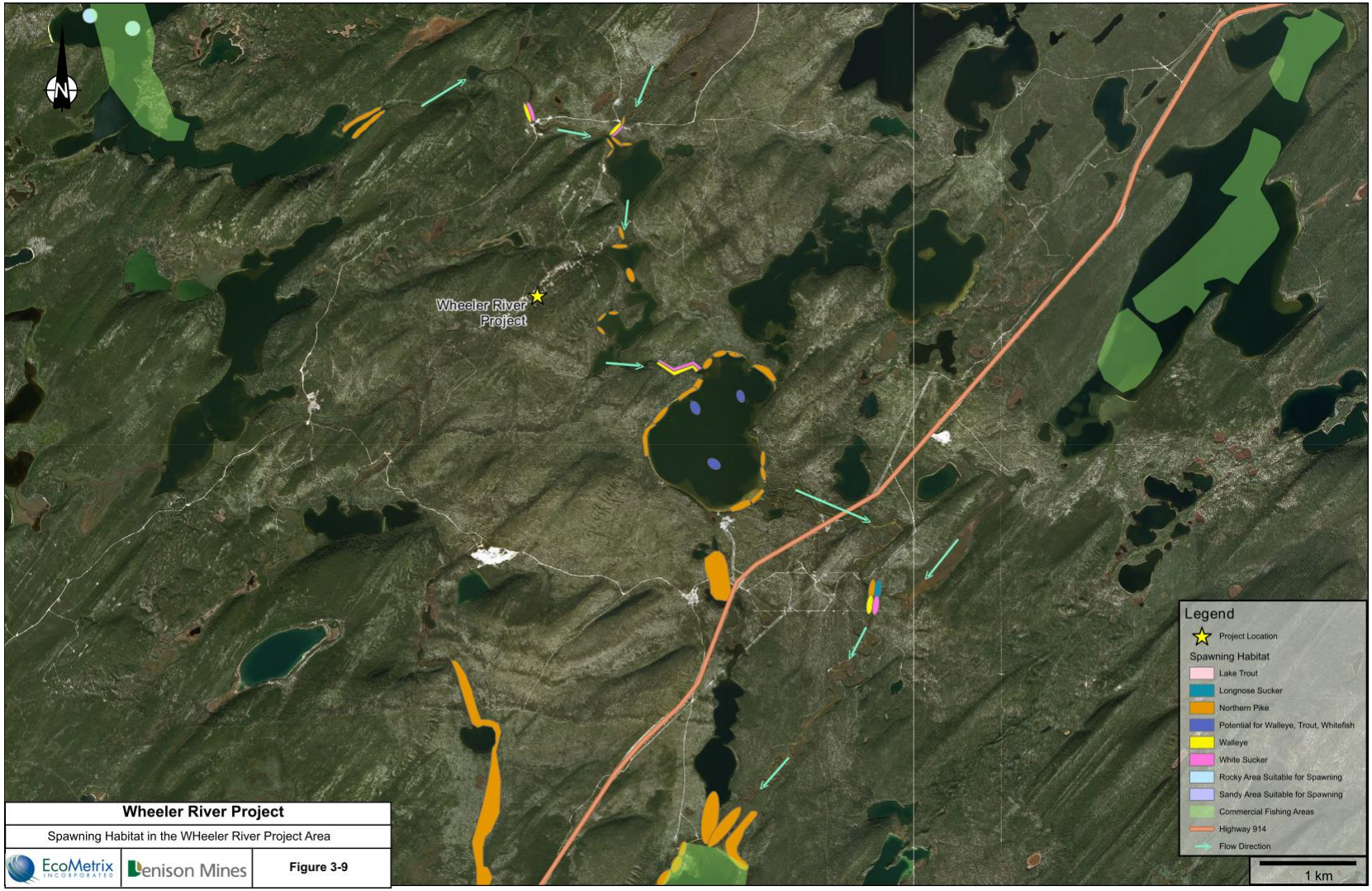



**Figure 3-9 Fish Spawning Area at the Wheeler River Project Area**

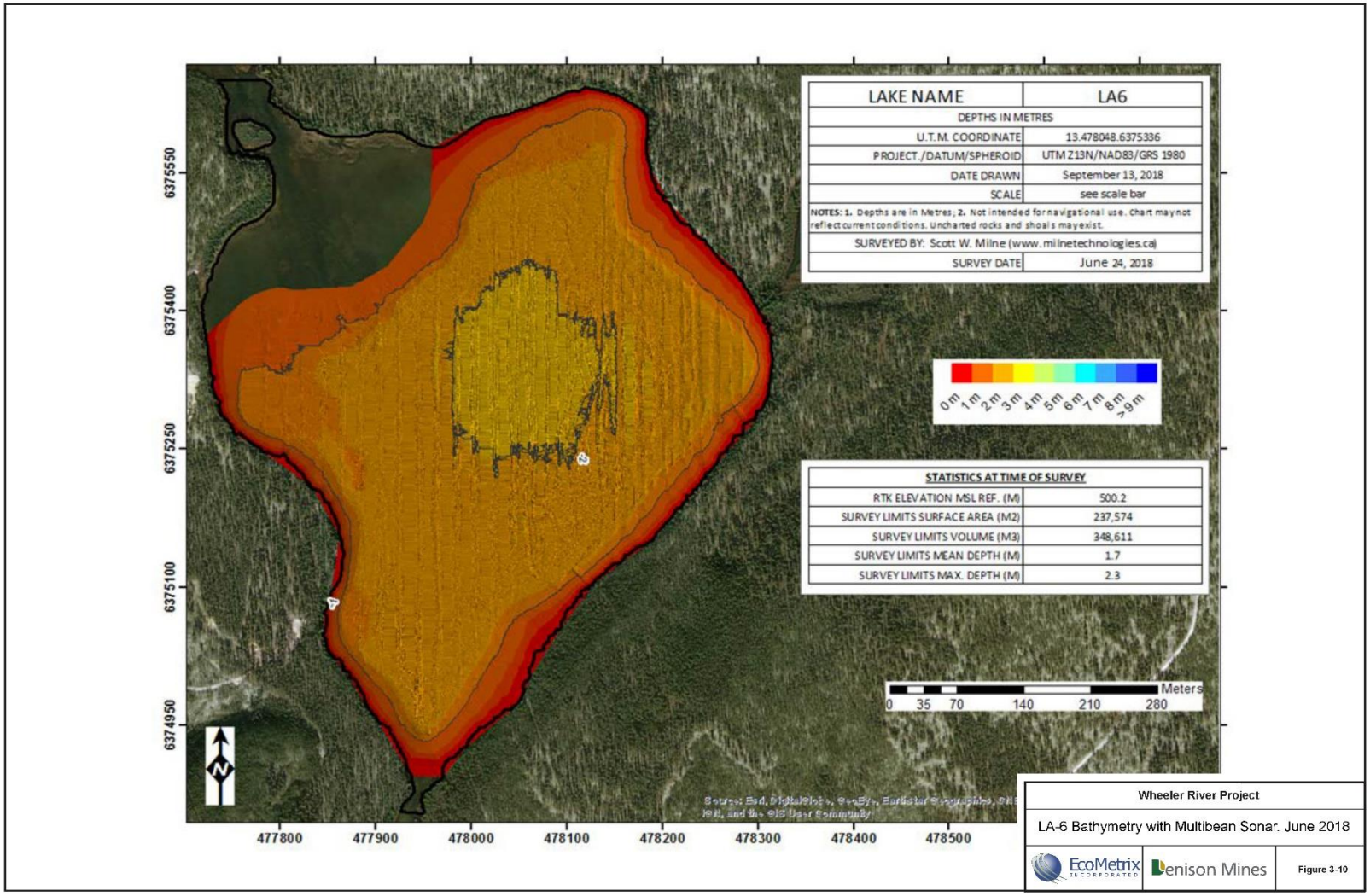



**Figure 3-10: Whitefish Lake, North Basin (LA-6) Bathymetry Characterized with Multibeam Sonar, June 2018**

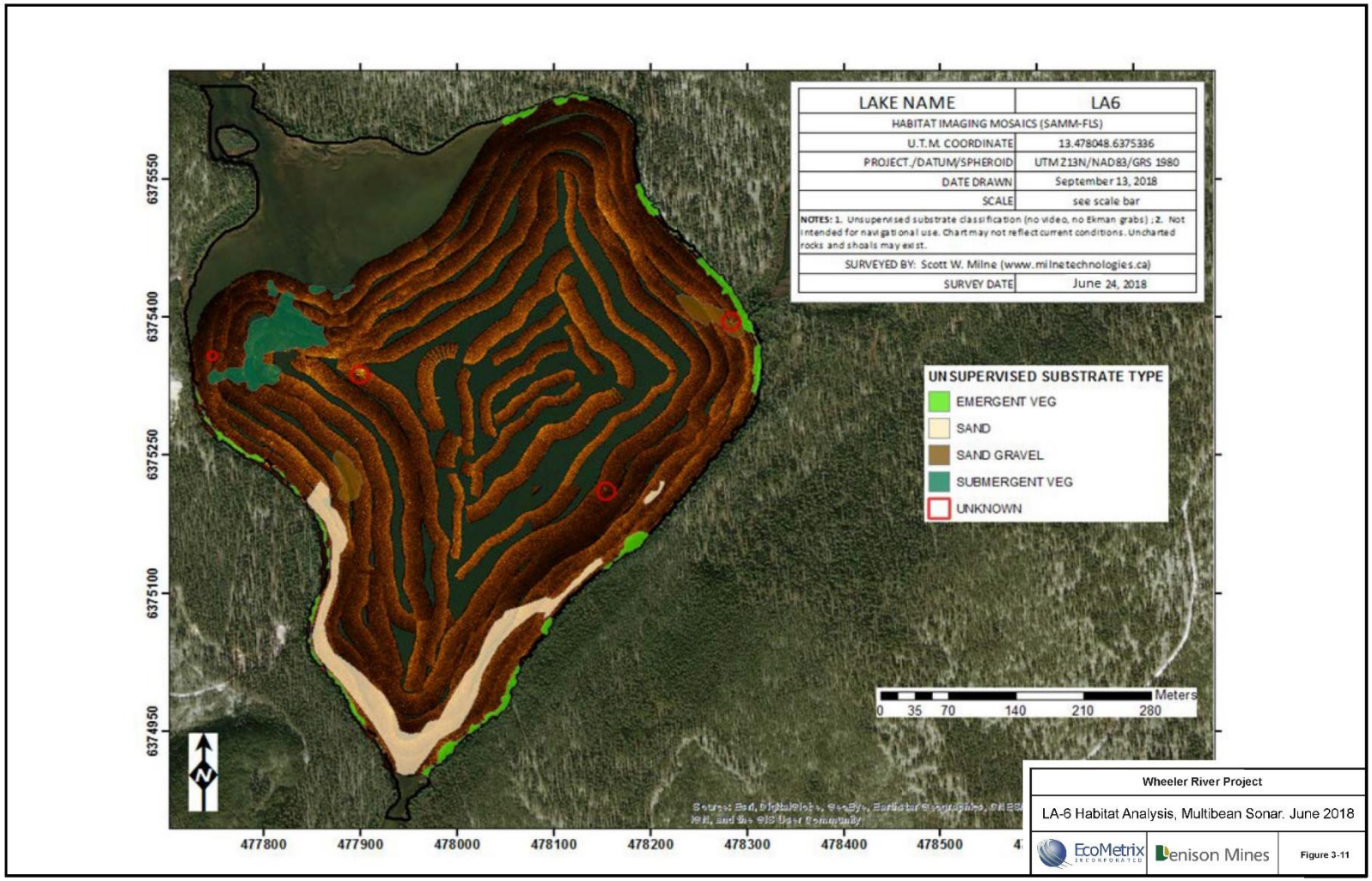



**Figure 3-11: Whitefish Lake, North Basin (LA-6) Habitat Characterized with Multibeam Sonar, June 2018**

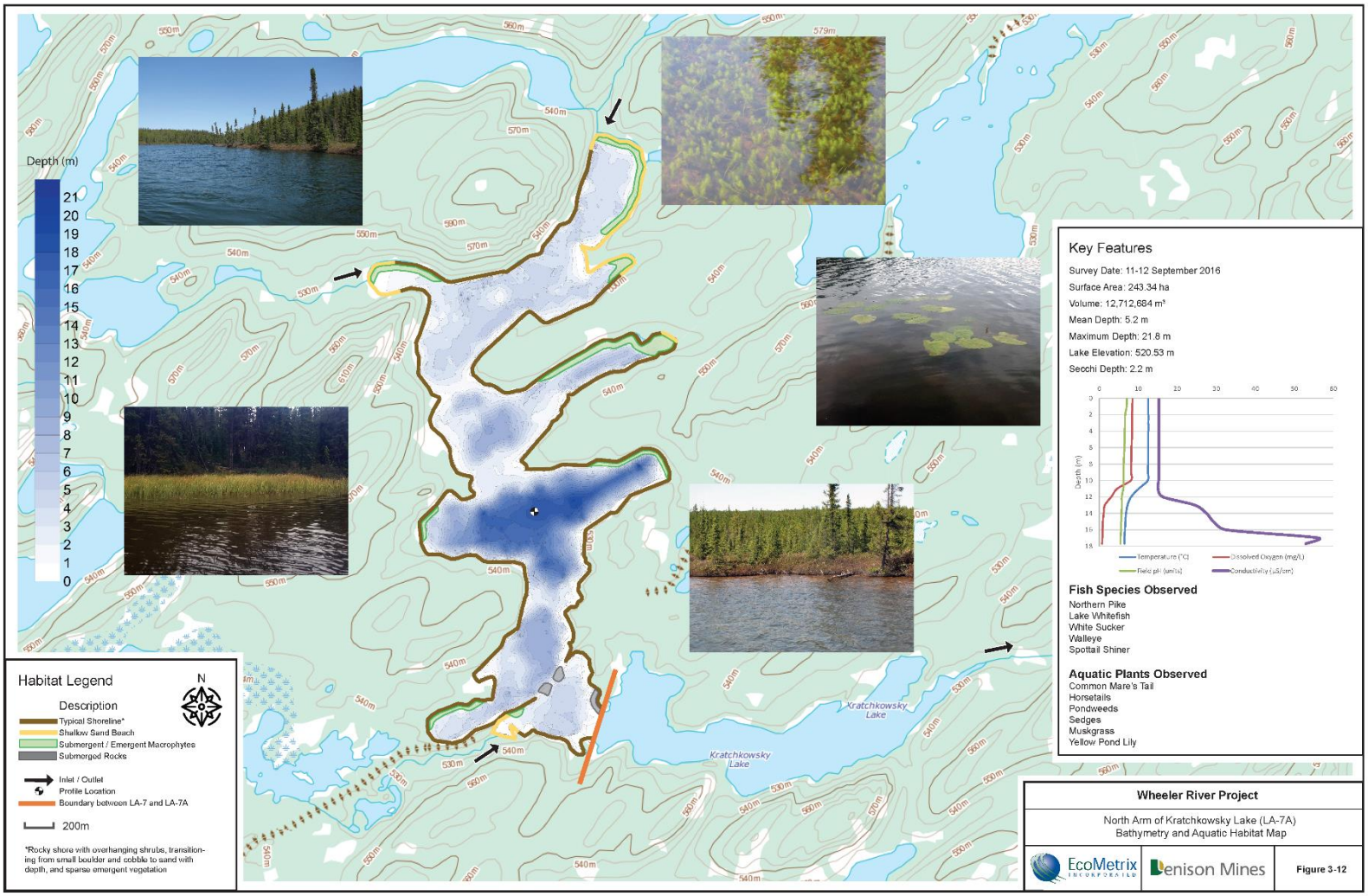



**Figure 3-12: North Arm of Kratchkowsky Lake (LA-7A) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake.**

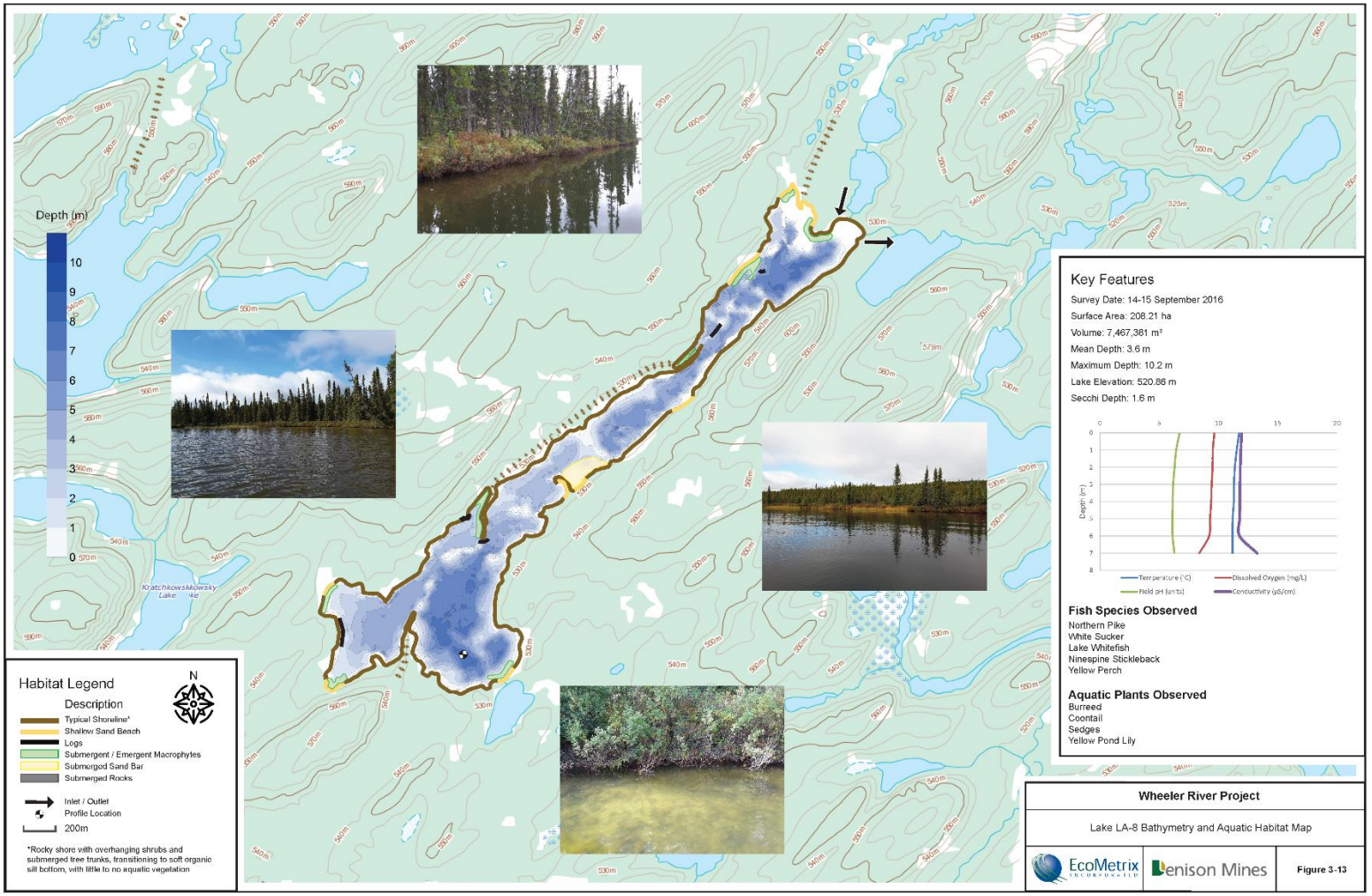



**Figure 3-13: Lake LA-8 Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake.**

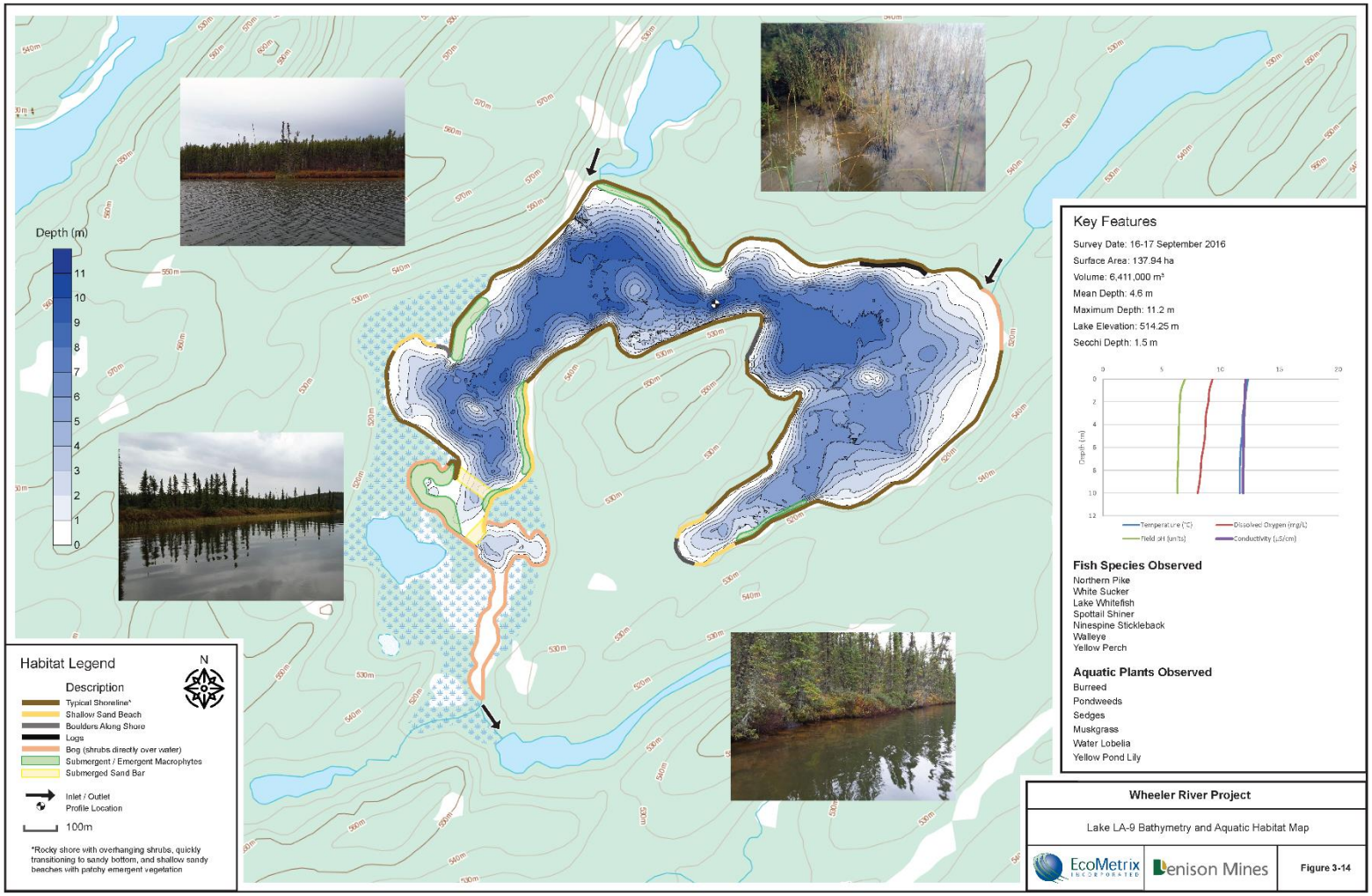



**Figure 3-14: Lake LA-9 Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake.**

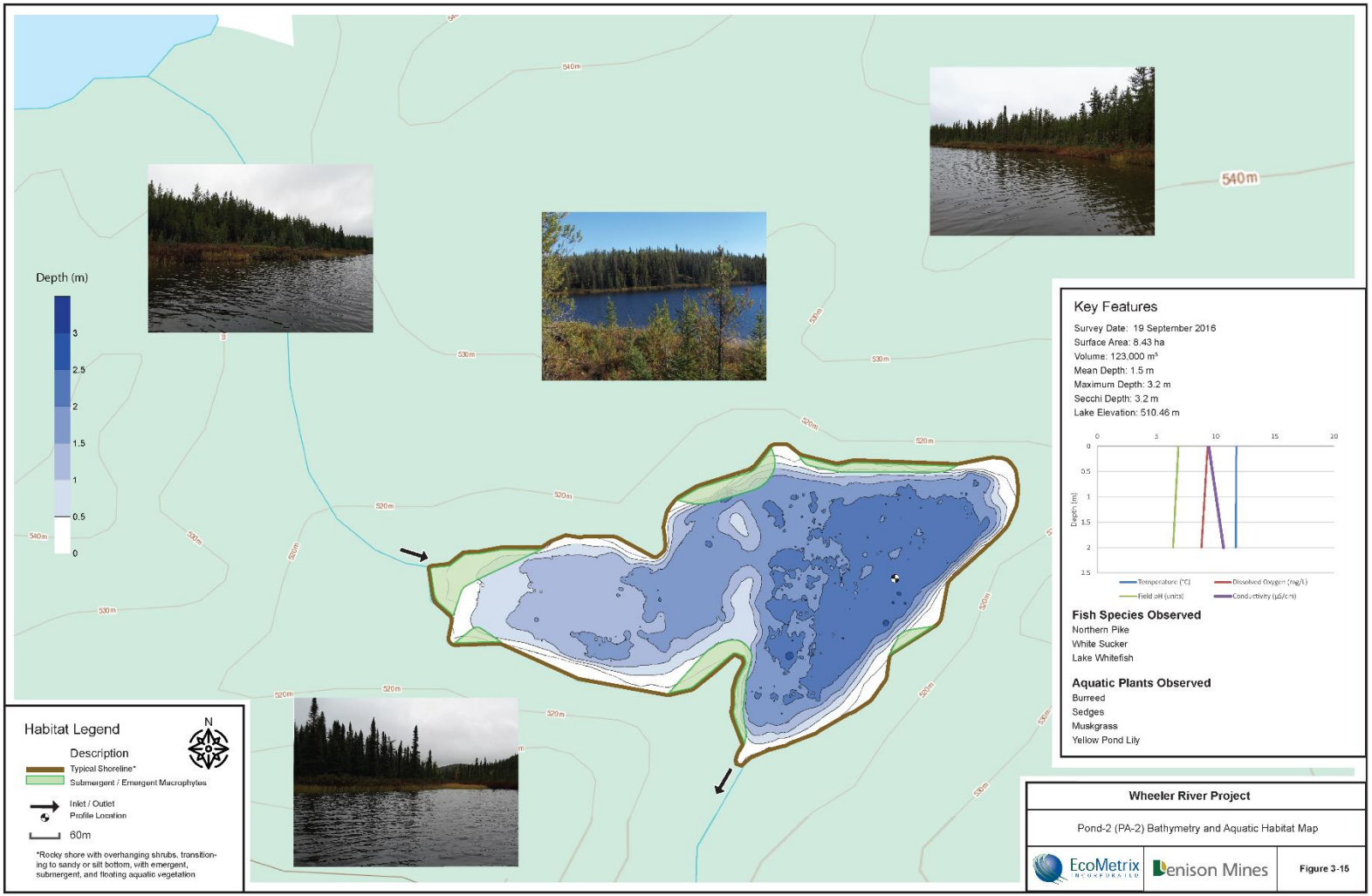



**Figure 3-15: Pond-(PA-2) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake.**

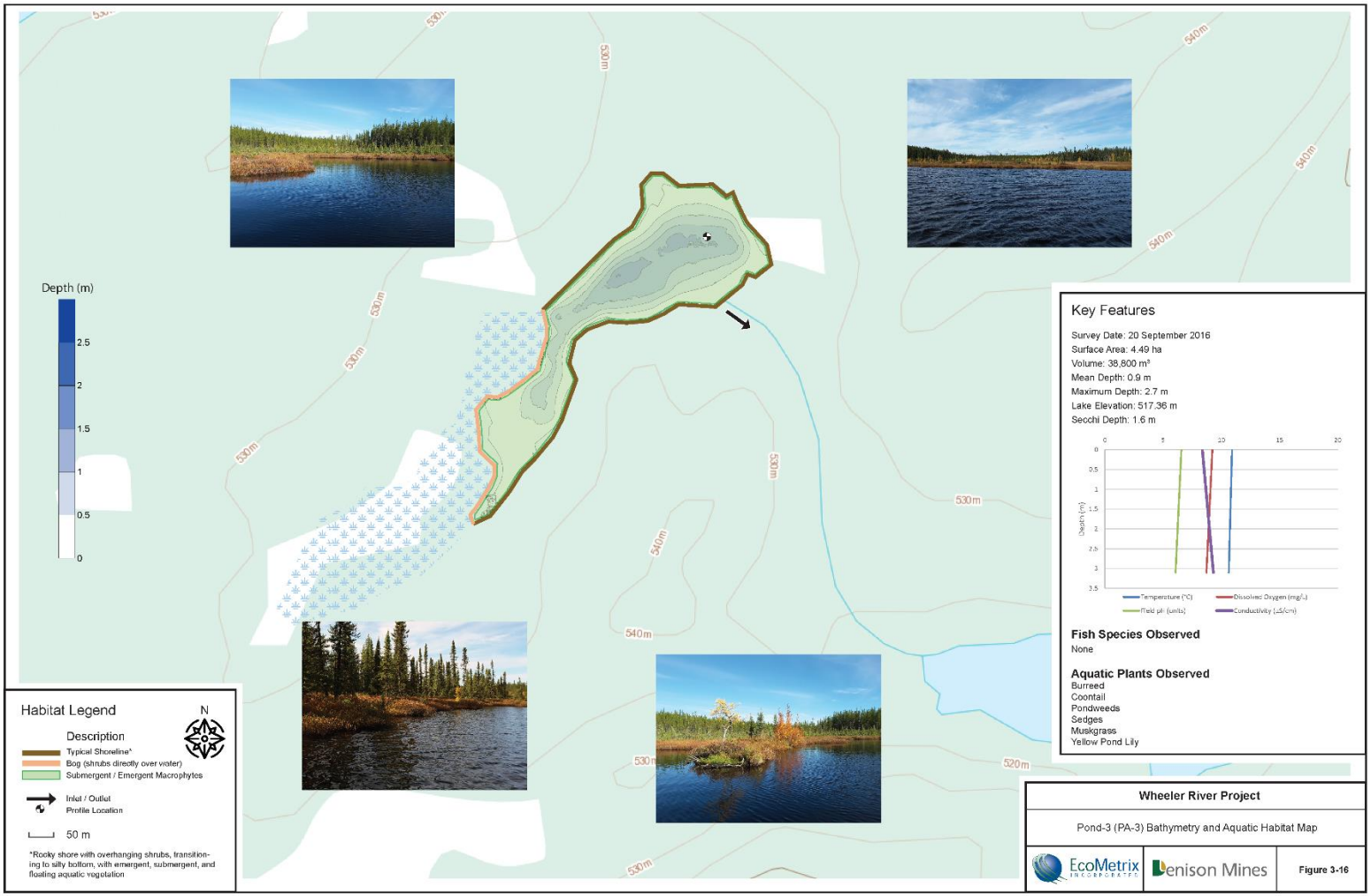



**Figure 3-16: Pond (PA-3) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake.**

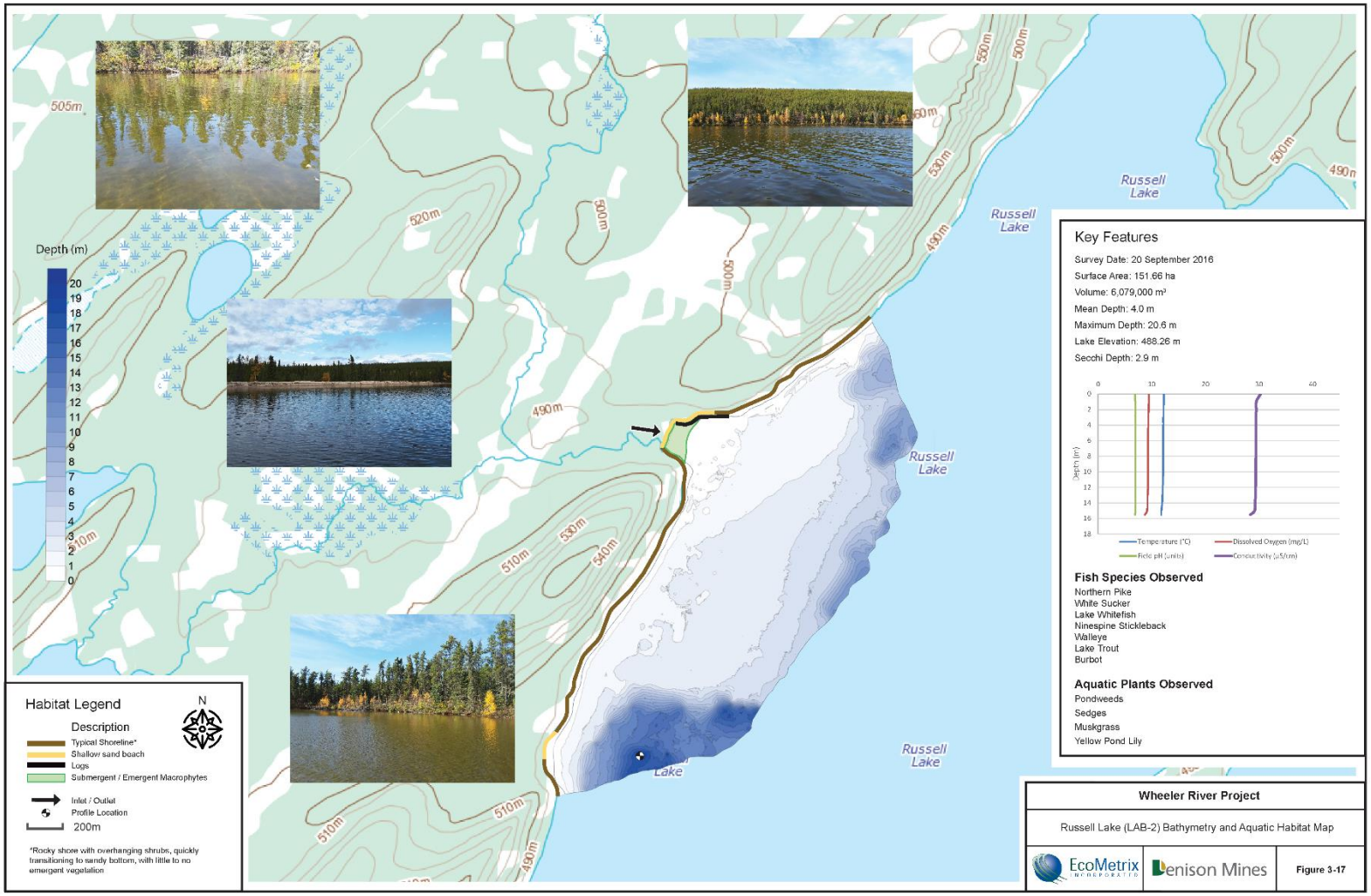



**Figure 3-17: Russell Lake (LAB-2) Bathymetry and Aquatic Habitat Map. Typical shorelines are depicted with photographs taken within the vicinity of the Lake.**

# 4.0 STREAM ASSESSMENT RESULTS

Results of the EcoMetrix aquatic baseline survey at stream monitoring locations are presented for the two principal watersheds. **Figure 1-2** displays the watersheds as defined for the baseline studies.

The Icelander River drainage flows in a southerly direction, discharging into the northwest portion of Russell Lake. Three sub-basins of the Icelander River are included in the study area. The northern sub-basin includes stream monitoring stations SA-5, SA-9 and SA-10, and the western sub-basin includes stations SA-4, SA-7, SA-8, SA-11 and RC-1. These two sub-basins are combined at SA-2 and SA-6. The eastern sub-basin includes station SA-3. All three sub-basins join at SA-1, upstream of Russell Lake.

The William Lake drainage, is situated to the southwest of the Icelander River drainage. It flows in a southerly and easterly direction into Russell Lake, approximately 3 km southwest of the Icelander River outlet. The William Lake drainage consists of two sub-basins, the most northerly of which is part of the study area and includes stream monitoring stations SB-1, SB-3, SB4 and SB-5. Station SB-2 is situated on the western sub-basin of the Williams Lake Drainage.

New stations, which were part of the 2016-19 baseline study that were not assessed in the previous baseline studies, include the inlets to Kratchkowsky Lake (SA-7, SA-8, SA 11), the outlet of LA-8 (SA-9) and the inlet to LA-9 (SA-10). **Figure 1-8** shows the locations of hydrological and aquatic monitoring stations on streams within the study area. Baseline data from 2016-19 are summarized along with historical baseline data from Golder in **Table 4-1** through **Table 4-5** and **Appendix G**.

As indicated previously, on Oct 29, 2019, Denison interviewed a local residence, Mr. Bobby John, who is familiar with local and regional ecology. EcoMetrix reviewed the meeting notes provided by Denison (Denison 2020), and compared comments provided by Bobby John to field observations at stream stations documented herein and incorporated his local knowledge into this report.

## 4.1 SA-1

Stream station SA-1 is the most downstream monitoring station in Icelander River basin with an estimated upstream drainage area of approximately 371 $km^2$ (**Figure 1-2**). The Icelander River at SA-1 is a 3$^{rd}$ order stream, outletting from McGowan Lake approximately 2 km upstream and discharging to Russell Lake approximately 3 km downstream (see **Figure 1-8**).

Historical and 2016-19 baseline data for SA-1 have been compiled in **Table 4-1** through **Table 4-5**.

### 4.1.1 Hydrology

#### 4.1.1.1 Water Elevation and Discharge

Water level elevations measured at SA-1 between September 2016 and August 2019 ranged from 492.71 to 492.744 masl, respectively, and measured stream flows (discharge) ranged from 2.34 to 3.06 cubic metres per second ($m^3/s$), respectively (**Table 4-1**).

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SA-1 (**Appendix G**). Manual flow measurements taken in 2019 was greater than previous years, and the stage-discharge curve was adjusted to accommodate a larger range of discharge. The updated flow measurements are plotted to the rating curve in **Appendix G**.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2011-2019 surveys is presented in **Table 4-1**.

#### 4.1.1.2 Continuous Water Level Recording

Continuous water level recording was available from September 2016, when a Solinst levelogger was installed in SA-1. The results are presented in **Appendix G**. In 2016, the fall discharge at SA-1 surpassed the spring peak flow measured in previous years, likely in response to the high volume of summer precipitation. The spring peak flow in 2017 was captured in mid-May, and the flow decreased steadily to late August, when in subsequently increased till end of the open-water season. During the period between May and early July 2018, stream discharge at SA-1 was in the same range as previously measured in 2013. In 2019, flow measured in both summer and fall was greater than in all previous years.

### 4.1.2 Water Quality

Descriptive statistics for all water quality parameters at SA-1 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. There was an exceedance of guideline limits iron (1 of 10 samples) and of the lower guideline limit for pH (1 of 10 samples). Annual baseline water quality data from 2011 to 2019 are provided in **Appendix A**, **Table A-1**.

#### 4.1.2.1 Limnology

Water temperature, dissolved oxygen, conductivity and pH were measured at SA-1 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**).

Water temperature, conductivity, pH and dissolved oxygen measured at SA-1 during September 2016, May 2017, July 2019 and August 2019 are presented in **Table 4-3**. Over

this period, *in-situ* water temperature, conductivity, pH and dissolved oxygen were in the order of 12 °C, 13 µS/cm, 6.8 and 9.7 mg/L (91% saturation), respectively.

### 4.1.3 Aquatic Habitat

Mean wetted channel width, water depth and water velocity for the 195 m long surveyed reach were 10 m, 0.35 m and 1.25 m/s, respectively. The stream banks were stable and the channel was meandering with some braiding. Within the surveyed reach, the stream gradient was mainly high with some moderate and low gradient sections (see **Appendix C**, Photo 1). The stream morphology was mostly riffles (65%), with some runs (20%) and pools (15%), and minor flats (5%). The canopy was mostly to partly open and instream cover was primarily afforded by deep pools, boulders, aquatic macrophytes and undercut banks. Substrates were comprised of 55% boulder, 25% cobble, 5% gravel and 15% sand, with minor amounts of detritus. Aquatic vegetation included sedges (*Carex* spp.). Slight amounts of algae and sediment were observed overlying the substrate. No barriers to fish migration were observed in the surveyed reach. The surrounding terrain was 75% upland and 25% lowland forest and riparian vegetation included jack pine, black spruce, sweet gale (*Myrica gale*) and willow (*Salix* spp.). Stonefly nymphs (Plecoptera) were observed on bottom substrates. Stream habitat characteristics are detailed in **Appendix A**, **Table A-15**.

### 4.1.4 Fish Community

A summary of the fish community is presented in **Table 4-4**. Detailed fish catch data including fishing effort and numbers of each species collected are presented in **Appendix A**, **Tables A-13, A-15**. Within a 75-m stream reach during the fall 2016 survey, 1,144 seconds of electrofishing effort was expended, resulting in the capture of 42 fish from 5 species. One additional species, Arctic Grayling, was observed but not captured. Eleven young-of-the-year (YOY) and 12 juvenile Burbot, 1 juvenile and 9 adult Lake Chub, 4 juvenile Longnose Sucker, 4 adult Slimy Sculpin (*Cottus cognatus*), and 1 juvenile White Sucker were captured. Catch-per-unit-effort (CPUE) was 2.20 fish/minute of electrofishing. Ten Northern Pike and one Lake Whitefish were captured by angling at the lower end of the reach, below the rapids, during the spring 2017 survey. Twelve adult Longnose Sucker were captured by gillnet and two adult Northern Pike were observed within the ponded area above the rapids. The list of fish species identified was reviewed by Bobby John, and is considered inclusive and comprehensive.

#### 4.1.4.1 Fish Spawning

During the fall 2016 survey, potential spawning habitat was identified for Arctic Grayling, Walleye, Northern Pike and suckers in the station reach. A spring spawning survey was undertaken at this location during late May 2017 and Longnose Sucker and Northern Pike were observed within the reach (**Table 4-5**). The water temperature was 10°C, within the range reported for Longnose Sucker spawning (Scott and Crossman, 1973). Nine male and 3 female Longnose Sucker were collected. The sexual condition of the some of the

males was ripe, but the females were not, indicating that spawning was imminent but had not yet occurred. Two adult Northern Pike exhibiting courtship behaviour were observed adjacent suitable spawning habitat, within the ponded area upstream of the rapids (see **Appendix C**, **Photo 2**). Suitable spawning habitats for Walleye and White Sucker were also observed but species use was not confirmed. No additional spawning areas in the vicinity of SA-1 were noted by Bobby John during his interview with Denison (Denison 2020).

## 4.2 SA-2

Stream station SA-2 is situated within the Icelander River watershed, on the northwest tributary of McGowan Lake (LA-1), immediately upstream of the lake, approximately 800 m downstream of Whitefish Lake (LA-6) (see **Figure 1-8**). At this location the stream is 3rd order.

Historical and 2016-19 baseline data for SA-2 have been compiled in **Table 4-1**through **Table 4-5.**

### 4.2.1 Hydrology

#### 4.2.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-2 ranged from 496.75 to 496.77 masl; and 1.95 to 2.24 $m^3/s$, respectively (**Appendix G**).

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SA-2 (**Appendix G**). During the 2019 monitoring survey, it was determined that water level elevations recorded in September 2016 and July 2019 were not measured at the original Golder cross-section location, creating a discrepancy in water levels. The old cross section was identified during the August field program and sufficient data were available to correct the July 2019 measurement. The original cross section location will be used for measurements in future field monitoring programs.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2011-2019 surveys is found in **Table 4-1**.

### 4.2.2 Water Quality

Descriptive statistics for all water quality parameters at SA-2 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. There was an exceedance of CCME CWQG guideline limit for zinc (1 of 10 samples). This exceedance

was only slightly above the 0.007 mg/L value based on dissolved zinc. Annual baseline water quality data from 2011 to 2019 are provided in **Appendix A**, **Table A-1**.

#### 4.2.2.1 Limnology

Water temperature, dissolved oxygen, conductivity, and pH were measured at SA-2 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**).

Water temperature, conductivity, pH and dissolved oxygen measured at SA-2 during September 2016, May 2017, July 2019 and August 2019 are presented in **Table 4-3**. Over this period, *in-situ* water temperature, conductivity, pH and dissolved oxygen were in the order of 14 °C, 13 µS/cm, 6.8 and 9.7 mg/L (93% saturation), respectively.

### 4.2.3 Aquatic Habitat

Mean wetted channel width, water depth and water velocity for the 285 m long surveyed reach were 9 m, 0.35 m and 1 m/s, respectively. The stream banks were stable and the channel was meandering with some braiding (see **Appendix C**, **Photo 3**). Within the surveyed reach, the stream gradient was mainly high to moderate. The stream morphology was mostly riffles (90%), with minor runs (5%) and pools (5%). The canopy was dense to partly open. Instream cover was primarily afforded by boulders and undercut banks, with minor contributions from logs and trees, deep pools and aquatic macrophytes. Substrates were comprised of 45% boulder, 40% cobble and 5% gravel, with trace amounts of sand and silt. Aquatic vegetation included sedges and horsetail (*Equisetum* sp.). Algal growth was moderate and no sediment were observed overlying the substrate. No barriers to fish migration were observed in the reach. The surrounding terrain was 90% upland and 10% lowland forest and observed riparian vegetation included jack pine, black spruce, alder (*Alnus* sp.), sweet gale, Labrador tea (*Ledum groenlandicum*) and willow. Stonefly nymphs and caddisfly larvae (Trichoptera) were observed. Stream habitat characteristics are detailed in **Appendix A**, **Table A-15**.

### 4.2.4 Fish Community

A summary of the fish community is presented in **Table 4-4**. Detailed fish catch data including fishing effort and numbers of each species collected are presented in **Appendix A, Tables A-13, A-16**. During the fall 2016 survey, 1,271 seconds of electrofishing effort was expended within a 285-m reach, resulting in the capture of 97 fish from 6 species. Slimy Sculpin were the most abundant species encountered, with 16 YOY, 19 juveniles and 35 adults collected. One YOY, 7 juvenile and 5 adult Lake Chub, 2 YOY and 5 juvenile Burbot, 2 YOY and 1 juvenile Northern Pike, 1 juvenile and 1 adult Arctic Grayling and 2 juvenile White Sucker were also captured. In addition, Walleye was observed but not captured. CPUE was 4.58 fish/minute of electrofishing.

Eighteen adult White Suckers were captured by gillnet at this location during the spring 2017 survey.

The list of fish species identified was reviewed by Bobby John, and is considered inclusive and comprehensive.

#### 4.2.4.1 Fish Spawning

During the fall 2016 survey, potential spawning habitat was identified for Walleye and suckers in the vicinity of the station. A spring spawning survey was undertaken at this location during late May 2017 and use of the reach by White Sucker and Walleye was observed (**Table 4-5**) (see **Appendix C**, **Photo 4**). Fifteen male and three female White Sucker were collected. All suckers were ripe to partially spent indicating that spawning was occurring. Use of the area by Walleye was confirmed by the presence of scale piles on the stream banks left by predators. In addition, a female Walleye in post-spawning condition was captured in McGowan Lake. The water temperature was 12.4°C, above the reported spawning temperature range of 5.6 to 11.1°C for Walleye (Scott and Crossman, 1973), suggesting that spawning had already taken place.

No additional spawning areas in the vicinity of SA-2 were noted by Bobby John during his interview with Denison (Denison 2020).

## 4.3 SA-3

Stream station SA-3 is situated on a shallow, wide, slow-flowing, sandy-bottom stream with vertical banks, upstream of lake McGowan Lake and downstream of lake LA-2 (see **Figure** 1-8; **Appendix C**, Photos 5 and 6).

Historical and 2016-19 baseline data for SA-3 have been compiled in **Table 4-1** and **Table** 4-2.

### 4.3.1 Hydrology

#### 4.3.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-3 ranged from 494.43 to 494.54 masl; and 0.44 to 0.62 $m^3/s$, respectively (**Table 4-1**).

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SA-3 (**Appendix G**). This curve was adjusted in 2019 for a better fit of updated manual stream flows taken between 2016 and 2019. The updated flow measurements are plotted to the updated rating curve in **Appendix G**.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2011-2019 surveys is found in **Table 4-1**.

### 4.3.2 Water Quality

Descriptive statistics for all water quality parameters at SA-3 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. There was one exceedance of the guideline lower limit for pH (1 of 10 samples). Annual baseline water quality data from 2011 to 2019 are provided in **Appendix A**, **Table A-1**.

#### 4.3.2.1 Limnology

Water temperature, dissolved oxygen, conductivity, and pH were measured at SA-3 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**).

Water temperature, conductivity, pH and dissolved oxygen measured at SA-3 during July 2019 and August 2019 are presented in **Table 4-3**. Over this period, *in-situ* water temperature, conductivity, pH and dissolved oxygen were in the order of 16 °C, 16 µS/cm, 6.7 and 8.9 mg/L (91% saturation), respectively.

## 4.4 SA-4

Stream station SA-4 is situated about 800 m upstream of Whitefish Lake (LA-6) and approximately 2 km downstream of the outlet of Kratchkowsky Lake (LA-7), and drainage from ponds PA-2 and PA-3 (see **Figure 1-8** and **Appendix C,** Photo 7 and 8). At this location the stream is 2$^{nd}$ order.

Historical and 2016-19 baseline data for SA-4 have been compiled in **Table 4-1** through **Table 4-5.**

### 4.4.1 Hydrology

#### 4.4.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-4 ranged from 506.35 to 506.39 masl; and 0.48 to 0.63 m$^3$/s, respectively (**Table 4-1**).

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SA-4. Manual flow measurements taken in 2016-19 appeared to fit the existing rating curve and the rating

curve can be applied to the level data. The updated flow measurements are plotted to the previously established rating curve in **Appendix G.**

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2011-2019 surveys is found in **Table 4-1** and **Appendix G.**

#### 4.4.1.2 Continuous Water Level Recording

A Solinst levelogger was installed within a pool in this reach in September 2016, and continuous flow measurements are thus available from that time, and results are presented in **Appendix G**. In 2016, the fall discharge in SA-4 surpassed the spring peak flow in all previous monitored years, likely in response to the high volume of summer precipitation. The spring peak flow in 2017 was captured in early May, and the flow decreased gradually to mid-September, after which it increased till end of the open-water season. In May-early July, 2018, spring peak flow was observed in mid-May at approximately 0.6 $m^3/s$ and slightly decreased in the following month. In 2019, there was no apparent spring freshet discharge peak, likely owing to low precipitation over the winter. Stream discharge was highest in early July, corresponding to the highest manual measured flow compared to previous years.

### 4.4.2 Water Quality

Descriptive statistics for all water quality parameters at SA-4 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. There was an exceedance of the guideline limit for cadmium (1 of 10 samples). Annual baseline water quality data from 2011 to 2019 are provided in **Appendix A**, **Table A-1**.

#### 4.4.2.1 Limnology

Water temperature, dissolved oxygen, conductivity, and pH were measured at SA-4 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**).

Water temperature, conductivity, pH and dissolved oxygen measured at SA-4 during September 2016, May 2017, July 2019 and August 2019 are presented in **Table 4-3**. Over this period, *in-situ* water temperature, conductivity, pH and dissolved oxygen were on the order of 12 °C, 14 µS/cm, 6.7 and 8.8 mg/L (83% saturation), respectively.

### 4.4.3 Aquatic Habitat

Mean wetted channel width, water depth and water velocity for the 200 m long surveyed reach were 7 m, 0.25 m and 0.5 m/s, respectively. The stream banks were stable and the portions of the channel were braided, meandering, straight reach and ponded. The stream

gradient was 50% high, 35% moderate and 15% low within the surveyed reach. The stream morphology was mostly riffles (60%), with some runs (20%) and pools (20%). The canopy was dense to partly open, with some open areas. Instream cover was abundant, afforded by boulders, aquatic macrophytes, deep pools, logs and trees, and undercut banks (see **Appendix C**, Photo 7). Substrates were comprised of 80% boulder, 10% cobble, 5% gravel, and 5% sand. Observed aquatic vegetation included sedges, pondweed (*Potamogeton* sp.), spike rush (*Eleocharis* sp.), burreed (*Sparganium* sp.) and horsetail. Algae growth was slight and no sediment were observed overlying the substrate. No barriers to fish migration were observed in the surveyed reach. The surrounding terrain was 70% upland and 30% lowland forest and observed riparian vegetation included jack pine, black spruce, alder, sweet gale, Labrador tea and willow. Stonefly nymphs, dragonfly nymphs (Anisoptera) and caddisfly larvae were observed. Stream habitat characteristics are detailed in **Appendix A**, **Table A-15**.

### 4.4.4 Fish Community

A summary of the fish community is presented in **Table 4-4**. Detailed fish catch data including fishing effort and numbers of each species collected are presented in **Appendix A, Tables A-13, A-16**. A total of 1,749 seconds of electrofishing effort was expended during the fall 2016 survey, resulting in the capture of 81 fish from 8 species. Ninespine Stickleback, White Sucker and Slimy Sculpin were the most abundant species encountered, with 23 adult stickleback, 2 YOY and 19 juvenile suckers, and 7 YOY, 6 juvenile and 6 adult sculpins collected. Three YOY and 6 juvenile Burbot, 2 YOY and 3 adult Lake Club, 1 juvenile and 1 adult Arctic Grayling, 1 juvenile Longnose Sucker, and 1 YOY Northern Pike were also captured. CPUE was 2.78 fish/minute of electrofishing. Sixteen adult White Sucker were captured by electrofishing during the spring 2017 survey. Other species observed included juvenile and adult Lake Chub, juvenile White Sucker, adult Spottail Shiner and adult Northern Pike.

The list of fish species identified during the baseline surveys was reviewed and confirmed by Bobby John (Denison, 2020).

#### 4.4.4.1 Fish Spawning

During the fall 2016 survey, potential spawning habitat was identified for Arctic Grayling, Northern Pike and suckers within the station reach. A spring spawning survey was undertaken at this location during late May 2017 and use of the reach by White Sucker and Lake Chub was observed (**Table 4-5).** On 26 May 2016, the water temperature was 11°C, within the range reported for White Sucker spawning (Scott and Crossman, 1973) and hundreds of White Suckers were observed (see **Appendix C**, Photo 8). Sixteen suckers were collected, including 11 males and 5 females. Male spawning condition ranged from ripe to spent, whereas female condition ranged from ripe to partially spent, indicating that spawning was occurring. Sucker spawning activity was primarily confined to the portion of the reach downstream of the Fox Lake Tote Road, below the rapids, whereas no fish were

observed above the road crossing. On 01 June 2017, large schools of Lake Chub were observed at the road crossing, suggesting that spawning was imminent or occurring nearby (**Figure 3-9**).

The fish spawning map prepared by EcoMetrix was reviewed by Bobby John and no additional spawning areas were noted in the vicinity of SA-4.

## 4.5 SA-5

Stream station SA-5 is situated immediately upstream of Whitefish Lake (LA-6) on the northeastern tributary into which drainage from lakes LA-8 and LA-9 reports (see **Figure** 1-8 and **Appendix C,** Photo 9 and 10). At this location the stream is 3rd order.

Historical and 2016-19 baseline data for SA-5 have been compiled in **Table 4-1** through **Table 4-5.**

### 4.5.1 Hydrology

#### 4.5.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-5 ranged from 500.89 to 500.96 masl; and 1.27 to 1.95 $m^3/s$, respectively (**Table 4-1**).

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SA-5. Based on the 2016-19 data, it is apparent that the new station for SA-5 was installed upstream of the previous location. The stream bed in this area is of consistent width and gradient. Considering this, the rating curve has been adjusted to accommodate the slight change in elevation and more recent manual monitoring data. The manual flow measurements appear to be within an acceptable fit of the updated rating curve, and the rating curve could be applied to the level data but future data collection is also recommended. The updated flow measurements are plotted to the updated rating curve in **Appendix G.**

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2011-2019 surveys is found in **Table 4-1.**

#### 4.5.1.2 Continuous Water Level Recording

A levelogger was installed on a straight run downstream of the Fox Lake Tote Road crossing, and slightly upstream of the previous continuous flow monitoring station. Results from the continuous water level recording is presented in **Appendix G**. In 2016, the fall discharge in SA-5 surpassed the spring peak flow in all previous monitored years, likely in response to the high volume of summer precipitation. The spring peak flow in 2017 was

captured in early and mid-May. The flow decreased gradually to mid-September, and increased in the fall till end of the open-water season. In May-early July, 2018, the flow of SA-5 was observed higher than any previously monitored level in the spring, and the peak flow occurred in mid-May at approximately 2.5 $m^3/s$.

### 4.5.2 Water Quality

Descriptive statistics for all water quality parameters at SA-5 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. There was an exceedance of the lower guideline limit for pH (1 of 10 samples). Annual baseline water quality data from 2011 to 2019 are provided in **Appendix A**, **Table A-1**.

#### 4.5.2.1 **Limnology**

Water temperature, dissolved oxygen, conductivity, pH were measured at SA-5 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**).

Water temperature, conductivity, pH and dissolved oxygen measured at SA-5 during September 2016, May 2017, July 2019 and August 2019 are presented in **Table 4-3**. Over this period, *in-situ* water temperature, conductivity, pH and dissolved oxygen were on the order of 12 °C, 13 µS/cm, 6.5 and 9.3 mg/L (87% saturation), respectively.

### 4.5.3 Aquatic Habitat

Mean wetted channel width, water depth and water velocity for the 300 m long surveyed reach were 15 m, 0.4 m and 0.4 m/s, respectively. The stream banks were stable and the channel was mainly a straight ponded reach, with some braiding. The stream gradient was 70% moderate and 30% low. The stream morphology was a combination of runs (40%), riffles (30%), and pools (25%), with some flats (5%) (see **Appendix C**, **Photo 9**). The canopy was partly open. Instream cover was abundant, primarily afforded by deep pools, aquatic macrophytes, boulders, and undercut banks. Substrates were comprised of 50% boulder, 25% cobble and 25% sand. Observed aquatic vegetation included sedges, pondweeds (*Potamogeton* spp.), wild calla and burreed. No algae growth or sediment were observed overlying the substrate and no barriers to fish migration were observed in the surveyed reach. The surrounding terrain was 70% upland and 30% lowland forest and observed riparian vegetation included jack pine, black spruce, alder, sweet gale, and Labrador tea. Stonefly and dragonfly nymphs were observed. Stream habitat characteristics are detailed in **Appendix A, Table A-15**.

### 4.5.4 Fish Community

A summary of the fish community is presented in **Table 4-4**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A**

**Tables A-13, A-16**. A total of 2,314 seconds of electrofishing effort was expended during the fall 2016 survey, resulting in the capture of 54 fish from 5 species. One additional species, Walleye (adult), was observed but not captured. Three YOY and 23 juvenile Burbot, 10 YOY and 7 adult Slimy Sculpin, 2 juvenile and 4 adult Lake Chub, 1 YOY and 3 juvenile White Sucker, and 1 adult Ninespine Stickleback were captured. CPUE was 1.40 fish/minute of electrofishing.

Eighteen adult White Sucker and 1 adult Longnose Sucker were captured by gillnet during the spring 2017 survey.

The list of fish species identified during the baseline surveys was reviewed and confirmed by Bobby John (Denison, 2020).

#### 4.5.4.1 Fish Spawning

During the fall 2016 survey, potential spawning habitat was identified for Walleye, suckers and Northern Pike within the station reach. A spring spawning survey was undertaken at this location during late May 2017 and use of the reach by White Sucker, Longnose Sucker, Walleye and Lake Chub was observed (**Table 4-5**). On May 29th the water temperature was 10.6°C, within the range reported for sucker spawning (Scott and Crossman, 1973). Eleven male and seven female White Sucker, and 1 male Longnose Sucker were collected. All suckers were ripe to spent indicating that spawning was occurring. Use of the area by Walleye was confirmed by the presence of scale piles left by predators on the stream banks. Sucker spawning activity was observed within the portion of the reach downstream of the Fox Lake Tote Road, to the outlet at lake LA-6. A large school of White Suckers was observed in the ponded area immediately upstream of the road (see **Appendix C**, **Photo 10**). On 01 June 2017, the water temperature was 19°C, within the range reported for Lake Chub spawning (Scott and Crossman, 1973) and large schools of Lake Chub were observed in the vicinity of the crossing, suggesting that spawning was imminent or occurring nearby. Many suckers were also observed in the ponded area upstream of the road but fish were no longer tightly grouped in schools, exhibiting post-spawning behaviour (**Figure 3-9**).

The fish spawning map prepared by EcoMetrix was reviewed by Bobby John and no additional spawning areas were noted in the vicinity of SA-5.

## 4.6 SA-6

Station SA-6 is situated on the connecting channel between the north and south basins of Whitefish Lake, LA-6 (upstream) and LA-5 (downstream), respectively (see **Figure 1-8**). At this location the watercourse is 3rd order.

Historical and 2016-19 baseline data for SA-6 have been compiled in **Table 4-1** through **Table 4-5.**

## 4.6.1 Hydrology

### 4.6.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-6 ranged from 500.07 to 500.13 masl and 1.56 to 2.27 $m^3/s$, respectively (**Table 4-1**). Elevation of SA-6 corresponds well with the elevation of the north basin of Whitefish Lake (LA-6).

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SA-6. This curve was adjusted in 2019 to accommodate greater discharge manually measured in 2019. The updated flow measurements are plotted to the rating curve in **Appendix G**.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2011-2019 surveys is found in **Table 4-1**.

### 4.6.1.2 Continuous Water Level Recording

The logger installed by Golder Associates was retrieved and reinstalled at the same location. The stream gauging equipment was located approximately halfway between the two Whitefish Lake basins (LA-5 and LA-6). In 2016, the fall discharge in SA-6 surpassed the spring peak flow in all previous monitored years, likely in response to the high volume of summer precipitation. The spring peak flow in 2017 was captured in early and mid-May. The flow decreased gradually to mid-September, and increased in the fall till the end of the open-water season. In May-early July, 2018, the flow at SA-6 was fluctuating around 1.7 $m^3/s$ till end of May before decreasing.

## 4.6.2 Water Quality

Descriptive statistics for all water quality parameters at SA-6 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. There were exceedances of guideline limits for cadmium (1 of 9 samples), as well as the lower guideline limit for pH (1 of 9 samples). Annual baseline water quality data from 2011 to 2019 are provided in **Appendix A**, **Table A-1**.

### 4.6.2.1 Limnology

Water temperature, dissolved oxygen, conductivity, pH were measured at SA-6 by Golder during May, August and October 2012 and 2013, and April 2014 (see **Appendix G**).

Water temperature, conductivity, pH and dissolved oxygen measured at SA-6 during September 2016, May 2017, July 2019 and August 2019 are presented in **Table 4-3**. Over

this period, *in-situ* water temperature, conductivity, pH and dissolved oxygen were on the order of 12 °C, 14 µS/cm, 6.3 and 9.2 mg/L (86% saturation), respectively.

### 4.6.3 Aquatic Habitat

The surveyed reach (390 m) included the entire length of stream between the two lake basins. Mean wetted channel width, water depth and water velocity were 14 m, 0.7 m and 0.2 m/s, respectively. The banks were stable and the channel was meandering (see **Appendix C**, Photo 11). The stream gradient was low and stream morphology was primarily runs (75%) and pools (20%), with some flats (5%). The canopy was partly open. Instream cover was diverse, afforded by deep pools, aquatic macrophytes, boulders, logs and trees, and undercut banks. Substrates were comprised of 85% sand, 10% boulder and 2% silt. Observed aquatic vegetation included sedges, pondweed and horsetail (see **Appendix C**, Photo 12). Moderate algae growth and slight sediment were observed overlying the substrate and no barriers to fish migration were observed. The surrounding terrain was 50% upland and 50% lowland forest and observed riparian vegetation included jack pine, black spruce, sweet gale, and Labrador tea. Snails (Gastropoda), mayfly nymphs (*Hexagenia* sp.) and dragonfly nymphs were observed. Stream habitat characteristics are detailed in **Appendix A**, **Table A-15**.

### 4.6.4 Fish Community

A summary of the fish community is presented in **Table 4-4**. Detailed fish catch data including fishing effort and numbers of each species collected are presented in **Appendix A, Tables A-13, A-16**. Within a 150-m stretch of the reach, 1,531 seconds of electrofishing effort was expended during the fall 2016 survey, resulting in the capture of 24 fish from species. Twelve YOY and 3 adult Spottail Shiner, 4 YOY and 2 juvenile Burbot, 2 adult Ninespine Stickleback and 1 YOY Longnose Sucker were captured. The CPUE was 0.94 fish/minute of electrofishing.

Three adult White Sucker, 1 adult Walleye, and 3 juvenile and 3 adult Northern Pike were captured by gillnet during the spring 2017 survey. In addition, 6 adult Northern Pike and 2 adult White Sucker were observed.

The list of fish species identified during baseline surveys was reviewed by Bobby John, and is considered inclusive and comprehensive (Denison, 2020).

#### 4.6.4.1 **Fish Spawning**

Potential spawning habitat for Northern Pike was observed during the fall 2016 survey within the lower reaches of the station. A spring spawning survey was undertaken during late May 2017 and White Sucker, Walleye and Northern Pike were observed (**Table 4-5**). Suitable spawning habitat for Northern Pike was noted near the inlet to the south Whitefish Lake basin (LA-5), and adult pike were observed in this vicinity (see **Appendix C**, Photo

12). On May 29th the water temperature was 12.4°C and 1 male (ripe) and 2 female White Sucker (ripe and spent), 1 male Walleye (spent), and 3 juvenile and 3 adult Northern Pike were collected. Pike spawning typically occurs immediately after ice melt at temperatures between 4.4 and 11.1° C (Scott and Crossman, 1973), suggesting that spawning had already taken place. No suitable spawning habitats for suckers or Walleye were observed within the station SA-6 reach between the two lakes (LA-5 and LA-6, **Figure 3-9**).

The fish spawning map prepared by EcoMetrix was reviewed by Bobby John and no additional spawning areas were noted in the vicinity of SA-6.

## 4.7 SA-7

Stream station SA-7 is situated on the southwestern inlet tributary to Kratchkowsky Lake (LA-7A) approximately 60 m upstream of the lake (see **Figure 1-8**). At this location, the watercourse is a narrow, marshy stream with vertical banks (see **Appendix C**, Photos 13 and 14).

The 2016 baseline data for SA-7 have been compiled in **Table 4-1**.

### 4.7.1 Hydrology

#### 4.7.1.1 Water Elevation and Discharge

The measured stream flow in September 2016 was 0.04 $m^3/s$ (**Table 4-1**). A summary of stream water elevations and manual stream flow measurements for all stream locations is found in **Table 4-1**.

#### 4.7.1.2 Continuous Water Level Recording

Flow at SA-7 is slow and the channel is deep, with significant undercut banks. The gradient in the area is low, allowing backwater from Kratchkowsky Lake to influence stream water levels. SA7 was identified for continuous water level monitoring, however no logger was installed at this location. Although the water levels at this stream could be monitored, it is unlikely that a reliable rating curve could be developed for this location to convert levels to flows due to the site conditions.

## 4.8 SA-8

Stream station SA-8 is situated on the northwestern inlet tributary to Kratchkowsky Lake (LA-7A) approximately 15 m upstream of the lake (see **Figure 1-8**). The stream in this area is meandering, narrow, and has a sandy-bottom with steep banks (see **Appendix C**, Photos 15 and 16). Some areas of the bank were undercut.

The 2016-19 baseline data for SA-8 have been compiled in **Table 4-1**.

### 4.8.1 Hydrology

#### 4.8.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-8 ranged from 500.07 to 500.13 masl; and 1.56 to 2.27 $m^3/s$, respectively(**Table 4-1**).

It was believed that stage measurements in taken at SA-8 during September 2016, May 2017 and July 2018 were influenced by Kratchkowsky Lake water level and not representative of the hydraulics of the inflow channel. Therefore, in August 2019, the cross-section was moved upstream and surveyed to new local benchmarks.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2016-2019 surveys is found in **Table 4-1**.

#### 4.8.1.2 Continuous Water Level Recording

A continuous water level recording device was installed in a relatively straight faster section of the stream immediately upstream of the lake in September 2016. As noted above, the station was moved upstream in August 2019 and the levelogger was re installed at the new location. As a rating curve is not yet available, elevation results were compiled and presented in **Appendix G**.

## 4.9 SA-9

### 4.9.1 General Description

Stream station SA-9 is situated on the southeastern outlet tributary of lake LA-8, approximately 50 m downstream of the lake (see **Figure 1-8**). The stream in this area is shallow and the stream bottom is comprised mainly of sand, gravel, and cobbles (see **Appendix C**, **Photos 17** and **18**).

The 2016-19 baseline data for SA-9 have been compiled in **Table 4-1**.

### 4.9.2 Hydrology

#### 4.9.2.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-9 ranged from 520.49 to 520.55 masl; and 0.15 to 0.18 $m^3/s$, respectively (**Table 4-1**).

The manual flow measurements taken at SA-9 to date were not sufficient to develop a rating curve.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2016-2019 surveys is found in **Table 4-1**.

#### 4.9.2.2 Continuous Water Level Recording

A continuous water level recording device was installed in a pool upstream of an access trail crossing along this stretch of the stream in September 2016. Stream banks are low and the surrounding land is relatively flat. The stage-discharge data collected in 2016, 2017 and 2019 were not sufficient to develop a rating curve. Elevation results were compiled and presented in **Appendix G**.

## 4.10 SA-10

Stream station SA-10 is situated on the northern inlet tributary to lake LA-9, approximately 150 m upstream of the lake (see **Figure 1-8**). At this location, the watercourse is a wide, with a sandy-bottom and steep, vertical bank. The water is deep and slow flowing (see **Appendix C**, Photos 19 and 20).

The 2016-19 baseline data for SA-10 have been compiled in **Table 4-1**.

### 4.10.1 Hydrology

#### 4.10.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-10 ranged from 514.31 to 514.35 masl; and 1.22 to 1.55 $m^3/s$, respectively (**Table 4-1**).

The manual flow measurements taken to date at SA-10 were not sufficient to develop a rating curve.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2016-2019 surveys is found in **Table 4-1**.

#### 4.10.1.2 Continuous Water Level Recording

A continuous water level recording device was installed in a relatively straight section of the stream in an area with wadeable depths at the time of installation in September 2016. The stage-discharge data collected in 2016, 2017 and 2019 were not sufficient to develop a rating curve yet. Elevation results were compiled and presented in **Appendix G**. These data could be converted to discharge after more extreme stage results are recorded.

## 4.11 SA-11

Stream station SA-11 is situated on the northeastern inlet tributary to Kratchkowsky Lake (LA-7A) approximately 25 m upstream of the lake (see **Figure 1-8**). The stream bottom is comprised primarily of gravel and cobbles and the stream channel is braided (see **Appendix C**, Photos 21 and 22).

The 2016-19 baseline data for SA-11 have been compiled in **Table 4-1**.

### 4.11.1 Hydrology

#### 4.11.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at SA-11 ranged from 520.56 to 520.73 masl; and 0.31 to 0.42 $m^3/s$, respectively (**Table 4-1**).

The manual flow measurements taken to date at SA-11 were used to develop a preliminary rating curve (**Appendix G**). However, due to the limited number of data points, caution is advised when using this curve especially for extrapolation above the highest measured discharge.

A summary of stream water elevations and manual stream flow measurements for all stream locations in the 2016-2019 surveys are found in **Table 4-1**.

#### 4.11.1.2 Continuous Water Level Recording

A continuous water level recording device was installed in an unbraided section of the stream immediately upstream of the lake in September 2016. The stage-discharge data collected in 2016, 2017 and 2019 were not yet sufficient to develop a rating curve. Elevation results were compiled and presented in **Appendix G**.

## 4.12 RC-1

Stream station RC-1 is situated immediately downstream of Kratchkowsky Lake (LA-7), approximately 2 km upstream of station SA-4 (see **Figure 1-8,** and **Appendix C,** Photo 23 and 24). At this location the stream is 2nd order. This station encompasses the stream reach in the vicinity of the proposed mine road crossing.

The 2016-19 baseline data for RC-1 have been compiled in **Table 4-1** through **Table 4.5**.

### 4.12.1 Hydrology

#### 4.12.1.1 Water Elevation and Discharge

Between September 2016 and August 2019, water level elevation and stream flow measured at RC-1 ranged from 520.30 to 520.56 masl; and 0.23 to 0.60 $m^3/s$, respectively (**Table 4-1**).

A summary of stream water elevations and manual stream flow measurements for all stream locations is found in **Table 4-1**.

### 4.12.2 Water Quality

Descriptive statistics for all water quality parameters at RC-1 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), all constituent concentrations were below guideline limits. Baseline water quality data from 2019 are provided in **Appendix A**, **Table A-1**.

#### 4.12.2.1 Limnology

Water temperature, conductivity, pH and dissolved oxygen measured at RC-1 during September 2016, May 2017, July 2019 and August 2019 are presented in **Table 4-3**. Over this period, *in-situ* water temperature, conductivity, pH and dissolved oxygen were on the order of 13 °C, 16 µS/cm, 7.0 and 9.7 mg/L (93% saturation), respectively.

### 4.12.3 Aquatic Habitat

Mean wetted channel width, water depth and water velocity for the 305 m long reach were 3.5 m, 0.3 m and 0.75 m/s, respectively. The stream banks were stable and the channel was meandering. The stream gradient was 70% high, 25% moderate and 5% low within the surveyed reach. The stream morphology was a combination of runs (60%), riffles (30%), and pools (10%), with some flats and cascades also present (see **Appendix C**, Photo 23). The canopy was mostly dense with some partly open areas. Instream cover was diverse, afforded by boulders, deep pools, aquatic macrophytes, logs and trees, and undercut banks. Substrates were comprised of 55% cobble, 35% boulder, 5% gravel and 5% sand. Aquatic vegetation included sedges and burreed. Slight algae growth and sediment were observed overlying the substrate and no barriers to fish migration were observed. The surrounding terrain was forested upland and observed riparian vegetation included jack pine, black spruce, alder, willow, sweet gale, and Labrador tea. Stonefly nymphs, caddisfly larvae and snails were observed. Stream habitat characteristics are detailed in **Appendix A, Table A-15**.

### 4.12.4 Fish Community

A summary of the fish community is presented in **Table 4-4**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Tables A-13, A-16**. Within a 190-m reach, 1,719 seconds of electrofishing effort was expended during the fall 2016 survey, resulting in the capture of 101 fish from 6 species. Two YOY, 10 juvenile and 48 adult Lake Chub, 22 juvenile White Sucker, 1 YOY and 15 juvenile Burbot, 2 YOY Yellow Perch, 1 adult Slimy Sculpin, and 1 juvenile Northern Pike were captured. The CPUE was 3.53 fish/minute of electrofishing.

Fourteen juvenile White Sucker, 1 juvenile Northern Pike, 27 juvenile and 6 adult Lake Chub, and 5 juvenile Burbot were captured by electrofishing during the spring 2017 survey.

#### 4.12.4.1 **Fish Spawning**

During the fall 2016 survey, potential spawning habitat was identified for Walleye and suckers in the vicinity of the location. A spring spawning survey was undertaken at this location on two occasions during late May 2017 but no spawning activity, nor signs of spawning activity, were observed for any species (**Table 4-5**, **Appendix C**, Photo 24).

## 4.13 SB-1

Stream station SB-1 is the most downstream station in the Williams Lake drainage area, situated at the Highway 914 crossing, approximately 650 m upstream of Russell Lake (see **Figure 1-8**; **Appendix C**, **Photo 25** and **26**). At this location the stream is 3$^{nd}$ order.

Historical and 2016-19 baseline data for SB-1 have been compiled in **Table 4-1** through **Table 4-4**.

### 4.13.1 Hydrology

#### 4.13.1.1 **Water Elevation and Discharge**

Water level elevation and stream flow at SB-1 in September 2016 were 488.55 masl and 0.64 m$^3$/s, respectively (**Table 4-1**). A summary of stream water elevations and manual stream flow measurements for all stream locations is found in **Table 4-1**.

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SB-1. The rating curve for SB-1 is presented in **Appendix G.**

#### 4.13.1.2 **Continuous Water Level Recording**

The monitoring station was located immediately upstream of the culverts at the McArthur River haul road. The logger deployed 2013 by Golder Associates was retrieved from this

location and redeployed at SA-1. Data retrieved from the instrument included water level and temperature data from May 18, 2013 to August 30, 2015.

### 4.13.2 Water Quality

Descriptive statistics for all water quality parameters at SB-1 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. There were exceedances of guideline limits for iron (2 of 8 samples), as well as the guideline lower limit for pH (3 of 8 samples). Annual baseline water quality data from 2011 to 2014 are provided in **Appendix A**, **Table A-1**.

#### 4.13.2.1 **Limnology**

Water temperature, dissolved oxygen, conductivity, pH were measured at SB-1 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**)

On 17 September 2016, the water was a clear, yellow/brown colour, and the temperature was 10.6 °C. In-situ DO was 8.41 mg/L (75.2% saturation), conductivity was 15 µS/cm, and pH was 5.98 (**Table 4-3**).

### 4.13.3 Aquatic Habitat

Mean wetted channel width, water depth and water velocity for the 280 m long surveyed reach were 8 m, 0.5 m and 0.2 m/s, respectively. The stream banks were stable and the channel was ponded, meandering and braided (see **Appendix C**, Photo 26). The stream gradient was 75% low and 25% moderate within the surveyed reach. The stream morphology was mostly pools (50%) and runs (40%), with flats (10%). The canopy was mostly open with some partly open. Instream cover was dense, afforded primarily by aquatic macrophytes, with some boulders and log jams. Substrates were soft and comprised of 85% muck, 10% sand and 5% boulder. Aquatic vegetation included sedges, pondweed, wild calla, yellow pond lily (*Nuphar lutea*) and burreed. No algae growth was observed overlying the substrate. Beaver dams were observed in the surveyed reach, but did not pose a barrier to fish migration. The surrounding terrain was forested lowland and riparian vegetation included tamarack, black spruce, and sweet gale. Stream habitat characteristics are detailed in **Appendix A, Table A-15**.

### 4.13.4 Fish Community

A summary of the fish community is presented in **Table 4-4**. Detailed fish catch data including fishing effort and numbers of each species collected is presented in **Appendix A, Table A-13**. A total of 752 seconds of electrofishing effort was expended at this location, resulting in the capture of 8 fish from a single species. Five YOY and three juvenile Burbot were captured. The CPUE was 0.64 fish/minute of electrofishing.

#### 4.13.4.1 **Fish Spawning**

Suitable spawning habitat for Northern Pike was observed within the vicinity of SB-1 and pike spawning is reported to occur along the creek (B. John, pers comm, 29 October 2019).

## 4.14 SB-2

Stream station SB-2 is situated on a tributary that drains from the west, and joins the primary Williams Lake drainage watercourse immediately upstream of the Highway 914 crossing (see **Figure 1-8**; **Appendix C**, Photo 27). The area in the vicinity of the survey location is marshy with a thick organic base impacted by the road construction. There were signs of beaver activity in the area.

Historical and 2016-19 baseline data for SB-2 have been compiled in **Table 4-1** and **Table 4-2**.

### 4.14.1 Hydrology

#### 4.14.1.1 **Water Elevation and Discharge**

At the time of the September 2016 field survey, no surface water connection to SB-1 was observed at this location (see **Appendix C**, Photo 28 of the Golder report located with **Appendix G** of this report). It is suspected that water either flows laterally towards SB-1 or seeps under the road embankment.

### 4.14.2 Water Quality

Descriptive statistics for all water quality parameters at SB-2 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. Exceedances of guideline limits occurred for iron (6 of 7 samples), as well as the lower limit guideline for pH (6 of 7 samples). All exceedances were small in magnitude. Annual baseline water quality data from 2011 to 2013 are provided in **Appendix A**, **Table A-**1.

#### 4.14.2.1 **Limnology**

Water temperature, dissolved oxygen, conductivity, pH were measured at SB-2 by Golder during May, August and October 2012 and 2013 (see **Appendix F**).

## 4.15 SB-3

Stream station SB-3 is situated approximately 100 m downstream of lake LB-2. The stream bottom is comprised of organic material, sand, cobbles and boulders. The stream banks are nearly vertical (see **Figure 1-8**; **Appendix C**, Photos 29 and 30).

Historical and 2016-19 baseline data for SB-3 have been compiled in **Table 4-1** and **Table** 4-2.

### 4.15.1 Hydrology

#### 4.15.1.1 **Water Elevation and Discharge**

Water level elevation and stream flow at SB-3 in September 2016 were 510.47 masl and 0.12 $m^3/s$, respectively. A summary of stream water elevations and manual stream flow measurements for all stream locations is found in **Table 4-1**.

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SB-3. The rating curve for SB-3 is presented in **Appendix G**.

### 4.15.2 Water Quality

Descriptive statistics for all water quality parameters at SB-3 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. An exceedance of the lower limit guideline for pH occurred (1 of 8 samples). Annual baseline water quality data from 2011 to 2014 are provided in **Appendix A**, **Table A-1**.

#### 4.15.2.1 **Limnology**

Water temperature, dissolved oxygen, conductivity, and pH were measured at SB-3 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**).

## 4.16 SB-4

Stream station SB-4 is situated on the southwestern inlet tributary to Williams Lake (LB-3), approximately 160 m upstream of the lake. The stream banks are shallow and poorly defined. The stream bottom is primarily boulders and large cobbles (see **Figure 1-8**; **Appendix C**, Photos 31 and 32).

Historical and 2016-19 baseline data for SB-4 have been compiled in **Tables**

**Table 4-1:** and **Table 4-2**.

### 4.16.1 Hydrology

#### 4.16.1.1 **Water Elevation and Discharge**

Water level elevation and stream flow at SB-4 in September 2016 were 519.21 masl and 0.12 $m^3/s$, respectively. A summary of stream water elevations and manual stream flow measurements for all stream locations is found in **Table 4-1**.

Stage and discharge measurements collected during the 2011, 2012 and 2013 monitoring seasons were used to create a stage-discharge curve for SB-4. The rating curve for SB-4 is presented in **Appendix G**.

### 4.16.2 Water Quality

Descriptive statistics for all water quality parameters at SB-4 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. Exceedances of the lower limit guideline for pH (4 of 7 samples) occurred. Annual baseline water quality data from 2011 to 2013 are provided in **Appendix A, Table A-1**.

#### 4.16.2.1 **Limnology**

Water temperature, dissolved oxygen, conductivity, and pH were measured at SB-4 by Golder during May, August and October 2012 and 2013 (see **Appendix F**).

## 4.17 SB-5

Stream station SB-5 is situated on the outlet tributary from Williams Lake (LB-3), approximately 350 m downstream of the lake and 2.6 km upstream of lake LB-2. The stream bottom was composed of sand, gravel and cobbles (see **Figure 1-8**; **Appendix C**, Photos 33 and 34).

Historical and 2016-19 baseline data for SB-5 have been compiled in **Table 4-1** and **Table 4-2.**

### 4.17.1 Hydrology

#### 4.17.1.1 **Water Elevation and Discharge**

Water level elevation and stream flow at SB-5 in September 2016 were 518.33 masl and 0.14 $m^3/s$, respectively. A summary of stream water elevations and manual stream flow measurements for all stream locations is found in **Table 4-1**.

### 4.17.2 Water Quality

Descriptive statistics for all water quality parameters at SB-5 are provided in **Table 4-2**. For parameters where water quality guidelines are available (SEQG, CCME CWQG, and SSWQO), most constituent concentrations were below guideline limits. An exceedance of the lower limit guideline for pH (1 of 7 samples) occurred. Annual baseline water quality data from 2012 to 2014 are provided in **Appendix A**, **Table A-1**.

#### 4.17.2.1 **Limnology**

Water temperature, dissolved oxygen, conductivity, pH were measured at SB-5 by Golder during May, August and October 2012 and 2013, and March 2014 (see **Appendix F**).

# Tables

**Table 4-1: Baseline Stream Water Elevations and Flow Measurements**

| Site | Number of Measurements | Minimum Elevation (masl) | Maximum Elevation (masl) | Minimum Discharge ($m^3/s$) | Maximum Discharge ($m^3/s$) |
|---|---|---|---|---|---|
| SA-1* | 15 | 492.554 | 492.869 | 0.887 | 3.06 |
| SA-2 | 13 | 496.46 | 496.805 | 0.741 | 2.24 |
| SA-3 | 13 | 494.243 | 494.541 | 0.051 | 0.6219 |
| SA-4* | 15 | 506.249 | 506.387 | 0.199 | 0.6336 |
| SA-5* | 16 | 500.609 | 500.955 | 0.476 | 1.95 |
| SA-6* | 15 | 499.956 | 500.125 | 0.717 | 2.27 |
| SA-7 | 1 | No BM Set | | 0.04 | 0.04 |
| SA-8* | 5 | 520.54 | 520.62 | 0.01 | 0.056 |
| SA-9* | 3 | 520.49 | 520.55 | 0.16 | 0.18 |
| SA-10* | 3 | 514.31 | 514.35 | 1.22 | 1.55 |
| SA-11* | 4 | 520.71 | 520.84 | 0.31 | 0.42 |
| RC-1 | 4** | 520.3 | 520.56 | 0.23 | 0.58 |
| SB-1 | 11 | 488.335 | 489.027 | 0.16 | 0.64 |
| SB-2 | No Measurements Taken | | | | |
| SB-3 | 11 | 510.389 | 510.517 | 0.08 | 0.255 |
| SB-4 | 10 | 518.964 | 519.245 | 0.007 | 0.12 |
| SB-5 | 1 | 518.33 | 518.33 | 0.14 | 0.14 |

Notes:

- Units: masl = metres above sea level.
- BM - benchmark
- Refer to Figure 4-1 for location of streamflow monitoring stations
- Water level elevations are referenced to benchmarks with geodetic elevations established by Golder Associates, except for SA8, SA9, SA10, SA11, and SB5 which are referenced to geodetic elevations established as part of the 2016-17 Baseline Study
- Water level elevations and stream flows for 2011 to 2014 are from Golder (2014)
- Water level elevations and stream flows for 2016, 2018 and 2019 were collected during the 2016-19 Baseline Study conducted by Calder Engineering Ltd., EcoMetrix Incorporated and Missinipi Water Solutions

* - indicates that continuous monitoring equipment was installed during the 2016-19 Baseline Study
** - 2 elevation measurements; 4 discharge measurements

## Table 4-2: Baseline Stream Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count Less Than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| SA-1 | Alkalinity | mg/L | | | 10 | 0 | 2 | 13 | 5.8 |
| | Aluminum | mg/L | 0.1 | SEQG | 10 | 0 | 0.0022 | 0.0056 | 0.00391 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 10 | 7 | <0.01 | 0.04 | <0.015 |
| | Antimony | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 10 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 10 | 0 | 0.0022 | 0.0035 | 0.00267 |
| | Beryllium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 10 | 0 | 2 | 16 | 7 |
| | Boron | mg/L | 1.5 | CCME CWQG | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 10 | 8 | <1.00E-05 | 0.00002 | <0.000012 |
| | Calcium | mg/L | | | 10 | 0 | 1.2 | 1.7 | 1.37 |
| | Carbonate | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 10 | 0 | 0.4 | 0.5 | 0.42 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 10 | 0 | 1.7 | 2.4 | 2.19 |
| | Dissolved Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 10 | 0 | 0.01 | 0.07 | 0.023 |
| | Hardness | mg/L | | | 8 | 0 | 5 | 6 | 5.25 |
| | Hydroxide | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 10 | 0 | 0.031 | **0.31** | 0.1286 |
| | Lead | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 10 | 9 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 10 | 0 | 0.3 | 0.5 | 0.41 |
| | Manganese | mg/L | | | 10 | 0 | 0.0041 | 0.025 | 0.01477 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 10 | 8 | 2.00E-06 | <1.00E-05 | <8.60E-06 |
| | Molybdenum | mg/L | 31 | SEQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 7 | 6 | <0.04 | 0.26 | <0.071429 |
| | P. Alkalinity | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 10 | 0 | **6.34** | 7.06 | 6.789 |
| | Phosphorus | mg/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 10 | 9 | <0.005 | 0.01 | <0.0055 |
| | Potassium | mg/L | | | 10 | 0 | 0.2 | 0.5 | 0.36 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 10 | 7 | <0.005 | 0.009 | <0.0058 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 10 | 10 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 10 | 0 | 1.4 | 1.7 | 1.5 |
| | Specific Conductivity | µS/cm | | | 12 | 0 | 13 | 22 | 17.35 |
| | Strontium | mg/L | | | 10 | 0 | 0.011 | 0.015 | 0.0126 |
| | Sulphate | mg/L | 128 | SEQG | 10 | 0 | 0.4 | 0.9 | 0.68 |
| | Sum of Ions | | | | 10 | 0 | 6 | 22 | 11.7 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 10 | 0 | 20 | 33 | 23.5 |
| | Total Kjeldahl Nitrogen | mg/L | | | 10 | 0 | 0.11 | 0.48 | 0.257 |
| | Total Organic Carbon | mg/L | | | 10 | 0 | 1.8 | 2.6 | 2.24 |
| | Total Suspended Solids | mg/L | | | 10 | 1 | <1. | 4 | <2.2 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 10 | 7 | <0.0005 | 0.0028 | <0.00086 |
| SA-2 | Alkalinity | mg/L | | | 10 | 0 | 2 | 11 | 6.6 |
| | Aluminum | mg/L | 0.1 | SEQG | 10 | 0 | 0.0039 | 0.081 | 0.01355 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 10 | 8 | <0.01 | 0.04 | <0.014 |
| | Antimony | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 10 | 4 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 10 | 0 | 0.0019 | 0.0041 | 0.00256 |
| | Beryllium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 10 | 1 | <1 | 13 | <7.1 |
| | Boron | mg/L | 1.5 | CCME CWQG | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 10 | 7 | <1.00E-05 | 0.00002 | <0.000012 |
| | Calcium | mg/L | | | 10 | 0 | 1.1 | 1.7 | 1.29 |
| | Carbonate | mg/L | | | 10 | 9 | <1. | <1. | <1. |
| | Chloride | mg/L | 120 | CCME CWQG | 10 | 0 | 0.2 | 0.4 | 0.32 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 10 | 9 | <0.0002 | 0.0008 | <0.00026 |
| | Dissolved Organic Carbon | mg/L | | | 10 | 0 | 1.9 | 2.7 | 2.3 |
| | Dissolved Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 10 | 0 | 0.01 | 0.03 | 0.016 |
| | Hardness | mg/L | | | 8 | 0 | 4 | 6 | 4.75 |
| | Hydroxide | mg/L | | | 10 | 9 | <1 | 2 | <1.1 |
| | Iron | mg/L | 0.3 | SEQG | 10 | 0 | 0.041 | 0.11 | 0.0767 |
| | Lead | mg/L | 0.001 | CCME CWQG | 10 | 9 | <0.0001 | 0.0003 | <0.00012 |
| | Lead-210 | Bq/L | | | 10 | 9 | <0.02 | 0.05 | <0.023 |
| | Magnesium | mg/L | | | 10 | 0 | 0.3 | 0.6 | 0.37 |
| | Manganese | mg/L | | | 10 | 0 | 0.0044 | 0.017 | 0.01064 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 10 | 8 | 2.00E-06 | <1.00E-05 | <8.60E-06 |
| | Molybdenum | mg/L | 31 | SEQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 10 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 7 | 6 | <0.04 | 0.31 | <0.078571 |
| | P. Alkalinity | mg/L | | | 10 | 9 | <1 | 7 | <1.6 |
| | pH | units | 6.5–9 | CCME CWQG | 10 | 0 | 6.58 | 7.04 | 6.818 |
| | Phosphorus | mg/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 10 | 10 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 10 | 0 | 0.1 | 0.4 | 0.34 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 10 | 7 | <0.005 | 0.01 | <0.0059 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 10 | 10 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 10 | 0 | 1.2 | 1.8 | 1.44 |
| | Specific Conductivity | µS/cm | | | 12 | 0 | 9 | 22 | 15.75 |
| | Strontium | mg/L | | | 10 | 0 | 0.01 | 0.015 | 0.0118 |
| | Sulphate | mg/L | 128 | SEQG | 10 | 1 | <0.2 | 0.7 | <0.59 |
| | Sum of Ions | | | | 10 | 0 | 6 | 19 | 11.6 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 10 | 9 | <0.01 | 0.02 | <0.011 |
| | Thorium-232 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 10 | 8 | <0.0002 | 0.0015 | <0.00034 |
| | Total Dissolved Solids | mg/L | | | 10 | 0 | 12 | 30 | 20.8 |
| | Total Kjeldahl Nitrogen | mg/L | | | 10 | 1 | <0.05 | 0.58 | <0.24 |
| | Total Organic Carbon | mg/L | | | 10 | 0 | 2.1 | 2.4 | 2.28 |
| | Total Suspended Solids | mg/L | | | 10 | 3 | <1 | 6 | <1.9 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 10 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 10 | 6 | <0.0005 | **0.0096** | <0.00163 |

## Table 4-2 Cont'd: Baseline Stream Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count Less Than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| SA-3 | Alkalinity | mg/L | | | 10 | 0 | 1 | 23 | 6.9 |
| | Aluminum | mg/L | 0.1 | SEQG | 10 | 0 | 0.0013 | 0.016 | 0.00411 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 10 | 7 | <0.01 | 0.04 | <0.014 |
| | Antimony | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 10 | 4 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 10 | 0 | 0.0025 | 0.004 | 0.00312 |
| | Beryllium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 10 | 1 | <1 | 28 | <7.5 |
| | Boron | mg/L | 1.5 | CCME CWQG | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 10 | 8 | <1.00E-05 | 0.00002 | <0.000011 |
| | Calcium | mg/L | | | 10 | 0 | 1.4 | 1.9 | 1.55 |
| | Carbonate | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 10 | 0 | 0.5 | 0.7 | 0.62 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 10 | 0 | 1.7 | 2.7 | 2.35 |
| | Dissolved Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 10 | 1 | <0.01 | 0.07 | <0.023 |
| | Hardness | mg/L | | | 8 | 0 | 5 | 7 | 5.75 |
| | Hydroxide | mg/L | | | 10 | 9 | <1 | 2 | <1.1 |
| | Iron | mg/L | 0.3 | SEQG | 10 | 0 | 0.036 | 0.13 | 0.0794 |
| | Lead | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 10 | 9 | <0.02 | 0.03 | <0.021 |
| | Magnesium | mg/L | | | 10 | 0 | 0.4 | 0.5 | 0.44 |
| | Manganese | mg/L | | | 10 | 0 | 0.0063 | 0.023 | 0.01197 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 10 | 8 | 2.00E-06 | <1.00E-05 | <8.80E-06 |
| | Molybdenum | mg/L | 31 | SEQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 10 | 9 | <0.0001 | 0.0002 | <0.00011 |
| | Nitrate | mg/L | 13.29 | SEQG | 7 | 6 | <0.04 | 0.26 | <0.071429 |
| | P. Alkalinity | mg/L | | | 10 | 9 | <1 | 7 | <1.6 |
| | pH | units | 6.5–9 | CCME CWQG | 10 | 0 | **6.42** | 7.02 | 6.801 |
| | Phosphorus | mg/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 10 | 8 | <0.005 | 0.01 | <0.0056 |
| | Potassium | mg/L | | | 10 | 0 | 0.3 | 0.5 | 0.4 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 10 | 5 | <0.005 | 0.01 | <0.0062 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 10 | 10 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 10 | 0 | 1.4 | 1.8 | 1.54 |
| | Specific Conductivity | µS/cm | | | 12 | 0 | 14 | 24 | 18.758 |
| | Strontium | mg/L | | | 10 | 0 | 0.013 | 0.018 | 0.0145 |
| | Sulphate | mg/L | 128 | SEQG | 10 | 0 | 0.4 | 0.8 | 0.73 |
| | Sum of Ions | | | | 10 | 0 | 6 | 33 | 12.7 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 9 | 8 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 10 | 9 | <0.0001 | 0.0009 | <0.00018 |
| | Titanium | mg/L | | | 10 | 9 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 10 | 0 | 17 | 26 | 21.6 |
| | Total Kjeldahl Nitrogen | mg/L | | | 10 | 0 | 0.13 | 0.3 | 0.237 |
| | Total Organic Carbon | mg/L | | | 10 | 0 | 1.8 | 2.6 | 2.35 |
| | Total Suspended Solids | mg/L | | | 10 | 3 | <1 | 3 | <1.7 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 10 | 6 | <0.0005 | 0.0021 | <0.00078 |
| SA-4 | Alkalinity | mg/L | | | 10 | 0 | 2 | 15 | 7.6 |
| | Aluminum | mg/L | 0.1 | SEQG | 10 | 0 | 0.0025 | 0.0099 | 0.00568 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 10 | 8 | <0.01 | 0.05 | <0.015 |
| | Antimony | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 10 | 5 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 10 | 0 | 0.0021 | 0.0032 | 0.0025 |
| | Beryllium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 10 | 0 | 2 | 18 | 9.2 |
| | Boron | mg/L | 1.5 | CCME CWQG | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 10 | 8 | <1.00E-05 | **0.00007** | <0.000016 |
| | Calcium | mg/L | | | 10 | 0 | 1.3 | 2 | 1.52 |
| | Carbonate | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 10 | 0 | 0.4 | 0.6 | 0.46 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 10 | 0 | 2 | 3.1 | 2.37 |
| | Dissolved Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 10 | 0 | 0.01 | 0.07 | 0.025 |
| | Hardness | mg/L | | | 8 | 0 | 5 | 7 | 5.625 |
| | Hydroxide | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 10 | 0 | 0.034 | 0.13 | 0.0789 |
| | Lead | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 10 | 9 | <0.02 | 0.03 | <0.021 |
| | Magnesium | mg/L | | | 10 | 0 | 0.4 | 0.6 | 0.43 |
| | Manganese | mg/L | | | 10 | 0 | 0.0029 | 0.019 | 0.0112 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 10 | 8 | 2.00E-06 | <1.00E-05 | <8.60E-06 |
| | Molybdenum | mg/L | 31 | SEQG | 10 | 9 | <0.0001 | 0.0002 | <0.00011 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 7 | 5 | <0.04 | 0.35 | <0.091429 |
| | P. Alkalinity | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 10 | 0 | 6.58 | 7.16 | 6.88 |
| | Phosphorus | mg/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 10 | 9 | <0.005 | 0.007 | <0.0052 |
| | Potassium | mg/L | | | 10 | 0 | 0.2 | 0.6 | 0.38 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 10 | 6 | <0.005 | 0.009 | <0.006 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 10 | 10 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 10 | 0 | 1.4 | 2.1 | 1.62 |
| | Specific Conductivity | µS/cm | | | 12 | 0 | 11 | 25 | 18.301 |
| | Strontium | mg/L | | | 10 | 0 | 0.012 | 0.018 | 0.0138 |
| | Sulphate | mg/L | 128 | SEQG | 10 | 0 | 0.4 | 0.7 | 0.53 |
| | Sum of Ions | | | | 10 | 0 | 7 | 25 | 14.2 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 10 | 9 | <0.0001 | 0.0002 | <0.00011 |
| | Titanium | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 10 | 0 | 21 | 40 | 26.6 |
| | Total Kjeldahl Nitrogen | mg/L | | | 10 | 0 | 0.13 | 0.3 | 0.227 |
| | Total Organic Carbon | mg/L | | | 10 | 0 | 2 | 2.6 | 2.35 |
| | Total Suspended Solids | mg/L | | | 10 | 1 | <1. | 5 | <2.2 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 10 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 10 | 5 | <0.0005 | 0.0015 | <0.00068 |

## Table 4-2 Cont'd: Baseline Stream Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count Less Than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| SA-5 | Alkalinity | mg/L | | | 10 | 0 | 2 | 9 | 5.5 |
| | Aluminum | mg/L | 0.1 | SEQG | 10 | 0 | 0.004 | 0.014 | 0.00673 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 10 | 8 | <0.01 | 0.05 | <0.014 |
| | Antimony | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 10 | 4 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 10 | 0 | 0.0021 | 0.0031 | 0.00251 |
| | Beryllium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 10 | 0 | 2 | 11 | 6.6 |
| | Boron | mg/L | 1.5 | CCME CWQG | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 10 | 8 | <1.00E-05 | 0.00004 | <0.000014 |
| | Calcium | mg/L | | | 10 | 0 | 1.1 | 1.4 | 1.22 |
| | Carbonate | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 10 | 0 | 0.2 | 0.3 | 0.24 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 10 | 0 | 1.8 | 2.8 | 2.29 |
| | Dissolved Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 10 | 1 | <0.01 | 0.08 | <0.023 |
| | Hardness | mg/L | | | 8 | 0 | 4 | 5 | 4.625 |
| | Hydroxide | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 10 | 0 | 0.03 | 0.11 | 0.0746 |
| | Lead | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 10 | 10 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 10 | 0 | 0.2 | 0.4 | 0.33 |
| | Manganese | mg/L | | | 10 | 0 | 0.0025 | 0.018 | 0.00876 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 10 | 8 | 2.00E-06 | <1.00E-05 | <8.70E-06 |
| | Molybdenum | mg/L | 31 | SEQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 7 | 5 | <0.04 | 0.31 | <0.085714 |
| | P. Alkalinity | mg/L | | | 10 | 10 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 10 | 0 | **6.17** | 6.99 | 6.757 |
| | Phosphorus | mg/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 10 | 10 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 10 | 0 | 0.2 | 0.4 | 0.33 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 10 | 6 | <0.005 | 0.007 | <0.0055 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 10 | 10 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 10 | 0 | 1.3 | 1.6 | 1.4 |
| | Specific Conductivity | µS/cm | | | 12 | 0 | 8 | 20 | 14.842 |
| | Strontium | mg/L | | | 10 | 0 | 0.0097 | 0.013 | 0.01107 |
| | Sulphate | mg/L | 128 | SEQG | 10 | 0 | 0.4 | 0.8 | 0.62 |
| | Sum of Ions | | | | 10 | 0 | 6 | 15 | 11 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 10 | 10 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 9 | 8 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 10 | 10 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 10 | 0 | 13 | 36 | 20.9 |
| | Total Kjeldahl Nitrogen | mg/L | | | 10 | 0 | 0.11 | 0.29 | 0.21 |
| | Total Organic Carbon | mg/L | | | 10 | 0 | 1.9 | 2.7 | 2.29 |
| | Total Suspended Solids | mg/L | | | 10 | 3 | <1 | 4 | <2 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 10 | 10 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 10 | 8 | <0.0005 | 0.0024 | <0.00079 |
| SA-6 | Alkalinity | mg/L | | | 9 | 0 | 3 | 13 | 6.3333 |
| | Aluminum | mg/L | 0.1 | SEQG | 9 | 0 | 0.0032 | 0.02 | 0.010011 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 9 | 7 | <0.01 | 0.04 | <0.014444 |
| | Antimony | mg/L | | | 9 | 9 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 9 | 3 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 9 | 0 | 0.0021 | 0.0032 | 0.0026444 |
| | Beryllium | mg/L | | | 9 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 9 | 0 | 4 | 16 | 7.7778 |
| | Boron | mg/L | 1.5 | CCME CWQG | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 9 | 3 | <1.00E-05 | **0.00005** | <0.000017778 |
| | Calcium | mg/L | | | 9 | 0 | 1.2 | 1.8 | 1.3333 |
| | Carbonate | mg/L | | | 9 | 9 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 9 | 0 | 0.3 | 0.5 | 0.34444 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 9 | 9 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 9 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 9 | 9 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 9 | 0 | 1.9 | 2.8 | 2.3444 |
| | Dissolved Phosphorus | mg/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 9 | 1 | <0.01 | 0.07 | <0.0233333 |
| | Hardness | mg/L | | | 7 | 0 | 4 | 6 | 5.1429 |
| | Hydroxide | mg/L | | | 9 | 9 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 9 | 0 | 0.036 | 0.16 | 0.093889 |
| | Lead | mg/L | 0.001 | CCME CWQG | 9 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 9 | 9 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 9 | 0 | 0.3 | 0.5 | 0.38889 |
| | Manganese | mg/L | | | 9 | 0 | 0.0037 | 0.029 | 0.012711 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 9 | 7 | 2.00E-06 | <1.00E-05 | <8.56E-06 |
| | Molybdenum | mg/L | 31 | SEQG | 9 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 9 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 6 | 5 | <0.04 | 0.35 | <0.091667 |
| | P. Alkalinity | mg/L | | | 9 | 9 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 9 | 0 | **6.48** | 7.07 | 6.8111 |
| | Phosphorus | mg/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 9 | 6 | <0.005 | 0.007 | <0.0053 |
| | Potassium | mg/L | | | 9 | 0 | 0.2 | 0.4 | 0.35556 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 9 | 7 | <0.005 | 0.006 | <0.0051 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 9 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 9 | 9 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 9 | 0 | 1.3 | 1.9 | 1.4667 |
| | Specific Conductivity | µS/cm | | | 11 | 0 | 9 | 23 | 15.745 |
| | Strontium | mg/L | | | 9 | 0 | 0.01 | 0.016 | 0.012 |
| | Sulphate | mg/L | 128 | SEQG | 9 | 0 | 0.3 | 0.8 | 0.61111 |
| | Sum of Ions | | | | 9 | 0 | 8 | 22 | 12.222 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 9 | 9 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 9 | 9 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 9 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 9 | 7 | <0.0002 | 0.0003 | <0.00022222 |
| | Total Dissolved Solids | mg/L | | | 9 | 0 | 15 | 35 | 21.333 |
| | Total Kjeldahl Nitrogen | mg/L | | | 9 | 0 | 0.15 | 0.41 | 0.27889 |
| | Total Organic Carbon | mg/L | | | 9 | 0 | 1.9 | 2.6 | 2.2889 |
| | Total Suspended Solids | mg/L | | | 9 | 2 | <1 | 6 | <3.2222 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 9 | 9 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 9 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 9 | 6 | <0.0005 | 0.0016 | <0.00063333 |

## Table 4-2 Cont'd: Baseline Stream Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count Less Than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| SB-1 | Alkalinity | mg/L | | | 8 | 0 | 3 | 20 | 7 |
| | Aluminum | mg/L | 0.1 | SEQG | 8 | 0 | 0.012 | 0.025 | 0.017125 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 8 | 6 | <0.01 | 0.1 | <0.0275 |
| | Antimony | mg/L | | | 8 | 8 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 8 | 4 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 8 | 0 | 0.002 | 0.0039 | 0.00265 |
| | Beryllium | mg/L | | | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 8 | 0 | 4 | 24 | 8.5 |
| | Boron | mg/L | 1.5 | CCME CWQG | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 8 | 5 | <1.00E-05 | 0.00004 | <0.00001375 |
| | Calcium | mg/L | | | 8 | 0 | 1.1 | 2.2 | 1.3875 |
| | Carbonate | mg/L | | | 8 | 8 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 8 | 0 | 0.1 | 0.4 | 0.225 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 8 | 8 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 8 | 7 | <0.0002 | 0.0004 | <0.000225 |
| | Dissolved Organic Carbon | mg/L | | | 8 | 0 | 2.5 | 4.6 | 3.7 |
| | Dissolved Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 8 | 1 | <0.01 | 0.07 | <0.02375 |
| | Hardness | mg/L | | | 8 | 0 | 3 | 8 | 5 |
| | Hydroxide | mg/L | | | 8 | 8 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 8 | 0 | 0.1 | **0.64** | 0.24375 |
| | Lead | mg/L | 0.001 | CCME CWQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 8 | 8 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 8 | 1 | <0.1 | 0.7 | <0.4125 |
| | Manganese | mg/L | | | 8 | 0 | 0.0071 | 0.036 | 0.013138 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 8 | 8 | <1.00E-05 | <1.00E-05 | <1.00E-05 |
| | Molybdenum | mg/L | 31 | SEQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 8 | 2 | <0.0001 | 0.0006 | <0.000175 |
| | Nitrate | mg/L | 13.29 | SEQG | 5 | 4 | <0.04 | 0.31 | <0.094 |
| | P. Alkalinity | mg/L | | | 8 | 8 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 8 | 0 | **6.27** | 6.9 | 6.5725 |
| | Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 8 | 4 | <0.005 | 0.006 | <0.005375 |
| | Potassium | mg/L | | | 8 | 0 | 0.2 | 0.5 | 0.325 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 8 | 6 | <0.005 | 0.01 | <0.005625 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 8 | 8 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 8 | 0 | 1.2 | 2.1 | 1.3875 |
| | Specific Conductivity | µS/cm | | | 8 | 0 | 14 | 26 | 17 |
| | Strontium | mg/L | | | 8 | 0 | 0.011 | 0.021 | 0.013375 |
| | Sulphate | mg/L | 128 | SEQG | 8 | 0 | 0.5 | 1.1 | 0.8 |
| | Sum of Ions | | | | 8 | 0 | 8 | 31 | 13 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 8 | 8 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 8 | 7 | <0.0001 | 0.0007 | <0.000175 |
| | Titanium | mg/L | | | 8 | 1 | <0.0002 | 0.001 | <0.0003875 |
| | Total Dissolved Solids | mg/L | | | 8 | 0 | 18 | 36 | 23.5 |
| | Total Kjeldahl Nitrogen | mg/L | | | 8 | 0 | 0.15 | 0.28 | 0.22625 |
| | Total Organic Carbon | mg/L | | | 8 | 0 | 2.8 | 4.6 | 3.8375 |
| | Total Suspended Solids | mg/L | | | 8 | 2 | <1 | 4 | <1.625 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 8 | 1 | <0.0001 | 0.0002 | <0.0001125 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 8 | 6 | <0.0005 | 0.0007 | <0.000525 |
| SB-2 | Alkalinity | mg/L | | | 7 | 0 | 3 | 8 | 4.7143 |
| | Aluminum | mg/L | 0.1 | SEQG | 7 | 0 | 0.02 | 0.051 | 0.027857 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 7 | 3 | <0.0001 | 0.0002 | <0.00012857 |
| | Barium | mg/L | | | 7 | 0 | 0.0017 | 0.0036 | 0.0023714 |
| | Beryllium | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 7 | 0 | 4 | 10 | 5.8571 |
| | Boron | mg/L | 1.5 | CCME CWQG | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 7 | 2 | <1.00E-05 | 0.00003 | <0.000015714 |
| | Calcium | mg/L | | | 7 | 0 | 1.1 | 1.8 | 1.4 |
| | Carbonate | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 7 | 0 | 0.3 | 0.6 | 0.5 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 7 | 5 | <0.0001 | 0.0002 | <0.00011429 |
| | Copper | mg/L | 0.002 | CCME CWQG | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 7 | 0 | 2 | 6.4 | 4.8429 |
| | Dissolved Phosphorus | mg/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 7 | 1 | <0.01 | 0.03 | <0.017143 |
| | Hardness | mg/L | | | 7 | 0 | 4 | 7 | 5.2857 |
| | Hydroxide | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 7 | 0 | 0.25 | **1.34** | 0.62429 |
| | Lead | mg/L | 0.001 | CCME CWQG | 7 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 7 | 6 | <0.02 | 0.04 | <0.022857 |
| | Magnesium | mg/L | | | 7 | 0 | 0.2 | 0.6 | 0.42857 |
| | Manganese | mg/L | | | 7 | 0 | 0.0085 | 0.054 | 0.025643 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 7 | 7 | <1.00E-05 | <1.00E-05 | <1.00E-05 |
| | Molybdenum | mg/L | 31 | SEQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 7 | 0 | 0.0001 | 0.0003 | 0.00022857 |
| | Nitrate | mg/L | 13.29 | SEQG | 4 | 4 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 7 | 0 | **6.05** | 6.78 | 6.3343 |
| | Phosphorus | mg/L | | | 7 | 4 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 7 | 1 | <0.005 | 0.01 | <0.0074286 |
| | Potassium | mg/L | | | 7 | 0 | 0.2 | 0.4 | 0.28571 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 7 | 3 | <0.005 | 0.009 | <0.0064286 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 7 | 7 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 7 | 0 | 1 | 1.5 | 1.1857 |
| | Specific Conductivity | µS/cm | | | 7 | 0 | 14 | 21 | 16.429 |
| | Strontium | mg/L | | | 7 | 0 | 0.01 | 0.019 | 0.013714 |
| | Sulphate | mg/L | 128 | SEQG | 7 | 0 | 0.6 | 0.9 | 0.74286 |
| | Sum of Ions | | | | 7 | 0 | 8 | 16 | 10.429 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 6 | 5 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 6 | 6 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 7 | 0 | 0.0003 | 0.0018 | 0.00081429 |
| | Total Dissolved Solids | mg/L | | | 7 | 0 | 19 | 31 | 24.857 |
| | Total Kjeldahl Nitrogen | mg/L | | | 7 | 0 | 0.18 | 0.4 | 0.28286 |
| | Total Organic Carbon | mg/L | | | 7 | 0 | 2.4 | 7.6 | 5.1571 |
| | Total Suspended Solids | mg/L | | | 7 | 0 | 1 | 8 | 3 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 7 | 6 | <0.0001 | 0.0002 | <0.00011429 |
| | Vanadium | mg/L | | | 7 | 0 | 0.0001 | 0.0003 | 0.00018571 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 7 | 4 | <0.0005 | 0.0032 | <0.00097143 |

## Table 4-2 Cont'd: Baseline Stream Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count Less Than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| SB-3 | Alkalinity | mg/L | | | 8 | 0 | 3 | 24 | 7.5 |
| | Aluminum | mg/L | 0.1 | SEQG | 8 | 0 | 0.0052 | 0.012 | 0.0086 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 8 | 7 | <0.01 | 0.04 | <0.01375 |
| | Antimony | mg/L | | | 8 | 8 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 8 | 4 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 8 | 0 | 0.0025 | 0.0041 | 0.0031375 |
| | Beryllium | mg/L | | | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 8 | 0 | 4 | 29 | 9.25 |
| | Boron | mg/L | 1.5 | CCME CWQG | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 8 | 7 | <1.00E-05 | 0.00002 | <0.00001125 |
| | Calcium | mg/L | | | 8 | 0 | 1.1 | 1.7 | 1.4 |
| | Carbonate | mg/L | | | 8 | 8 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 8 | 0 | 0.1 | 0.2 | 0.175 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 8 | 8 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 8 | 8 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 8 | 0 | 2.2 | 3.4 | 3.025 |
| | Dissolved Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 8 | 0 | 0.01 | 0.07 | 0.02375 |
| | Hardness | mg/L | | | 8 | 0 | 4 | 6 | 5.125 |
| | Hydroxide | mg/L | | | 8 | 8 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 8 | 0 | 0.042 | 0.22 | 0.096375 |
| | Lead | mg/L | 0.001 | CCME CWQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 8 | 8 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 8 | 0 | 0.3 | 0.5 | 0.3875 |
| | Manganese | mg/L | | | 8 | 0 | 0.0053 | 0.02 | 0.011213 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 8 | 8 | <1.00E-05 | <1.00E-05 | <1.00E-05 |
| | Molybdenum | mg/L | 31 | SEQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 8 | 2 | <0.0001 | 0.0002 | <0.0001125 |
| | Nitrate | mg/L | 13.29 | SEQG | 5 | 3 | <0.04 | 0.4 | <0.13 |
| | P. Alkalinity | mg/L | | | 8 | 8 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 8 | 0 | **6.18** | 6.99 | 6.6838 |
| | Phosphorus | mg/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 8 | 6 | <0.005 | 0.008 | <0.0055 |
| | Potassium | mg/L | | | 8 | 0 | 0.2 | 0.5 | 0.35 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 8 | 5 | <0.005 | 0.01 | <0.006 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 8 | 8 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 8 | 0 | 1.2 | 1.7 | 1.425 |
| | Specific Conductivity | µS/cm | | | 8 | 0 | 15 | 22 | 17 |
| | Strontium | mg/L | | | 8 | 0 | 0.011 | 0.015 | 0.012625 |
| | Sulphate | mg/L | 128 | SEQG | 8 | 0 | 0.3 | 0.9 | 0.6875 |
| | Sum of Ions | | | | 8 | 0 | 8 | 34 | 13.75 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 8 | 8 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 8 | 8 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 8 | 8 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 8 | 0 | 14 | 26 | 20.5 |
| | Total Kjeldahl Nitrogen | mg/L | | | 8 | 0 | 0.16 | 0.34 | 0.2575 |
| | Total Organic Carbon | mg/L | | | 8 | 0 | 2.4 | 3.6 | 3.1125 |
| | Total Suspended Solids | mg/L | | | 8 | 1 | <1 | 4 | <2.5 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 8 | 8 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 8 | 6 | <0.0005 | 0.0012 | <0.0006 |
| SB-4 | Alkalinity | mg/L | | | 7 | 0 | 2 | 7 | 3.7143 |
| | Aluminum | mg/L | 0.1 | SEQG | 7 | 0 | 0.019 | 0.033 | 0.026286 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Antimony | mg/L | | | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 7 | 1 | <0.0001 | 0.0002 | <0.00012857 |
| | Barium | mg/L | | | 7 | 0 | 0.0025 | 0.0036 | 0.0031429 |
| | Beryllium | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 7 | 0 | 2 | 8 | 4.4286 |
| | Boron | mg/L | 1.5 | CCME CWQG | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 7 | 4 | <1.00E-05 | 0.00002 | <0.000011429 |
| | Calcium | mg/L | | | 7 | 0 | 1 | 1.5 | 1.2714 |
| | Carbonate | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 7 | 6 | <0.1 | <0.1 | <0.1 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 7 | 6 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 7 | 1 | <0.2 | 5.9 | <4.1714 |
| | Dissolved Phosphorus | mg/L | | | 7 | 6 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 7 | 1 | <0.01 | 0.03 | <0.017143 |
| | Hardness | mg/L | | | 7 | 0 | 4 | 5 | 4.7143 |
| | Hydroxide | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 7 | 0 | 0.095 | 0.29 | 0.19214 |
| | Lead | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 7 | 7 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 7 | 0 | 0.2 | 0.4 | 0.34286 |
| | Manganese | mg/L | | | 7 | 0 | 0.0036 | 0.016 | 0.0089 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 7 | 7 | <1.00E-05 | <1.00E-05 | <1.00E-05 |
| | Molybdenum | mg/L | 31 | SEQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 7 | 2 | <0.0001 | 0.0003 | <0.00015714 |
| | Nitrate | mg/L | 13.29 | SEQG | 4 | 3 | <0.04 | 0.26 | <0.095 |
| | P. Alkalinity | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 7 | 0 | **6.07** | 6.84 | 6.4743 |
| | Phosphorus | mg/L | | | 7 | 6 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 7 | 2 | <0.005 | 0.01 | <0.0061429 |
| | Potassium | mg/L | | | 7 | 0 | 0.1 | 0.4 | 0.24286 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 7 | 6 | <0.005 | 0.007 | <0.0052857 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 7 | 7 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 7 | 0 | 0.9 | 1.3 | 1.1429 |
| | Specific Conductivity | µS/cm | | | 7 | 0 | 12 | 17 | 14.429 |
| | Strontium | mg/L | | | 7 | 0 | 0.0089 | 0.014 | 0.0117 |
| | Sulphate | mg/L | 128 | SEQG | 7 | 0 | 0.4 | 0.7 | 0.51429 |
| | Sum of Ions | | | | 7 | 0 | 5 | 11 | 7.8571 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 6 | 6 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 6 | 6 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 7 | 1 | <0.0002 | 0.0006 | <0.00038571 |
| | Total Dissolved Solids | mg/L | | | 7 | 0 | 18 | 27 | 22.571 |
| | Total Kjeldahl Nitrogen | mg/L | | | 7 | 0 | 0.22 | 0.65 | 0.33571 |
| | Total Organic Carbon | mg/L | | | 7 | 0 | 4 | 5.9 | 4.7571 |
| | Total Suspended Solids | mg/L | | | 7 | 1 | <1 | 4 | <2.4286 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 7 | 0 | 0.0001 | 0.0002 | 0.00015714 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 7 | 5 | <0.0005 | 0.0042 | <0.0010571 |

## Table 4-2 Cont'd: Baseline Stream Water Quality Summary

| Location | Parameter | Units | Benchmark | | Total Count | Count Less Than RDL | Minimum | Maximum | Arithmetic Mean |
|---|---|---|---|---|---|---|---|---|---|
| | | | Value | Reference | | | | | |
| SB-5 | Alkalinity | mg/L | | | 7 | 0 | 3 | 13 | 6.7143 |
| | Aluminum | mg/L | 0.1 | SEQG | 7 | 0 | 0.0016 | 0.0086 | 0.0055857 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 7 | 6 | <0.01 | 0.04 | <0.014286 |
| | Antimony | mg/L | | | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 7 | 1 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 7 | 0 | 0.0026 | 0.004 | 0.0030857 |
| | Beryllium | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 7 | 0 | 4 | 16 | 8.1429 |
| | Boron | mg/L | 1.5 | CCME CWQG | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 7 | 3 | <1.00E-05 | 0.00004 | <0.000017143 |
| | Calcium | mg/L | | | 7 | 0 | 1.2 | 1.7 | 1.3714 |
| | Carbonate | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 7 | 0 | 0.1 | 0.2 | 0.18571 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 7 | 0 | 2.6 | 3.2 | 2.9429 |
| | Dissolved Phosphorus | mg/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 7 | 0 | 0.01 | 0.07 | 0.025714 |
| | Hardness | mg/L | | | 7 | 0 | 4 | 6 | 4.8571 |
| | Hydroxide | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 7 | 0 | 0.036 | 0.16 | 0.10014 |
| | Lead | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 7 | 7 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 7 | 0 | 0.2 | 0.5 | 0.37143 |
| | Manganese | mg/L | | | 7 | 0 | 0.0071 | 0.016 | 0.010729 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 7 | 7 | <1.00E-05 | <1.00E-05 | <1.00E-05 |
| | Molybdenum | mg/L | 31 | SEQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 4 | 3 | <0.04 | 0.4 | <0.13 |
| | P. Alkalinity | mg/L | | | 7 | 7 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 7 | 0 | **6.47** | 6.99 | 6.7157 |
| | Phosphorus | mg/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 7 | 7 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 7 | 0 | 0.2 | 0.5 | 0.35714 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 7 | 6 | <0.005 | 0.006 | <0.0051429 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 7 | 7 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 7 | 0 | 1.3 | 1.7 | 1.4429 |
| | Specific Conductivity | µS/cm | | | 7 | 0 | 15 | 23 | 17.429 |
| | Strontium | mg/L | | | 7 | 0 | 0.011 | 0.015 | 0.012 |
| | Sulphate | mg/L | 128 | SEQG | 7 | 0 | 0.5 | 1 | 0.71429 |
| | Sum of Ions | | | | 7 | 0 | 8 | 22 | 12.571 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 7 | 6 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 7 | 7 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 7 | 7 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 7 | 0 | 16 | 24 | 19.286 |
| | Total Kjeldahl Nitrogen | mg/L | | | 7 | 0 | 0.18 | 0.3 | 0.26143 |
| | Total Organic Carbon | mg/L | | | 7 | 0 | 2.7 | 3.2 | 2.9714 |
| | Total Suspended Solids | mg/L | | | 7 | 2 | <1 | 3 | <1.8571 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 7 | 7 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 7 | 5 | <0.0005 | 0.0016 | <0.00067143 |
| RC-1 | Alkalinity | mg/L | | | 2 | 0 | 13 | 15 | 14 |
| | Aluminum | mg/L | 0.1 | SEQG | 2 | 0 | 0.0041 | 0.0046 | 0.00435 |
| | Ammonia as N | mg/L | 0.103 | CCME CWQG | 2 | 1 | <0.01 | 0.04 | <0.025 |
| | Antimony | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Arsenic | mg/L | 0.005 | SEQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Barium | mg/L | | | 2 | 0 | 0.002 | 0.0023 | 0.00215 |
| | Beryllium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Bicarbonate | mg/L | | | 2 | 0 | 16 | 18 | 17 |
| | Boron | mg/L | 1.5 | CCME CWQG | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Cadmium | mg/L | 0.00004 | CCME CWQG | 2 | 2 | <1.00E-05 | <1.00E-05 | <1.00E-05 |
| | Calcium | mg/L | | | 2 | 0 | 1.4 | 1.4 | 1.4 |
| | Carbonate | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Chloride | mg/L | 120 | CCME CWQG | 2 | 0 | 0.5 | 0.6 | 0.55 |
| | Chromium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0005 | <0.0005 | <0.0005 |
| | Cobalt | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Copper | mg/L | 0.002 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Dissolved Organic Carbon | mg/L | | | 2 | 0 | 2.6 | 2.6 | 2.6 |
| | Fluoride | mg/L | 0.12 | CCME CWQG | 2 | 0 | 0.01 | 0.02 | 0.015 |
| | Hydroxide | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | Iron | mg/L | 0.3 | SEQG | 2 | 0 | 0.048 | 0.081 | 0.0645 |
| | Lead | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Lead-210 | Bq/L | | | 2 | 2 | <0.02 | <0.02 | <0.02 |
| | Magnesium | mg/L | | | 2 | 0 | 0.4 | 0.4 | 0.4 |
| | Manganese | mg/L | | | 2 | 0 | 0.0073 | 0.013 | 0.01015 |
| | Mercury | mg/L | 0.000026 | CCME CWQG | 2 | 0 | 2.00E-06 | 5.00E-06 | 3.50E-06 |
| | Molybdenum | mg/L | 31 | SEQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Nickel | mg/L | 0.025 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Nitrate | mg/L | 13.29 | SEQG | 2 | 2 | <0.04 | <0.04 | <0.04 |
| | P. Alkalinity | mg/L | | | 2 | 2 | <1 | <1 | <1 |
| | pH | units | 6.5–9 | CCME CWQG | 2 | 0 | 7.03 | 7.18 | 7.105 |
| | Phosphorus | mg/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Polonium-210 | Bq/L | | | 2 | 2 | <0.005 | <0.005 | <0.005 |
| | Potassium | mg/L | | | 2 | 0 | 0.4 | 0.4 | 0.4 |
| | Radium-226 | Bq/L | 0.11 | SSWQO | 2 | 2 | <0.005 | <0.005 | <0.005 |
| | Selenium | mg/L | 0.001 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Silver | mg/L | 0.0001 | CCME CWQG | 2 | 2 | <0.00005 | <0.00005 | <0.00005 |
| | Sodium | mg/L | | | 2 | 0 | 1.6 | 1.6 | 1.6 |
| | Specific Conductivity | µS/cm | | | 4 | 0 | 12 | 20.1 | 15.925 |
| | Strontium | mg/L | | | 2 | 0 | 0.013 | 0.014 | 0.0135 |
| | Sulphate | mg/L | 128 | SEQG | 2 | 0 | 0.4 | 0.5 | 0.45 |
| | Sum of Ions | | | | 2 | 0 | 21 | 23 | 22 |
| | Thallium | mg/L | 0.0008 | CCME CWQG | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Thorium-228 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-230 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Thorium-232 | Bq/L | | | 2 | 2 | <0.01 | <0.01 | <0.01 |
| | Tin | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Titanium | mg/L | | | 2 | 2 | <0.0002 | <0.0002 | <0.0002 |
| | Total Dissolved Solids | mg/L | | | 2 | 0 | 26 | 38 | 32 |
| | Total Kjeldahl Nitrogen | mg/L | | | 2 | 0 | 0.26 | 0.29 | 0.275 |
| | Total Organic Carbon | mg/L | | | 2 | 0 | 2.2 | 2.2 | 2.2 |
| | Total Suspended Solids | mg/L | | | 2 | 0 | 2 | 5 | 3.5 |
| | Uranium | mg/L | 0.015 | CCME CWQG | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Vanadium | mg/L | | | 2 | 2 | <0.0001 | <0.0001 | <0.0001 |
| | Zinc | mg/L | 0.007 | CCME CWQG | 2 | 1 | <0.0005 | 0.0029 | <0.0017 |

Notes:
Summary of baseline water quality data from 2011 to 2019
SEQG - Saskatchewan Environmental Quality Guideline - Water Quality Guideline for Freshwater Aquatic Life (Government of Saskachewan, 2019)
CCME CWQG - Canadian Water Quality Guideline for the Protection of Aquatic Life (CCME, 1999)
SSWQO - Saskatchewan Surface Water Quality Objective (Water Security Agency, 2015)
Mean values are indicated as "less than", "<", when one or more of the samples were below the analytical detection limit for the parameter
Ammonia guideline assumes a maximum pH of 8.5 and temperature of 25°C

**Table 4-3: Baseline Stream Water Chemistry 2016-2019**

| Station | Date (dd/mm/yy) | Parameter | | | | |
|---|---|---|---|---|---|---|
| | | Temperature (°C) | Conductivity (µS/cm) | pH | Dissolved Oxygen (mg/L) | Oxygen Saturation (%) |
| SA-1 | 17/09/16 | 12.3 | 15 | 7.01 | 10.63 | 99.4 |
| | 28/05/17 | 10.0 | 10 | - | 10.83 | 96.0 |
| | 05/07/19 | 14.0 | 13.4 | 6.69 | 8.53 | 83.0 |
| | 30/08/19 | 12.8 | 14.0 | 6.82 | 8.91 | 84.1 |
| SA-2 | 16/09/16 | 12.1 | 15 | 6.89 | 10.64 | 98.9 |
| | 27/05/17 | 12.4 | 11 | - | 10.29 | 96.9 |
| | 05/07/19 | 15.5 | 12.8 | 6.53 | 8.80 | 88.1 |
| | 30/08/19 | 14.0 | 13.7 | 6.98 | 9.11 | 88.2 |
| SA-3 | 05/07/19 | 17.7 | 16.0 | 6.70 | 8.62 | 89.8 |
| | 30/08/19 | 15.2 | 16.7 | 6.76 | 9.21 | 92.3 |
| SA-4 | 10/09/16 | 11.0 | 16 | 6.71 | 9.58 | 87.0 |
| | 26/05/17 | 11.0 | 11 | - | 10.21 | 92.4 |
| | 04/07/19 | 13.8 | 13.9 | 6.56 | 8.30 | 80.5 |
| | 29/08/19 | 14.1 | 15.8 | 6.93 | 7.15 | 70.2 |
| SA-5 | 09/09/16 | 13.6 | 20 | 5.96 | 9.52 | 91.6 |
| | 29/05/17 | 10.6 | 9 | - | 11.14 | 100.7 |
| | 04/07/19 | 12.9 | 11.5 | 6.64 | 8.58 | 81.3 |
| | 29/08/19 | 12.4 | 12.3 | 6.75 | 7.81 | 73.2 |
| SA-6 | 12/09/16 | 8.9 | 22 | 5.83 | 10.92 | 93.6 |
| | 29/05/17 | 12.4 | 11 | - | 10.51 | 98.3 |
| | 04/07/19 | 13.7 | 10.8 | 6.25 | 8.12 | 79.2 |
| | 29/08/19 | 13.8 | 13.7 | 6.86 | 7.33 | 71.1 |
| RC-1 | 14/09/16 | 10.6 | 21 | 6.92 | 10.23 | 92.0 |
| | 29/05/17 | 13.1 | 11 | - | 10.71 | 101.7 |
| | 06/07/19 | 15.8 | 15.4 | 7.18 | 8.94 | 90.2 |
| | 01/09/19 | 12.8 | 15.4 | 7.04 | 9.09 | 86.1 |
| SB-1 | 17/09/16 | 10.6 | 15 | 5.98 | 8.41 | 75.2 |

**Table 4-4: Baseline Stream Fish Community Summary**

| Fish Species | Station | | | | | | |
|---|---|---|---|---|---|---|---|
| | SA1 | SA2 | SA4 | SA5 | SA6 | RC1 | SB1 |
| Lake Chub | x | x | x | x | - | x | - |
| Spottail Shiner | - | - | x | - | x | - | - |
| Longnose Sucker | x | - | x | x | x | - | - |
| White Sucker | x | x | x | x | x | x | - |
| Arctic Grayling | x | x | x | - | - | - | - |
| Northern Pike | x | x | x | - | x | x | - |
| Burbot | x | x | x | x | x | x | x |
| Ninespine Stickleback | - | - | x | x | x | - | - |
| Slimy Sculpin | x | x | x | x | - | x | - |
| Yellow Perch | - | - | - | - | - | x | - |
| Walleye | - | x | - | x | x | - | - |

**Notes:**
Results presented in this table is from fish survey performed between 2016 and 2017.
x indicates that the species was either captured or observed
- indicates that the species was neither captured nor observed

**Table 4-5: Baseline Stream Fish Spawning Summary**

| Station | | Units | SA-1 | SA-2 | SA-4 | SA-5 | SA-6 | RC-1 |
|---|---|---|---|---|---|---|---|---|
| | | | 28-May-17 | 27-May-17 | 26-May-17 | 29-May-17 | 29-May-17 | 26-May-17 |
| Notes/Observations | | - | Northern Pike spawning habitat present in upper reach. Suitable sucker and Walleye spawning habitat. | Spawning habitat for White Sucker and Walleye; limited Northern Pike spawning habitat upstream. | White Sucker and Lake Chub spawning confirmed. No quality Northern Pike spawning habitat. | Spawning habitat for suckers, Lake Chub and Walleye; limited Northern Pike spawning habitat upstream. | Northern Pike spawning habitat present in lower reach. | No large-bodied fish spawning observed. |
| Station Details | Location | - | Icelander River u/s of Russell Lake, d/s of LA-1 | u/s of LA-1 | d/s of LA-7, u/s of LA-6 | u/s of LA-6 | between LA-6 and LA-5 | d/s of LA-7 |
| | Coordinates | Lat<br>Long | 57° 28' 56.8"<br>-105° 19' 38.6" | 57° 30' 05.0"<br>-105° 21' 26.7" | 57° 31' 25.1"<br>-105° 23' 02.1" | 57° 31' 26.7"<br>-105° 22' 10.6" | 57° 30' 56.6"<br>-105° 22' 06.4" | 57° 31' 32.7"<br>-105° 24' 34.7" |
| Habitat Features | | | Coolwater | Coolwater | Coolwater | Coolwater | Coolwater | Coolwater |
| Water Quality | Temperature | °C | 9.99 | 12.41 | 10.95 | 10.59 | 12.35 | 13.09 |
| | Conductivity | µS/cm | 10 | 11 | 11 | 9 | 11 | 11 |
| | Specific Conductivity | µS/cm | 14 | 14 | 15 | 13 | 14 | 16 |
| | Dissolved Oxygen | mg/L | 10.83 | 10.29 | 10.21 | 11.14 | 10.51 | 10.71 |
| | Dissolved Oxygen | % | 96 | 96.9 | 92.4 | 100.7 | 98.3 | 101.7 |
| | Water Colour | - | Colourless | Colourless | Colourless | Colourless | Colourless | Colourless |
| | Water Clarity | - | Clear | Clear | Clear | Clear | Clear | Clear |
| Physical Qualities | Reach Length | m | 215 | 200 | 70 | 160 | 200 | 120 |
| | Stream Width (wet) | m | 12 | 7 | 8 | 6.5 | 15 | 8 |
| | Mean Depth | m | 0.5 | 0.5 | 0.25 | 0.3 | 0.7 | 0.2 |
| | Mean Flow Velocity | m/s | 0.6-0.95 | 0.7-1.0 | 0.5-0.7 | 0.5 | 0.2 | 0.5 |
| | Barriers | - | None | None | None | None | None | None |
| Reach Morphology | Riffle | - | 85 | 65 | 70 | 60 | - | 60 |
| | Run | - | 10 | 30 | 10 | 35 | 85 | 20 |
| | Pool | - | 5 | 5 | 20 | 5 | 10 | 15 |
| | Flat | - | - | - | - | - | 5 | 5 |
| Substrate | Bedrock | - | - | - | - | - | - | - |
| | Boulder (>25cm) | - | 60 | 30 | 5 | 15 | 5 | 10 |
| | Cobble | - | 25 | 50 | 70 | 70 | - | 20 |
| | Gravel | - | 10 | 20 | 10 | 5 | - | 50 |
| | Sand | - | 5 | - | 15 | 10 | 95 | 20 |
| Aquatic Vegetation | Emergent | - | Sedges | Sedges | Sedges, horsetail | Sedges | Sedges | Sedges |

Notes:
u/s - upstream
d/s - downstream

# 5.0 SUMMARY OF BASELINE AQUATIC ENVIRONMENT CONDITIONS FOR THE WHEELER RIVER MINE PROJECT AREA

Baseline aquatic environment studies were undertaken at the Wheeler River Project site between 2011 and 2019. The studies included surveying of lentic (lakes and ponds) and lotic (streams) environments within two sub-basins of the Wheeler River in the Churchill River basin, the Icelander River drainage and the Williams Lake drainage. The estimated drainage areas for the Icelander River and Williams Lake drainage areas are 371 $km^2$ and 78 $km^2$, respectively. Both drainages flow into the northwest portion of Russell Lake. Downstream of Russell Lake, the Wheeler River flows into the Geikie River which subsequently discharges to Wollaston Lake.

The scope of the baseline studies included:

- water elevation measurements, instantaneous discharge measurements, and continuous water level recording;
- bathymetry and aquatic habitat assessments and mapping;
- limnological, water quality, and sediment quality evaluations;
- benthic invertebrate community and tissue characterization;
- phytoplankton and zooplankton surveys; and,
- fish community and spawning surveys and tissue chemistry analysis.

A summary of the aquatic baseline information presented in this current report is provided below.

## 5.1 Water Elevation and Stream Discharge

Water level elevations were surveyed at thirteen lakes and two ponds in from 2011 to 2019. Stream flow measurements were taken on seventeen watercourses and continuous stream flow monitoring equipment has been installed at thirteen lotic locations and two lentic locations. Details are provided in **Table 4-1** and **Appendix G**.

In the 2016 surveys, lake and pond surface water elevations in the Icelander River drainage ranged from 520.86 masl at the headwater lake LA-8 to 487.94 masl at Russell Lake. Water level elevations at the stream locations ranged from 520.84 masl at the most upstream station (SA-11), to 492.55 masl at the most downstream station (SA-1), in September 2016. In Williams Lake drainage area, water levels at stream locations ranged

from 519.24 masl at SB-4 to 488.34 masl at the most downstream station, SB-1. The average daily streamflow at the most downstream location in the Icelander River and the Williams Lake drainage areas ranged from 0.655 to 3.23 $m^3/s$ and 0.067 to 1.5 $m^3/s$, respectively. The difference in stream flows for the two basins reflects the difference in the catchment areas of each drainage area that are estimated at 371 $km^2$ for the Icelander River Drainage and 78 $km^2$ for the Williams Lake Drainage.

Rating curves were developed for five locations: SA-1, SA-4, SA-5, SA-6 and SA-11 in the Icelander River drainage area, and SB-1, SB-3 and SB-4 in the Williams Lake drainage area (see **Appendix G**).

## 5.2 Surface Water Quality and Limnology

Water quality was assessed at 17 lentic locations and 12 lotic stations within the study area. Baseline water quality data were compiled for the years 2011, 2012, 2013, 2014, 2016, 2018 and 2019. The baseline water quality for all stations within the baseline study area are summarized in **Appendix A**, **Table A-1**.

Surface water within the study area is characterized by very soft water, low alkalinity, low nutrient levels (nitrate and phosphorus), low conductivity, and low concentrations of total dissolved solids and total suspended solids.

The highest hardness levels were found at Russell Lake (maximum of 12 and 13 mg/L $CaCO_3$ at LAB-2 and LAB-1, respectively). At all other locations, mean and maximum hardness concentrations were < 10 mg/L $CaCO_3$. The pH range for surface water within the study area is slightly acidic to neutral, ranging from 5.7 to 7.2. The pH was measured below the lower CWQG value of 6.5 at three (3) lentic stations including a water sample collected in Whitefish Lake (LA-6), the two (2) water samples collected below the thermocline in Kratchkowsky Lake (LA-7-A) and Williams Lake (LB-3), and at 9 lotic stations (19 samples).

Total alkalinity measured at lentic and lotic locations within the study area was generally low, ranging between 1.0 and 38 mg/L. Alkalinity is a measure of the buffering capacity of water or the ability to neutralize acids. Surface water with an alkalinity level < 25 mg/L is considered to be poorly buffered (Bain, 1999).

- A maximum concentration of 38 mg/L was measured at Whitefish Lake northern basin (LA-6) for lentic stations, and the mean concentration of 16 mg/L was calculated at Kratchkowsky Lake (LA-7) based on three samples.

- A maximum concentration of 24 mg/L was measured at SB-3 for lotic stations, and the mean concentration of 6.7 mg/L was calculated at SB-5 based on seven samples.

- The average alkalinity of all water samples at each station was less than 20 mg/L.

Nutrient levels in surface water, including nitrate (as $NO_3$) and phosphorus (total and dissolved) concentrations, were low within the study area.

- Nitrate measurements were below the laboratory detection limit of 0.04 mg/L for more than half of the surface water samples (68 of 103 samples).
- Where measurable in surface water, nitrate concentrations were well below SEQG guideline value of 13.29 mg/L, with a maximum measured nitrate concentration of 0.66 mg/L measured at LB-2.
- The majority of phosphorus measurements (total and dissolved) were less than the laboratory detection limit of 0.01 mg/L (135 of 142, and 136 of 142, respectively).
- The highest phosphorus concentrations were measured at depth, below the thermocline in stratified lakes. These included total and dissolved concentrations of phosphorus at Karchkowsky Lake (LA-7A) of 0.11 mg/L and 0.10 mg/L, and at Williams Lake (LB-3) of 0.17 mg/L and 0.15 mg/L, respectively.

Ammonia ($NH_3$-N) and total Kjeldahl nitrogen (TKN) concentrations in surface water within the study area were low, ranging from <0.01 to 1.2 mg $NH_3$-N/L and <0.05 and 1.6 mg TKN/L.

- Ammonia and TKN concentrations were highest in water below the thermocline at stratified lakes: Krachkowsky Lake (LA-7A) (0.91 and 1.2 mg/L, respectively) and Williams Lake (LB-3) (1.2 and 1.6 mg/L, respectively).
- Maximum concentrations of ammonia and TKN in water samples collected at the surface of lakes and ponds and at streams stations within the study area were max 0.12 mg $NH_3$-N/L and 0.65 mg TKN/L.

Total dissolved solids (TDS) and specific conductivity measurements in surface water were low within the study area, ranging from 11 to 40 mg TDS/L and 8 to 47 µS/cm.

- The maximum TDS value measured in surface water within the study area was 40 mg/L, measured at SA-4.
- The highest conductivity measurements were measured at Russell Lake: 47 µs/cm at LAB-1 and 42 µs/cm at LAB-2.

Total suspended solid (TSS) concentrations in surface water were low within the study area, ranging from <1 to 23 mg/L.

- The most elevated TSS concentrations were measured in water below the thermocline at Karchkowsky Lake (LA-7A) (13 mg/L) and Williams Lake (LB-3) (23 mg/L).
- Concentrations of TSS in water collected from the surface of lakes and ponds and at stream stations were <10 mg/L with the majority being <5 mg/L.

Total organic carbon (TOC) and dissolved organic carbon (DOC) concentrations were low in surface water within the study area, ranging from 1.4 to 8.4 mg TOC/L and <0.2 to 8.4 mg DOC/L.

- The highest concentrations of TOC of 8.4 mg/L and DOC of 8.4 mg/L were measured at pond PA-3.
- Mean concentrations for TOC and DOC across all stations were 2.9 mg/L and 2.8 mg/L, respectively.

In general, metals and metalloids had similar concentrations in surface water across the study area. For metal and metalloid parameters where water quality benchmarks from SEQG or CCME CWQO were available, most were below the guideline limits with a few exceptions, including cadmium, iron, lead, mercury and zinc.

- One exceedance each of the cadmium SEQG value of 0.00004 mg/L was measured at SA-4 and SA-6.
- Exceedances of the iron SEQG value of 0.3 mg/L occurred at 5 surface water stations including in water samples collected at two lentic stations below the thermocline, Kratchkowsky Lake (LA-7A) and Williams Lake (LB-3), and at three lotic stations, SA-1, SB-1 and SB-2.
- One exceedance of the lead CWQG value of 0.001 mg/L was measured at Whitefish Lake northern basin (LA-6).
- One exceedance of the mercury CWQG value of 0.000026 mg/L was measured at Kratchkowsky Lake (LA-7A), in water below the thermocline.
- Two exceedances of the zinc CWQG value of 0.007 mg/L were measured in surface waters at Whitefish Lake northern basin (LA-6) and SA-2.

Radionuclide concentrations in surface water were low within the study area, and generally below the laboratory detection limits of 0.02 Bq/L for lead-210, 0.005 Bq/L for

polonium-210, 0.005 Bq/L for radium-226, 0.01 Bq/L for thorium-228, thorium-230 and thorium-232.

## 5.3 Lake Sediment Quality

Sediment samples were collected in 2016 for grain size and chemical analysis. Sediment data for the top 0-2 cm of sediment were summarized to characterize the baseline conditions in the Wheeler River Project area. Sediment samples were collected from depositional areas within lakes, including McGowan Lake (LA-1), Whitefish Lake (LA-5 and LA-6), Kratchkowsky Lake (LA-7 and LA-7A), LA-8, LA-9, Williams Lake (LB-3), and Russell Lake (LAB-1 and LAB-2). Three to five sediment samples were obtained from each waterbody, with the exception of LAB-2 where only one core sample was obtained.

The baseline sediment grain size and chemistry analysis for all stations within the baseline study area are summarized in **Tables A-3** and **A-4** of **Appendix A**, respectively.

Lake sediments were generally silty-clay or sandy-silt. The proportion of clay ranged from 10% to 82% with a mean value of 56%. The proportion of silt ranged from 13% to 55% with a mean value of 30%. The proportion of sand ranged from 0.1% to 77% with a mean value of 14%. The proportion of total organic carbon in the sediments ranged from 0.44% to 26%, with a mean value of 16%. For parameters where sediment quality guidelines are available, all constituent concentrations were at or below their respective REF, ISQG or LEL value.

## 5.4 Aquatic Habitat and Bathymetry

Shoreline vegetation at most lakes primarily consisted of shrubs and black spruce with upland jack pine forests. The shoreline generally consisted of rocks with overhanging shrubs, transitioning from small boulder and cobble to a sand or silty bottom, with patches of sandy beach and sparse emergent or submergent aquatic vegetation. The shoreline near the LA-9 lake inlet and outlet, consisted of bog. At some lakes submerged tree trunks were found in localized areas nearshore. Typical nearshore substrates included, boulders, cobble, sand and organic matter. Shoreline slopes ranged from shallow to steep with the presence of old and active erosional areas. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris. The ponds supported emergent, submergent and floating aquatic macrophyte beds along much of the nearshore, and nearly the entire waterbody at PA-3 supported emergent, submergent and floating aquatic macrophyte beds.

The stream habitats surveyed as part of the baseline study included 2nd (SA-4, RC-1) and 3rd (SA-1, SA-1, SA-5, SA-6, SB-1) order streams in the Icelander River basin and the Williams Lake drainage. Stream channels were generally stable and portions of the channels within any of the reaches surveyed were braided, meandering, straight or ponded.

Stream gradients within any reach surveyed were high to low and characterized by riffles, runs or pools, with some flats. No barriers to fish migration were observed.

The surface areas of the lakes within the study area ranged from 26.3 ha for the north basin of Whitefish Lake (LA-6) to 323 ha for Kratchkowsky Lake (LA-7 and LA-7A) combined. A total area of approximately 227 ha of Russell Lake (LAB-1 and LAB-2) was surveyed. The mean depth of the lakes surveyed ranged from 1.1 m for the south basin of Whitefish Lake (LA-5) to 5.5 m for McGowan Lake. Lake volumes, excluding LAB-1 and LAB-2 which are small portions of the larger Russell Lake, were estimated to range from 333,000 $m^3$ for Whitefish Lake (LA-5) to 12,700,000 $m^3$ for Kratchkowsky Lake (LA-7 and LA-7A combined).

The pond surface areas ranged from 4.5 ha to 8.4 ha for PA-3 and PA-2, respectively. Mean pond depths were 0.9 m for PA-3 and 1.5 m for PA-2. Pond volumes were estimated to be 39,000 $m^3$ for PA-3 and 123,000 $m^3$ for PA-2.

## 5.5 Lake Plankton Community

Phytoplankton and zooplankton samples were collected in September 2016 at six locations: McGowan Lake (LA-1), Whitefish Lake (LA-5 and LA-6), Kratchkowsky Lake (LA-7), and Russell Lake (LAB-1 and LAB-2). The detailed data are presented and summarized in **Appendix A, Tables A-5** and **A-6** for phytoplankton and zooplankton communities, respectively. The results for chlorophyll analysis are presented in **Appendix A, Table A-7**.

For phytoplankton, total biovolume ($\mu m^3$) was greatest at McGowan Lake, $1.4\times10^{10}\mu m^3/L$. The total biovolume for phytoplankton was an order of magnitude or more less at all other sampling areas. In total, 55 phytoplankton taxa were identified from 7 classes. The number of taxa present in September 2016 ranged from 21 to 37, and at least 6 classes were identified in each of the waterbodies sampled. Diatoms (Bacilliarophyceae) were dominant at all locations representing more than one-quarter (LAB-2) and up to 90% (McGowan Lake) of total biovolume at each location. Other dominant classes present at some of the locations were cryptophytes (Cryptophyceae), cyanophytes (Cyanophyceae), and dinoflagellates (Dinophyceae).

For zooplankton, total biovolume in September 2016 ranged from approximately $1.0 \times 10^{10}$ $\mu m^3/L$ at LA-6 to $2.2 \times 10^{12}$ $\mu m^3/L$ at McGowan Lake. A total of 32 taxa belonging to 10 classes were identified. Within each of the waterbodies sampled, 15 to 22 taxa were present and 7 to 9 classes were identified. Branchiopods (Branchiopoda) were dominant at all locations representing approximately one-third (at LAB-2) to 94% (McGowan Lake) of zooplankton biovolume at each location. Other dominant classes present at some of the locations were copepods (Copepoda) and Monogononta.

At all locations, chlorophyll-a concentrations were below the laboratory method detection limit (< 0.60 µg/L); the low levels of chlorophyll-a suggest that there is low primary

productivity in the lakes, reflecting the oligotrophic state of lakes within the Wheeler River Project study area.

## 5.6 Lake Benthic Invertebrate Community and Chemistry

### 5.6.1 Benthic Invertebrate Community

Benthic invertebrate samples were collected in 2016 at lake locations McGowan Lake, Whitefish Lake (LA-5 and LA-6), Kratchkowsky Lake (LA-7 and LA-7A), LA-8, LA-9, Williams Lake (LB-3) and Russell Lake (LAB-1 and LAB-2). Baseline benthic invertebrate community data are provided in **Appendix A**, **Tables A-8** through **A-10**, for abundance and relative abundance of major taxonomic groups (family). **Appendix A**, **Table A-11** presents benthic community metrics and abundance and relative abundance of feeding groups for each station.

Total invertebrate density was variable among locations; three locations, LA-8, LA-7A and McGowan Lake, had total invertebrate densities less than 1,000 individuals/$m^2$ (mean densities of 671, 800 and 981 individuals/$m^2$, respectively). Three locations, LA-5, LA-6, and Williams Lake (LB-3), had total invertebrate densities nearing or greater than 10,000 individuals/$m^2$ (mean densities of 9597, 10,163, and 10,457 individuals/$m^2$). Total invertebrate densities at the remaining four locations, LA-7, LA-9, LAB-1, and LAB-2, ranged between 1,633 and 5,295 individuals/$m^2$.

A total of 78 taxa were identified in the study area. Mean invertebrate richness ranged from 7 to 24 taxa per sample. Mean richness was lowest at the three locations with the lowest invertebrate densities (richness of 10, 7, and 9 at LA-8, LA-7A, and McGowan Lake, respectively), and highest at two of the locations with highest total invertebrate densities (17 and 21 at LA-6 and LA-5, respectively), as well as Russell Lake (19 and 24 taxa at LAB-1 and LAB-2, respectively).

Simpson's Diversity Index (*D*) values suggested that the benthic communities were relatively diverse at all locations. Mean Diversity index values ranged from 0.65 at LA-6 to 0.85 at LAB-1. Russell Lake had the highest diversity among all locations (*D* = 0.82 at LAB-2 and *D* = 0.85 at LAB-1).

Simpson's Evenness Index (*E*) values suggested that few taxa comprised a large proportion of total invertebrate density at any given sampling location. Evenness was lowest at LA-6 (mean *E* = 0.18) and highest at McGowan Lake (mean *E* = 0.44).

The benthic communities at Whitefish Lake (LA-5 and LA-6), shared many of the same taxa compared to the reference location as indicated by the Bray-Curtis (*B-C*) dissimilarity index. The mean *B-C* index was 0.39 and 0.37 at LA-5 and LA-6, respectively. At the remainder of the lakes (McGowan Lake, Kracthkowsky Lake [LA-7 and LA-7A], LA-8, LA-9, Williams Lake (LB-3), and Russell Lake [LAB-1 and LAB-2]), mean *B-C* indices suggested that some

locations shared the same taxa as the median reference condition of the large lakes group more so than others and that other locations did not share the same taxa. The mean *B-C* index ranged from 0.36 (LA-7A at north arm of Kratchkowsky Lake) to 0.87 (LAB-2 at Russell Lake). In general, the lakes locations with higher taxa richness [Williams Lake (LB-3), Russell Lake (LAB-1 and LAB-2)] tended to not share the same taxa as the median reference condition group.

Thirty-eight major taxonomic groups (Families) were present in the study area. Chironomids were the most prevalent, comprising between 16 to 85% of the total benthic invertebrate density at each location. Furthermore, chironomids were the most numerically dominant taxon at all locations except lakes LA-5 and LA-6, where they were the second-most dominant taxon. At Whitefish Lake (LA-5 and LA-6), the numerically dominant taxon was the Chydoridae family of water fleas (Cladocera). At the locations where chironomids were the numerically dominant taxon, they comprised a minimum of 44% of the benthic invertebrate density (McGowan Lake); at each of the remainder of the locations, they comprised more than half of the benthic invertebrate density and even comprised more than 80% of the density at Kratchkowsky Lake (LA-7 and LA-7A) and at LA-8. Other major taxonomic groups that represented more than 10% of the total benthic invertebrate density at a sampling location were detritus worms (Naididae), pill clams (Pisidiidae), water fleas from the families Holopedidae and Macrothricidae, and phantom midges (Chaoboridae). Seed shrimps (Ostracoda) and cyclopoid copepod did not represent more than 8% and 7% of the invertebrate density at a given location but were the second-most common taxon present at Kratchkowksy Lake locations LA-7 and LA-7A, respectively.

Benthic macroinvertebrates from the following functional feeding groups were present at all locations sampled in the study area: scrapers, shredders, collector-gatherers, collector-filterers, and predators. There was variation in the dominant functional feeding group at each location but scrapers were the least abundant at each location, comprising less than 1% of total invertebrate density. Predators were numerically dominant at four locations (McGowan Lake, LA-7A, LA-8, and LA-9; range, 35 to 61% of total invertebrate density), collector-gatherers were also numerically dominant at four locations (LA-7, Williams Lake (LB-3), LAB-1, and LAB-2; range, 34 to 60% of total invertebrate density), and collector-filterers were numerically dominant at two locations (LA-5 and LA-6; range, 66 to 75% of Total invertebrate density). At most locations, one functional feeding group was numerically dominant over others; however, at LA-7A, LA-8 and Williams Lake (LB-3), two or more functional feeding groups were represented almost equally.

### 5.6.2 Benthic Invertebrate Tissue Chemistry

Dragonfly nymphs from LA-8 and LA-9, and caddisfly larvae collected in 2016 from lakes McGowan Lake, LA-5, LA-6, Kratchkowsky Lake (LA-7 [south arm], LA-7A [north arm]), and Russell Lake (LAB-1 and LAB-2) were analyzed for metals and radionuclides. The 2016

baseline benthic invertebrate tissue chemistry and summary statistics for the study area are presented in **Appendix A**, **Table A-12**.

Metal concentrations were similar for dragonfly nymphs collected from LA-8 and LA-9. Radionuclide levels in dragonfly nymph tissues from LA-8 and LA-9 were generally below the laboratory method detection limit with the exception of Po-210 which ranged from 0.06 Bq/g at LA-8 to 0.1 Bq/g at LA-9, and Ra-226 at LA-9 (0.008 Bq/g).

Metal concentrations were generally similar in caddisfly larvae tissues at all locations, with concentrations within an order of magnitude of each other. Cobalt and nickel concentrations were more variable. Cobalt concentrations ranged from 0.16 (LA-7) to 3.7 µg/g (LAB-2) and nickel concentrations ranged from 0.19 (LA-7) to 2.7 µg/g (LAB-2 and McGowan Lake). Caddisflies from Russell Lake location LAB-2 had higher concentrations of some metals, including aluminum, cobalt, and uranium. Radionuclide concentrations were generally below the laboratory method detection limit in caddisfly larvae tissue with the following exceptions: Po-210 ranged from 0.03 Bg/g at LAB-2 to 0.12 Bg/g at LA-7A, and Ra-226 ranged from 0.01 Bg/g at LA-5 to 0.02 Bq/g at McGowan Lake, LAB-1 and LAB-2.

## 5.7 Fish Community, Spawning and Fish Tissue Chemistry

### 5.7.1 Fish Community

The fish community and fish habitat for the study area are described in **Appendix A**, **Tables A-13** to **A-16**, which present fish catch data for 2016 and 2017 (**Table A-13**), describe key lake features (**Table A-14**), stream spawning habitat (**Table A-15**), and fish condition for fish captured during the 2016-2017 aquatic study (**Table A-16**). Photographs depicting aquatic habitat at stream sampling locations, and fish species observed within the study area during the 2016-2017 aquatic study are provided in **Appendix C** and **Appendix D**, respectively.

A total of 13 species of fish were collected within the study area during baseline surveys. All waterbodies sampled, except one headwater pond, supported fish.

Eleven fish species were collected within study area lakes including representative forage and sport fish species. The species captured included Lake Chub, Spottail Shiner, Longnose Sucker, White Sucker, Lake Whitefish, Lake Trout, Northern Pike, Burbot, Ninespine Stickleback, Yellow Perch and Walleye.

Eleven fish species were also collected at stream stations across the study area. These included Lake Chub, Spottail Shiner, Longnose Sucker, White Sucker, Arctic Grayling, Northern Pike, Burbot, Ninespine Stickleback, Slimy Sculpin, Yellow Perch and Walleye.

Results from eDNA analysis is described in **Section 3.0**. Only human reads were detected in environmental samples; no other vertebrate DNA (e.g. no fish DNA) was detected. Environmental DNA platforms has been successfully applied in various stream systems as well as inland lakes, and the results have been demonstrated to be consistent with traditional fishing approaches. Technical challenges occasionally occur, including DNA extraction and downstream processing being inhibited by tannins and humic acid present in environmental samples. EcoMetrix staff noticed that the lake water samples appeared tea color in the summer, demonstrated the potential presence of inhibition factors. Further eDNA sampling is recommended to overcome inhibition issues, and provide archivable biodiversity reference point to evaluate environmental impact of the mine through different cycles of the life stage.

### 5.7.2 Fish Spawning

Large-bodied fish spawning surveys were undertaken during the fall of 2016 and spring of 2017 at selected lake and stream locations to determine the utilization of these areas for spawning. The fall survey was conducted during a period in which it was expected that fall spawners would be sexually mature. The spring survey was timed to take place shortly after ice-out, a period when spring spawning was expected to be underway.

Fall spawning species present within the study area include Lake Whitefish and Lake Trout. Potential spawning habitat for Lake Whitefish was identified in Kratchkowsky Lake, as well as McGowan Lake, and lakes LA-8 and LA-9. Spawning habitat for Lake Whitefish is also present within riverine habitats proximate to the lakes. Potential spawning habitat for Lake Trout was identified in McGowan Lake and Russell Lake.

Spring spawning species present within the study area include Walleye, Northern Pike, Arctic Grayling, White Sucker, Longnose Sucker and Yellow Perch. Spawning habitats for Walleye were observed at SA-1, SA-2 and SA-5. Sucker spawning habitat was observed at SA-1, SA-2, SA-4, and SA-5. Northern Pike spawning habitats were observed in Kratchkowsky Lake, Russell Lake, McGowan Lake, and Whitefish Lake, as well as stream stations SA-1, SA-2, SA-5 and SA-6 within the Icelander River Drainage, as well as SB-1 within the Williams Lake Drainage. Burbot spawn during late winter in streams or lake shallows under ice (McPhail and Lindsey, 1970). No specific spawning surveys targeted Burbot, however potential spawning habitat occurs within the study area.

### 5.7.3 Fish Tissue Chemistry

Northern Pike and White Sucker were collected in 2016 and 2017 from McGowan Lake (LA-1), Whitefish Lake (LA-5 and LA-6), Kratchkowsky Lake (LA-7) and Russell Lake (LAB) for fish chemistry analysis. Northern Pike represented a predator species whereas White Sucker represented a forage species. Fish tissue and bone were analyzed for metals and radionuclides. **Appendix A**, **Tables A-17** and **A-18** present baseline data and summary statistics for fish tissue and bone chemistry, respectively, for the study area.

Guideline values for constituents in fish tissue are available for mercury (Health Canada, 2007) and selenium (BC MOE, 2014). Health Canada's standard is a human health risk - based maximum permissible concentration applied to most species of commercially-sold fish. The BC MOE and US EPA (2016) provide fish tissue concentrations (muscle) for selenium that are protective of the health of freshwater aquatic life.

- Mercury concentrations in both Northern Pike and White Sucker tissue were below the Health Canada standard of 0.5 µg/g ww for commercially sold fish. In general, mercury concentrations were higher in Northern Pike (mean, 0.18 µg/g ww; range, 0.047 to 0.48 µg/g ww) than in White Sucker (mean, 0.034 µg/g ww; range, 0.012 to 0.076 µg/g ww). This is expected because mercury is known to bioaccumulate in higher trophic levels in the aquatic food chain.

- Selenium concentrations in both Northern Pike and White Sucker tissue were below the BC MOE (2014) guideline of 4 µg/g dw and the USEPA (2016) criterion of 11.3 µg/g dw for fish muscle. The mean concentration for Northern Pike and White Sucker tissue were 1.0 µg/g dw and 1.2 µg/g dw, respectively. The highest concentrations of selenium in fish muscle of 0.53 µg/g dw was measured in a Northern Pike sample collected at Russell Lake (LAB). Selenium concentrations in fish tissue from Russell Lake for both Northern Pike and Lake Whitefish were consistently higher than selenium concentrations in fish tissue from all locations in the Icelander River Basin and the Williams Lake Drainage, within the study area.

## 5.8 Incorporation of Local Land User Information into the Aquatic Resources Baseline Program

This report incorporates information provided by Mr. Bobby John, a local resident who fishes commercially in the area and has extensive local and regional knowledge of the area. Bobby graciously agreed to be interviewed by Denison in order to document his local knowledge (Denison, 2020) and this information was subsequently provided to EcoMetrix. Bobby provided invaluable information about local and indigenous land use and the local environment. In addition, Bobby reviewed key information derived from the baseline surveys documented herein, including information associated with aquatic habitats, fish communities, and fish spawning areas, and provided further insights.

Overall, based on his interview and through his review of the baseline survey information, Bobby was able to confirm that the majority of information collected was comprehensive in nature and reflected his own local knowledge and vast experience in the area. In particular he noted that the list of fish species collected at the various locations was inclusive of his understanding of species distribution and mentioned that EcoMetrix has "*… identified all the fish species in the area. Even those little ones with the spiny backs.*". The following additional information is noted through the documentation provided by Bobby John that was not identified specifically by the baseline surveys:

- There are additional Northern Pike spawning areas outside the specific bounds of SB-1 along a reach of the creek north of Russel Lake;
- There are additional Lake Trout spawning areas in Russell Lake, south of the study area; and,
- There are two additional rocky areas in Kratchkowsky Lake that may potentially provide spawning habitat.

# 6.0 REFERENCES

Alberta Environment (AENV). 1990. Selected Methods for the Monitoring of Benthic Invertebrates in Alberta Rivers. Environmental Quality Monitoring Branch, Environmental Assessment Division. Edmonton, AB.

Bain, M.B. 1999. Interpreting chemical data. Pages 181–192 *in* M.B. Bain and N.J. Stevenson, editors. Aquatic habitat assessment: common methods. American Fisheries Society, Bethesda, Maryland. 136 pp.

British Columbia Ministry of Environment (BC MOE). 2014. Ambient Water Quality Guidelines for Selenium. Technical Report Update. April.

Canadian Council of Ministers of the Environment (CCME). 2016. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 3: Suggested Operating Procedures.

Canadian Council of Ministers of the Environment (CCME). 2011. Protocols Manual for Water Quality Sampling in Canada. 180 pp.

Casselman, J.M. and C.A. Lewis.1996. Habitat requirements of Northern Pike (*Esox lucius*). Can. J. Fish. Aquat. Sci. 53(S1): 161–174, https://doi.org/10.1139/f96-019.

R.C. Edgar (2010. Search and clustering orders of magnitude faster than BLAST. Bioinformatics 26(19): 2460-2461.

Environment Canada (EC). 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. National EEM Office, Ottawa, ON, Canada.

Environment Canada (EC). 2010. Pulp and Paper Environmental Effects Monitoring (EEM) Technical Guidance Document. National EEM Office, Ottawa, ON, Canada

Environment Canada (EC). 2002. Revised Guidance for Sample Sorting and Subsampling Protocols for EEM Benthic Invertebrate Community Surveys. National EEM Office, Ottawa, ON, Canada.

Ecological Stratification Working Group (ESWG). 1996. A National Ecological Framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resources Research, and Environment Canada, State of the Environment Directorate, Ecozone Analysis Branch, Ottawa/ Hull. Report and national map at 1:7 500 000 scale.

Gibbons, W.N., M.D. Munn, M.D. Paine and EVS Environmental Consultants. 1993. Guidelines for Monitoring Benthos in Freshwater Environments. Environment Canada. North Vancouver, BC.

Government of Saskatchewan. 2019. Saskatchewan Environmental Quality Guidelines. https://envrbrportal.crmp.saskatchewan.ca/segg-search/. Accessed 23 July 2019.

Health Canada (HC). 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. Bureau of Nutritional Sciences, Food Directorate, Health Products and Food Branch. Available through: https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html#a4

Krebs, C.J. 1994. Ecology: The experimental analysis of distribution and abundance, 4th edition. Harper Collins, New York. p. 705-706.

Mandaville, S.M. 2002. Benthic macroinvertebrates in freshwaters – Taxa tolerance values, metrics, and protocols. Soil & Water Conservation Society of Metro Halifax. 128 p.

McLaughlin, M.S., R.A. Wright, and R.D. Jiricka. 2010. Field Guide to the Ecosites of Saskatchewan's Provincial Forests. Saskatchewan Ministry of Environment. Forest Service. Prince Albert. SK. 343 pp.

McPhail, J.D. and C.C. Lindsey. 1970. Freshwater fishes of northwestern Canada and Alaska. Bull. Fish. Res. Board Can. 173. Ottawa, ON. 381 pp.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. Rapid Bioassessment Protocols for use in Streams and Rivers: Benthic Macroinvertebrates and Fish. U.S. Environmental Protection Agency. EPA 440/4-89/001.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 184. [1998 Reprint] Galt House Publications Ltd. Oakville, ON. xx + 966 pp.

Smith B. and J.B. Wilson. 1996. A consumer's guide to evenness indices. Oikos 76: 70-82.

South Saskatchewan River Watershed Stewards (SSRWS). 2010. Fish Species of Saskatchewan. 28 pp.

Thompson, P.A., J. Kurias, and S. Mihok. 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the

environment from uranium mining and milling activities in Canada. Environ Monit Assess. 110(1-3):71-85. https://doi.org/10.1007/s10661-005-6291-0.

United States Environmental Protection Agency (US EPA). 2016. Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016. Office of Water. EPA 822-R-16-006.

Water Security Agency. 2015. Surface Water Quality Objectives. Interim Edition. EPB 356. June 2015. 9 pp.

Wrona, F.J., J.M. Culp and R.W. Davies. 1982. Macroinvertebrate Subsampling: a Simplified Apparatus and Approach. Canadian Journal of Fisheries and Aquatic Science. 39:1051-1054

# Appendix A Baseline Aquatic Environment Quality Data

Table A-1: Baseline Water Quality Data
Table A-2: Baseline Water Profile Data
Table A-3: Baseline Sediment Grainsize Analysis
Table A-4: Baseline Sediment Quality Data
Table A-5: Baseline Phytoplankton Community Data Collected in September 2016
Table A-6: Baseline Zooplankton Community Data Collected in September 2016
Table A-7: Plant Pigments in Surface Water Collected in September 2016
Table A-8: Baseline Benthic Invertebrate Community Collected in September 2016 Number of Individuals per Taxonomic Unit and Reference Median
Table A-9: Baseline Benthic Invertebrate Community Collected in September 2016 Number of Individuals per Taxonomic Group
Table A-10: Baseline Benthic Invertebrate Community Collected in September 2016 Percent Abundance per Taxonomic Group
Table A-11: Baseline Benthic Invertebrate Community Collected in September 2016 Feeding Groups Summary
Table A-12: Baseline Benthic Invertebrate Chemistry Collected September 2016
Table A-13: Baseline Fish Catch Summary
Table A-14: Key Baseline Lake Features
Table A-15: Baseline Stream Spawning Habitat
Table A-16: Baseline Detailed Fish Collection Data
Table A-17: Baseline Fish Flesh Chemistry
Table A-18: Baseline Fish Bone Chemistry

| Parameter | | Bicarbonate | Carbonate | Chloride | Hydroxide | P. Alkalinity | pH | Specific Conductivity | Sum of Ions | Total Alkalinity | Hardness | Ammonia as N | Nitrate | Total Kjeldahl Nitrogen | Mercury | Total Organic Carbon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | mg/L | mg/L | mg/L | mg/L | mg/L | units | µS/cm | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Water Quality Benchmarks | SEQG/SSWQO | | | | | | | | | | | 0.103 | 13.29 | | | |
| | CCME CWQG | | | 120 | | | 6.5 - 9 | | | | | | | | 0.000026 | |
| | Reference | | | CWQG | | | CWQG | | | | | SEQG | SEQG | | CWQG | |
| Baseline Water Quality Characteristics | Count | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 103 | 142 | 142 | 142 |
| | #DL | 0 | 142 | 7 | 142 | 142 | 0 | 0 | 0 | 0 | 0 | 95 | 68 | 1 | 138 | 0 |
| | Min | 1 | <1 | <0.1 | <1 | <1 | **5.7** | 8 | 5 | 1.0 | 3 | <0.01 | <0.04 | <0.05 | <0.0000001 | 1.4 |
| | Mean | 8.5 | 1 | 0.37 | 1.014084507 | 1.084507042 | 6.8 | 18 | 14 | 7.1 | 5.3 | 0.033 | 0.11 | 0.27 | 8.4E-06 | 2.8 |
| | 75th | 10 | 1 | 0.50 | 1 | 1 | 7.0 | 20 | 16 | 8.3 | 6.0 | 0.013 | 0.09 | 0.3 | 0.00001 | 3.1 |
| | 95th | 20 | 1 | 0.70 | 1 | 1 | 7.1 | 26 | 28 | 16 | 7.0 | 0.068 | 0.44 | 0.44 | 0.00001 | 5.255 |
| | Max | 46 | 1 | 0.90 | 2 | 7 | 7.2 | 47 | 51 | 38 | 13 | **1.2** | 0.66 | 1.6 | **0.000068** | 8.4 |
| | Geomean | 6.7 | 1 | 0.32 | 1.009810446 | 1.027786217 | 6.7 | 17 | 12 | 5.8 | 5.2 | 0.015 | 0.067 | 0.25 | 5.9E-06 | 2.7 |
| | SD | 6.3 | 0 | 0.18 | 0.118256572 | 0.709539435 | 0.26 | 5.5 | 7.0 | 5.1 | 1.4 | 0.13 | 0.15 | 0.16 | 6.2E-06 | 1.1 |
| Location | Sample Date | | | | | | | | | | | | | | | |
| LA-1 | 06-Jun-2011 | 2 | <1 | 0.4 | <1 | <1 | 6.94 | 17 | 6.0 | 2.0 | 5.0 | <0.01 | <0.04 | 0.25 | <0.00001 | 2.5 |
| LA-1 | 12-Aug-2012 | 5 | <1 | 0.4 | <1 | <1 | 6.52 | 17 | 10 | 4.0 | 6.0 | <0.01 | | 0.31 | <0.00001 | 2.6 |
| LA-1 | 29-Mar-2014 | 12 | <1 | 0.5 | <1 | <1 | 6.83 | 24 | 18 | 10 | 6.0 | 0.09 | 0.49 | 0.17 | <0.00001 | 2.3 |
| LA-1 | 14-Sep-2016 | 10 | <1 | 0.4 | <1 | <1 | 6.79 | 19 | 14 | 8.0 | 5.0 | <0.01 | <0.04 | 0.38 | <0.000001 | 2.3 |
| LA-1 | 02-Jul-2018 | 8 | <1 | 0.4 | <1 | <1 | 6.71 | 9 | 12 | 7 | 4 | <0.01 | <0.04 | 0.33 | <0.0000001 | 2.2 |
| LA-1 | 16-Mar-2018 | 10 | <1 | 0.5 | <1 | <1 | 6.82 | 15 | 15 | 8 | 5 | 0.03 | 0.29 | 0.2 | 0.000004 | 2.3 |
| LA-1-Bottom | 02-Jul-2018 | 5 | <1 | 0.4 | <1 | <1 | 6.62 | 10 | 9 | 4 | 4 | <0.01 | <0.04 | 0.23 | 0.0000009 | 2 |
| LA-1-Bottom | 16-Mar-2018 | 6 | <1 | 0.5 | <1 | <1 | 6.8 | 14 | 12 | 5 | 5 | 0.02 | 0.6 | 0.14 | 0.000007 | 2.2 |
| LA-2 | 06-Jun-2011 | 5 | <1 | 0.5 | <1 | <1 | 7.00 | 18 | 10 | 4.0 | 5.0 | <0.01 | <0.04 | 0.22 | <0.00001 | 2.5 |
| LA-2 | 28-Mar-2014 | 15 | <1 | 0.7 | <1 | <1 | 6.9 | 25 | 22 | 12 | 7.0 | 0.04 | 0.53 | 0.15 | <0.00001 | 2.2 |
| LA-2 | 21-Sep-2016 | 11 | <1 | 0.7 | <1 | <1 | 7.19 | 22 | 16 | 9.0 | 5.0 | <0.01 | 0.05 | 0.22 | <0.000001 | 2.2 |
| LA-3 | 07-Jun-2011 | 4 | <1 | 0.7 | <1 | <1 | 6.95 | 20 | 9.0 | 3.0 | 5.0 | <0.01 | <0.04 | 0.27 | <0.00001 | 2.8 |
| LA-3 | 28-Mar-2014 | 12 | <1 | 0.9 | <1 | <1 | 6.92 | 24 | 19 | 10 | 6.0 | 0.04 | 0.4 | 0.16 | <0.00001 | 2.3 |
| LA-3 | 21-Sep-2016 | 8 | <1 | 0.8 | <1 | <1 | 7.15 | 22 | 14 | 7.0 | 5.0 | <0.01 | 0.05 | 0.25 | <0.000001 | 2.3 |
| LA-4 | 29-Mar-2014 | 20 | <1 | 0.6 | <1 | <1 | 6.98 | 26 | 27 | 16 | 7.0 | 0.07 | 0.18 | 0.08 | <0.00001 | 1.5 |
| LA-4 | 21-Sep-2016 | 15 | <1 | 0.6 | <1 | <1 | 7.19 | 24 | 21 | 12 | 5.0 | <0.01 | 0.05 | 0.24 | <0.000001 | 1.4 |
| LA-5 | 08-Aug-2012 | 4 | <1 | 0.3 | <1 | <1 | 6.57 | 16 | 8.0 | 3.0 | 5.0 | <0.01 | | 0.34 | <0.00001 | 4.3 |
| LA-5 | 01-Apr-2014 | 16 | <1 | 0.4 | <1 | <1 | 7.01 | 22 | 22 | 13 | 6.0 | 0.05 | 0.26 | 0.14 | <0.00001 | 1.9 |
| LA-5 | 10-Sep-2016 | 8 | <1 | 0.3 | <1 | <1 | 6.95 | 19 | 12 | 7.0 | 5.0 | 0.07 | <0.04 | 0.19 | <0.000001 | 2.2 |
| LA-6 | 13-Aug-2012 | 5 | <1 | 0.3 | <1 | <1 | 6.55 | 16 | 10 | 4.0 | 5.0 | <0.01 | | 0.29 | <0.00001 | 2.9 |
| LA-6 | 30-Mar-2014 | 46 | <1 | 0.3 | <1 | <1 | **5.71** | 21 | 51 | 38 | 5.0 | 0.05 | 0.31 | 0.24 | <0.00001 | 2.2 |
| LA-6 | 12-Sep-2016 | 4 | <1 | 0.4 | <1 | <1 | 6.71 | 18 | 8.0 | 3.0 | 5.0 | 0.04 | <0.04 | 0.43 | <0.000001 | 2.3 |
| LA-6 | 02-Jul-2018 | 8 | <1 | 0.3 | <1 | <1 | 6.75 | 9 | 12 | 7 | 4 | <0.01 | <0.04 | 0.28 | <0.0000001 | 2.2 |
| LA-6 | 17-Mar-2018 | 4 | <1 | 0.3 | <1 | <1 | 6.79 | 12 | 9 | 3 | 4 | 0.02 | 0.3 | 0.29 | 0.000007 | 2.2 |
| LA-7 | 09-Aug-2012 | 26 | <1 | 0.4 | <1 | <1 | 6.73 | 18 | 32 | 21 | 6.0 | <0.01 | | 0.34 | <0.00001 | 3.2 |
| LA-7 | 29-Mar-2014 | 23 | <1 | 0.7 | <1 | <1 | 6.82 | 26 | 30 | 19 | 7.0 | **0.12** | 0.26 | 0.44 | <0.00001 | 2.0 |
| LA-7 | 10-Sep-2016 | 10 | <1 | 0.5 | <1 | <1 | 7.14 | 21 | 14 | 8.0 | 5.0 | 0.01 | <0.04 | 0.32 | <0.000001 | 2.4 |
| LA-7A | 12-Sep-2016 | 7 | <1 | 0.6 | <1 | <1 | 6.89 | 21 | 12 | 6.0 | 5.0 | <0.01 | <0.04 | 0.34 | <0.000001 | 2.1 |
| LA-7A-bottom | 12-Sep-2016 | 16 | <1 | 0.6 | <1 | <1 | **6.46** | 32 | 23 | 13 | 7.0 | **0.91** | <0.04 | 1.2 | **0.000068** | 2.6 |
| LA-8 | 14-Sep-2016 | 2 | <1 | 0.3 | <1 | <1 | 6.79 | 17 | 6.0 | 2.0 | 5.0 | <0.01 | <0.04 | 0.61 | <0.000001 | 2.2 |
| LA-9 | 16-Sep-2016 | 5 | <1 | 0.2 | <1 | <1 | 6.88 | 17 | 9.0 | 4.0 | 4.0 | <0.01 | 0.04 | 0.28 | <0.000001 | 2.2 |
| LAB-1 | 10-Aug-2012 | 2 | <1 | 0.4 | <1 | <1 | 6.65 | 38 | 18 | 2.0 | 13 | <0.01 | | 0.22 | <0.00001 | 2.6 |
| LAB-1 | 31-Mar-2014 | 17 | <1 | 0.5 | <1 | <1 | 6.98 | 30 | 28 | 14 | 9.0 | 0.05 | 0.44 | 0.14 | 0.00001 | 2.2 |
| LAB-1 | 15-Sep-2016 | 8 | <1 | <0.1 | <1 | <1 | 6.96 | 47 | 23 | 7.0 | 12 | <0.01 | 0.05 | 0.15 | <0.000001 | 2.4 |
| LAB-2 | 21-Sep-2016 | 10 | <1 | 0.4 | <1 | <1 | 7.17 | 42 | 25 | 8.0 | 12 | <0.01 | 0.05 | 0.29 | <0.0000001 | 2.2 |
| LB-1 | 13-Sep-2016 | 5 | <1 | 0.1 | <1 | <1 | 6.7 | 18 | 9.0 | 4.0 | 5.0 | <0.01 | <0.04 | 0.28 | <0.000001 | 3.4 |
| LB-2 | 01-Apr-2014 | 15 | <1 | 0.2 | <1 | <1 | 6.82 | 22 | 21 | 12 | 6.0 | 0.04 | 0.66 | 0.13 | <0.00001 | 2.7 |
| LB-2 | 13-Sep-2016 | 8 | <1 | 0.2 | <1 | <1 | 6.74 | 20 | 12 | 7.0 | 5.0 | <0.01 | <0.04 | 0.35 | <0.000001 | 3.6 |
| LB-3-Top | 11-Aug-2012 | 7 | <1 | 0.2 | <1 | <1 | 6.58 | 17 | 12 | 6.0 | 5.0 | <0.01 | | 0.34 | <0.00001 | 3.0 |
| LB-3-Top | 01-Apr-2014 | 17 | <1 | 0.2 | <1 | <1 | 7.00 | 22 | 23 | 14 | 6.0 | 0.04 | 0.44 | 0.18 | 0.00001 | 3.1 |
| LB-3-Top | 10-Sep-2016 | 10 | <1 | 0.2 | <1 | <1 | 7.11 | 18 | 14 | 8.0 | 5.0 | 0.02 | <0.04 | 0.2 | <0.000001 | 2.7 |
| LB-3-bottom | 10-Sep-2016 | 17 | <1 | 0.8 | <1 | <1 | **6.42** | 32 | 24 | 14 | 6.0 | **1.2** | <0.04 | 1.6 | 0.00001 | 4.4 |
| PA-2 | 20-Sep-2016 | 7 | <1 | 0.3 | <1 | <1 | 7.03 | 20 | 12 | 6.0 | 5.0 | <0.01 | 0.04 | 0.22 | <0.0000001 | 3.4 |
| PA-3 | 19-Sep-2016 | 5 | <1 | 0.4 | <1 | <1 | 6.74 | 18 | 10 | 4.0 | 4.0 | <0.01 | <0.04 | 0.33 | 0.0000001 | 8.4 |
| SA-1 | 05-Jun-2011 | 2 | <1 | 0.4 | <1 | <1 | 6.93 | 17 | 6.0 | 2.0 | 5.0 | <0.01 | <0.04 | 0.25 | <0.00001 | 2.5 |
| SA-1 | 08-May-2012 | 5 | <1 | 0.4 | <1 | <1 | 6.6 | 20 | 10 | 4.0 | 6.0 | <0.01 | | 0.28 | <0.00001 | 2.2 |
| SA-1 | 07-Aug-2012 | 5 | <1 | 0.4 | <1 | <1 | 6.55 | 16 | 10 | 4.0 | 5.0 | <0.01 | | 0.24 | <0.00001 | 2.5 |
| SA-1 | 24-Oct-2012 | 12 | <1 | 0.4 | <1 | <1 | 6.78 | 17 | 16 | 10 | 5.0 | <0.01 | | 0.28 | <0.00001 | 2.6 |
| SA-1 | 22-May-2013 | 10 | <1 | 0.4 | <1 | <1 | **6.34** | 19 | 14 | 8.0 | 5.0 | 0.02 | <0.04 | 0.19 | <0.00001 | 1.8 |
| SA-1 | 15-Aug-2013 | 2 | <1 | 0.4 | <1 | <1 | 6.68 | 18 | 7.0 | 2.0 | 5.0 | <0.01 | <0.04 | 0.21 | <0.00001 | 2.2 |
| SA-1 | 18-Oct-2013 | 5 | <1 | 0.4 | <1 | <1 | 6.95 | 18 | 10 | 4.0 | 5.0 | <0.01 | <0.04 | 0.28 | <0.00001 | 2.2 |
| SA-1 | 30-Mar-2014 | 16 | <1 | 0.5 | <1 | <1 | 6.98 | 22 | 22 | 13 | 6.0 | 0.04 | 0.26 | 0.11 | <0.00001 | 2.1 |
| SA-1 | 05-Jul-2019 | 8 | <1 | 0.5 | <1 | <1 | 7.02 | 13 | 13 | 7 | 5 | <0.01 | <0.04 | 0.48 | <0.000002 | 2.2 |
| SA-1 | 30-Aug-2019 | 5 | <1 | 0.4 | <1 | <1 | 7.06 | 13 | 9 | 4 | 5.0 | 0.02 | 0.04 | 0.25 | <0.000004 | 2.1 |
| SA-2 | 06-Jun-2011 | 11 | <1 | 0.3 | <1 | <1 | 6.89 | 16 | 15 | 9.0 | 5.0 | <0.01 | <0.04 | 0.23 | <0.00001 | 2.3 |
| SA-2 | 08-May-2012 | 2 | <1 | 0.3 | <1 | <1 | 6.77 | 16 | 6.0 | 2.0 | 4.0 | <0.01 | | 0.16 | <0.00001 | 2.4 |
| SA-2 | 08-Aug-2012 | 2 | <1 | 0.3 | <1 | <1 | 6.58 | 14 | 6.0 | 2.0 | 4.0 | <0.01 | | 0.24 | <0.00001 | 2.4 |
| SA-2 | 24-Oct-2012 | 10 | <1 | 0.3 | <1 | <1 | 6.79 | 16 | 14 | 8.0 | 4.0 | <0.01 | | 0.2 | <0.00001 | 2.4 |
| SA-2 | 22-May-2013 | 11 | <1 | 0.2 | <1 | <1 | 6.59 | 16 | 14 | 9.0 | 4.0 | <0.01 | <0.04 | 0.25 | <0.00001 | 2.1 |
| SA-2 | 15-Aug-2013 | 10 | <1 | 0.4 | <1 | <1 | 6.72 | 18 | 15 | 8.0 | 5.0 | <0.01 | <0.04 | 0.31 | <0.00001 | 2.4 |
| SA-2 | 18-Oct-2013 | 6 | <1 | 0.3 | <1 | <1 | 7.01 | 18 | 11 | 5.0 | 6.0 | <0.01 | <0.04 | <0.05 | <0.00001 | 2.2 |
| SA-2 | 29-Mar-2014 | 13 | <1 | 0.4 | <1 | <1 | 6.87 | 22 | 19 | 11 | 6.0 | 0.04 | 0.31 | 0.12 | <0.00001 | 2.1 |
| SA-2 | 05-Jul-2019 | 5 | <1 | 0.4 | <1 | <1 | 7.04 | 9 | 9 | 4 | 4.0 | <0.01 | <0.04 | 0.58 | <0.000002 | 2.3 |
| SA-2 | 30-Aug-2019 | <1 | <1 | 0.3 | <2 | <7 | 6.92 | 11 | 7 | 8 | 4.0 | 0.02 | <0.04 | 0.26 | <0.000004 | 2.2 |
| SA-3 | 05-Jun-2011 | 2 | <1 | 0.6 | <1 | <1 | 6.93 | 18 | 7.0 | 2.0 | 6.0 | <0.01 | <0.04 | 0.23 | <0.00001 | 2.5 |
| SA-3 | 08-May-2012 | 2 | <1 | 0.6 | <1 | <1 | 6.60 | 20 | 7.0 | 2.0 | 6.0 | <0.01 | | 0.25 | <0.00001 | 2.2 |
| SA-3 | 07-Aug-2012 | 1 | <1 | 0.6 | <1 | <1 | 6.60 | 18 | 6.0 | 1.0 | 5.0 | <0.01 | | 0.25 | <0.00001 | 2.6 |
| SA-3 | 24-Oct-2012 | 28 | <1 | 0.6 | <1 | <1 | 6.85 | 19 | 33 | 23 | 6.0 | <0.01 | | 0.28 | <0.00001 | 2.6 |
| SA-3 | 22-May-2013 | 8 | <1 | 0.5 | <1 | <1 | **6.42** | 20 | 13 | 7.0 | 6.0 | <0.01 | <0.04 | 0.16 | <0.00001 | 1.8 |
| SA-3 | 15-Aug-2013 | 5 | <1 | 0.7 | <1 | <1 | 6.66 | 19 | 10 | 4.0 | 5.0 | <0.01 | <0.04 | 0.3 | <0.00001 | 2.5 |
| SA-3 | 18-Oct-2013 | 7 | <1 | 0.6 | <1 | <1 | 7.02 | 20 | 12 | 6.0 | 6.0 | <0.01 | <0.04 | 0.27 | <0.00001 | 2.5 |
| SA-3 | 31-Mar-2014 | 16 | <1 | 0.7 | <1 | <1 | 6.99 | 24 | 22 | 13 | 7.0 | 0.04 | 0.26 | 0.13 | <0.00001 | 2.3 |
| SA-3 | 05-Jul-2019 | 5 | <1 | 0.6 | <1 | <1 | 6.96 | 14 | 10 | 4 | 5.0 | 0.02 | 0.04 | 0.24 | <0.000002 | 2.3 |
| SA-3 | 30-Aug-2019 | <1 | <1 | 0.7 | <2 | <7 | 6.98 | 14 | 7 | 7 | 5.0 | 0.01 | <0.04 | 0.26 | <0.000006 | 2.2 |
| SA-4 | 05-Jun-2011 | 10 | <1 | 0.4 | <1 | <1 | 6.92 | 17 | 14 | 8.0 | 5.0 | <0.01 | <0.04 | 0.22 | <0.00001 | 2.4 |
| SA-4 | 08-May-2012 | 10 | <1 | 0.5 | <1 | <1 | 6.8 | 20 | 15 | 8.0 | 6.0 | <0.01 | | 0.22 | <0.00001 | 2.6 |
| SA-4 | 07-Aug-2012 | 4 | <1 | 0.4 | <1 | <1 | 6.58 | 17 | 8.0 | 3.0 | 5.0 | <0.01 | | 0.19 | <0.00001 | 2.5 |
| SA-4 | 24-Oct-2012 | 13 | <1 | 0.4 | <1 | <1 | 6.88 | 18 | 18 | 11 | 5.0 | <0.01 | | 0.28 | <0.00001 | 2.4 |
| SA-4 | 22-May-2013 | 2 | <1 | 0.4 | <1 | <1 | 6.67 | 19 | 7.0 | 2.0 | 6.0 | <0.01 | 0.09 | 0.16 | <0.00001 | 2.0 |
| SA-4 | 15-Aug-2013 | 6 | <1 | 0.5 | <1 | <1 | 6.76 | 19 | 11 | 5.0 | 5.0 | <0.01 | <0.04 | 0.3 | <0.00001 | 2.4 |
| SA-4 | 18-Oct-2013 | 10 | <1 | 0.4 | <1 | <1 | 7.02 | 20 | 15 | 8.0 | 6.0 | <0.01 | <0.04 | 0.22 | <0.00001 | 2.2 |
| SA-4 | 30-Mar-2014 | 18 | <1 | 0.6 | <1 | <1 | 7.16 | 25 | 25 | 15 | 7.0 | 0.05 | 0.35 | 0.13 | <0.00001 | 2.1 |
| SA-4 | 04-Jul-2019 | 11 | <1 | 0.5 | <1 | <1 | 7.04 | 11 | 16 | 9 | 5.0 | 0.01 | <0.04 | 0.27 | <0.000002 | 2.6 |
| SA-4 | 29-Aug-2019 | 8 | <1 | 0.5 | <1 | <1 | 6.97 | 16 | 13 | 7 | 5.0 | 0.02 | <0.04 | 0.28 | <0.000004 | 2.3 |
| SA-5 | 05-Jun-2011 | 6 | <1 | 0.2 | <1 | <1 | 6.86 | 16 | 10 | 5.0 | 5.0 | <0.01 | <0.04 | 0.25 | <0.00001 | 2.6 |
| SA-5 | 08-May-2012 | 2 | <1 | 0.2 | <1 | <1 | 6.76 | 16 | 6.0 | 2.0 | 5.0 | <0.01 | | 0.28 | <0.00001 | 2.7 |
| SA-5 | 07-Aug-2012 | 5 | <1 | 0.2 | <1 | <1 | 6.57 | 14 | 12 | 4.0 | 4.0 | <0.01 | | 0.18 | <0.00001 | 2.3 |
| SA-5 | 24-Oct-2012 | 10 | <1 | 0.2 | <1 | <1 | 6.78 | 15 | 14 | 8.0 | 4.0 | <0.01 | | 0.29 | <0.00001 | 2.5 |
| SA-5 | 22-May-2013 | 7 | <1 | 0.2 | <1 | <1 | **6.17** | 16 | 11 | 6.0 | 5.0 | <0.01 | 0.09 | 0.18 | <0.00001 | 1.9 |
| SA-5 | 15-Aug-2013 | 5 | <1 | 0.3 | <1 | <1 | 6.66 | 15 | 9.0 | 4.0 | 4.0 | <0.01 | <0.04 | 0.27 | <0.00001 | 2.3 |
| SA-5 | 18-Oct-2013 | 5 | <1 | 0.3 | <1 | <1 | 6.92 | 17 | 9.0 | 4.0 | 5.0 | <0.01 | <0.04 | 0.11 | <0.00001 | 2.2 |
| SA-5 | 30-Mar-2014 | 8 | <1 | 0.3 | <1 | <1 | 6.97 | 20 | 13 | 7.0 | 5.0 | 0.05 | 0.31 | 0.11 | <0.00001 | 2.1 |
| SA-5 | 04-Jul-2019 | 7 | <1 | 0.3 | <1 | <1 | 6.99 | 8 | 11 | 6.0 | 4.0 | <0.01 | <0.04 | 0.21 | <0.000002 | 2.2 |
| SA-5 | 29-Aug-2019 | 11 | <1 | 0.2 | <1 | <1 | 6.89 | 10 | 15 | 9.0 | 4.0 | 0.01 | <0.04 | 0.22 | <0.000005 | 2.1 |
| SA-6 | 08-May-2012 | 4 | <1 | 0.3 | <1 | <1 | 6.74 | 17 | 8.0 | 3.0 | 5.0 | <0.01 | | 0.3 | <0.00001 | 2.6 |
| SA-6 | 07-Aug-2012 | 4 | <1 | 0.3 | <1 | <1 | 6.54 | 14 | 8.0 | 3.0 | 4.0 | <0.01 | | 0.32 | <0.00001 | 2.4 |
| SA-6 | 24-Oct-2012 | 10 | <1 | 0.3 | <1 | <1 | 6.82 | 16 | 14 | 8.0 | 5.0 | <0.01 | | 0.41 | <0.00001 | 2.5 |
| SA-6 | 22-May-2013 | 6 | <1 | 0.3 | <1 | <1 | **6.48** | 16 | 10 | 5.0 | 5.0 | <0.01 | <0.04 | 0.17 | <0.00001 | 2.0 |
| SA-6 | 15-Aug-2013 | 7 | <1 | 0.3 | <1 | <1 | 6.75 | 18 | 12 | 6.0 | 5.0 | <0.01 | <0.04 | 0.35 | <0.00001 | 2.5 |
| SA-6 | 18-Oct-2013 | 5 | <1 | 0.4 | <1 | <1 | 6.94 | 18 | 10 | 4.0 | 6.0 | <0.01 | <0.04 | 0.27 | <0.00001 | 2.1 |
| SA-6 | 01-Apr-2014 | 16 | <1 | 0.5 | <1 | <1 | 7.07 | 23 | 22 | 13 | 6.0 | 0.04 | 0.35 | 0.15 | <0.00001 | 1.9 |
| SA-6 | 04-Jul-2019 | 6 | <1 | 0.4 | <1 | <1 | 7.03 | 9 | 10 | 5 | 4.0 | <0.01 | <0.04 | 0.25 | <0.000002 | 2.3 |
| SA-6 | 29-Aug-2019 | 12 | <1 | 0.3 | <1 | <1 | 6.93 | 11 | 16 | 10 | 5.0 | 0.02 | <0.04 | 0.29 | <0.000005 | 2.3 |
| RC-1 | 06-Jul-2019 | 16 | <1 | 0.6 | <1 | <1 | 7.18 | 12 | 21 | 13 | 5.0 | <0.01 | <0.04 | 0.26 | <0.000002 | 2.2 |
| RC-1 | 01-Sep-2019 | 18 | <1 | 0.5 | <1 | <1 | 7.03 | 13 | 23 | 15 | 5.0 | 0.04 | <0.04 | 0.29 | <0.000005 | 2.2 |
| SB-1 | 09-Jun-2011 | 5 | <1 | 0.1 | <1 | <1 | 6.90 | 17 | 9.0 | 4.0 | 5.0 | <0.01 | <0.04 | 0.17 | <0.00001 | 2.8 |
| SB-1 | 09-May-2012 | 4 | <1 | 0.2 | <1 | <1 | 6.54 | 16 | 8.0 | 3.0 | 5.0 | <0.01 | | 0.25 | <0.00001 | 4.6 |
| SB-1 | 07-Aug-2012 | 6 | <1 | 0.1 | <1 | <1 | **6.38** | 14 | 10 | 5.0 | 4.0 | <0.01 | | 0.25 | <0.00001 | 4.6 |
| SB-1 | 25-Oct-2012 | 10 | <1 | 0.2 | <1 | <1 | 6.64 | 15 | 15 | 8.0 | 5.0 | 0.06 | | 0.27 | <0.00001 | 4.5 |
| SB-1 | 22-May-2013 | 5 | <1 | 0.2 | <1 | <1 | **6.27** | 14 | 9.0 | 4.0 | 4.0 | <0.01 | <0.04 | 0.15 | <0.00001 | 3.1 |
| SB-1 | 15-Aug-2013 | 7 | <1 | 0.2 | <1 | <1 | 6.53 | 18 | 11 | 6.0 | 6.0 | <0.01 | <0.04 | 0.24 | <0.00001 | 4.0 |
| SB-1 | 19-Oct-2013 | 7 | <1 | 0.4 | <1 | <1 | **6.46** | 16 | 11 | 6.0 | 3.0 | <0.01 | <0.04 | 0.28 | <0.00001 | 3.8 |
| SB-1 | 31-Mar-2014 | 24 | <1 | 0.4 | <1 | <1 | 6.86 | 26 | 31 | 20 | 8.0 | 0.1 | 0.31 | 0.2 | <0.00001 | 3.3 |
| SB-2 | 09-Jun-2011 | 10 | <1 | 0.6 | <1 | <1 | 6.78 | 21 | 16 | 8.0 | 6.0 | <0.01 | <0.04 | 0.18 | <0.00001 | 2.4 |
| SB-2 | 09-May-2012 | 6 | <1 | 0.5 | <1 | <1 | **6.21** | 15 | 10 | 5.0 | 5.0 | <0.01 | | 0.27 | <0.00001 | 6.7 |
| SB-2 | 07-Aug-2012 | 6 | <1 | 0.5 | <1 | <1 | **6.05** | 15 | 11 | 5.0 | 6.0 | <0.01 | | 0.31 | <0.00001 | 5.3 |
| SB-2 | 25-Oct-2012 | 6 | <1 | 0.5 | <1 | <1 | **6.41** | 14 | 10 | 5.0 | 4.0 | <0.01 | | 0.35 | <0.00001 | 7.6 |
| SB-2 | 22-May-2013 | 5 | <1 | 0.3 | <1 | <1 | **6.08** | 16 | 9.0 | 4.0 | 5.0 | <0.01 | <0.04 | 0.18 | <0.00001 | 4.2 |
| SB-2 | 15-Aug-2013 | 4 | <1 | 0.5 | <1 | <1 | **6.44** | 19 | 9.0 | 3.0 | 7.0 | <0.01 | <0.04 | 0.4 | <0.00001 | 5.3 |
| SB-2 | 19-Oct-2013 | 4 | <1 | 0.6 | <1 | <1 | **6.37** | 15 | 8.0 | 3.0 | 4.0 | <0.01 | <0.04 | 0.29 | <0.00001 | 4.6 |
| SB-3 | 05-Jun-2011 | 4 | <1 | 0.2 | <1 | <1 | 6.87 | 15 | 8.0 | 3.0 | 4.0 | <0.01 | <0.04 | 0.26 | <0.00001 | 3.1 |
| SB-3 | 09-May-2012 | 4 | <1 | 0.1 | <1 | <1 | 6.50 | 17 | 8.0 | 3.0 | 5.0 | <0.01 | | 0.34 | <0.00001 | 2.4 |
| SB-3 | 08-Aug-2012 | 4 | <1 | 0.2 | <1 | <1 | 6.61 | 15 | 8.0 | 3.0 | 6.0 | <0.01 | | 0.24 | <0.00001 | 3.4 |
| SB-3 | 25-Oct-2012 | 29 | <1 | 0.2 | <1 | <1 | 6.78 | 16 | 34 | 24 | 5.0 | <0.01 | | 0.32 | <0.00001 | 3.6 |
| SB-3 | 22-May-2013 | 8 | <1 | 0.1 | <1 | <1 | **6.18** | 16 | 12 | 7 | 5.0 | <0.01 | 0.13 | 0.16 | <0.00001 | 2.8 |
| SB-3 | 15-Aug-2013 | 5 | <1 | 0.2 | <1 | <1 | 6.68 | 17 | 10 | 4.0 | 5.0 | <0.01 | <0.04 | 0.28 | <0.00001 | 3.4 |
| SB-3 | 18-Oct-2013 | 5 | <1 | 0.2 | <1 | <1 | 6.99 | 18 | 9.0 | 4.0 | 5.0 | <0.01 | <0.04 | 0.26 | <0.00001 | 3.0 |
| SB-3 | 31-Mar-2014 | 15 | <1 | 0.2 | <1 | <1 | 6.86 | 22 | 21 | 12 | 6.0 | 0.04 | 0.4 | 0.2 | <0.00001 | 3.2 |
| SB-4 | 05-Jun-2011 | 2 | <1 | <0.1 | <1 | <1 | 6.84 | 17 | 6.0 | 2.0 | 5.0 | <0.01 | 0.26 | 0.27 | <0.00001 | 4.0 |
| SB-4 | 08-May-2012 | 2 | <1 | <0.1 | <1 | <1 | **6.37** | 15 | 5.0 | 2.0 | 5.0 | <0.01 | | 0.26 | <0.00001 | 5.8 |
| SB-4 | 07-Aug-2012 | 5 | <1 | <0.1 | <1 | <1 | **6.35** | 12 | 8.0 | 4.0 | 4.0 | <0.01 | | 0.3 | <0.00001 | 5.0 |
| SB-4 | 24-Oct-2012 | 8 | <1 | <0.1 | <1 | <1 | 6.50 | 12 | 11 | 7.0 | 4.0 | <0.01 | | 0.65 | <0.00001 | 5.9 |
| SB-4 | 22-May-2013 | 5 | <1 | <0.1 | <1 | <1 | **6.07** | 13 | 8.0 | 4.0 | 5.0 | <0.01 | <0.04 | 0.22 | <0.00001 | 4.5 |
| SB-4 | 15-Aug-2013 | 4 | <1 | 0.1 | <1 | <1 | **6.49** | 16 | 8.0 | 3.0 | 5.0 | <0.01 | <0.04 | 0.3 | <0.00001 | 4.1 |
| SB-4 | 18-Oct-2013 | 5 | <1 | <0.1 | <1 | <1 | 6.70 | 16 | 9.0 | 4.0 | 5.0 | <0.01 | <0.04 | 0.35 | <0.00001 | 4.0 |
| SB-5 | 09-May-2012 | 6 | <1 | 0.2 | <1 | <1 | 6.61 | 18 | 10 | 5.0 | 5.0 | <0.01 | | 0.28 | <0.00001 | 2.9 |
| SB-5 | 07-Aug-2012 | 5 | <1 | 0.2 | <1 | <1 | 6.59 | 15 | 9.0 | 4.0 | 5.0 | <0.01 | | 0.22 | <0.00001 | 3.2 |
| SB-5 | 25-Oct-2012 | 11 | <1 | 0.2 | <1 | <1 | 6.77 | 16 | 16 | 9.0 | 5.0 | <0.01 | | 0.3 | <0.00001 | 3.2 |
| SB-5 | 22-May-2013 | 7 | <1 | 0.1 | <1 | <1 | **6.47** | 16 | 11 | 6.0 | 4.0 | <0.01 | <0.04 | 0.25 | <0.00001 | 2.7 |
| SB-5 | 15-Aug-2013 | 4 | <1 | 0.2 | <1 | <1 | 6.62 | 16 | 8.0 | 3.0 | 5.0 | <0.01 | <0.04 | 0.3 | <0.00001 | 3.1 |
| SB-5 | 18-Oct-2013 | 8 | <1 | 0.2 | <1 | <1 | 6.99 | 18 | 12 | 7.0 | 4.0 | <0.01 | <0.04 | 0.3 | <0.00001 | 2.8 |
| SB-5 | 31-Mar-2014 | 16 | <1 | 0.2 | <1 | <1 | 6.96 | 23 | 22 | 13 | 6.0 | 0.04 | 0.4 | 0.18 | <0.00001 | 2.9 |

| Parameter | | Dissolved Organic Carbon | Fluoride | Total Dissolved Solids | Total Suspended Solids | Lead-210 | Polonium-210 | Radium-226 | Thorium-228 | Thorium-230 | Thorium-232 | Calcium | Magnesium | Potassium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | mg/L | mg/L | mg/L | mg/L | Bq/L | Bq/L | Bq/L | Bq/L | Bq/L | Bq/L | mg/L | mg/L | mg/L |
| Water Quality Benchmarks | SEQG/SSWQO | | | | | | | 0.11 | | | | | | |
| | CCME CWQG | | 0.12 | | | | | | | | | | | |
| | Reference | | CWQG | | | | | SSWQO | | | | | | |
| Baseline Water Quality Characteristics | Count | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 120 | 142 | 120 | 142 | 142 | 142 |
| | #DL | 1 | 13 | 0 | 26 | 138 | 108 | 96 | 104 | 139 | 103 | 0 | 1 | 0 |
| | Min | <0.2 | <0.01 | 11 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1 | <0.1 | 0.1 |
| | Mean | 2.7 | 0.025211268 | 23 | 2.4 | 0.021 | 0.0055 | 0.0057 | 0.01 | 0.010 | 0.01 | 1.4 | 0.40 | 0.352816901 |
| | 75th | 2.9 | 0.030 | 26 | 3.0 | 0.020 | 0.0050 | 0.0060 | 0.01 | 0.01 | 0.01 | 1.5 | 0.40 | 0.40 |
| | 95th | 5.1 | 0.070 | 35 | 5.0 | 0.020 | 0.0088 | 0.010 | 0.01 | 0.01 | 0.01 | 2.0 | 0.60 | 0.50 |
| | Max | 8.4 | 0.080 | 40 | 23 | 0.050 | 0.020 | 0.010 | 0.01 | 0.02 | 0.01 | 3.9 | 0.70 | 0.80 |
| | Geomean | 2.6 | 0.020 | 23 | 2.0 | 0.020 | 0.0054 | 0.0056 | 0.01 | 0.010 | 0.01 | 1.4 | 0.39 | 0.33 |
| | SD | 1.1 | 0.020 | 5.3 | 2.3 | 0.003 | 0.0017 | 0.0014 | 7.0E-18 | 0.0012 | 7.0E-18 | 0.42 | 0.094 | 0.12 |
| Location | Sample Date | | | | | | | | | | | | | |
| LA-1 | 08-Jun-2011 | 2.6 | 0.02 | 22 | 4 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.3 | 0.4 | 0.3 |
| LA-1 | 12-Aug-2012 | 2.4 | 0.02 | 23 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.5 | 0.4 |
| LA-1 | 29-Mar-2014 | 2.1 | 0.03 | 22 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.7 | 0.5 | 0.5 |
| LA-1 | 14-Sep-2016 | 2.1 | <0.01 | 18 | 4 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.2 | 0.4 | 0.2 |
| LA-1 | 02-Jul-2018 | 2 | 0.08 | 26 | 2 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.1 | 0.3 | 0.4 |
| LA-1 | 16-Mar-2018 | 2.2 | 0.03 | 22 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| LA-1-Bottom | 02-Jul-2018 | 1.9 | 0.08 | 24 | 2 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.1 | 0.3 | 0.3 |
| LA-1-Bottom | 16-Mar-2018 | 2.2 | 0.02 | 22 | <1 | 0.03 | <0.005 | <0.005 | <0.01 | 0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| LA-2 | 06-Jun-2011 | 2.3 | 0.02 | 22 | 2 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.5 | 0.4 | 0.3 |
| LA-2 | 28-Mar-2014 | 2.1 | 0.07 | 26 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.9 | 0.6 | 0.5 |
| LA-2 | 21-Sep-2016 | 2.2 | <0.01 | 22 | 2 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| LA-3 | 07-Jun-2011 | 2.7 | 0.02 | 25 | 3 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.5 | 0.4 | 0.3 |
| LA-3 | 28-Mar-2014 | 2.2 | 0.07 | 25 | <1 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.8 | 0.5 | 0.5 |
| LA-3 | 21-Sep-2016 | 2.2 | <0.01 | 22 | 4 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.8 |
| LA-4 | 29-Mar-2014 | 1.6 | 0.01 | 36 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 2.0 | 0.5 | 0.5 |
| LA-4 | 21-Sep-2016 | 1.4 | 0.02 | 26 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.6 |
| LA-5 | 08-Aug-2012 | 2.5 | 0.02 | 22 | 3 | <0.02 | 0.008 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| LA-5 | 01-Apr-2014 | 2.0 | 0.07 | 29 | <1 | <0.02 | <0.005 | 0.010 | <0.01 | <0.01 | <0.01 | 1.6 | 0.4 | 0.4 |
| LA-5 | 10-Sep-2016 | 2.1 | 0.02 | 22 | 4 | <0.02 | 0.005 | 0.008 | <0.01 | 0.02 | <0.01 | 1.2 | 0.4 | 0.2 |
| LA-6 | 13-Aug-2012 | 2.5 | 0.02 | 24 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.3 |
| LA-6 | 30-Mar-2014 | 2.0 | 0.07 | 29 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.5 | 0.4 | 0.4 |
| LA-6 | 12-Sep-2016 | 2.2 | 0.02 | 14 | 4 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.2 | 0.4 | 0.2 |
| LA-6 | 02-Jul-2018 | 2.2 | 0.08 | 23 | 2 | <0.02 | <0.005 | 0.005 | | <0.01 | | 1.1 | 0.2 | 0.3 |
| LA-6 | 17-Mar-2018 | 2.2 | 0.02 | 21 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.1 | 0.4 | 0.4 |
| LA-7 | 09-Aug-2012 | 2.8 | 0.02 | 26 | 3 | <0.02 | 0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.5 | 0.5 | 0.4 |
| LA-7 | 29-Mar-2014 | 2.1 | 0.06 | 29 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 2.0 | 0.5 | 0.5 |
| LA-7 | 10-Sep-2016 | 2.2 | 0.02 | 22 | 4 | <0.02 | <0.005 | <0.005 | <0.01 | 0.01 | <0.01 | 1.4 | 0.4 | 0.2 |
| LA-7A | 12-Sep-2016 | 2.1 | <0.01 | 22 | 3 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.4 | 0.4 | 0.2 |
| LA-7A-bottom | 12-Sep-2016 | 2.6 | <0.01 | 29 | 13 | <0.02 | 0.008 | 0.010 | | <0.01 | | 2.1 | 0.5 | 0.2 |
| LA-8 | 14-Sep-2016 | 2.0 | <0.01 | 21 | 4 | <0.02 | <0.005 | 0.010 | | <0.01 | | 1.2 | 0.4 | 0.2 |
| LA-9 | 16-Sep-2016 | 2.1 | 0.01 | 11 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.1 | 0.3 | 0.1 |
| LAB-1 | 10-Aug-2012 | 2.5 | 0.03 | 35 | 1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 3.9 | 0.7 | 0.6 |
| LAB-1 | 31-Mar-2014 | 2.1 | 0.07 | 31 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 2.7 | 0.5 | 0.6 |
| LAB-1 | 15-Sep-2016 | 2.4 | 0.02 | 30 | 1 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 3.8 | 0.6 | 0.3 |
| LAB-2 | 21-Sep-2016 | 2.2 | 0.03 | 35 | 4 | <0.02 | <0.005 | 0.007 | <0.01 | <0.01 | <0.01 | 3.5 | 0.7 | 0.8 |
| LB-1 | 13-Sep-2016 | 3.6 | 0.02 | 19 | 2 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.2 | 0.4 | 0.2 |
| LB-2 | 01-Apr-2014 | 2.6 | 0.07 | 30 | <1 | <0.02 | <0.005 | 0.008 | <0.01 | <0.01 | <0.01 | 1.8 | 0.4 | 0.4 |
| LB-2 | 13-Sep-2016 | 3.5 | <0.01 | 19 | <1 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.3 | 0.4 | 0.2 |
| LB-3-Top | 11-Aug-2012 | 2.8 | 0.02 | 22 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| LB-3-Top | 01-Apr-2014 | 2.9 | 0.07 | 23 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.7 | 0.4 | 0.5 |
| LB-3-Top | 10-Sep-2016 | 2.6 | 0.02 | 24 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.2 |
| LB-3-bottom | 10-Sep-2016 | 4.2 | 0.02 | 33 | 23 | <0.02 | 0.02 | 0.007 | <0.01 | <0.01 | <0.01 | 1.8 | 0.5 | 0.3 |
| PA-2 | 20-Sep-2016 | 3.4 | 0.06 | 22 | 2 | <0.02 | 0.007 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.2 |
| PA-3 | 19-Sep-2016 | 8.4 | 0.02 | 29 | 2 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.0 | 0.3 | 0.5 |
| SA-1 | 05-Jun-2011 | 2.4 | 0.02 | 24 | 3 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.3 | 0.4 | 0.3 |
| SA-1 | 08-May-2012 | 2.1 | 0.01 | 20 | 2 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.6 | 0.5 | 0.3 |
| SA-1 | 07-Aug-2012 | 2.3 | 0.02 | 21 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.2 |
| SA-1 | 24-Oct-2012 | 2.2 | 0.01 | 25 | 2 | <0.02 | <0.005 | 0.008 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| SA-1 | 22-May-2013 | 1.7 | 0.01 | 23 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.3 | 0.4 |
| SA-1 | 15-Aug-2013 | 2.2 | 0.02 | 21 | 2 | <0.02 | 0.01 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.5 |
| SA-1 | 18-Oct-2013 | 2.2 | 0.04 | 22 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.3 |
| SA-1 | 30-Mar-2014 | 2.0 | 0.07 | 24 | <1 | <0.02 | <0.005 | 0.009 | <0.01 | <0.01 | <0.01 | 1.7 | 0.5 | 0.4 |
| SA-1 | 05-Jul-2019 | 2.4 | 0.02 | 33 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.4 |
| SA-1 | 30-Aug-2019 | 2.4 | 0.01 | 22 | <4 | <0.02 | <0.005 | 0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.4 |
| SA-2 | 06-Jun-2011 | 2.5 | 0.02 | 24 | 1 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.3 | 0.4 | 0.3 |
| SA-2 | 08-May-2012 | 2.2 | 0.01 | 13 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.3 | 0.1 |
| SA-2 | 08-Aug-2012 | 2.4 | 0.02 | 19 | 3 | <0.02 | <0.005 | 0.010 | <0.01 | <0.01 | <0.01 | 1.2 | 0.3 | 0.3 |
| SA-2 | 24-Oct-2012 | 2.2 | 0.01 | 23 | 2 | 0.05 | <0.005 | 0.006 | <0.01 | 0.02 | <0.01 | 1.2 | 0.3 | 0.4 |
| SA-2 | 22-May-2013 | 2.0 | 0.01 | 21 | 1 | <0.02 | <0.005 | 0.008 | <0.01 | <0.01 | <0.01 | 1.2 | 0.3 | 0.4 |
| SA-2 | 15-Aug-2013 | 2.2 | 0.02 | 20 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SA-2 | 18-Oct-2013 | 2.4 | 0.03 | 20 | 1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.6 | 0.4 |
| SA-2 | 29-Mar-2014 | 1.9 | 0.01 | 30 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.7 | 0.4 | 0.4 |
| SA-2 | 05-Jul-2019 | 2.7 | 0.02 | 12 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.1 | 0.3 | 0.3 |
| SA-2 | 30-Aug-2019 | 2.5 | 0.01 | 26 | <6 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.1 | 0.4 | 0.4 |
| SA-3 | 05-Jun-2011 | 2.4 | 0.02 | 23 | 2 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.3 | 0.4 | 0.3 |
| SA-3 | 08-May-2012 | 2.2 | <0.01 | 17 | 2 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.6 | 0.5 | 0.4 |
| SA-3 | 07-Aug-2012 | 2.4 | 0.02 | 21 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.5 | 0.4 | 0.3 |
| SA-3 | 24-Oct-2012 | 2.5 | 0.01 | 24 | 2 | 0.03 | 0.006 | 0.010 | <0.01 | <0.01 | <0.01 | 1.5 | 0.5 | 0.4 |
| SA-3 | 22-May-2013 | 1.7 | 0.01 | 19 | <1 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.6 | 0.5 | 0.4 |
| SA-3 | 15-Aug-2013 | 2.4 | 0.02 | 21 | 1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.5 | 0.4 | 0.4 |
| SA-3 | 18-Oct-2013 | 2.6 | 0.04 | 24 | 2 | <0.02 | 0.01 | 0.010 | <0.01 | <0.01 | 0.01 | 1.6 | 0.4 | 0.5 |
| SA-3 | 31-Mar-2014 | 2.2 | 0.07 | 26 | <1 | <0.02 | <0.005 | 0.005 | <0.01 | <0.01 | <0.01 | 1.9 | 0.5 | 0.5 |
| SA-3 | 05-Jul-2019 | 2.7 | 0.02 | 17 | <1 | <0.02 | <0.005 | 0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SA-3 | 30-Aug-2019 | 2.4 | 0.01 | 24 | <3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SA-4 | 05-Jun-2011 | 2.3 | 0.02 | 28 | 2 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.3 | 0.4 | 0.2 |
| SA-4 | 08-May-2012 | 2.4 | 0.01 | 21 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.7 | 0.5 | 0.3 |
| SA-4 | 07-Aug-2012 | 2.4 | 0.02 | 23 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.3 |
| SA-4 | 24-Oct-2012 | 2.4 | 0.01 | 26 | 2 | 0.03 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SA-4 | 22-May-2013 | 2.0 | 0.01 | 22 | 1 | <0.02 | <0.005 | 0.009 | <0.01 | <0.01 | <0.01 | 1.5 | 0.6 | 0.6 |
| SA-4 | 15-Aug-2013 | 2.4 | 0.03 | 24 | 3 | <0.02 | <0.005 | 0.007 | <0.01 | <0.01 | <0.01 | 1.5 | 0.4 | 0.3 |
| SA-4 | 18-Oct-2013 | 2.2 | 0.04 | 24 | 2 | <0.02 | 0.007 | <0.005 | <0.01 | <0.01 | <0.01 | 1.7 | 0.4 | 0.4 |
| SA-4 | 30-Mar-2014 | 2.1 | 0.07 | 32 | <1 | <0.02 | <0.005 | 0.008 | <0.01 | <0.01 | <0.01 | 2.0 | 0.4 | 0.5 |
| SA-4 | 04-Jul-2019 | 3.1 | 0.02 | 40 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| SA-4 | 29-Aug-2019 | 2.4 | 0.02 | 26 | <5 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SA-5 | 05-Jun-2011 | 2.4 | 0.02 | 22 | 2 | <0.02 | <0.005 | <0.005 | | <0.01 | | 1.2 | 0.4 | 0.2 |
| SA-5 | 08-May-2012 | 2.5 | <0.01 | 17 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.2 |
| SA-5 | 07-Aug-2012 | 2.3 | 0.02 | 13 | 2 | <0.02 | <0.005 | 0.007 | <0.01 | <0.01 | 0.01 | 1.2 | 0.2 | 0.3 |
| SA-5 | 24-Oct-2012 | 2.4 | 0.01 | 20 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.3 | 0.4 |
| SA-5 | 22-May-2013 | 1.8 | 0.01 | 20 | 2 | <0.02 | <0.005 | 0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.4 |
| SA-5 | 15-Aug-2013 | 2.3 | 0.02 | 18 | 2 | <0.02 | <0.005 | 0.007 | <0.01 | <0.01 | <0.01 | 1.2 | 0.3 | 0.4 |
| SA-5 | 18-Oct-2013 | 2.3 | 0.03 | 19 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| SA-5 | 30-Mar-2014 | 2.0 | 0.08 | 28 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.3 | 0.4 |
| SA-5 | 04-Jul-2019 | 2.8 | 0.02 | 36 | <1 | <0.02 | <0.005 | <0.006 | <0.01 | <0.01 | <0.01 | 1.1 | 0.3 | 0.3 |
| SA-5 | 29-Aug-2019 | 2.1 | 0.01 | 16 | <4 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.1 | 0.3 | 0.3 |
| SA-6 | 08-May-2012 | 2.5 | <0.01 | 16 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.2 |
| SA-6 | 07-Aug-2012 | 2.5 | 0.02 | 19 | 5 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.3 | 0.3 |
| SA-6 | 24-Oct-2012 | 2.3 | 0.01 | 15 | 6 | <0.02 | 0.006 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| SA-6 | 22-May-2013 | 2.0 | 0.01 | 20 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.4 |
| SA-6 | 15-Aug-2013 | 2.3 | 0.02 | 20 | 5 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SA-6 | 18-Oct-2013 | 2.2 | 0.04 | 21 | 1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.5 | 0.4 |
| SA-6 | 01-Apr-2014 | 1.9 | 0.07 | 28 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.8 | 0.4 | 0.4 |
| SA-6 | 04-Jul-2019 | 2.8 | 0.02 | 35 | <1 | <0.02 | <0.007 | <0.006 | <0.01 | <0.01 | <0.01 | 1.2 | 0.3 | 0.4 |
| SA-6 | 29-Aug-2019 | 2.6 | 0.01 | 18 | <5 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.3 |
| RC-1 | 06-Jul-2019 | 2.6 | 0.02 | 38 | <2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| RC-1 | 01-Sep-2019 | 2.6 | 0.01 | 26 | <5 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SB-1 | 09-Jun-2011 | 2.5 | 0.02 | 21 | 1 | <0.02 | 0.006 | <0.005 | | <0.01 | | 1.3 | 0.4 | 0.2 |
| SB-1 | 09-May-2012 | 4.5 | <0.01 | 19 | 2 | <0.02 | 0.006 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.3 |
| SB-1 | 07-Aug-2012 | 4.6 | 0.02 | 22 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.3 | 0.3 |
| SB-1 | 25-Oct-2012 | 4.3 | 0.01 | 25 | 4 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.6 | 0.4 |
| SB-1 | 22-May-2013 | 2.8 | 0.01 | 18 | 1 | <0.02 | <0.005 | 0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.3 | 0.3 |
| SB-1 | 15-Aug-2013 | 3.9 | 0.02 | 22 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.6 | 0.5 | 0.2 |
| SB-1 | 19-Oct-2013 | 3.8 | 0.03 | 25 | <1 | <0.02 | 0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.1 | <0.1 | 0.4 |
| SB-1 | 31-Mar-2014 | 3.2 | 0.07 | 36 | 1 | <0.02 | 0.006 | 0.010 | <0.01 | <0.01 | <0.01 | 2.2 | 0.7 | 0.5 |
| SB-2 | 09-Jun-2011 | 2.0 | 0.02 | 31 | 3 | <0.02 | 0.01 | <0.005 | | <0.01 | | 1.8 | 0.5 | 0.3 |
| SB-2 | 09-May-2012 | 6.2 | <0.01 | 19 | 2 | <0.02 | 0.008 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.2 |
| SB-2 | 07-Aug-2012 | 5.1 | 0.02 | 26 | 8 | 0.04 | 0.01 | 0.009 | <0.01 | <0.01 | <0.01 | 1.4 | 0.5 | 0.3 |
| SB-2 | 25-Oct-2012 | 6.4 | 0.01 | 28 | 1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.1 | 0.4 | 0.3 |
| SB-2 | 22-May-2013 | 3.9 | 0.01 | 21 | 2 | <0.02 | 0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| SB-2 | 15-Aug-2013 | 5.6 | 0.02 | 24 | 3 | <0.02 | 0.005 | 0.008 | 0.01 | <0.01 | <0.01 | 1.8 | 0.6 | 0.2 |
| SB-2 | 19-Oct-2013 | 4.7 | 0.03 | 25 | 2 | <0.02 | 0.009 | 0.007 | <0.01 | <0.01 | <0.01 | 1.1 | 0.2 | 0.3 |
| SB-3 | 05-Jun-2011 | 3.1 | 0.01 | 24 | 3 | <0.02 | 0.008 | <0.005 | | <0.01 | | 1.1 | 0.4 | 0.2 |
| SB-3 | 09-May-2012 | 2.2 | 0.01 | 14 | 2 | <0.02 | <0.005 | 0.010 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.2 |
| SB-3 | 08-Aug-2012 | 3.4 | 0.02 | 18 | 3 | <0.02 | 0.006 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.5 | 0.3 |
| SB-3 | 25-Oct-2012 | 3.4 | 0.01 | 21 | 3 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SB-3 | 22-May-2013 | 2.6 | 0.01 | 22 | 2 | <0.02 | 0.005 | 0.007 | <0.01 | <0.01 | <0.01 | 1.4 | 0.3 | 0.4 |
| SB-3 | 15-Aug-2013 | 3.4 | 0.02 | 17 | 4 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.4 |
| SB-3 | 18-Oct-2013 | 3.0 | 0.04 | 22 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.3 | 0.4 |
| SB-3 | 31-Mar-2014 | 3.1 | 0.07 | 26 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.7 | 0.4 | 0.5 |
| SB-4 | 05-Jun-2011 | <0.2 | 0.02 | 27 | 3 | <0.02 | 0.006 | <0.005 | | <0.01 | | 1.5 | 0.4 | 0.2 |
| SB-4 | 08-May-2012 | 5.9 | <0.01 | 19 | 2 | <0.02 | 0.006 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.3 | 0.1 |
| SB-4 | 07-Aug-2012 | 4.8 | 0.02 | 22 | 3 | <0.02 | 0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.2 | 0.3 |
| SB-4 | 24-Oct-2012 | 5.6 | 0.01 | 26 | 2 | <0.02 | 0.01 | <0.005 | <0.01 | <0.01 | <0.01 | 1.0 | 0.3 | 0.3 |
| SB-4 | 22-May-2013 | 4.2 | 0.01 | 18 | 2 | <0.02 | 0.006 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.3 |
| SB-4 | 15-Aug-2013 | 4.5 | 0.02 | 22 | 4 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.1 |
| SB-4 | 18-Oct-2013 | 4.0 | 0.03 | 24 | <1 | <0.02 | <0.005 | 0.007 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.4 |
| SB-5 | 09-May-2012 | 2.9 | 0.01 | 16 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.4 | 0.2 |
| SB-5 | 07-Aug-2012 | 3.1 | 0.02 | 20 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.2 | 0.4 | 0.3 |
| SB-5 | 25-Oct-2012 | 3.2 | 0.01 | 19 | 2 | <0.02 | <0.005 | 0.006 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| SB-5 | 22-May-2013 | 2.6 | 0.01 | 18 | 2 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.3 | 0.3 |
| SB-5 | 15-Aug-2013 | 3.1 | 0.02 | 17 | 3 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.3 | 0.4 | 0.4 |
| SB-5 | 18-Oct-2013 | 2.8 | 0.04 | 21 | <1 | <0.02 | <0.005 | <0.005 | <0.01 | <0.01 | <0.01 | 1.4 | 0.2 | 0.4 |
| SB-5 | 31-Mar-2014 | 2.9 | 0.07 | 24 | <1 | <0.02 | <0.005 | <0.005 | 0.01 | <0.01 | <0.01 | 1.7 | 0.5 | 0.5 |

| Parameter | | Sodium | Sulphate | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Molybdenum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Water Quality Benchmarks | SEQG/SSWQO | | 128 | 0.1 | | 0.005 | | | | 0.00004 | | | | 0.3 | | | 31 |
| | CCME CWQG | | | | | | | | 1.5 | | 0.001 | | 0.002 | | 0.001 | | |
| | Reference | | SEQG | SEQG | | SEQG | | | CWQG | SEQG | CWQG | | CWQG | SEQG | CWQG | | SEQG |
| Baseline Water Quality Characteristics | Count | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 |
| | #DL | 0 | 1 | 0 | 142 | 45 | 0 | 142 | 142 | 72 | 142 | 139 | 138 | 0 | 131 | 0 | 134 |
| | Min | 0.9 | <0.2 | 0.0006 | <0.0002 | <0.0001 | 0.0017 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0001 | 0.0087 | <0.0001 | 0.0024 | <0.0001 |
| | Mean | 1.5 | 0.85 | 0.0094 | 0.00020 | 0.00010 | 0.0029 | 0.0001 | 0.01 | 1.3E-05 | 0.0005 | 0.00010 | 0.0002 | 0.23 | 0.00012 | 0.018 | 0.00012 |
| | 75th | 1.6 | 0.80 | 0.010 | 0.00020 | 0.00010 | 0.0033 | 0.0001 | 0.01 | 0.00001 | 0.0005 | 0.00010 | 0.0002 | 0.15 | 0.00010 | 0.018 | 0.00010 |
| | 95th | 1.8 | 1.1 | 0.029 | 0.00020 | 0.00010 | 0.0041 | 0.0001 | 0.01 | 3.0E-05 | 0.0005 | 0.00010 | 0.0002 | 0.49 | 0.00010 | 0.036 | 0.00010 |
| | Max | 2.1 | 8.3 | 0.081 | 0.00030 | 0.00030 | 0.0095 | 0.0001 | 0.01 | 0.00007 | 0.0005 | 0.00020 | 0.0008 | 9.5 | 0.0012 | 0.34 | 0.0013 |
| | Geomean | 1.5 | 0.69 | 0.0060 | 0.00020 | 0.00010 | 0.0028 | 0.0001 | 0.01 | 1.2E-05 | 0.0005 | 0.00010 | 0.00019 | 0.10 | 0.00011 | 0.012 | 0.00011 |
| | SD | 0.21 | 1.1 | 0.011 | 8.4E-06 | 2.5E-05 | 0.00084 | 2.2E-19 | 7.0E-18 | 8.7E-06 | 3.3E-19 | 8.4E-06 | 6.2E-05 | 0.90 | 0.00011 | 0.035 | 0.00014 |
| Location | Sample Date | | | | | | | | | | | | | | | | |
| LA-1 | 08-Jun-2011 | 1.4 | 0.7 | 0.0036 | <0.0002 | <0.0001 | 0.0027 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.11 | 0.0004 | 0.0084 | <0.0001 |
| LA-1 | 12-Aug-2012 | 1.5 | 0.8 | 0.001 | <0.0002 | 0.0001 | 0.0027 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 0.22 | <0.0001 | 0.029 | <0.0001 |
| LA-1 | 29-Mar-2014 | 1.8 | 0.8 | 0.0023 | <0.0002 | 0.0001 | 0.0038 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.051 | <0.0001 | 0.02 | <0.0001 |
| LA-1 | 14-Sep-2016 | 1.5 | 0.7 | 0.0039 | <0.0002 | <0.0001 | 0.0030 | <0.0001 | <0.01 | 0.00003 | <0.0005 | <0.0001 | <0.0002 | 0.27 | <0.0001 | 0.023 | <0.0001 |
| LA-1 | 02-Jul-2018 | 1.4 | 0.7 | 0.0051 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.052 | <0.0001 | 0.01 | <0.0001 |
| LA-1 | 16-Mar-2018 | 1.6 | 0.8 | 0.0046 | <0.0002 | 0.0001 | 0.0032 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.037 | <0.0001 | 0.0039 | <0.0001 |
| LA-1-Bottom | 02-Jul-2018 | 1.4 | 0.7 | 0.004 | <0.0002 | <0.0001 | 0.0026 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.13 | <0.0001 | 0.013 | <0.0001 |
| LA-1-Bottom | 16-Mar-2018 | 1.6 | 0.8 | 0.0034 | <0.0002 | <0.0001 | 0.0031 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.036 | <0.0001 | 0.0053 | <0.0001 |
| LA-2 | 06-Jun-2011 | 1.5 | 0.7 | 0.0024 | <0.0002 | <0.0001 | 0.0027 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.054 | 0.0002 | 0.0064 | <0.0001 |
| LA-2 | 28-Mar-2014 | 1.8 | 0.8 | 0.001 | <0.0002 | 0.0001 | 0.0043 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.081 | <0.0001 | 0.030 | <0.0001 |
| LA-2 | 21-Sep-2016 | 1.6 | 0.6 | 0.0022 | <0.0002 | <0.0001 | 0.0029 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.064 | <0.0001 | 0.0078 | <0.0001 |
| LA-3 | 07-Jun-2011 | 1.5 | 0.6 | 0.0033 | <0.0002 | <0.0001 | 0.0034 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.19 | 0.0007 | 0.011 | <0.0001 |
| LA-3 | 28-Mar-2014 | 1.8 | 0.9 | 0.0014 | <0.0002 | 0.0001 | 0.0041 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.066 | <0.0001 | 0.014 | <0.0001 |
| LA-3 | 21-Sep-2016 | 1.5 | 0.9 | 0.0021 | <0.0002 | <0.0001 | 0.0030 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.072 | <0.0001 | 0.0086 | <0.0001 |
| LA-4 | 29-Mar-2014 | 2.0 | 1.3 | 0.0009 | <0.0002 | 0.0001 | 0.0039 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.0087 | <0.0001 | 0.029 | <0.0001 |
| LA-4 | 21-Sep-2016 | 1.7 | 1.3 | 0.0017 | <0.0002 | 0.0001 | 0.0030 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.02 | <0.0001 | 0.025 | <0.0001 |
| LA-5 | 08-Aug-2012 | 1.5 | 0.6 | 0.0056 | 0.0003 | 0.0001 | 0.0021 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 0.10 | <0.0001 | 0.018 | <0.0001 |
| LA-5 | 01-Apr-2014 | 1.7 | 0.7 | 0.0048 | <0.0002 | <0.0001 | 0.0032 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.04 | <0.0001 | 0.0046 | <0.0001 |
| LA-5 | 10-Sep-2016 | 1.4 | 0.6 | 0.0078 | <0.0002 | 0.0001 | 0.0027 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.19 | <0.0001 | 0.020 | <0.0001 |
| LA-6 | 13-Aug-2012 | 1.5 | 0.7 | 0.073 | <0.0002 | 0.0001 | 0.0051 | <0.0001 | 0.01 | 0.00004 | <0.0005 | <0.0001 | 0.0004 | 0.11 | 0.0012 | 0.017 | <0.0001 |
| LA-6 | 30-Mar-2014 | 1.8 | 0.7 | 0.005 | <0.0002 | 0.0001 | 0.0032 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.085 | <0.0001 | 0.0062 | <0.0001 |
| LA-6 | 12-Sep-2016 | 1.4 | 0.5 | 0.0093 | <0.0002 | <0.0001 | 0.0027 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.21 | <0.0001 | 0.017 | <0.0001 |
| LA-6 | 02-Jul-2018 | 1.4 | 0.6 | 0.0074 | <0.0002 | <0.0001 | 0.0024 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.096 | <0.0001 | 0.019 | <0.0001 |
| LA-6 | 17-Mar-2018 | 1.5 | 0.7 | 0.0058 | <0.0002 | <0.0001 | 0.003 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.031 | <0.0001 | 0.0024 | <0.0001 |
| LA-7 | 09-Aug-2012 | 1.6 | 0.6 | 0.0051 | <0.0002 | 0.0001 | 0.0024 | <0.0001 | <0.01 | 0.00003 | <0.0005 | <0.0001 | <0.0002 | 0.14 | <0.0001 | 0.019 | <0.0001 |
| LA-7 | 29-Mar-2014 | 2.0 | 0.5 | 0.0006 | <0.0002 | 0.0001 | 0.0038 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.15 | <0.0001 | 0.026 | <0.0001 |
| LA-7 | 10-Sep-2016 | 1.6 | 0.4 | 0.0036 | <0.0002 | 0.0001 | 0.0024 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.13 | <0.0001 | 0.015 | <0.0001 |
| LA-7A | 12-Sep-2016 | 1.7 | 0.3 | 0.0015 | <0.0002 | <0.0001 | 0.0025 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.085 | <0.0001 | 0.013 | <0.0001 |
| LA-7A-bottom | 12-Sep-2016 | 1.7 | 0.5 | 0.0033 | <0.0002 | 0.0002 | 0.0036 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 5.2 | <0.0001 | 0.25 | <0.0001 |
| LA-8 | 14-Sep-2016 | 1.3 | 0.6 | 0.0046 | <0.0002 | <0.0001 | 0.0029 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.14 | <0.0001 | 0.028 | <0.0001 |
| LA-9 | 16-Sep-2016 | 1.4 | 0.6 | 0.0016 | <0.0002 | 0.0001 | 0.0024 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.071 | <0.0001 | 0.011 | 0.00002 |
| LAB-1 | 10-Aug-2012 | 1.7 | 7.8 | 0.0023 | <0.0002 | 0.0001 | 0.0033 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.056 | <0.0001 | 0.029 | 0.0007 |
| LAB-1 | 31-Mar-2014 | 2.0 | 3.7 | 0.0024 | <0.0002 | <0.0001 | 0.0039 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.080 | <0.0001 | 0.064 | 0.0003 |
| LAB-1 | 15-Sep-2016 | 1.8 | 8.1 | 0.0025 | <0.0002 | <0.0001 | 0.0035 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.076 | <0.0001 | 0.041 | 0.0013 |
| LAB-2 | 21-Sep-2016 | 1.7 | 8.3 | 0.0029 | <0.0002 | 0.0001 | 0.0034 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.039 | <0.0001 | 0.019 | 0.0011 |
| LB-1 | 13-Sep-2016 | 1.4 | 0.7 | 0.011 | <0.0002 | 0.0001 | 0.0033 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 0.084 | <0.0001 | 0.0044 | <0.0001 |
| LB-2 | 01-Apr-2014 | 1.6 | 0.8 | 0.0067 | <0.0002 | 0.0001 | 0.0046 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.15 | <0.0001 | 0.037 | <0.0001 |
| LB-2 | 13-Sep-2016 | 1.4 | 0.5 | 0.0096 | <0.0002 | 0.0001 | 0.0033 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.15 | <0.0001 | 0.0094 | <0.0001 |
| LB-3-Top | 11-Aug-2012 | 1.4 | 0.8 | 0.0035 | <0.0002 | 0.0001 | 0.0041 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 0.24 | 0.0001 | 0.028 | <0.0001 |
| LB-3-Top | 01-Apr-2014 | 1.8 | 0.8 | 0.0018 | <0.0002 | 0.0001 | 0.0037 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.045 | <0.0001 | 0.0025 | <0.0001 |
| LB-3-Top | 10-Sep-2016 | 1.4 | 0.7 | 0.0016 | <0.0002 | 0.0001 | 0.0028 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.062 | <0.0001 | 0.012 | <0.0001 |
| LB-3-bottom | 10-Sep-2016 | 1.6 | 0.5 | 0.0086 | <0.0002 | 0.0003 | 0.0095 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 9.5 | <0.0001 | 0.34 | <0.0001 |
| PA-2 | 20-Sep-2016 | 1.4 | 1.1 | 0.0096 | <0.0002 | <0.0001 | 0.0026 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.044 | <0.0001 | 0.0026 | <0.0001 |
| PA-3 | 19-Sep-2016 | 1.3 | 1.1 | 0.027 | <0.0002 | <0.0001 | 0.0026 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.098 | <0.0001 | 0.0025 | <0.0001 |
| SA-1 | 05-Jun-2011 | 1.4 | 0.7 | 0.004 | <0.0002 | <0.0001 | 0.0025 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 0.11 | <0.0001 | 0.0086 | <0.0001 |
| SA-1 | 08-May-2012 | 1.6 | 0.8 | 0.004 | <0.0002 | 0.0001 | 0.0035 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.14 | <0.0001 | 0.021 | <0.0001 |
| SA-1 | 07-Aug-2012 | 1.4 | 0.9 | 0.0056 | <0.0002 | 0.0001 | 0.0025 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0001 | 0.21 | <0.0001 | 0.025 | <0.0001 |
| SA-1 | 24-Oct-2012 | 1.5 | 0.5 | 0.0022 | <0.0002 | 0.0001 | 0.0026 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.081 | <0.0001 | 0.012 | <0.0001 |
| SA-1 | 22-May-2013 | 1.4 | 0.4 | 0.0044 | <0.0002 | <0.0001 | 0.0030 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.31 | <0.0001 | 0.023 | <0.0001 |
| SA-1 | 15-Aug-2013 | 1.6 | 0.9 | 0.0035 | <0.0002 | 0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.091 | <0.0001 | 0.016 | <0.0001 |
| SA-1 | 18-Oct-2013 | 1.6 | 0.5 | 0.0037 | <0.0002 | 0.0001 | 0.0026 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.073 | <0.0001 | 0.011 | <0.0001 |
| SA-1 | 30-Mar-2014 | 1.7 | 0.8 | 0.0029 | <0.0002 | 0.0001 | 0.0032 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.031 | <0.0001 | 0.0041 | <0.0001 |
| SA-1 | 05-Jul-2019 | 1.4 | 0.7 | 0.0054 | <0.0002 | <0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.12 | <0.0001 | 0.012 | <0.0001 |
| SA-1 | 30-Aug-2019 | 1.4 | 0.6 | 0.0034 | <0.0002 | 0.0001 | 0.0024 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.12 | <0.0001 | 0.015 | <0.0001 |
| SA-2 | 06-Jun-2011 | 1.4 | 0.6 | 0.0054 | <0.0002 | 0.0001 | 0.0019 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.056 | <0.0001 | 0.0062 | <0.0001 |
| SA-2 | 08-May-2012 | 1.2 | 0.6 | 0.081 | <0.0002 | 0.0001 | 0.0041 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | 0.0008 | 0.11 | 0.0003 | 0.017 | <0.0001 |
| SA-2 | 08-Aug-2012 | 1.3 | 0.6 | 0.0068 | <0.0002 | 0.0001 | 0.0029 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0001 | 0.091 | <0.0001 | 0.017 | <0.0001 |
| SA-2 | 24-Oct-2012 | 1.4 | 0.7 | 0.0041 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.063 | <0.0001 | 0.0091 | <0.0001 |
| SA-2 | 22-May-2013 | 1.4 | <0.2 | 0.0093 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 0.074 | <0.0001 | 0.0077 | <0.0001 |
| SA-2 | 15-Aug-2013 | 1.5 | 0.6 | 0.005 | <0.0002 | 0.0001 | 0.0024 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.098 | <0.0001 | 0.015 | <0.0001 |
| SA-2 | 18-Oct-2013 | 1.6 | 0.7 | 0.0039 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.058 | <0.0001 | 0.0062 | <0.0001 |
| SA-2 | 29-Mar-2014 | 1.8 | 0.7 | 0.0042 | <0.0002 | 0.0001 | 0.0031 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.041 | <0.0001 | 0.0044 | <0.0001 |
| SA-2 | 05-Jul-2019 | 1.4 | 0.6 | 0.0071 | <0.0002 | <0.0001 | 0.002 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.066 | <0.0001 | 0.0098 | <0.0001 |
| SA-2 | 30-Aug-2019 | 1.4 | 0.6 | 0.0087 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.11 | <0.0001 | 0.014 | <0.0001 |
| SA-3 | 05-Jun-2011 | 1.4 | 0.8 | 0.0022 | <0.0002 | 0.0001 | 0.0027 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.057 | <0.0001 | 0.0066 | <0.0001 |
| SA-3 | 08-May-2012 | 1.5 | 0.8 | 0.0031 | <0.0002 | <0.0001 | 0.0039 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.072 | <0.0001 | 0.018 | <0.0001 |
| SA-3 | 07-Aug-2012 | 1.5 | 0.7 | 0.0039 | <0.0002 | 0.0001 | 0.0027 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0001 | 0.13 | <0.0001 | 0.016 | <0.0001 |
| SA-3 | 24-Oct-2012 | 1.5 | 0.8 | 0.0018 | <0.0002 | 0.0001 | 0.0030 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.062 | <0.0001 | 0.0084 | <0.0001 |
| SA-3 | 22-May-2013 | 1.5 | 0.4 | 0.0018 | <0.0002 | <0.0001 | 0.0038 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.12 | <0.0001 | 0.023 | <0.0001 |
| SA-3 | 15-Aug-2013 | 1.6 | 0.8 | 0.0017 | <0.0002 | 0.0001 | 0.0025 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.084 | <0.0001 | 0.013 | <0.0001 |
| SA-3 | 18-Oct-2013 | 1.6 | 0.7 | 0.006 | <0.0002 | 0.0001 | 0.0035 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.096 | <0.0001 | 0.011 | <0.0001 |
| SA-3 | 31-Mar-2014 | 1.8 | 0.8 | 0.0013 | <0.0002 | 0.0001 | 0.0040 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.036 | <0.0001 | 0.0098 | <0.0001 |
| SA-3 | 05-Jul-2019 | 1.5 | 0.8 | 0.0033 | <0.0002 | 0.0001 | 0.0025 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.065 | <0.0001 | 0.0076 | <0.0001 |
| SA-3 | 30-Aug-2019 | 1.5 | 0.7 | 0.016 | <0.0002 | <0.0001 | 0.0026 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.072 | <0.0001 | 0.0063 | <0.0001 |
| SA-4 | 05-Jun-2011 | 1.4 | 0.5 | 0.0043 | <0.0002 | 0.0001 | 0.0021 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.050 | <0.0001 | 0.0067 | 0.0002 |
| SA-4 | 08-May-2012 | 1.6 | 0.6 | 0.0099 | <0.0002 | <0.0001 | 0.0029 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.086 | <0.0001 | 0.0095 | <0.0001 |
| SA-4 | 07-Aug-2012 | 1.4 | 0.4 | 0.0064 | <0.0002 | 0.0001 | 0.0024 | <0.0001 | <0.01 | 0.00007 | <0.0005 | <0.0001 | <0.0001 | 0.13 | <0.0001 | 0.017 | <0.0001 |
| SA-4 | 24-Oct-2012 | 1.6 | 0.5 | 0.0033 | <0.0002 | <0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.064 | <0.0001 | 0.010 | <0.0001 |
| SA-4 | 22-May-2013 | 1.5 | 0.6 | 0.006 | <0.0002 | <0.0001 | 0.0028 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.077 | <0.0001 | 0.0089 | <0.0001 |
| SA-4 | 15-Aug-2013 | 1.7 | 0.5 | 0.0065 | <0.0002 | 0.0001 | 0.0024 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.12 | <0.0001 | 0.019 | <0.0001 |
| SA-4 | 18-Oct-2013 | 1.7 | 0.4 | 0.0035 | <0.0002 | 0.0001 | 0.0025 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.058 | <0.0001 | 0.011 | <0.0001 |
| SA-4 | 30-Mar-2014 | 2.1 | 0.7 | 0.0025 | <0.0002 | 0.0001 | 0.0032 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.034 | <0.0001 | 0.0029 | <0.0001 |
| SA-4 | 04-Jul-2019 | 1.6 | 0.6 | 0.0084 | <0.0002 | <0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.075 | <0.0001 | 0.012 | <0.0001 |
| SA-4 | 29-Aug-2019 | 1.6 | 0.5 | 0.006 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.095 | <0.0001 | 0.015 | <0.0001 |
| SA-5 | 05-Jun-2011 | 1.3 | 0.6 | 0.00054 | <0.0002 | 0.0001 | 0.0023 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0002 | 0.054 | <0.0001 | 0.0064 | <0.0001 |
| SA-5 | 08-May-2012 | 1.4 | 0.7 | 0.014 | <0.0002 | 0.0001 | 0.0030 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.11 | <0.0001 | 0.0086 | <0.0001 |
| SA-5 | 07-Aug-2012 | 1.3 | 0.7 | 0.0071 | <0.0002 | 0.0001 | 0.0031 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0001 | 0.11 | <0.0001 | 0.018 | <0.0001 |
| SA-5 | 24-Oct-2012 | 1.4 | 0.8 | 0.0047 | <0.0002 | 0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.067 | <0.0001 | 0.010 | <0.0001 |
| SA-5 | 22-May-2013 | 1.6 | 0.6 | 0.0078 | <0.0002 | <0.0001 | 0.0028 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.095 | <0.0001 | 0.0063 | <0.0001 |
| SA-5 | 15-Aug-2013 | 1.4 | 0.5 | 0.0058 | <0.0002 | 0.0001 | 0.0021 | <0.0001 | <0.01 | 0.00004 | <0.0005 | <0.0001 | <0.0002 | 0.086 | <0.0001 | 0.012 | <0.0001 |
| SA-5 | 18-Oct-2013 | 1.4 | 0.4 | 0.004 | <0.0002 | 0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.035 | <0.0001 | 0.0047 | <0.0001 |
| SA-5 | 30-Mar-2014 | 1.6 | 0.8 | 0.0044 | <0.0002 | 0.0001 | 0.0030 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.030 | <0.0001 | 0.0025 | <0.0001 |
| SA-5 | 04-Jul-2019 | 1.3 | 0.6 | 0.0078 | <0.0002 | <0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.074 | <0.0001 | 0.0094 | <0.0001 |
| SA-5 | 29-Aug-2019 | 1.3 | 0.5 | 0.0063 | <0.0002 | <0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.085 | <0.0001 | 0.0097 | <0.0001 |
| SA-6 | 06-May-2012 | 1.4 | 0.7 | 0.02 | <0.0002 | 0.0001 | 0.0030 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.098 | <0.0001 | 0.0095 | <0.0001 |
| SA-6 | 07-Aug-2012 | 1.3 | 0.6 | 0.016 | <0.0002 | 0.0001 | 0.0029 | <0.0001 | <0.01 | 0.00002 | <0.0005 | <0.0001 | <0.0001 | 0.16 | <0.0001 | 0.029 | <0.0001 |
| SA-6 | 24-Oct-2012 | 1.4 | 0.5 | 0.014 | <0.0002 | 0.0001 | 0.0029 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.14 | <0.0001 | 0.018 | <0.0001 |
| SA-6 | 22-May-2013 | 1.4 | 0.3 | 0.0084 | <0.0002 | <0.0001 | 0.0024 | <0.0001 | <0.01 | 0.00003 | <0.0005 | <0.0001 | <0.0002 | 0.061 | <0.0001 | 0.0062 | <0.0001 |
| SA-6 | 15-Aug-2013 | 1.4 | 0.7 | 0.009 | <0.0002 | 0.0001 | 0.0028 | <0.0001 | <0.01 | 0.00005 | <0.0005 | <0.0001 | <0.0002 | 0.12 | <0.0001 | 0.018 | <0.0001 |
| SA-6 | 18-Oct-2013 | 1.6 | 0.8 | 0.0044 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.052 | <0.0001 | 0.007 | <0.0001 |
| SA-6 | 01-Apr-2014 | 1.9 | 0.7 | 0.0032 | <0.0002 | 0.0001 | 0.0032 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.036 | <0.0001 | 0.0037 | <0.0001 |
| SA-6 | 04-Jul-2019 | 1.4 | 0.6 | 0.0079 | <0.0002 | <0.0001 | 0.0021 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.078 | <0.0001 | 0.01 | <0.0001 |
| SA-6 | 29-Aug-2019 | 1.4 | 0.6 | 0.0072 | <0.0002 | 0.0001 | 0.0022 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.1 | <0.0001 | 0.013 | <0.0001 |
| RC-1 | 06-Jul-2019 | 1.6 | 0.5 | 0.0046 | <0.0002 | <0.0001 | 0.002 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.048 | <0.0001 | 0.0073 | <0.0001 |
| RC-1 | 01-Sep-2019 | 1.6 | 0.4 | 0.0041 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.081 | <0.0001 | 0.013 | <0.0001 |
| SB-1 | 09-Jun-2011 | 1.3 | 0.7 | 0.012 | <0.0002 | <0.0001 | 0.0024 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.10 | <0.0001 | 0.011 | <0.0001 |
| SB-1 | 09-May-2012 | 1.3 | 0.8 | 0.022 | <0.0002 | <0.0001 | 0.0025 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.20 | <0.0001 | 0.0098 | <0.0001 |
| SB-1 | 07-Aug-2012 | 1.2 | 0.6 | 0.016 | <0.0002 | 0.0001 | 0.0026 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0001 | 0.16 | <0.0001 | 0.0071 | <0.0001 |
| SB-1 | 25-Oct-2012 | 1.4 | 0.9 | 0.025 | <0.0002 | 0.0001 | 0.0023 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.16 | <0.0001 | 0.0088 | <0.0001 |
| SB-1 | 22-May-2013 | 1.2 | 0.7 | 0.015 | <0.0002 | <0.0001 | 0.0023 | <0.0001 | <0.01 | 0.00004 | <0.0005 | <0.0001 | <0.0002 | 0.18 | <0.0001 | 0.010 | <0.0001 |
| SB-1 | 15-Aug-2013 | 1.3 | 0.5 | 0.018 | <0.0002 | 0.0001 | 0.0032 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.33 | <0.0001 | 0.014 | <0.0001 |
| SB-1 | 19-Oct-2013 | 1.3 | 1.1 | 0.015 | <0.0002 | 0.0001 | 0.0020 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.18 | <0.0001 | 0.0084 | <0.0001 |
| SB-1 | 31-Mar-2014 | 2.1 | 1.1 | 0.014 | <0.0002 | <0.0001 | 0.0039 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | 0.0004 | 0.64 | <0.0001 | 0.036 | <0.0001 |
| SB-2 | 09-Jun-2011 | 1.5 | 0.8 | 0.031 | <0.0002 | <0.0001 | 0.0020 | <0.0001 | <0.01 | <0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.59 | <0.0001 | 0.035 | <0.0001 |
| SB-2 | 09-May-2012 | 1.0 | 0.6 | 0.051 | <0.0002 | <0.0001 | 0.0022 | <0.0001 | <0.01 | 0.00001 | <0.0005 | <0.0001 | <0.0002 | 0.49 | 0.0001 | 0.011 | <0.0001 |
| SB-2 | 07-Aug-2012 | 1.1 | 0

| Parameter | | Nickel | Selenium | Silver | Strontium | Thallium | Tin | Titanium | Uranium | Vanadium | Zinc | Phosphorus | Dissolved Phosphorus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Water Quality Benchmarks | SEGG/SSWQO | | | | | | | | | | | | |
| | CCME CWQG | 0.025 | 0.001 | 0.0001 | | 0.0008 | | | 0.015 | | 0.007 | | |
| | Reference | CWQG | CWQG | CWQG | | CWQG | | | CWQG | | CWQG | | |
| Baseline Water Quality Characteristics | Count | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 | 142 |
| | #DL | 102 | 140 | 141 | 0 | 142 | 121 | 107 | 135 | 108 | 105 | 135 | 136 |
| | Min | <0.0001 | <0.0001 | <0.00005 | 0.0089 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| | Mean | 0.00012 | 0.00010 | 0.00005 | 0.013 | 0.0002 | 0.00018 | 0.00026 | 0.00013 | 0.00011 | 0.00098 | 0.012 | 0.012 |
| | 75th | 0.00010 | 0.00010 | 0.00005 | 0.014 | 0.0002 | 0.00010 | 0.00020 | 0.00010 | 0.00010 | 0.00060 | 0.010 | 0.010 |
| | 95th | 0.00030 | 0.00010 | 0.00005 | 0.018 | 0.0002 | 0.00090 | 0.00060 | 0.00020 | 0.00020 | 0.0029 | 0.010 | 0.010 |
| | Max | 0.00060 | 0.00020 | 0.00005 | 0.021 | 0.0002 | 0.0016 | 0.0018 | 0.0018 | 0.00050 | **0.02** | 0.17 | 0.15 |
| | Geomean | 0.00011 | 0.00010 | 0.00005 | 0.013 | 0.0002 | 0.00013 | 0.00023 | 0.00011 | 0.00011 | 0.00068 | 0.010 | 0.010 |
| | SD | 6.8E-05 | 8.4E-06 | 1.1E-19 | 0.0022 | 4.4E-19 | 0.00027 | 0.00021 | 0.00019 | 4.7E-05 | 0.0019 | 0.016 | 0.014 |
| Location | Sample Date | | | | | | | | | | | | |
| LA-1 | 08-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | 0.0007 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-1 | 12-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-1 | 29-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.016 | <0.0002 | 0.0013 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-1 | 14-Sep-2016 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-1 | 02-Jul-2018 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-1 | 16-Mar-2018 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.001 | <0.01 | <0.01 |
| LA-1-Bottom | 02-Jul-2018 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0013 | <0.01 | <0.01 |
| LA-1-Bottom | 16-Mar-2018 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0016 | <0.01 | <0.01 |
| LA-2 | 06-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | 0.0006 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-2 | 28-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.018 | <0.0002 | 0.0004 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-2 | 21-Sep-2016 | 0.0003 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0011 | <0.01 | <0.01 |
| LA-3 | 07-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | 0.001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-3 | 28-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.018 | <0.0002 | 0.0004 | <0.0002 | <0.0001 | <0.0001 | 0.0005 | <0.01 | <0.01 |
| LA-3 | 21-Sep-2016 | 0.0002 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0005 | <0.01 | <0.01 |
| LA-4 | 29-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.017 | <0.0002 | 0.0012 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | 0.01 |
| LA-4 | 21-Sep-2016 | 0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-5 | 08-Aug-2012 | <0.0001 | <0.0001 | 0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-5 | 01-Apr-2014 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | 0.0008 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-5 | 10-Sep-2016 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-6 | 13-Aug-2012 | 0.0004 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | 0.0002 | <0.0001 | 0.0001 | **0.02** | 0.01 | <0.01 |
| LA-6 | 30-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | 0.0011 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-6 | 12-Sep-2016 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-6 | 02-Jul-2018 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-6 | 17-Mar-2018 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0022 | <0.01 | <0.01 |
| LA-7 | 09-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | 0.0001 | <0.0005 | <0.01 | 0.01 |
| LA-7 | 29-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.019 | <0.0002 | 0.0009 | 0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-7 | 10-Sep-2016 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-7A | 12-Sep-2016 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-7A-bottom | 12-Sep-2016 | <0.0001 | 0.0002 | <0.00005 | 0.018 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0003 | 0.0014 | 0.11 | 0.10 |
| LA-8 | 14-Sep-2016 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LA-9 | 16-Sep-2016 | 0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LAB-1 | 10-Aug-2012 | 0.0001 | <0.0001 | <0.00005 | 0.018 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LAB-1 | 31-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.017 | <0.0002 | 0.001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LAB-1 | 15-Sep-2016 | 0.0001 | <0.0001 | <0.00005 | 0.017 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LAB-2 | 21-Sep-2016 | 0.0003 | <0.0001 | <0.00005 | 0.016 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LB-1 | 13-Sep-2016 | 0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| LB-2 | 01-Apr-2014 | 0.0002 | <0.0001 | <0.00005 | 0.016 | <0.0002 | 0.0008 | <0.0002 | <0.0001 | <0.0001 | 0.0018 | <0.01 | <0.01 |
| LB-2 | 13-Sep-2016 | 0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | 0.03 |
| LB-3-Top | 11-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0031 | <0.01 | <0.01 |
| LB-3-Top | 01-Apr-2014 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | 0.0016 | <0.0002 | <0.0001 | <0.0001 | 0.002 | <0.01 | <0.01 |
| LB-3-Top | 10-Sep-2016 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| LB-3-bottom | 10-Sep-2016 | 0.0003 | 0.0001 | <0.00005 | 0.016 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0005 | 0.0029 | 0.17 | 0.15 |
| PA-2 | 20-Sep-2016 | 0.0002 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| PA-3 | 19-Sep-2016 | 0.0002 | <0.0001 | <0.00005 | 0.010 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | <0.0001 | 0.0006 | <0.01 | <0.01 |
| SA-1 | 05-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-1 | 08-May-2012 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0002 | <0.0001 | 0.0028 | <0.01 | <0.01 |
| SA-1 | 07-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0006 | <0.01 | <0.01 |
| SA-1 | 24-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-1 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-1 | 15-Aug-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-1 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-1 | 30-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-1 | 05-Jul-2019 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0017 | <0.01 | <0.01 |
| SA-1 | 30-Aug-2019 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-2 | 06-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-2 | 08-May-2012 | 0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0015 | 0.0015 | 0.0001 | **0.0096** | <0.01 | <0.01 |
| SA-2 | 08-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0008 | <0.01 | <0.01 |
| SA-2 | 24-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-2 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-2 | 15-Aug-2013 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-2 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-2 | 29-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-2 | 05-Jul-2019 | <0.0001 | <0.0001 | <0.00005 | 0.01 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.002 | <0.01 | <0.01 |
| SA-2 | 30-Aug-2019 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0009 | <0.01 | <0.01 |
| SA-3 | 05-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-3 | 08-May-2012 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0002 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-3 | 07-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-3 | 24-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0008 | <0.01 | <0.01 |
| SA-3 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-3 | 15-Aug-2013 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-3 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-3 | 31-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.018 | <0.0002 | <0.0001 | 0.0002 | <0.0001 | <0.0001 | 0.0011 | <0.01 | <0.01 |
| SA-3 | 05-Jul-2019 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | 0.0002 | <0.0001 | <0.0001 | 0.0021 | <0.01 | <0.01 |
| SA-3 | 30-Aug-2019 | <0.0002 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0009 | <0.0002 | <0.0001 | <0.0001 | 0.0008 | <0.01 | <0.01 |
| SA-4 | 05-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | 0.0002 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-4 | 08-May-2012 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0002 | <0.0001 | 0.0005 | <0.01 | <0.01 |
| SA-4 | 07-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0001 | 0.0012 | <0.01 | <0.01 |
| SA-4 | 24-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-4 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-4 | 15-Aug-2013 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-4 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-4 | 30-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.018 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0006 | <0.01 | <0.01 |
| SA-4 | 04-Jul-2019 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0015 | <0.01 | <0.01 |
| SA-4 | 29-Aug-2019 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0005 | <0.01 | <0.01 |
| SA-5 | 05-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0015 | <0.01 | <0.01 |
| SA-5 | 08-May-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0002 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-5 | 07-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-5 | 24-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-5 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-5 | 15-Aug-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-5 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-5 | 30-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-5 | 04-Jul-2019 | <0.0001 | <0.0001 | <0.00005 | 0.0097 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0024 | <0.01 | <0.01 |
| SA-5 | 29-Aug-2019 | <0.0001 | <0.0001 | <0.00005 | 0.01 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-6 | 08-May-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-6 | 07-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0001 | 0.0005 | <0.01 | <0.01 |
| SA-6 | 24-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | <0.0001 | 0.0006 | <0.01 | <0.01 |
| SA-6 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-6 | 15-Aug-2013 | 0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-6 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-6 | 01-Apr-2014 | <0.0001 | <0.0001 | <0.00005 | 0.016 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SA-6 | 04-Jul-2019 | <0.0001 | <0.0001 | <0.00005 | 0.01 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0016 | <0.01 | <0.01 |
| SA-6 | 29-Aug-2019 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| RC-1 | 06-Jul-2019 | <0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0029 | <0.01 | <0.01 |
| RC-1 | 01-Sep-2019 | <0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-1 | 09-Jun-2011 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-1 | 09-May-2012 | 0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | 0.0004 | 0.0004 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-1 | 07-Aug-2012 | 0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | 0.0001 | 0.0007 | <0.01 | <0.01 |
| SB-1 | 25-Oct-2012 | 0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | 0.001 | <0.0001 | 0.0002 | <0.0005 | <0.01 | <0.01 |
| SB-1 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0002 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-1 | 15-Aug-2013 | 0.0002 | <0.0001 | <0.00005 | 0.016 | <0.0002 | <0.0001 | 0.0004 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-1 | 19-Oct-2013 | 0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-1 | 31-Mar-2014 | 0.0006 | <0.0001 | <0.00005 | 0.021 | <0.0002 | 0.0007 | 0.0003 | <0.0001 | 0.0001 | 0.0005 | <0.01 | <0.01 |
| SB-2 | 09-Jun-2011 | 0.0003 | <0.0001 | <0.00005 | 0.016 | <0.0002 | <0.0001 | 0.001 | <0.0001 | 0.0003 | 0.001 | <0.01 | <0.01 |
| SB-2 | 09-May-2012 | 0.0002 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0018 | 0.0018 | 0.0002 | 0.0032 | 0.01 | <0.01 |
| SB-2 | 07-Aug-2012 | 0.0003 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | 0.0009 | <0.0001 | 0.0002 | 0.0006 | 0.01 | <0.01 |
| SB-2 | 25-Oct-2012 | 0.0002 | <0.0001 | <0.00005 | 0.010 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-2 | 22-May-2013 | 0.0001 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | 0.0006 | <0.0001 | 0.0002 | <0.0005 | <0.01 | <0.01 |
| SB-2 | 15-Aug-2013 | 0.0003 | <0.0001 | <0.00005 | 0.019 | <0.0002 | <0.0001 | 0.0005 | <0.0001 | 0.0002 | <0.0005 | 0.01 | <0.01 |
| SB-2 | 19-Oct-2013 | 0.0002 | <0.0001 | <0.00005 | 0.01 | <0.0002 | <0.0001 | 0.0006 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-3 | 05-Jun-2011 | 0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-3 | 09-May-2012 | 0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0002 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-3 | 08-Aug-2012 | 0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0012 | <0.01 | <0.01 |
| SB-3 | 25-Oct-2012 | 0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-3 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-3 | 15-Aug-2013 | 0.0001 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-3 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-3 | 31-Mar-2014 | 0.0002 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0006 | <0.01 | <0.01 |
| SB-4 | 05-Jun-2011 | 0.0002 | <0.0001 | <0.00005 | 0.014 | <0.0002 | <0.0001 | 0.0006 | <0.0001 | 0.0002 | 0.0042 | <0.01 | 0.01 |
| SB-4 | 08-May-2012 | 0.0002 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0004 | 0.0004 | 0.0002 | <0.0005 | <0.01 | <0.01 |
| SB-4 | 07-Aug-2012 | 0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | 0.0001 | 0.0007 | <0.01 | <0.01 |
| SB-4 | 24-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.0089 | <0.0002 | <0.0001 | 0.0003 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-4 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | 0.0005 | <0.0001 | 0.0002 | <0.0005 | <0.01 | <0.01 |
| SB-4 | 15-Aug-2013 | 0.0003 | <0.0001 | <0.00005 | 0.013 | <0.0002 | <0.0001 | 0.0004 | <0.0001 | 0.0002 | <0.0005 | 0.01 | <0.01 |
| SB-4 | 18-Oct-2013 | 0.0001 | <0.0001 | <0.00005 | 0.010 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | 0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-5 | 09-May-2012 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0002 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-5 | 07-Aug-2012 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0016 | <0.01 | <0.01 |
| SB-5 | 25-Oct-2012 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-5 | 22-May-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-5 | 15-Aug-2013 | <0.0001 | <0.0001 | <0.00005 | 0.011 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |
| SB-5 | 18-Oct-2013 | <0.0001 | <0.0001 | <0.00005 | 0.012 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | 0.0006 | <0.01 | <0.01 |
| SB-5 | 31-Mar-2014 | <0.0001 | <0.0001 | <0.00005 | 0.015 | <0.0002 | <0.0001 | <0.0002 | <0.0001 | <0.0001 | <0.0005 | <0.01 | <0.01 |

Note:
Coloured cell with bold value indicates that the value is greater that the water quality benchmark value

| Station | Sampling Date | Sample ID | Depth | Temperature | Dissolved Oxygen | Dissolved Oxygen | pH | Specific Conductivity | Conductivity |
|---|---|---|---|---|---|---|---|---|---|
| Unit | | | m | °C | % | mg/L | - | µS/cm | µS/cm |
| LA-1 13 V 478856 6371913 | 14-Sep-16 | LA-1-0.25 | 0.25 | 11.73 | 92.3 | 9.97 | 7.56 | 18 | 13 |
| | | LA-1-1 | 1 | 11.722 | 90.7 | 9.84 | 7.46 | 18 | 13 |
| | | LA-1-2 | 2 | 11.71 | 90.6 | 9.82 | 7.33 | 18 | 13 |
| | | LA-1-3 | 3 | 11.71 | 90.8 | 9.85 | 7.19 | 18 | 13 |
| | | LA-1-4 | 4 | 11.71 | 90.8 | 9.84 | 7.16 | 18 | 13 |
| | | LA-1-5 | 5 | 11.7 | 90.5 | 9.81 | 7.1 | 18 | 13 |
| | | LA-1-6 | 6 | 11.7 | 90.3 | 9.8 | 7.04 | 18 | 13 |
| | | LA-1-7 | 7 | 11.71 | 90.2 | 9.79 | 7.01 | 18 | 13 |
| | | LA-1-7.8 | 7.8 | 11.7 | 89.9 | 9.75 | 6.97 | 18 | 13 |
| | 16-Mar-18 | LA-1-0.7 | 0.7 | 0.08 | 81.8 | 12.43 | 6.78 | 25 | 13 |
| | | LA-1-1.7 | 1.7 | 0.91 | 79.7 | 11.37 | 6.58 | 25 | 13 |
| | | LA-1-2.7 | 2.7 | 1.04 | 79.5 | 11.28 | 6.6 | 26 | 14 |
| | | LA-1-3.7 | 3.7 | 1.45 | 76 | 10.81 | 6.58 | 26 | 14 |
| | | LA-1-4.7 | 4.7 | 2.23 | 67.6 | 9.31 | 6.74 | 27 | 15 |
| | | LA-1-5.7 | 5.7 | 3.12 | 41.4 | 5.69 | 6.65 | 28 | 18 |
| | | LA-1-6.7 | 6.7 | 3.94 | 6.5 | 0.85 | 6.83 | 34 | 20 |
| | | LA-1-7.7 | 7.7 | 4.72 | 1.8 | 0.23 | 6.75 | 38 | 23 |
| | | LA-1-8.6 | 8.6 | 4.86 | 3.1 | 0.36 | 6.58 | 30 | 19 |
| | 02-Jul-18 | LA-1-0 | 0 | 18.6 | 98.9 | 9.24 | 7.22 | 17 | 15 |
| | | LA-1-0.5 | 0.5 | 18.62 | 98.8 | 9.22 | 7.24 | 17 | 15 |
| | | LA-1-1 | 1 | 18.61 | 98.7 | 9.21 | 7.26 | 17 | 15 |
| | | LA-1-2 | 2 | 18.56 | 98.6 | 9.22 | 7.22 | 17 | 15 |
| | | LA-1-3 | 3 | 18.58 | 98.3 | 9.19 | 7.2 | 17 | 15 |
| | | LA-1-4 | 4 | 18.22 | 96.7 | 9.1 | 7.22 | 17 | 15 |
| | | LA-1-5 | 5 | 17.31 | 93 | 8.92 | 7.13 | 17 | 15 |
| | | LA-1-6 | 6 | 15.35 | 92.1 | 9.08 | 7.08 | 18 | 14 |
| | | LA-1-7 | 7 | 13.6 | 58 | 5.97 | 6.75 | 19 | 15 |
| | | LA-1-7.5 | 7.5 | 12.73 | 28.4 | 2.91 | 6.51 | 20 | 16 |
| | | LA-1-8.5 | 8.5 | 11.7 | 3 | 0.3 | | | |
| | | LA-1-9.5 | 9.5 | 11.1 | 0.4 | 0.04 | | | |
| LA-2 13 V 479354 6374020 | 21-Sep-16 | LA-2-0.15 | 0.15 | 11.35 | 97.6 | 10.64 | 6.67 | 20 | 15 |
| | | LA-2-1 | 1 | 11.38 | 94.5 | 10.32 | 6.65 | 20 | 15 |
| | | LA-2-2 | 2 | 11.38 | 93.3 | 10.19 | 6.32 | 20 | 15 |
| | | LA-2-3 | 3 | 11.36 | 92.4 | 10.1 | 6.28 | 20 | 15 |
| | | LA-2-4 | 4 | 11.33 | 91.7 | 10.02 | 6.23 | 20 | 15 |
| | | LA-2-5 | 5 | 11.28 | 91 | 9.97 | 6.22 | 20 | 15 |
| LA-3 13 V 480889 6374208 | 21-Sep-16 | LA-3-0.15 | 0.15 | 11.72 | 96.2 | 10.43 | 6.6 | 20 | 15 |
| | | LA-3-1 | 1 | 11.75 | 92.5 | 10.01 | 6.61 | 20 | 15 |
| | | LA-3-2 | 2 | 11.75 | 91.6 | 9.92 | 6.52 | 20 | 15 |
| | | LA-3-3 | 3 | 11.73 | 90.7 | 9.84 | 6.37 | 20 | 15 |
| | | LA-3-4 | 4 | 11.7 | 90.2 | 9.78 | 6.3 | 20 | 15 |
| | | LA-3-5 | 5 | 11.67 | 89.4 | 9.7 | 6.28 | 20 | 15 |
| | | LA-3-6 | 6 | 11.65 | 88.7 | 9.63 | 6.26 | 20 | 15 |
| | | LA-3-7 | 7 | 11.65 | 88.5 | 9.6 | 6.22 | 20 | 15 |
| | | LA-3-8 | 8 | 11.65 | 88.2 | 9.58 | 6.2 | 20 | 15 |
| | | LA-3-9 | 9 | 11.64 | 88 | 9.55 | 6.19 | 20 | 15 |
| | | LA-3-10 | 10 | 11.6 | 88 | 9.54 | 6.28 | 20 | 15 |
| | | LA-3-11 | 11 | 11.49 | 86.5 | 9.42 | 6.23 | 20 | 15 |
| | | LA-3-12 | 12 | 11.38 | 85.4 | 9.32 | 6.18 | 20 | 15 |

| Station | Sampling Date | Sample ID | Depth | Temperature | Dissolved Oxygen | Dissolved Oxygen | pH | Specific Conductivity | Conductivity |
|---|---|---|---|---|---|---|---|---|---|
| Unit | | | m | °C | % | mg/L | - | µS/cm | µS/cm |
| LA-4 13 V 480889 6376599 | 21-Sep-16 | LA-4-0.3 | 0.3 | 12.15 | 88 | 9.42 | 6.83 | 22 | 17 |
| | | LA-4-1 | 1 | 12.25 | 87.4 | 9.36 | 6.55 | 22 | 17 |
| | | LA-4-2 | 2 | 12.27 | 86.9 | 9.31 | 6.48 | 22 | 17 |
| | | LA-4-3 | 3 | 12.29 | 86.6 | 9.27 | 6.4 | 22 | 17 |
| | | LA-4-4 | 4 | 12.29 | 86.4 | 9.26 | 6.34 | 22 | 17 |
| | | LA-4-5 | 5 | 12.29 | 86.6 | 9.26 | 6.25 | 22 | 17 |
| | | LA-4-6 | 6 | 12.29 | 85.9 | 9.19 | 6.32 | 22 | 17 |
| | | LA-4-7 | 7 | 12.29 | 85.6 | 9.17 | 6.3 | 22 | 17 |
| | | LA-4-8 | 8 | 12.29 | 85.6 | 9.17 | 6.21 | 22 | 17 |
| | | LA-4-9 | 9 | 12.29 | 85.6 | 9.16 | 6.2 | 22 | 17 |
| | | LA-4-10 | 10 | 12.28 | 85.2 | 9.13 | 6.22 | 22 | 17 |
| | | LA-4-11 | 11 | 12.28 | 85.1 | 9.11 | 6.19 | 22 | 17 |
| | | LA-4-12 | 12 | 12.26 | 84.8 | 9.08 | 6.2 | 22 | 17 |
| | | LA-4-13 | 13 | 11.8 | 66.8 | 7.03 | 5.98 | 23 | 17 |
| LA-5 13 V 477925 6374453 | 10-Sep-16 | LA-5-0.25 | 0 | 12 | 85 | 9 | 9 | 18 | 13 |
| | | LA-5-1 | 1 | 12 | 85 | 9 | 9 | 18 | 13 |
| | | LA-5-2 | 2 | 12 | 84 | 9 | 9 | 18 | 13 |
| | | LA-5-2.5 | 3 | 12 | 48 | 5 | 7 | 19 | 14 |
| LA-6 13 V 478048 6375335 | 13-Sep-16 | LA-6-0.25 | 0.25 | 8.61 | 92.7 | 10.78 | 6.85 | 17 | 12 |
| | | LA-6-1 | 1 | 8.51 | 89.8 | 10.5 | 6.82 | 17 | 12 |
| | | LA-6-2 | 2 | 9.47 | 26.7 | 2.83 | 6.53 | 24 | 17 |
| | 17-Mar-18 | LA-6-0.7 | 0.7 | 0.26 | 76.9 | 11.09 | 6.94 | 17 | 9 |
| | | LA-6-1.7 | 1.7 | 1.8 | 5.81 | 0.78 | 6.89 | 32 | 18 |
| | 02-Jul-18 | LA-6-0 | 0 | 17.8 | 97.2 | 9.22 | 7.2 | 14 | 18 |
| | | LA-6-0.5 | 0.5 | 17.99 | 97.5 | 9.23 | 6.91 | 15 | 17 |
| | | LA-6-1 | 1 | 17.71 | 96 | 9.13 | 6.98 | 14 | 17 |
| | | LA-6-1.5 | 1.5 | 17.71 | 95.9 | 9.14 | 6.83 | 14 | 17 |
| | | LA-6-1.8 | 1.8 | 17.5 | 2.1 | 0.19 | 6.35 | 21 | 24 |
| | | LA-6-2 | 2 | | | | | | |
| LA-7 13 V 473200 6375598 | 10-Sep-16 | LA-7-0 | 0 | 12.82 | 88 | 9.31 | 6.7 | 19 | 15 |
| | | LA-7-1 | 1 | 12.83 | 87.4 | 9.24 | 6.15 | 19 | 15 |
| | | LA-7-2 | 2 | 12.83 | 87 | 9.19 | 6.18 | 19 | 15 |
| | | LA-7-3 | 3 | 12.82 | 80.6 | 9.15 | 6 | 19 | 15 |
| | | LA-7-4 | 4 | 12.82 | 86.4 | 9.15 | 5.89 | 19 | 15 |
| | | LA-7-5 | 5 | 12.83 | 82.1 | 8.79 | 6.3 | 20 | 15 |
| | | LA-7-6 | 6 | 12.91 | 49 | 4.8 | 5.95 | 25 | 19 |
| | 18-Mar-18 | LA-7-0.7 | 0.7 | 0.77 | 79.3 | 11.3 | 6.16 | 23 | 12 |
| | | LA-7-1.7 | 1.7 | 3.48 | 27.5 | 3.67 | 6.04 | 25 | 15 |
| | | LA-7-2.7 | 2.7 | 4.36 | 3.2 | 0.42 | 6.07 | 25 | 15 |
| | | LA-7-3.7 | 3.7 | 4.52 | 1.1 | 0.15 | 6 | 26 | 16 |
| | | LA-7-4.2 | 4.2 | | | | | | |
| LA-7A 13 V 472632 6376868 | 12-Sep-16 | LA-7A-0 | 0 | 12.5 | 80.2 | 8.54 | 7.03 | 20 | 15 |
| | | LA-7A-1 | 1 | 12.55 | 79.1 | 8.42 | 6.99 | 20 | 15 |
| | | LA-7A-2 | 2 | 12.56 | 78.8 | 8.38 | 6.61 | 20 | 15 |
| | | LA-7A-3 | 3 | 12.56 | 78.6 | 8.36 | 6.57 | 20 | 15 |
| | | LA-7A-4 | 4 | 12.56 | 78.4 | 8.34 | 6.5 | 20 | 15 |
| | | LA-7A-5 | 5 | 12.51 | 78.1 | 8.32 | 6.47 | 20 | 15 |
| | | LA-7A-6 | 6 | 12.5 | 77.7 | 8.23 | 6.42 | 20 | 15 |
| | | LA-7A-7 | 7 | 12.49 | 77.1 | 8.21 | 6.33 | 20 | 15 |
| | | LA-7A-8 | 8 | 12.49 | 76.6 | 8.16 | 6.23 | 20 | 15 |
| | | LA-7A-9 | 9 | 12.47 | 76.3 | 8.13 | 6.21 | 20 | 15 |
| | | LA-7A-10 | 10 | 12.41 | 75.4 | 8.05 | 6.19 | 20 | 15 |
| | | LA-7A-11 | 11 | 10.11 | 42.2 | 4.57 | 6.14 | 21 | 15 |
| | | LA-7A-12 | 12 | 8.15 | 25.8 | 3.05 | 5.75 | 24 | 16 |
| | | LA-7A-13 | 13 | 7.23 | 12.1 | 1.41 | 5.78 | 37 | 24 |
| | | LA-7A-14 | 14 | 6.84 | 9.1 | 1.11 | 5.67 | 42 | 27 |
| | | LA-7A-15 | 15 | 6.67 | 7.3 | 0.9 | 5.59 | 45 | 29 |
| | | LA-7A-16 | 16 | 6.56 | 6.8 | 0.83 | 5.56 | 50 | 32 |
| | | LA-7A-17 | 17 | 6.42 | 6.2 | 0.77 | 5.42 | 87 | 56 |
| | | LA-7A-17.7 | 17.7 | 6.43 | 5.6 | 0.69 | 5.44 | 82 | 53 |

| Station | Sampling Date | Sample ID | Depth | Temperature | Dissolved Oxygen | Dissolved Oxygen | pH | Specific Conductivity | Conductivity |
|---|---|---|---|---|---|---|---|---|---|
| Unit | | | m | °C | % | mg/L | - | µS/cm | µS/cm |
| LA-8 13 V 475261 6378486 | 14-Sep-16 | LA-8-0 | 0 | 11.74 | 89.3 | 9.65 | 6.72 | 16 | 12 |
| | | LA-8-1 | 1 | 11.54 | 87.4 | 9.52 | 6.43 | 16 | 12 |
| | | LA-8-2 | 2 | 11.38 | 86.9 | 9.5 | 6.29 | 16 | 12 |
| | | LA-8-3 | 3 | 11.31 | 86 | 9.42 | 6.17 | 16 | 12 |
| | | LA-8-4 | 4 | 11.29 | 85.6 | 9.38 | 6.13 | 16 | 12 |
| | | LA-8-5 | 5 | 11.2 | 84.8 | 9.29 | 6.11 | 16 | 12 |
| | | LA-8-6 | 6 | 11.18 | 83.8 | 9.21 | 6.12 | 16 | 12 |
| | | LA-8-7 | 7 | 11.18 | 77.8 | 8.38 | 6.28 | 18 | 13 |
| LA-9 13 V 479328 6379952 | 16-Sep-16 | LA-9-0 | 0 | 12.33 | 87 | 9.31 | 0.97 | 16 | 12 |
| | | LA-9-1 | 1 | 12.17 | 84.2 | 9.04 | 6.63 | 16 | 12 |
| | | LA-9-2 | 2 | 12.07 | 83.4 | 8.96 | 6.54 | 16 | 12 |
| | | LA-9-3 | 3 | 11.89 | 81.2 | 8.77 | 6.48 | 16 | 12 |
| | | LA-9-4 | 4 | 11.86 | 80.5 | 8.71 | 6.46 | 16 | 12 |
| | | LA-9-5 | 5 | 11.82 | 80.1 | 8.67 | 6.43 | 16 | 12 |
| | | LA-9-6 | 6 | 11.71 | 78.7 | 8.54 | 6.4 | 16 | 12 |
| | | LA-9-7 | 7 | 11.66 | 77.1 | 8.37 | 6.39 | 16 | 12 |
| | | LA-9-8 | 8 | 11.63 | 76.4 | 8.31 | 6.35 | 16 | 12 |
| | | LA-9-9 | 9 | 11.62 | 75.5 | 8.21 | 6.332 | 16 | 12 |
| | | LA-9-10 | 10 | 11.62 | 74 | 8.05 | 6.33 | 16 | 12 |
| LAB-1 13 V 478549 6367476 | 15-Sep-16 | LAB-1-0.25 | 0.25 | 12.6 | 91 | 9.67 | 7.02 | 39 | 30 |
| | | LAB-1-1 | 1 | 12.61 | 90.4 | 7.01 | 7.01 | 39 | 30 |
| | | LAB-1-2 | 2 | 12.59 | 90 | 9.57 | 6.98 | 39 | 30 |
| | | LAB-1-3 | 3 | 12.59 | 89.8 | 9.55 | 7.02 | 39 | 30 |
| | | LAB-1-4 | 4 | 12.57 | 89.5 | 9.51 | 7.01 | 30 | 30 |
| | | LAB-1-5 | 5 | 12.57 | 89.3 | 9.51 | 7.03 | 39 | 30 |
| | | LAB-1-6 | 6 | 12.55 | 88.9 | 9.46 | 7.04 | 39 | 30 |
| | | LAB-1-7 | 7 | 12.54 | 88.7 | 9.44 | 7.05 | 39 | 30 |
| | | LAB-1-8 | 8 | 12.54 | 88.5 | 9.42 | 7.04 | 39 | 30 |
| | | LAB-1-9 | 9 | 12.52 | 88.5 | 9.42 | 7.04 | 39 | 30 |
| | | LAB-1-10 | 10 | 12.49 | 88.3 | 9.41 | 7.05 | 39 | 30 |
| | | LAB-1-11 | 11 | 12.44 | 87.9 | 9.38 | 7.05 | 39 | 29 |
| | | LAB-1-12 | 12 | 12.4 | 87.7 | 9.37 | 7.03 | 38 | 29 |
| | | LAB-1-13 | 13 | 12.4 | 88 | 9.39 | 7.05 | 38 | 29 |
| | | LAB-1-14 | 14 | 12.39 | 87.8 | 9.38 | 6.94 | 38 | 29 |
| | | LAB-1-15 | 15 | 12.23 | 45.6 | 4.59 | 6.88 | 37 | 28 |
| LAB-2 13 V 476445 6364956 | 21-Sep-16 | LAB-2-0 | 0 | 12.24 | 88.4 | 9.47 | 6.9 | 40 | 30 |
| | | LAB-2-1 | 1 | 12.23 | 88.2 | 9.46 | 6.94 | 39 | 29 |
| | | LAB-2-2 | 2 | 12.21 | 87.8 | 9.41 | 6.94 | 39 | 29 |
| | | LAB-2-3 | 3 | 12.17 | 87.4 | 9.38 | 6.94 | 39 | 29 |
| | | LAB-2-4 | 4 | 12.17 | 87.1 | 9.35 | 6.96 | 39 | 29 |
| | | LAB-2-5 | 5 | 12.14 | 86.9 | 9.34 | 6.94 | 39 | 29 |
| | | LAB-2-6 | 6 | 12.13 | 86.7 | 9.32 | 6.97 | 39 | 29 |
| | | LAB-2-7 | 7 | 12.13 | 86.5 | 9.3 | 6.95 | 39 | 29 |
| | | LAB-2-8 | 8 | 12.13 | 86.7 | 9.32 | 6.94 | 39 | 29 |
| | | LAB-2-9 | 9 | 12.12 | 86.7 | 9.32 | 6.94 | 39 | 29 |
| | | LAB-2-10 | 10 | 12.12 | 86.7 | 9.32 | 6.95 | 39 | 29 |
| | | LAB-2-11 | 11 | 12.11 | 86.7 | 9.32 | 6.94 | 39 | 29 |
| | | LAB-2-12 | 12 | 12.05 | 86.6 | 9.31 | 6.95 | 39 | 29 |
| | | LAB-2-13 | 13 | 12.01 | 85.8 | 9.24 | 6.95 | 39 | 29 |
| | | LAB-2-14 | 14 | 11.95 | 85.5 | 9.23 | 6.95 | 39 | 29 |
| | | LAB-2-15 | 15 | 11.8 | 84.3 | 9.13 | 6.97 | 39 | 29 |
| | | LAB-2-15.5 | 15.5 | 11.78 | 80.6 | 8.73 | 6.9 | 38 | 28 |
| LB-1 13 V 476447 6369460 | 13-Sep-16 | LB-1-0.25 | 0 | 9 | 88 | 10 | 8 | 17 | 12 |
| | | LB-1-1 | 1 | 9 | 85 | 10 | 8 | 17 | 12 |
| | | LB-1-2 | 2 | 9 | 84 | 10 | 7 | 17 | 12 |

| Station | Sampling Date | Sample ID | Depth | Temperature | Dissolved Oxygen | Dissolved Oxygen | pH | Specific Conductivity | Conductivity |
|---|---|---|---|---|---|---|---|---|---|
| Unit | | | m | °C | % | mg/L | - | µS/cm | µS/cm |
| LB-2 13 V 474928 6371569 | 13-Sep-16 | LB-2-0.25 | 0 | 11 | 86 | 9 | 7 | 17 | 13 |
| | | LB-2-1 | 1 | 10.86 | 83.7 | 9.26 | 7.09 | 17 | 13 |
| | | LB-2-2 | 2 | 10.85 | 83.3 | 9.22 | 7.09 | 17 | 13 |
| | | LB-2-3 | 3 | 10.85 | 83.3 | 9.22 | 7.05 | 17 | 13 |
| | | LB-2-4 | 4 | 10.84 | 83.3 | 9.22 | 7.03 | 17 | 13 |
| | | LB-2-5 | 5 | 10.79 | 82.5 | 9.14 | 6.99 | 17 | 13 |
| | | LB-2-6 | 6 | 10.76 | 48.7 | 4.99 | 6.78 | 19 | 14 |
| LB-3 13 V 473922 6373609 | 09-Sep-16 | LB-3-0 | 0 | 14.23 | 87.5 | 8.97 | 6.8 | 18 | 14 |
| | | LB-3-1 | 1 | 14.24 | 87.3 | 8.96 | 6.81 | 18 | 14 |
| | | LB-3-2 | 2 | 14.23 | 87.1 | 8.94 | 6.8 | 18 | 14 |
| | | LB-3-3 | 3 | 14.23 | 86.9 | 8.92 | 6.8 | 18 | 14 |
| | | LB-3-4 | 4 | 14.23 | 86.6 | 8.89 | 6.79 | 18 | 14 |
| | | LB-3-5 | 5 | 14.22 | 86.3 | 8.88 | 6.79 | 18 | 14 |
| | | LB-3-6 | 6 | 14.18 | 85.3 | 8.78 | 6.78 | 18 | 14 |
| | | LB-3-7 | 7 | 14.16 | 85 | 8.73 | 6.76 | 18 | 14 |
| | | LB-3-8 | 8 | 14.11 | 84.4 | 8.68 | 6.75 | 18 | 14 |
| | | LB-3-9 | 9 | 14.11 | 84.1 | 8.65 | 6.76 | 18 | 14 |
| | | LB-3-10 | 10 | 13.88 | 77.7 | 8.01 | 6.73 | 18 | 14 |
| | | LB-3-11 | 11 | 10.87 | 9 | 1.08 | 6.66 | 25 | 18 |
| | | LB-3-12 | 12 | 7.74 | 9 | 1.08 | 6.5 | 49 | 33 |
| | | LB-3-13 | 13 | 7.54 | 9 | 1.08 | 6.5 | 53 | 35 |
| | | LB-3-14 | 14 | 7.37 | 9 | 1.08 | 6.5 | 58 | 38 |
| | | LB-3-15 | 15 | 7.32 | 9 | 1.08 | 6.46 | 62 | 41 |
| | | LB-3-16 | 16 | 7.28 | 9 | 1.08 | 6.4 | 78 | 52 |
| | | LB-3-17 | 17 | 7.26 | 9 | 1.08 | 6.36 | 77 | 51 |
| PA-2 13 V 477064 6377074 | 19-Sep-16 | PA-2-0 | 0 | 11.74 | 86.1 | 9.31 | 6.84 | 18 | 9 |
| | | PA-2-2 | 2 | 11.69 | 81 | 8.79 | 6.39 | 19 | 11 |
| PA-3 13 V 476338 6377666 | 20-Sep-16 | PA-3-0 | 0 | 10.91 | 83.4 | 9.22 | 6.56 | 16 | 8 |
| | | PA-3-3.1 | 3.1 | 10.63 | 78.3 | 8.71 | 6.06 | 16 | 9 |

Table A-3
Baseline Sediment Grainsize Analysis



| Location | | Percent Passing (%) | | | | | Soil Classification (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.04 µm | 4 µm | 63 µm | 200 µm | 2000 µm | Gravel | Sand | Silt | Clay |
| Baseline | Count | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Lake Sediment | Min | 1.8 | 11 | 15 | 99 | 99 | 0.0 | 0.1 | 13 | 10 |
| Grain Size | Mean | 7.8 | 64 | 85 | 100 | 100 | 0.0 | 14 | 30 | 56 |
| Statistics | 75th | 12 | 89 | 99 | 100 | 100 | 0 | 21 | 41 | 78 |
| | 95th | 14 | 94 | 100 | 100 | 100 | 0 | 74 | 52 | 82 |
| | Max | 14 | 94 | 100 | 100 | 100 | 0 | 77 | 55 | 82 |
| | Geomean | 6.3 | 56 | 79 | 100 | 100 | na | 3.5 | 28 | 49 |
| | SD | 4.4 | 28 | 22 | 0.1 | 0.1 | 0.0 | 20 | 12 | 24 |
| Location | Date | | | | | | | | | |
| LA-1-1 (0-2) | 14-Sep-2016 | 13.2 | 94.4 | 99.9 | 100.0 | 100.0 | 0.0 | 0.1 | 17.7 | 82.2 |
| LA-1-2 (0-2) | 14-Sep-2016 | 11.7 | 91.1 | 99.7 | 100.0 | 100.0 | 0.0 | 0.3 | 20.6 | 79.1 |
| LA-1-3 (0-2) | 17-Sep-2016 | 13.5 | 89.7 | 99.8 | 100.0 | 100.0 | 0.0 | 0.2 | 21.6 | 78.2 |
| LA-5-1 (0-2) | 09-Sep-2016 | 10.6 | 87.9 | 97.8 | 100.1 | 100.1 | 0.0 | 2.1 | 21.7 | 76.3 |
| LA-5-2 (0-2) | 11-Sep-2016 | 1.8 | 13.8 | 20.5 | 100.0 | 100.0 | 0.0 | 72.5 | 15.4 | 12.0 |
| LA-5-3 (0-2) | 11-Sep-2016 | 12.0 | 88.0 | 97.3 | 99.4 | 99.4 | 0.0 | 1.9 | 20.9 | 76.6 |
| LA-5-4 (0-2) | 10-Sep-2016 | 13.4 | 94.2 | 99.8 | 100.0 | 100.0 | 0.0 | 0.1 | 17.8 | 82.0 |
| LA-5-5 (0-2) | 10-Sep-2016 | 2.7 | 11.3 | 15.4 | 100.0 | 100.0 | 0.0 | 77.2 | 12.8 | 10.0 |
| LA-6-1 (0-2) | 12-Sep-2016 | 12.2 | 90.6 | 99.5 | 100.0 | 100.0 | 0.0 | 0.4 | 20.8 | 78.8 |
| LA-6-2 (0-2) | 12-Sep-2016 | 6.1 | 53.3 | 86.8 | 100.0 | 100.0 | 0.0 | 12.0 | 41.8 | 46.2 |
| LA-6-3 (0-2) | 16-Sep-2016 | 14.0 | 84.4 | 98.0 | 100.0 | 100.0 | 0.0 | 1.8 | 24.4 | 73.8 |
| LA-6-4 (0-2) | 16-Sep-2016 | 13.9 | 89.2 | 99.3 | 100.1 | 100.1 | 0.0 | 0.7 | 21.5 | 77.9 |
| LA-6-5 (0-2) | 18-Sep-2016 | 10.5 | 73.6 | 94.3 | 100.0 | 100.0 | 0.0 | 5.2 | 30.7 | 64.1 |
| LA-7A-1 (0-2) | 13-Sep-2016 | 3.7 | 49.3 | 84.8 | 100.0 | 100.0 | 0.0 | 13.9 | 43.7 | 42.4 |
| LA-7A-2 (0-2) | 13-Sep-2016 | 4.2 | 46.5 | 86.6 | 100.0 | 100.0 | 0.0 | 12.2 | 47.6 | 40.2 |
| LA-7A-3 (0-2) | 13-Sep-2016 | 3.4 | 43.2 | 79.8 | 100.0 | 100.0 | 0.0 | 18.4 | 44.4 | 37.2 |
| LA-7-1 (0-2) | 13-Sep-2016 | 6.8 | 78.7 | 89.7 | 100.0 | 100.0 | 0.0 | 9.4 | 22.7 | 67.9 |
| LA-7-2 (0-2) | 13-Sep-2016 | 4.8 | 66.7 | 92.2 | 100.0 | 100.0 | 0.0 | 7.1 | 35.5 | 57.3 |
| LA-7-3 (0-2) | 13-Sep-2016 | 2.3 | 25.5 | 46.8 | 100.0 | 100.0 | 0.0 | 48.5 | 29.5 | 22.0 |
| LA-8-1 (0-2) | 16-Sep-2016 | 7.2 | 85.2 | 99.4 | 100.0 | 100.0 | 0.0 | 0.6 | 26.0 | 73.4 |
| LA-8-2 (0-2) | 15-Sep-2016 | 2.2 | 23.0 | 55.7 | 100.0 | 100.0 | 0.0 | 40.4 | 39.7 | 19.8 |
| LA-8-3 (0-2) | 15-Sep-2016 | 2.9 | 32.6 | 63.5 | 100.0 | 100.0 | 0.0 | 33.3 | 38.6 | 28.1 |
| LA-9-1 (0-2) | 18-Sep-2016 | 1.9 | 26.3 | 73.2 | 100.0 | 100.0 | 0.0 | 24.5 | 50.8 | 24.7 |
| LA-9-2 (0-2) | 18-Sep-2016 | 2.9 | 32.9 | 73.5 | 100.1 | 100.1 | 0.0 | 24.3 | 47.4 | 28.3 |
| LA-9-3 (0-2) | 18-Sep-2016 | 10.7 | 89.1 | 98.5 | 99.9 | 99.9 | 0.0 | 1.3 | 21.3 | 77.3 |
| LB-3-1 (0-2) | 09-Sep-2016 | 9.4 | 89.6 | 99.7 | 100.0 | 100.0 | 0.0 | 0.3 | 22.1 | 77.6 |
| LB-3-2 (0-2) | 10-Sep-2016 | 4.8 | 42.3 | 76.0 | 100.1 | 100.1 | 0.0 | 22.0 | 41.5 | 36.6 |
| LB-3-3 (0-2) | 10-Sep-2016 | 2.7 | 35.5 | 84.4 | 100.0 | 100.0 | 0.0 | 14.2 | 55.2 | 30.5 |
| LAB-1-1 (0-2) | 19-Sep-2016 | 12.0 | 80.7 | 96.9 | 100.0 | 100.0 | 0.0 | 2.8 | 26.8 | 70.4 |
| LAB-1-2 (0-2) | 15-Sep-2016 | 10.8 | 84.5 | 99.4 | 99.9 | 99.9 | 0.0 | 0.5 | 26.0 | 73.4 |
| LAB-1-3 (0-2) | 15-Sep-2016 | 10.9 | 89.6 | 99.7 | 100.0 | 100.0 | 0.0 | 0.3 | 22.0 | 77.8 |
| LAB-2-CORE (0-2) | 21-Sep-2016 | 9.0 | 68.0 | 96.7 | 100.1 | 100.1 | 0.0 | 3.1 | 37.9 | 59.1 |

Notes:
Analysis by Beckman Coulter LS Particle Size Analyser
Results on sediment fraction passing 2,000 µm seive

**Table A-4**
**Baseline Sediment Quality Data**

| Parameter | | Moisture | Total Organic Carbon | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | | % | % | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g |
| **Sediment Quality Benchmarks** | **REF/ISQG/LEL** | | | | | 21 | | | | 0.6 | |
| | **NE2/PEL/SEL** | | | | | 522 | | | | 3.5 | |
| | **Reference** | | | | | REF and NE2 | | | | ISQG and PEL | |
| **Baseline Lake Sediment Quality Statistics** | **Count** | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| | **#DL** | 0 | 0 | 0 | 15 | 0 | 0 | 3 | 3 | 1 | 0 |
| | **Min** | 29 | 0.44 | 1860 | <0.2 | 0.60 | 20 | <0.1 | <1 | <0.1 | 1.0 |
| | **Mean** | 89 | 16 | 4689 | 0.23 | 3.7 | 42 | 0.26 | 5.8 | 0.39 | 9.2 |
| | **75th** | 96 | 19 | 5275 | 0.30 | 4.9 | 45 | 0.30 | 7.0 | 0.48 | 11 |
| | **95th** | 97 | 26 | 9235 | 0.34 | 6.7 | 81 | 0.50 | 11 | 0.60 | 18 |
| | **Max** | 97 | 26 | 9300 | 0.40 | 7.2 | 100 | 0.50 | 12 | 0.60 | 21 |
| | **Geomean** | 87 | 12 | 4360 | 0.23 | 3.3 | 40 | 0.24 | 4.9 | 0.38 | 7.8 |
| | **SD** | 17 | 6.8 | 1817 | 0.054 | 1.5 | 15 | 0.10 | 2.8 | 0.10 | 4.3 |
| **Location** | **Sample Date** | | | | | | | | | | |
| LA-1-1 | 14-Sep-2016 | 97 | 17 | 4740 | 0.3 | 5.7 | 42 | 0.3 | 8.0 | 0.5 | 16 |
| LA-1-2 | 14-Sep-2016 | 97 | 17 | 4440 | 0.2 | 5.0 | 34 | 0.3 | 8.0 | 0.4 | 9 |
| LA-1-3 | 17-Sep-2016 | 97 | 13 | 4010 | 0.2 | 5.3 | 30 | 0.2 | 5.0 | 0.3 | 7 |
| LA-5-1 | 09-Sep-2016 | 96 | 19 | 5300 | <0.2 | 4.4 | 49 | 0.3 | 6.0 | 0.4 | 11 |
| LA-5-2 | 11-Sep-2016 | 29 | 0.4 | 1990 | <0.2 | 0.6 | 33 | <0.1 | <1.0 | <0.1 | 4 |
| LA-5-3 | 11-Sep-2016 | 94 | 16 | 4860 | <0.2 | 3.9 | 42 | 0.3 | 3.0 | 0.3 | 10 |
| LA-5-4 | 10-Sep-2016 | 97 | 18 | 5800 | <0.2 | 3.1 | 45 | 0.3 | 4.0 | 0.3 | 11 |
| LA-5-5 | 10-Sep-2016 | 34 | 0.6 | 2450 | <0.2 | 1.2 | 45 | <0.1 | <1.0 | 0.4 | 1 |
| LA-6-1 | 12-Sep-2016 | 97 | 19 | 5200 | <0.2 | 3.3 | 45 | 0.3 | 6.0 | 0.4 | 10 |
| LA-6-2 | 12-Sep-2016 | 96 | 19 | 4670 | <0.2 | 3.1 | 43 | 0.3 | 6.0 | 0.4 | 8 |
| LA-6-3 | 16-Sep-2016 | 96 | 17 | 5900 | <0.2 | 4.2 | 42 | 0.3 | 7.0 | 0.5 | 10 |
| LA-6-4 | 16-Sep-2016 | 96 | 16 | 4620 | <0.2 | 3.8 | 37 | 0.3 | 6.0 | 0.4 | 8 |
| LA-6-5 | 18-Sep-2016 | 96 | 17 | 3820 | <0.2 | 3.4 | 56 | 0.3 | 4.0 | 0.4 | 8 |
| LA-7A-1 | 13-Sep-2016 | 95 | 24 | 4190 | 0.2 | 3.3 | 38 | 0.2 | 6.0 | 0.4 | 10 |
| LA-7A-2 | 13-Sep-2016 | 94 | 19 | 4530 | 0.3 | 5.0 | 33 | 0.2 | 6.0 | 0.4 | 10 |
| LA-7A-3 | 13-Sep-2016 | 95 | 23 | 3660 | 0.2 | 3.4 | 33 | 0.2 | 5.0 | 0.4 | 7 |
| LA-7-1 | 13-Sep-2016 | 97 | 26 | 3340 | 0.2 | 3.6 | 43 | 0.2 | 7.0 | 0.3 | 21 |
| LA-7-2 | 13-Sep-2016 | 95 | 26 | 3830 | 0.2 | 3.5 | 36 | 0.2 | 6.0 | 0.4 | 7 |
| LA-7-3 | 13-Sep-2016 | 96 | 26 | 3860 | 0.3 | 3.6 | 36 | 0.2 | 6.0 | 0.4 | 7 |
| LA-8-1 | 16-Sep-2016 | 97 | 24 | 4470 | 0.3 | 3.6 | 39 | 0.3 | 8.0 | 0.4 | 8 |
| LA-8-2 | 15-Sep-2016 | 88 | 8 | 1950 | <0.2 | 1.5 | 20 | 0.1 | 3.0 | 0.3 | 2 |
| LA-8-3 | 15-Sep-2016 | 95 | 16 | 4310 | 0.2 | 3.5 | 30 | 0.3 | 4.0 | 0.4 | 7 |
| LA-9-1 | 18-Sep-2016 | 66 | 2.6 | 1860 | <0.2 | 0.9 | 20 | <0.1 | <1.0 | 0.2 | 1 |
| LA-9-2 | 18-Sep-2016 | 94 | 17 | 4410 | 0.3 | 3.6 | 36 | 0.2 | 6.0 | 0.5 | 9 |
| LA-9-3 | 18-Sep-2016 | 95 | 17 | 4250 | 0.3 | 3.8 | 33 | 0.3 | 6.0 | 0.4 | 9 |
| LB-3-1 | 09-Sep-2016 | 94 | 20 | 7800 | 0.4 | 6.5 | 57 | 0.5 | 9.0 | 0.6 | 17 |
| LB-3-2 | 10-Sep-2016 | 92 | 18 | 6300 | 0.3 | 5.0 | 46 | 0.4 | 6.0 | 0.5 | 12 |
| LB-3-3 | 10-Sep-2016 | 68 | 3 | 2790 | <0.2 | 1.5 | 27 | 0.1 | <1.0 | 0.3 | 8 |
| LAB-1-1 | 19-Sep-2016 | 94 | 13 | 4810 | <0.2 | 2.6 | 45 | 0.3 | 7.0 | 0.3 | 8 |
| LAB-1-2 | 15-Sep-2016 | 93 | 13 | 7400 | 0.2 | 4.6 | 60 | 0.3 | 11.0 | 0.5 | 12 |
| LAB-1-3 | 15-Sep-2016 | 95 | 15 | 9200 | 0.3 | 5.6 | 71 | 0.4 | 11.0 | 0.5 | 15 |
| LAB-2-CORE | 21-Sep-2016 | 93 | 12 | 9300 | <0.2 | 7.2 | 100 | 0.5 | 12.0 | 0.6 | 13 |

**Table A-4**
**Baseline Sediment Quality Data**

| Parameter | | Cobalt | Copper | Iron | Lead | Manganese | Molybdenum | Nickel | Selenium | Silver | Strontium |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g |
| **Sediment Quality Benchmarks** | **REF/ISQG/LEL** | | 22 | | 37 | | 23 | 21 | 3.6 | | |
| | **NE2/PEL/SEL** | | 269 | | 412 | | 245 | 326 | 30 | | |
| | **Reference** | | LEL and SEL | | LEL and SEL | | REF and NE2 | REF and NE2 | REF and NE2 | | |
| **Baseline Lake Sediment Quality Statistics** | **Count** | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| | **#DL** | 3 | 4 | 0 | 0 | 0 | 2 | 1 | 2 | 49 | 0 |
| | **Min** | <0.2 | <0.5 | 1980 | 1.3 | 33 | <0.1 | <0.1 | <0.1 | <0.1 | 16 |
| | **Mean** | 1.7 | 2.9 | 14950 | 7.5 | 209 | 2.1 | 6.3 | 1.0 | 0.15 | 29 |
| | **75th** | 2.2 | 3.9 | 17150 | 9.5 | 230 | 1.3 | 7.9 | 1.3 | 0.20 | 33 |
| | **95th** | 3.8 | 7.1 | 53405 | 12 | 698 | 12 | 12 | 1.7 | 0.50 | 41 |
| | **Max** | 3.8 | 8.4 | 91300 | 13 | 1270 | 13 | 13 | 1.8 | 0.70 | 42 |
| | **Geomean** | 1.4 | 2.3 | 10899 | 6.7 | 162 | 0.90 | 4.9 | 0.83 | 0.13 | 28 |
| | **SD** | 0.90 | 1.8 | 15815 | 2.9 | 212 | 3.4 | 3.4 | 0.42 | 0.12 | 6.5 |
| **Location** | **Sample Date** | | | | | | | | | | |
| LA-1-1 | 14-Sep-2016 | 2.3 | 4.6 | 9900 | 10 | 170 | 2.0 | 12.0 | 1.3 | 0.2 | 25 |
| LA-1-2 | 14-Sep-2016 | 2.2 | 3.5 | 12100 | 9 | 150 | 0.9 | 8.8 | 1.5 | <0.1 | 24 |
| LA-1-3 | 17-Sep-2016 | 1.6 | 2.7 | 7800 | 8 | 140 | 0.8 | 6.0 | 1.0 | <0.1 | 21 |
| LA-5-1 | 09-Sep-2016 | 2.3 | 2.0 | 23500 | 8 | 320 | 0.7 | 6.3 | 0.9 | <0.1 | 26 |
| LA-5-2 | 11-Sep-2016 | 0.2 | <0.5 | 2050 | 1 | 33 | 0.1 | 1.8 | <0.1 | 0.2 | 19 |
| LA-5-3 | 11-Sep-2016 | 2.1 | 1.2 | 16400 | 7 | 240 | 0.6 | 5.7 | 0.7 | <0.1 | 27 |
| LA-5-4 | 10-Sep-2016 | 1.8 | 1.4 | 18500 | 7 | 210 | 0.5 | 6.0 | 0.7 | <0.1 | 33 |
| LA-5-5 | 10-Sep-2016 | <0.2 | <0.5 | 1980 | 2 | 46 | <0.1 | 0.9 | <0.1 | 0.7 | 24 |
| LA-6-1 | 12-Sep-2016 | 2.1 | 2.1 | 15100 | 9 | 140 | 0.7 | 6.4 | 0.9 | <0.1 | 28 |
| LA-6-2 | 12-Sep-2016 | 1.7 | 3.0 | 13200 | 8 | 190 | 0.4 | 4.7 | 0.9 | <0.1 | 34 |
| LA-6-3 | 16-Sep-2016 | 1.7 | 1.6 | 14600 | 8 | 230 | 0.6 | 5.5 | 0.8 | 0.2 | 28 |
| LA-6-4 | 16-Sep-2016 | 1.4 | 1.7 | 14000 | 8 | 180 | 0.4 | 4.2 | 0.8 | <0.1 | 26 |
| LA-6-5 | 18-Sep-2016 | 1.5 | 1.4 | 22600 | 7 | 390 | 0.4 | 4.7 | 0.8 | <0.1 | 27 |
| LA-7A-1 | 13-Sep-2016 | 1.2 | 3.5 | 7400 | 10 | 160 | 0.8 | 4.0 | 1.0 | <0.1 | 36 |
| LA-7A-2 | 13-Sep-2016 | 2.2 | 4.6 | 10000 | 9 | 120 | 1.3 | 6.2 | 1.3 | <0.1 | 30 |
| LA-7A-3 | 13-Sep-2016 | 1.4 | 3.4 | 6800 | 8 | 140 | 1.0 | 3.6 | 1.0 | <0.1 | 32 |
| LA-7-1 | 13-Sep-2016 | 1.9 | 3.6 | 8500 | 7 | 130 | 2.8 | 12.0 | 1.0 | 0.1 | 31 |
| LA-7-2 | 13-Sep-2016 | 1.4 | 4.0 | 6900 | 8 | 120 | 1.3 | 3.9 | 1.2 | <0.1 | 38 |
| LA-7-3 | 13-Sep-2016 | 1.4 | 3.9 | 8000 | 8 | 120 | 1.2 | 4.6 | 1.2 | <0.1 | 38 |
| LA-8-1 | 16-Sep-2016 | 1.0 | 4.1 | 14500 | 10 | 230 | 1.2 | 6.7 | 1.2 | 0.2 | 29 |
| LA-8-2 | 15-Sep-2016 | <0.2 | <0.5 | 9700 | 4 | 100 | 0.2 | 1.2 | 0.4 | <0.1 | 20 |
| LA-8-3 | 15-Sep-2016 | 1.7 | 3.2 | 10200 | 6 | 200 | 0.9 | 7.2 | 1.2 | <0.1 | 26 |
| LA-9-1 | 18-Sep-2016 | <0.2 | <0.5 | 2670 | 2 | 51 | <0.1 | <0.1 | 0.2 | 0.2 | 16 |
| LA-9-2 | 18-Sep-2016 | 1.4 | 3.5 | 4800 | 10 | 140 | 1.1 | 6.8 | 1.3 | 0.4 | 26 |
| LA-9-3 | 18-Sep-2016 | 1.2 | 3.0 | 6100 | 10 | 160 | 1.0 | 6.1 | 1.3 | 0.1 | 27 |
| LB-3-1 | 09-Sep-2016 | 3.3 | 8.4 | 24800 | 12 | 160 | 1.2 | 13.0 | 1.8 | <0.1 | 32 |
| LB-3-2 | 10-Sep-2016 | 3.8 | 6.4 | 17400 | 9 | 140 | 1.2 | 12.0 | 1.3 | <0.1 | 29 |
| LB-3-3 | 10-Sep-2016 | 1.2 | <0.5 | 5700 | 2 | 58 | 0.3 | 4.2 | 0.3 | 0.2 | 16 |
| LAB-1-1 | 19-Sep-2016 | 1.4 | 1.7 | 11900 | 5 | 290 | 6.3 | 6.5 | 1.0 | <0.1 | 28 |
| LAB-1-2 | 15-Sep-2016 | 2.0 | 2.8 | 27000 | 9 | 300 | 11.0 | 8.1 | 1.2 | 0.3 | 35 |
| LAB-1-3 | 15-Sep-2016 | 2.7 | 5.0 | 33000 | 13 | 360 | 13.0 | 12.0 | 1.6 | <0.1 | 42 |
| LAB-2-CORE | 21-Sep-2016 | 3.8 | 3.9 | 91300 | 10 | 1270 | 12.0 | 9.9 | 1.3 | 0.1 | 40 |

**Table A-4**
**Baseline Sediment Quality Data**

| Parameter | | Thallium | Tin | Titanium | Uranium | Vanadium | Zinc | Lead-210 | Polonium-210 | Radium-226 | Thorium-228 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | Bq/g | Bq/g | Bq/g | Bq/g |
| **Sediment Quality Benchmarks** | **REF/ISQG/LEL** | | | | 97 | | 123 | 900 | 800 | 600 | |
| | **NE2/PEL/SEL** | | | | 2296 | | 315 | 20800 | 12100 | 14400 | |
| | **Reference** | | | | REF and NE2 | | ISQG and PEL | LEL and SEL | LEL and SEL | LEL and SEL | |
| **Baseline Lake Sediment Quality Statistics** | **Count** | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| | **#DL** | 32 | 3 | 0 | 0 | 0 | 1 | 4 | 0 | 13 | 37 |
| | **Min** | <0.2 | <0.1 | 45 | 0.20 | <1.3 | <0.5 | <0.04 | 0.02 | <0.01 | <0.02 |
| | **Mean** | 0.2 | 0.20 | 235 | 0.73 | 18 | 25 | 0.40 | 0.41 | 0.026 | 0.02 |
| | **75th** | 0.2 | 0.20 | 278 | 0.80 | 22 | 29 | 0.56 | 0.54 | 0.030 | 0.02 |
| | **95th** | 0.2 | 0.40 | 461 | 1.4 | 31 | 50 | 0.74 | 0.71 | 0.050 | 0.02 |
| | **Max** | 0.2 | 0.40 | 480 | 1.5 | 33 | 62 | 0.75 | 0.76 | 0.050 | 0.02 |
| | **Geomean** | 0.2 | 0.19 | 211 | 0.67 | 15 | 19 | 0.32 | 0.31 | 0.023 | 0.02 |
| | **SD** | 8.5E-17 | 0.08 | 97 | 0.29 | 7.1 | 12 | 0.20 | 0.19 | 0.013 | 7.0E-18 |
| **Location** | **Sample Date** | | | | | | | | | | |
| LA-1-1 | 14-Sep-2016 | <0.2 | 0.20 | 200 | 0.8 | 22 | 27 | 0.73 | 0.64 | 0.04 | <0.02 |
| LA-1-2 | 14-Sep-2016 | <0.2 | 0.20 | 250 | 0.8 | 21 | 26 | 0.75 | 0.76 | 0.02 | <0.02 |
| LA-1-3 | 17-Sep-2016 | <0.2 | 0.20 | 280 | 0.7 | 18 | 20 | 0.54 | 0.52 | 0.02 | <0.02 |
| LA-5-1 | 09-Sep-2016 | <0.2 | 0.20 | 200 | 0.7 | 20 | 28 | 0.43 | 0.52 | 0.03 | 0.02 |
| LA-5-2 | 11-Sep-2016 | <0.2 | <0.1 | 45 | 0.2 | 1.5 | 0.8 | <0.04 | 0.02 | <0.01 | <0.02 |
| LA-5-3 | 11-Sep-2016 | <0.2 | 0.10 | 180 | 0.6 | 18 | 26 | 0.25 | 0.32 | 0.03 | <0.02 |
| LA-5-4 | 10-Sep-2016 | <0.2 | 0.10 | 170 | 0.6 | 17 | 24 | 0.40 | 0.40 | 0.03 | <0.02 |
| LA-5-5 | 10-Sep-2016 | <0.2 | <0.1 | 47 | 0.8 | 1.3 | <0.5 | <0.04 | 0.02 | 0.02 | <0.02 |
| LA-6-1 | 12-Sep-2016 | <0.2 | 0.20 | 180 | 0.7 | 18 | 28 | 0.45 | 0.48 | 0.04 | <0.02 |
| LA-6-2 | 12-Sep-2016 | <0.2 | 0.20 | 230 | 0.7 | 18 | 27 | 0.52 | 0.53 | 0.03 | <0.02 |
| LA-6-3 | 16-Sep-2016 | <0.2 | 0.20 | 310 | 0.7 | 19 | 26 | 0.32 | 0.34 | <0.01 | <0.02 |
| LA-6-4 | 16-Sep-2016 | <0.2 | 0.20 | 250 | 0.6 | 18 | 24 | 0.31 | 0.31 | 0.03 | <0.02 |
| LA-6-5 | 18-Sep-2016 | <0.2 | 0.20 | 300 | 0.6 | 18 | 22 | 0.59 | 0.57 | 0.03 | <0.02 |
| LA-7A-1 | 13-Sep-2016 | <0.2 | 0.20 | 230 | 0.6 | 17 | 23 | 0.41 | 0.51 | <0.01 | <0.02 |
| LA-7A-2 | 13-Sep-2016 | <0.2 | 0.20 | 220 | 0.8 | 24 | 23 | 0.35 | 0.38 | 0.03 | <0.02 |
| LA-7A-3 | 13-Sep-2016 | <0.2 | 0.20 | 190 | 0.6 | 16 | 22 | 0.44 | 0.38 | <0.01 | <0.02 |
| LA-7-1 | 13-Sep-2016 | <0.2 | 0.20 | 170 | 0.7 | 15 | 22 | 0.55 | 0.56 | <0.01 | <0.02 |
| LA-7-2 | 13-Sep-2016 | <0.2 | 0.20 | 200 | 0.6 | 16 | 29 | 0.29 | 0.30 | 0.02 | <0.02 |
| LA-7-3 | 13-Sep-2016 | <0.2 | 0.20 | 200 | 0.6 | 16 | 29 | 0.29 | 0.35 | 0.02 | <0.02 |
| LA-8-1 | 16-Sep-2016 | <0.2 | 0.20 | 250 | 0.7 | 20 | 30 | 0.58 | 0.44 | <0.01 | <0.02 |
| LA-8-2 | 15-Sep-2016 | <0.2 | <0.1 | 80 | 0.3 | 7 | 10 | 0.17 | 0.21 | 0.01 | 0.02 |
| LA-8-3 | 15-Sep-2016 | <0.2 | 0.20 | 250 | 0.8 | 20 | 26 | 0.22 | 0.26 | 0.02 | <0.02 |
| LA-9-1 | 18-Sep-2016 | <0.2 | <0.1 | 230 | 0.3 | 5.5 | 4.3 | <0.04 | 0.04 | 0.05 | <0.02 |
| LA-9-2 | 18-Sep-2016 | <0.2 | 0.20 | 290 | 0.7 | 20 | 27 | 0.45 | 0.45 | 0.03 | <0.02 |
| LA-9-3 | 18-Sep-2016 | <0.2 | 0.20 | 260 | 0.7 | 23 | 28 | 0.58 | 0.54 | 0.03 | <0.02 |
| LB-3-1 | 09-Sep-2016 | <0.2 | 0.30 | 270 | 1.0 | 33 | 43 | 0.61 | 0.50 | 0.02 | 0.02 |
| LB-3-2 | 10-Sep-2016 | <0.2 | 0.20 | 230 | 0.9 | 25 | 39 | 0.36 | 0.36 | 0.01 | <0.02 |
| LB-3-3 | 10-Sep-2016 | <0.2 | 0.10 | 130 | 0.3 | 8 | 12 | <0.04 | 0.05 | 0.04 | <0.02 |
| LAB-1-1 | 19-Sep-2016 | <0.2 | 0.30 | 380 | 1.1 | 16 | 18 | 0.63 | 0.55 | 0.03 | <0.02 |
| LAB-1-2 | 15-Sep-2016 | <0.2 | 0.40 | 450 | 1.3 | 22 | 30 | 0.56 | 0.55 | 0.04 | 0.02 |
| LAB-1-3 | 15-Sep-2016 | <0.2 | 0.40 | 480 | 1.5 | 27 | 44 | 0.55 | 0.68 | 0.05 | <0.02 |
| LAB-2-CORE | 21-Sep-2016 | <0.2 | 0.40 | 360 | 1.4 | 30 | 62 | 0.45 | 0.42 | 0.05 | <0.02 |

**Table A-4**
**Baseline Sediment Quality Data**

| Parameter | | Thorium-230 | Thorium-232 | Calcium | Magnesium | Phosphorus | Postassium | Sodium |
|---|---|---|---|---|---|---|---|---|
| Unit | | Bq/g | Bq/g | µg/g | µg/g | µg/g | µg/g | µg/g |
| Sediment Quality Benchmarks | REF/ISQG/LEL | | | | | | | |
| | NE2/PEL/SEL | | | | | | | |
| | Reference | | | | | | | |
| Baseline Lake Sediment Quality Statistics | Count | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| | #DL | 25 | 32 | 0 | 0 | 0 | 0 | 0 |
| | Min | <0.02 | <0.02 | 270 | 110 | 60 | 530 | 80 |
| | Mean | 0.020 | 0.02 | 2000 | 745 | 1096 | 962 | 205 |
| | 75th | 0.020 | 0.02 | 2775 | 905 | 1400 | 1000 | 210 |
| | 95th | 0.024 | 0.02 | 3370 | 1135 | 1980 | 1400 | 474 |
| | Max | 0.030 | 0.02 | 3500 | 1200 | 2500 | 1400 | 610 |
| | Geomean | 0.020 | 0.02 | 1745 | 668 | 864 | 943 | 190 |
| | SD | 0.002 | 7.0E-18 | 852 | 260 | 515 | 191 | 98 |
| Location | Sample Date | | | | | | | |
| LA-1-1 | 14-Sep-2016 | <0.02 | <0.02 | 1600 | 780 | 1400 | 1000 | 210 |
| LA-1-2 | 14-Sep-2016 | <0.02 | <0.02 | 1600 | 830 | 1300 | 980 | 170 |
| LA-1-3 | 17-Sep-2016 | <0.02 | <0.02 | 1400 | 690 | 1000 | 820 | 160 |
| LA-5-1 | 09-Sep-2016 | <0.02 | <0.02 | 1600 | 780 | 1600 | 1000 | 210 |
| LA-5-2 | 11-Sep-2016 | <0.02 | <0.02 | 270 | 120 | 60 | 1000 | 400 |
| LA-5-3 | 11-Sep-2016 | <0.02 | <0.02 | 1600 | 700 | 870 | 840 | 170 |
| LA-5-4 | 10-Sep-2016 | <0.02 | <0.02 | 2100 | 910 | 1400 | 1100 | 210 |
| LA-5-5 | 10-Sep-2016 | <0.02 | <0.02 | 360 | 110 | 70 | 1400 | 610 |
| LA-6-1 | 12-Sep-2016 | <0.02 | <0.02 | 1800 | 750 | 1500 | 940 | 190 |
| LA-6-2 | 12-Sep-2016 | <0.02 | <0.02 | 2500 | 880 | 1400 | 960 | 180 |
| LA-6-3 | 16-Sep-2016 | <0.02 | <0.02 | 1900 | 800 | 960 | 970 | 190 |
| LA-6-4 | 16-Sep-2016 | <0.02 | <0.02 | 1700 | 650 | 1000 | 860 | 140 |
| LA-6-5 | 18-Sep-2016 | <0.02 | <0.02 | 1900 | 710 | 1300 | 800 | 120 |
| LA-7A-1 | 13-Sep-2016 | <0.02 | <0.02 | 3300 | 970 | 1200 | 1000 | 190 |
| LA-7A-2 | 13-Sep-2016 | 0.02 | <0.02 | 2100 | 760 | 1300 | 920 | 170 |
| LA-7A-3 | 13-Sep-2016 | <0.02 | <0.02 | 2700 | 800 | 1500 | 940 | 160 |
| LA-7-1 | 13-Sep-2016 | <0.02 | <0.02 | 2900 | 1000 | 2500 | 1300 | 210 |
| LA-7-2 | 13-Sep-2016 | <0.02 | <0.02 | 3200 | 890 | 1200 | 870 | 180 |
| LA-7-3 | 13-Sep-2016 | <0.02 | <0.02 | 3100 | 920 | 1400 | 1000 | 200 |
| LA-8-1 | 16-Sep-2016 | <0.02 | <0.02 | 2500 | 890 | 1700 | 1000 | 120 |
| LA-8-2 | 15-Sep-2016 | <0.02 | <0.02 | 900 | 330 | 480 | 530 | 80 |
| LA-8-3 | 15-Sep-2016 | <0.02 | <0.02 | 1800 | 620 | 780 | 760 | 120 |
| LA-9-1 | 18-Sep-2016 | <0.02 | <0.02 | 600 | 260 | 120 | 610 | 240 |
| LA-9-2 | 18-Sep-2016 | <0.02 | <0.02 | 2000 | 780 | 1100 | 940 | 200 |
| LA-9-3 | 18-Sep-2016 | <0.02 | <0.02 | 1900 | 710 | 1100 | 850 | 170 |
| LB-3-1 | 09-Sep-2016 | <0.02 | <0.02 | 2000 | 870 | 1300 | 1100 | 340 |
| LB-3-2 | 10-Sep-2016 | <0.02 | <0.02 | 1900 | 720 | 1000 | 910 | 190 |
| LB-3-3 | 10-Sep-2016 | <0.02 | <0.02 | 680 | 350 | 150 | 720 | 340 |
| LAB-1-1 | 19-Sep-2016 | 0.03 | <0.02 | 2800 | 960 | 960 | 960 | 150 |
| LAB-1-2 | 15-Sep-2016 | <0.02 | <0.02 | 3000 | 1100 | 820 | 1100 | 210 |
| LAB-1-3 | 15-Sep-2016 | <0.02 | <0.02 | 3500 | 1200 | 1200 | 1400 | 180 |
| LAB-2-CORE | 21-Sep-2016 | 0.02 | <0.02 | 2800 | 1000 | 1400 | 1200 | 150 |

Notes:

Chemical analysis is reported on a dry weight basis

Sediment samples are composites of 3 or more 0-2 cm fraction core samples

REF and NE2 values are from: Burnett-Seidel and Liber (2013) - Sediment quality values derived for application at Saskatchewan uranium operations; reference (REF) values based on reference sites unaffected by mining and milling (representing background), and no-effect level (NE2) values based on sites with no significant difference in benthic invertebrate community effects criteria of abundance, richness and evenness between reference and exposure locations.

LEL and SEL values are from: Thompson *et al*. (2005) – Sediment quality guidelines derived for application to uranium ore bearing regions of northern Saskatchewan and Ontario; lowest effect levels (LELs) and severe effect levels (SELs) from the "weighted method".

ISQG and PEL values are from: Canadian Council of Ministers of the Environment (CCME) – Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 1999; updated September 2007; accessed June 2017: http://ceqg-rcqe.ccme.ca/). ISQG are Interim Sediment Quality Guidelines, PEL are Probable Effects Levels.

Table A-5
Baseline Phytoplankton Community Data Collected in September 2016



| Class | Genus | Species | LA-1 | | | LA-5 | | | LA-6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Units/L | Biovolume Unit ($\mu m^3$) | Normalized Biovolume ($\mu m^3$/L) | Units/L | Biovolume Unit ($\mu m^3$) | Normalized Biovolume ($\mu m^3$/L) | Units/L | Biovolume Unit ($\mu m^3$) | Normalized Biovolume ($\mu m^3$/L) |
| **Total** | | | **988,000** | **601,447** | **13,992,383,000** | **808,000** | **318,682** | **1,040,762,000** | **481,000** | **62,712** | **694,368,000** |
| Bacillariophyceae | *Achnanthes* | *sp.* | - | - | - | 12,000 | 180 | 2,160,000 | - | - | - |
| Bacillariophyceae | *Asterionella* | *formosa* | 94,000 | 810 | 76,140,000 | 7,000 | 810 | 5,670,000 | 8,000 | 810 | 6,480,000 |
| Bacillariophyceae | *Cyclotella* | *sp.* | - | - | - | 6,000 | 500 | 3,000,000 | 14,000 | 500 | 7,000,000 |
| Bacillariophyceae | *Fragilaria* | *sp.* | 18,000 | 640 | 11,520,000 | 170,000 | 320 | 54,400,000 | 90,000 | 320 | 28,800,000 |
| Bacillariophyceae | *Melosira* | *sp.* | 105,000 | 115,200 | 12,096,000,000 | 17,000 | 24,000 | 408,000,000 | 25,000 | 16,960 | 424,000,000 |
| Bacillariophyceae | *Navicula* | *sp.* | 6,000 | 4,000 | 24,000,000 | - | - | - | - | - | - |
| Bacillariophyceae | *Nitzschia* | *sigmoidea* | - | - | - | - | - | - | - | - | - |
| Bacillariophyceae | *Nitzschia* | *sp.* | - | - | - | 2,000 | 640 | 1,280,000 | 1,000 | 640 | 640,000 |
| Bacillariophyceae | *Rhizosolenia* | *sp.* | - | - | - | 37,000 | 540 | 19,980,000 | 19,000 | 540 | 10,260,000 |
| Bacillariophyceae | *Stephanodiscus* | *sp.* | 5,000 | 62,500 | 312,500,000 | - | - | - | - | - | - |
| Bacillariophyceae | *Synedra* | *sp.* | 12,000 | 810 | 9,720,000 | 6,000 | 810 | 4,860,000 | 7,000 | 810 | 5,670,000 |
| Bacillariophyceae | *Tabellaria* | *sp.* | 13,000 | 1,920 | 24,960,000 | 7,000 | 1,920 | 13,440,000 | 2,000 | 1,920 | 3,840,000 |
| Chlorophyceae | *Botryococcus* | *sp.* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Cosmarium* | *sp.* | 3,000 | 11,250 | 33,750,000 | - | - | - | - | - | - |
| Chlorophyceae | *Crucigenia* | *quadrata* | 56,000 | 12 | 672,000 | - | - | - | - | - | - |
| Chlorophyceae | *Crucigenia* | *sp.* | 25,000 | 12 | 300,000 | 16,000 | 12 | 192,000 | - | - | - |
| Chlorophyceae | *Crucigenia* | *tetrapedia* | 25,000 | 36 | 900,000 | - | - | - | - | - | - |
| Chlorophyceae | *Dictyosphaerium* | *sp.* | 2,000 | 27,000 | 54,000,000 | - | - | - | - | - | - |
| Chlorophyceae | *Elakatothrix* | *sp.* | 4,000 | 180 | 720,000 | 12,000 | 180 | 2,160,000 | 6,000 | 180 | 1,080,000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | 12,000 | 120 | 1,440,000 | 12,000 | 120 | 1,440,000 | 6,000 | 120 | 720,000 |
| Chlorophyceae | *Oocystis* | *sp.* | 2,000 | 4,500 | 9,000,000 | - | - | - | 4,000 | 2,000 | 8,000,000 |
| Chlorophyceae | *Pediastrum* | *Boryanum* | - | - | - | 1,000 | 5,000 | 5,000,000 | - | - | - |
| Chlorophyceae | *Pediastrum* | *privum* | 12,000 | 450 | 5,400,000 | 6,000 | 450 | 2,700,000 | - | - | - |
| Chlorophyceae | *Pediastrum* | *tetras* | 6,000 | 200 | 1,200,000 | - | - | - | - | - | - |
| Chlorophyceae | *Planktosphaeria* | *sp.* | 12,000 | 27,000 | 324,000,000 | - | - | - | - | - | - |
| Chlorophyceae | *Quadrigula* | *sp.* | 24,000 | 180 | 4,320,000 | 8,000 | 180 | 1,440,000 | 4,000 | 180 | 720,000 |
| Chlorophyceae | *Scenedesmus* | *acuminatus* | 4,000 | 160 | 640,000 | - | - | - | - | - | - |
| Chlorophyceae | *Scenedesmus* | *quadricauda* | 4,000 | 160 | 640,000 | - | - | - | 25,000 | 160 | 4,000,000 |
| Chlorophyceae | *Scenedesmus* | *sp.* | 37,000 | 160 | 5,920,000 | 14,000 | 160 | 2,240,000 | - | - | - |
| Chlorophyceae | *Spondylosium* | *sp.* | - | - | - | 1,000 | 1,000 | 1,000,000 | - | - | - |
| Chlorophyceae | *Staurastrum* | *sp.* | - | - | - | 2,000 | 6,750 | 13,500,000 | 1,000 | 6,750 | 6,750,000 |
| Chlorophyceae | *Staurodesmus* | *sp.* | - | - | - | - | - | - | 6,000 | 900 | 5,400,000 |
| Chlorophyceae | *Tetraedron* | *minimum* | - | - | - | 1,000 | 256 | 256,000 | - | - | - |
| Chlorophyceae | *Tetraedron* | *sp.* | | | | | | | | | |
| Chlorophyceae | *Tetraedron* | *trigonum* | 1,000 | 1,200 | 1,200,000 | - | - | - | - | - | - |
| Chlorophyceae | *Unidentified* | (filament) | 1,000 | 2,500 | 2,500,000 | - | - | - | 1,000 | 3,000 | 3,000,000 |
| Chlorophyceae | *Unidentified* | (single cell) | 297,000 | 64 | 19,008,000 | 99,000 | 64 | 6,336,000 | 19,000 | 64 | 1,216,000 |
| Chrysophyceae | *Bitrichia* | *sp.* | - | - | - | 6,000 | 432 | 2,592,000 | - | - | - |
| Chrysophyceae | *Dinobryon* | *bavaricum* | 6,000 | 540 | 3,240,000 | 43,000 | 540 | 23,220,000 | 6,000 | 540 | 3,240,000 |
| Chrysophyceae | *Dinobryon* | *sp.* | 6,000 | 540 | 3,240,000 | 31,000 | 540 | 16,740,000 | 19,000 | 540 | 10,260,000 |
| Chrysophyceae | *small chrysophytes* | | 68,000 | 64 | 4,352,000 | 248,000 | 64 | 15,872,000 | 161,000 | 64 | 10,304,000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | 19,000 | 6,750 | 128,250,000 | 6,000 | 6,750 | 40,500,000 | 2,000 | 6,750 | 13,500,000 |
| Cryptophyceae | *Unidentified* | | 74,000 | 324 | 23,976,000 | 6,000 | 324 | 1,944,000 | 12,000 | 324 | 3,888,000 |
| Cyanophyceae | *Anabaena* | *sp.* | 16,000 | 4,320 | 69,120,000 | 3,000 | 4,320 | 12,960,000 | 10,000 | 4,320 | 43,200,000 |
| Cyanophyceae | *Aphanizomenon* | *sp.* | - | - | - | 5,000 | 2,880 | 14,400,000 | 6,000 | 2,880 | 17,280,000 |
| Cyanophyceae | *Aphanocapsa* | *sp.* | 6,000 | 64,000 | 384,000,000 | - | - | - | - | - | - |
| Cyanophyceae | *Aphanothece* | *sp.* | 1,000 | 216,000 | 216,000,000 | 1,000 | 216,000 | 216,000,000 | - | - | - |
| Cyanophyceae | *Gomphosphaeria* | *sp.* | 3,000 | 27,000 | 81,000,000 | 2,000 | 27,000 | 54,000,000 | - | - | - |
| Cyanophyceae | *Eucapsis* | *sp.* | - | - | - | - | - | - | - | - | - |
| Cyanophyceae | *Oscillatoria* | *sp.* | - | - | - | - | - | - | - | - | - |
| Cyanophyceae | *Planktolyngbya* | *sp.* | 4,000 | 720 | 2,880,000 | 3,000 | 720 | 2,160,000 | 12,000 | 720 | 8,640,000 |
| Cyanophyceae | *Pseudanabaena* | *sp.* | - | - | - | 6,000 | 720 | 4,320,000 | 9,000 | 720 | 6,480,000 |
| Dinophyceae | *Gymnodinium* | *sp.* | 3,000 | 15,625 | 46,875,000 | 6,000 | 4,500 | 27,000,000 | - | - | - |
| Dinophyceae | *Peridinium* | *sp.* | - | - | - | 6,000 | 10,000 | 60,000,000 | 6,000 | 10,000 | 60,000,000 |
| Euglenophyceae | *Trachelomonas* | *sp.* | 2,000 | 4,500 | 9,000,000 | - | - | - | - | - | - |

Notes:
Samples were collected between September 10 and 21, 2016

**Table A-5**
**Baseline Phytoplankton Community Data Collected in September 2016**



| Class | Genus | Species | LA-7 | | | LAB-1 | | | LAB-2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Units/L | Biovolume Unit ($\mu m^3$) | Normalized Biovolume ($\mu m^3$/L) | Units/L | Biovolume Unit ($\mu m^3$) | Normalized Biovolume ($\mu m^3$/L) | Units/L | Biovolume Unit ($\mu m^3$) | Normalized Biovolume ($\mu m^3$/L) |
| **Total** | | | **583,000** | **145,866** | **1,124,808,000** | **542,000** | **139,210** | **1,881,494,000** | **566,000** | **121,112** | **1,540,866,000** |
| Bacillariophyceae | *Achnanthes* | *sp.* | - | - | - | - | - | - | - | - | - |
| Bacillariophyceae | *Asterionella* | *formosa* | - | - | - | 36,000 | 810 | 29,160,000 | 4,000 | 630 | 2,520,000 |
| Bacillariophyceae | *Cyclotella* | *sp.* | 81,000 | 500 | 40,500,000 | 4,000 | 1,800 | 7,200,000 | 12,000 | 500 | 6,000,000 |
| Bacillariophyceae | *Fragilaria* | *sp.* | 90,000 | 320 | 28,800,000 | - | - | - | - | - | - |
| Bacillariophyceae | *Melosira* | *sp.* | 22,000 | 15,680 | 344,960,000 | 23,000 | 24,000 | 552,000,000 | 16,000 | 21,120 | 337,920,000 |
| Bacillariophyceae | *Navicula* | *sp.* | - | - | - | - | - | - | - | - | - |
| Bacillariophyceae | *Nitzschia* | *sigmoidea* | 2,000 | 3,420 | 6,840,000 | - | - | - | - | - | - |
| Bacillariophyceae | *Nitzschia* | *sp.* | 2,000 | 640 | 1,280,000 | 6,000 | 640 | 3,840,000 | 6,000 | 640 | 3,840,000 |
| Bacillariophyceae | *Rhizosolenia* | *sp.* | 6,000 | 540 | 3,240,000 | 25,000 | 540 | 13,500,000 | 161,000 | 450 | 72,450,000 |
| Bacillariophyceae | *Stephanodiscus* | *sp.* | - | - | - | - | - | - | - | - | - |
| Bacillariophyceae | *Synedra* | *sp.* | 6,000 | 810 | 4,860,000 | 19,000 | 810 | 15,390,000 | 12,000 | 540 | 6,480,000 |
| Bacillariophyceae | *Tabellaria* | *sp.* | 13,000 | 1,920 | 24,960,000 | - | - | - | - | - | - |
| Chlorophyceae | *Botryococcus* | *sp.* | 1,000 | 64,000 | 64,000,000 | - | - | - | - | - | - |
| Chlorophyceae | *Cosmarium* | *sp.* | 6,000 | 500 | 3,000,000 | - | - | - | - | - | - |
| Chlorophyceae | *Crucigenia* | *quadrata* | - | - | - | 32,000 | 12 | 384,000 | - | - | - |
| Chlorophyceae | *Crucigenia* | *sp.* | - | - | - | 16,000 | 54 | 864,000 | - | - | - |
| Chlorophyceae | *Crucigenia* | *tetrapedia* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Dictyosphaerium* | *sp.* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Elakatothrix* | *sp.* | - | - | - | 2,000 | 180 | 360,000 | 1,000 | 180 | 180,000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | 19,000 | 120 | 2,280,000 | 4,000 | 120 | 480,000 | 6,000 | 120 | 720,000 |
| Chlorophyceae | *Oocystis* | *sp.* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Pediastrum* | *Boryanum* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Pediastrum* | *privum* | 2,000 | 800 | 1,600,000 | - | - | - | 6,000 | 450 | 2,700,000 |
| Chlorophyceae | *Pediastrum* | *tetras* | - | - | - | 6,000 | 450 | 2,700,000 | - | - | - |
| Chlorophyceae | *Planktosphaeria* | *sp.* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Quadrigula* | *sp.* | - | - | - | 4,000 | 180 | 720,000 | - | - | - |
| Chlorophyceae | *Scenedesmus* | *acuminatus* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Scenedesmus* | *quadricauda* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Scenedesmus* | *sp.* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Spondylosium* | *sp.* | 2,000 | 1,000 | 2,000,000 | - | - | - | - | - | - |
| Chlorophyceae | *Staurastrum* | *sp.* | - | - | - | 2,000 | 6,750 | 13,500,000 | - | - | - |
| Chlorophyceae | *Staurodesmus* | *sp.* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Tetraedron* | *minimum* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Tetraedron* | *sp.* | | | | 6,000 | 32 | 192,000 | - | - | - |
| Chlorophyceae | *Tetraedron* | *trigonum* | - | - | - | - | - | - | - | - | - |
| Chlorophyceae | *Unidentified* | (filament) | 2,000 | 1,500 | 3,000,000 | - | - | - | - | - | - |
| Chlorophyceae | *Unidentified* | (single cell) | 62,000 | 64 | 3,968,000 | 74,000 | 64 | 4,736,000 | 31,000 | 64 | 1,984,000 |
| Chrysophyceae | *Bitrichia* | *sp.* | - | - | - | - | - | - | - | - | - |
| Chrysophyceae | *Dinobryon* | *bavaricum* | 19,000 | 540 | 10,260,000 | 6,000 | 540 | 3,240,000 | 1,000 | 540 | 540,000 |
| Chrysophyceae | *Dinobryon* | *sp.* | 12,000 | 540 | 6,480,000 | 42,000 | 540 | 22,680,000 | - | - | - |
| Chrysophyceae | *small chrysophytes* | | 81,000 | 64 | 5,184,000 | 62,000 | 64 | 3,968,000 | 167,000 | 64 | 10,688,000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | 37,000 | 6,750 | 249,750,000 | 56,000 | 12,000 | 672,000,000 | 68,000 | 12,000 | 816,000,000 |
| Cryptophyceae | *Unidentified* | | - | - | - | 50,000 | 324 | 16,200,000 | 56,000 | 324 | 18,144,000 |
| Cyanophyceae | *Anabaena* | *sp.* | 9,000 | 4,320 | 38,880,000 | 8,000 | 6,480 | 51,840,000 | 1,000 | 1,440 | 1,440,000 |
| Cyanophyceae | *Aphanizomenon* | *sp.* | 6,000 | 2,880 | 17,280,000 | 2,000 | 2,880 | 5,760,000 | 1,000 | 3,840 | 3,840,000 |
| Cyanophyceae | *Aphanocapsa* | *sp.* | - | - | - | - | - | - | - | - | - |
| Cyanophyceae | *Aphanothece* | *sp.* | 12,000 | 8,000 | 96,000,000 | 2,000 | 27,000 | 54,000,000 | - | - | - |
| Cyanophyceae | *Gomphosphaeria* | *sp.* | - | - | - | 4,000 | 27,000 | 108,000,000 | 2,000 | 27,000 | 54,000,000 |
| Cyanophyceae | *Eucapsis* | *sp.* | 32,000 | 8 | 256,000 | - | - | - | - | - | - |
| Cyanophyceae | *Oscillatoria* | *sp.* | 1,000 | 5,250 | 5,250,000 | - | - | - | - | - | - |
| Cyanophyceae | *Planktolyngbya* | *sp.* | 19,000 | 720 | 13,680,000 | 17,000 | 960 | 16,320,000 | 2,000 | 960 | 1,920,000 |
| Cyanophyceae | *Pseudanabaena* | *sp.* | 25,000 | 480 | 12,000,000 | 2,000 | 480 | 960,000 | - | - | - |
| Dinophyceae | *Gymnodinium* | *sp.* | 12,000 | 10,000 | 120,000,000 | 19,000 | 10,000 | 190,000,000 | 5,000 | 27,000 | 135,000,000 |
| Dinophyceae | *Peridinium* | *sp.* | 1,000 | 10,000 | 10,000,000 | 6,000 | 10,000 | 60,000,000 | 2,000 | 18,750 | 37,500,000 |
| Euglenophyceae | *Trachelomonas* | *sp.* | 1,000 | 4,500 | 4,500,000 | 7,000 | 4,500 | 31,500,000 | 6,000 | 4,500 | 27,000,000 |

Notes:
Samples were collected between September 10 and 21, 2016

**Table A-6**
**Baseline Zooplankton Community Data Collected in September 2016**

| Class | Genus | Species | LA-1 | | | LA-5 | | | LA-6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total no. per sample | Average biovolume ($\mu m^3$) | Biovolume per Litre ($\mu m^3$) | Total no. per sample | Average biovolume ($\mu m^3$) | Biovolume per Litre ($\mu m^3$) | Total no. per sample | Average biovolume ($\mu m^3$) | Biovolume per Litre ($\mu m^3$) |
| **Total** | | | **30,150** | **422,465,000** | **2,216,729,600,000** | **6,850** | **55,562,000** | **15,524,300,000** | **3,617** | **89,939,000** | **9,974,407,083** |
| | | | | | | | | | | | |
| Unidentified Rotifer | *Unidentified* | | 800 | 972,000 | 1,555,200,000 | 1,900 | 972,000 | 3,693,600,000 | 617 | 1,730,000 | 2,133,667,820 |
| Branchiopoda | *Bosmina* | *sp.* | 800 | 16,200,000 | 25,920,000,000 | 150 | 22,700,000 | 6,810,000,000 | 100 | 9,720,000 | 1,944,000,000 |
| Branchiopoda | *Chydorus* | *sp.* | 50 | 10,800,000 | 1,080,000,000 | 25 | 8,060,000 | 403,000,000 | - | - | - |
| Branchiopoda | *Daphnia* | *sp.* | 50 | 4,320,000 | 432,000,000 | - | - | - | - | - | - |
| Branchiopoda | *Diaphanosoma* | *sp.* | 300 | 72,600,000 | 43,560,000,000 | - | - | - | 50 | 17,300,000 | 1,730,000,000 |
| Branchiopoda | *Holopedium* | *sp.* | 4,600 | 218,000,000 | 2,005,600,000,000 | - | - | - | 17 | 55,300,000 | 1,843,337,020 |
| Ciliata | *Epistylis* | *sp.* | 3,800 | 96,000 | 729,600,000 | - | - | - | - | - | - |
| Ciliata | *Unidentified* | | 600 | 1,730,000 | 2,076,000,000 | 750 | 324,000 | 486,000,000 | 400 | 324,000 | 259,200,000 |
| Ciliata | *Vorticella* | *sp.* | 10,100 | 216,000 | 4,363,200,000 | 100 | 216,000 | 43,200,000 | - | - | - |
| Copepoda | *Acanthocyclops* | *sp.* | 850 | 48,600,000 | 82,620,000,000 | - | - | - | - | - | - |
| Copepoda | *Nauplii* | | 1,800 | 972,000 | 3,499,200,000 | 350 | 972,000 | 680,400,000 | 83 | 972,000 | 161,999,935 |
| Copepoda | *Skistodiaptomus* | *sp.* | - | - | - | - | - | - | - | - | - |
| Copepoda | *Too young to ID* | | 2,600 | 6,750,000 | 35,100,000,000 | - | - | - | - | - | - |
| Copepoda | *Too young to ID* | | 100 | 38,000,000 | 7,600,000,000 | - | - | - | - | - | - |
| Euglenoidea | *Euglena* | *sp.* | - | - | - | - | - | - | - | - | - |
| Filosia | *Cyphoderia* | *sp.* | - | - | - | - | - | - | 33 | 1,300,000 | 86,666,580 |
| Filosia | *Euglypha* | *sp.* | 200 | 225,000 | 90,000,000 | 25 | 225,000 | 11,250,000 | 33 | 225,000 | 14,999,985 |
| Heliozoa | *Actinosphaerium* | *sp.* | - | - | - | 25 | 729,000 | 36,450,000 | - | - | - |
| Insecta | *Unidentified* | | - | - | - | 50 | 2,590,000 | 259,000,000 | - | - | - |
| Lobosa | *Arcella* | *sp.* | 150 | 500,000 | 150,000,000 | 25 | 500,000 | 25,000,000 | 33 | 500,000 | 33,333,300 |
| Lobosa | *Difflugia* | *sp.* | 100 | 810,000 | 162,000,000 | 100 | 810,000 | 81,000,000 | 150 | 810,000 | 243,000,000 |
| Monogononta | *Asplanchna* | *sp.* | - | - | - | - | - | - | - | - | - |
| Monogononta | *Collotheca* | *sp.* | - | - | - | 25 | 300,000 | 15,000,000 | 83 | 300,000 | 49,999,980 |
| Monogononta | *Conochilus* | *sp.* | 1,000 | 324,000 | 648,000,000 | - | - | - | 33 | 324,000 | 21,599,978 |
| Monogononta | *Euchlanis* | *sp.* | - | - | - | 25 | 12,000,000 | 600,000,000 | - | - | - |
| Monogononta | *Gastropus* | *sp.* | 200 | 486,000 | 194,400,000 | 275 | 486,000 | 267,300,000 | 517 | 486,000 | 502,200,324 |
| Monogononta | *Kellicottia* | *longispina* | 50 | 540,000 | 54,000,000 | 25 | 540,000 | 27,000,000 | - | - | - |
| Monogononta | *Keratella* | *sp.* | 2,000 | 324,000 | 1,296,000,000 | 2,200 | 324,000 | 1,425,600,000 | 1,167 | 324,000 | 756,002,160 |
| Monogononta | *Ploesoma* | *sp.* | - | - | - | 25 | 1,220,000 | 61,000,000 | - | - | - |
| Monogononta | *Polyarthra* | *sp.* | - | - | - | 750 | 324,000 | 486,000,000 | 300 | 324,000 | 194,400,000 |
| Monogononta | *Trichocerca* | *sp.* | - | - | - | 25 | 2,270,000 | 113,500,000 | - | - | - |
| Monogononta | *Trichotria* | *sp.* | - | - | - | - | - | - | - | - | - |

Notes:
Sample volume was 0.5 L.
Samples were collected between September 10 and 21, 2016

**Table A-6**
**Baseline Zooplankton Community Data Collected in September 2016**

| Class | Genus | Species | LA-7 | | | LAB-1 | | | LAB-2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total no. per sample | Average biovolume ($\mu m^3$) | Biovolume per Litre ($\mu m^3$) | Total no. per sample | Average biovolume ($\mu m^3$) | Biovolume per Litre ($\mu m^3$) | Total no. per sample | Average biovolume ($\mu m^3$) | Biovolume per Litre ($\mu m^3$) |
| **Total** | | | **86,200** | **434,744,000** | **628,107,600,000** | **33,850** | **135,268,000** | **147,913,600,000** | **50,650** | **303,642,000** | **319,664,000,000** |
| | | | | | | | | | | | |
| Unidentified Rotifer | *Unidentified* | | 900 | 324,000 | 583,200,000 | 6,300 | 972,000 | 12,247,200,000 | 7,300 | 972,000 | 14,191,200,000 |
| Branchiopoda | *Bosmina* | *sp.* | - | - | - | 900 | 16,200,000 | 29,160,000,000 | 1,000 | 16,200,000 | 32,400,000,000 |
| Branchiopoda | *Chydorus* | *sp.* | 150 | 13,500,000 | 4,050,000,000 | 1,400 | 10,800,000 | 30,240,000,000 | 2,400 | 10,800,000 | 51,840,000,000 |
| Branchiopoda | *Daphnia* | *sp.* | - | - | - | 200 | 9,600,000 | 3,840,000,000 | 150 | 25,900,000 | 7,770,000,000 |
| Branchiopoda | *Diaphanosoma* | *sp.* | 50 | 72,600,000 | 7,260,000,000 | - | - | - | - | - | - |
| Branchiopoda | *Holopedium* | *sp.* | 800 | 236,000,000 | 377,600,000,000 | 50 | 55,300,000 | 5,530,000,000 | 50 | 69,100,000 | 6,910,000,000 |
| Ciliata | *Epistylis* | *sp.* | 700 | 96,000 | 134,400,000 | 1,600 | 96,000 | 307,200,000 | 300 | 96,000 | 57,600,000 |
| Ciliata | *Unidentified* | | 200 | 1,730,000 | 692,000,000 | 200 | 1,730,000 | 692,000,000 | 3,800 | 1,730,000 | 13,148,000,000 |
| Ciliata | *Vorticella* | *sp.* | 700 | 216,000 | 302,400,000 | 4,600 | 216,000 | 1,987,200,000 | 1,900 | 216,000 | 820,800,000 |
| Copepoda | *Acanthocyclops* | *sp.* | - | - | - | - | - | - | - | - | - |
| Copepoda | *Nauplii* | | 6,300 | 972,000 | 12,247,200,000 | 4,100 | 972,000 | 7,970,400,000 | 5,000 | 972,000 | 9,720,000,000 |
| Copepoda | *Skistodiaptomus* | *sp.* | 650 | 75,600,000 | 98,280,000,000 | - | - | - | - | - | - |
| Copepoda | *Too young to ID* | | 2,600 | 6,750,000 | 35,100,000,000 | 1,700 | 6,750,000 | 22,950,000,000 | 3,500 | 6,750,000 | 47,250,000,000 |
| Copepoda | *Too young to ID* | | 1,000 | 19,400,000 | 38,800,000,000 | 500 | 16,200,000 | 16,200,000,000 | 100 | 16,200,000 | 3,240,000,000 |
| Euglenoidea | *Euglena* | *sp.* | 100 | 108,000 | 21,600,000 | - | - | - | - | - | - |
| Filosia | *Cyphoderia* | *sp.* | - | - | - | - | - | - | 200 | 432,000 | 172,800,000 |
| Filosia | *Euglypha* | *sp.* | - | - | - | - | - | - | - | - | - |
| Heliozoa | *Actinosphaerium* | *sp.* | - | - | - | - | - | - | 800 | 216,000 | 345,600,000 |
| Insecta | *Unidentified* | | - | - | - | 50 | 2,590,000 | 259,000,000 | 50 | 85,500,000 | 8,550,000,000 |
| Lobosa | *Arcella* | *sp.* | 50 | 500,000 | 50,000,000 | - | - | - | - | - | - |
| Lobosa | *Difflugia* | *sp.* | 100 | 810,000 | 162,000,000 | 50 | 810,000 | 81,000,000 | - | - | - |
| Monogononta | *Asplanchna* | *sp.* | - | - | - | 300 | 9,450,000 | 5,670,000,000 | 800 | 65,300,000 | 104,480,000,000 |
| Monogononta | *Collotheca* | *sp.* | - | - | - | 100 | 300,000 | 60,000,000 | 500 | 300,000 | 300,000,000 |
| Monogononta | *Conochilus* | *sp.* | 38,800 | 324,000 | 25,142,400,000 | 1,400 | 324,000 | 907,200,000 | 1,800 | 324,000 | 1,166,400,000 |
| Monogononta | *Euchlanis* | *sp.* | - | - | - | - | - | - | - | - | - |
| Monogononta | *Gastropus* | *sp.* | 800 | 486,000 | 777,600,000 | 2,100 | 486,000 | 2,041,200,000 | 6,400 | 486,000 | 6,220,800,000 |
| Monogononta | *Kellicottia* | *longispina* | 3,800 | 540,000 | 4,104,000,000 | 500 | 540,000 | 540,000,000 | 1,100 | 540,000 | 1,188,000,000 |
| Monogononta | *Keratella* | *sp.* | 23,900 | 324,000 | 15,487,200,000 | 5,500 | 324,000 | 3,564,000,000 | 9,900 | 324,000 | 6,415,200,000 |
| Monogononta | *Ploesoma* | *sp.* | - | - | - | - | - | - | - | - | - |
| Monogononta | *Polyarthra* | *sp.* | 3,700 | 324,000 | 2,397,600,000 | 1,200 | 648,000 | 1,555,200,000 | 2,700 | 324,000 | 1,749,600,000 |
| Monogononta | *Trichocerca* | *sp.* | 800 | 2,920,000 | 4,672,000,000 | 1,100 | 960,000 | 2,112,000,000 | 900 | 960,000 | 1,728,000,000 |
| Monogononta | *Trichotria* | *sp.* | 100 | 1,220,000 | 244,000,000 | - | - | - | - | - | - |

Notes:
Sample volume was 0.5 L.
Samples were collected between September 10 and 21, 2

## Table A-7
## Plant Pigments in Surface Water Collected in September 2016

| Parameter | DL | Unit | LA-1 | LA-5 | LA-6 | LA-7 | LAB-1 | LAB-2 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Chlorophyll a | 0.60 | ug/L | <0.60 | <0.60 | <0.60 | <0.60 | <0.60 | <0.60 |
| ODb/Oda | 1.0 | ABS Ratio | 1 | 1 | 1 | 1 | 1 | 1 |
| Pheophytin a | 0.60 | ug/L | 10.9 | 8.94 | 6.68 | 7.24 | 6.40 | 13.9 |

Notes:

Samples were collected between September 10 and 21, 2016

**Table A-8**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Number of Individuals per Taxonomic Unit and Reference Median**

| EcoMetrix - Denison Mine 2016 | | | | Small Lakes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LA-5 | | | | | LA-6 | | | | | Reference Median |
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | #1 | #2 | #3 | #4 | #5 | #1 | #2 | #3 | #4 | #5 | |
| Nematoda | | | | 1 | 0 | 5 | 0 | 0 | 3 | 0 | 4 | 8 | 0 | 0.50 |
| Microturbellaria | | | | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | Naididae | Tubificinae | | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 |
| Oligochaeta | Naididae | Naidinae | | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 24 | 0 | 0 |
| Gastropoda | Lymnaeidae | | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | Planorbidae | | *Gyraulus* | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | Valvatidae | | *Valvata sincera* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | Pisidiidae | | (i/d) | 8 | 28 | 6 | 3 | 72 | 2 | 22 | 2 | 4 | 10 | 7 |
| Pelecypoda | Pisidiidae | | *Pisidium* | 7 | 10 | 0 | 0 | 3 | 0 | 3 | 6 | 6 | 6 | 4.5 |
| Acari - Hydrachnidia | | | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | 0 | 1 | 0 | 0 | 12 | 0 | 1 | 5 | 0 | 2 | 0.5 |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Pionidae | | *Piona* | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | 0 | 2 | 1 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ostracoda | | | | 18 | 16 | 20 | 40 | 4 | 4 | 8 | 33 | 176 | 26 | 19 |
| Copepoda-Cyclopoida | | | | 16 | 41 | 32 | 8 | 12 | 5 | 0 | 8 | 24 | 24 | 14 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Chydoridae | | - | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 0 | 32 | 0 |
| Cladocera | Chydoridae | | *Eurycercus* | 293 | 54 | 377 | 691 | 82 | 155 | 491 | 297 | 761 | 150 | 295 |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | 8 | 0 | 0 | 8 | 0 | 1 | 0 | 0 | 16 | 24 | 0.5 |
| Cladocera | Macrothricidae | | | 225 | 40 | 164 | 152 | 76 | 4 | 60 | 128 | 136 | 72 | 102 |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Sididae | | *Latona setifera* | 0 | 0 | 4 | 0 | 8 | 1 | 0 | 8 | 0 | 0 | 0 |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 0 |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Ephemeroptera | Baetiscidae | | *Baetisca* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | Caenidae | | *Caenis* | 39 | 48 | 10 | 0 | 28 | 0 | 7 | 10 | 11 | 171 | 10.5 |
| Ephemeroptera | Ephemeridae | | *Ephemera* | 0 | 0 | 0 | 0 | 19 | 0 | 1 | 3 | 1 | 0 | 0 |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Hydroptilidae | | *Oxyethira* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Leptoceridae | | *Mystacides* | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Leptoceridae | | *Oecetis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Phryganeidae | | *Agrypnia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table A-8**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Number of Individuals per Taxonomic Unit and Reference Median**

| EcoMetrix - Denison Mine 2016 | | | | Small Lakes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LA-5 | | | | | LA-6 | | | | | Reference Median |
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | #1 | #2 | #3 | #4 | #5 | #1 | #2 | #3 | #4 | #5 | |
| Megaloptera | Sialidae | | *Sialis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | 2 | 2 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chaoboridae | | *Chaoborus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae - pupa | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 3 | 0 | 19 | 51 | 0 | 18 | 121 | 4 | 0 | 6 | 5 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | 0 | 0 | 2 | 0 | 4 | 0 | 0 | 5 | 0 | 1 | 0 |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 8 | 3 | 10 | 21 | 20 | 2 | 9 | 7 | 10 | 14 | 9.5 |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | 2 | 4 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | 1 | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 17 | 0 | 0 | 1 | 0 | 1 | 16 | 1 | 0 | 4 | 1 |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | 0 | 37 | 4 | 0 | 141 | 1 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Chironomini | *Tribelos* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 29 | 8 | 15 | 3 | 8 | 6 | 14 | 11 | 3 | 19 | 9.5 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | 2 | 1 | 13 | 0 | 1 | 5 | 4 | 33 | 65 | 25 | 4.5 |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 41 | 24 | 10 | 0 | 27 | 14 | 30 | 8 | 49 | 1 | 19 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | 0 | 4 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Terrestrial | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table A-8**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Number of Individuals per Taxonomic Unit and Reference Median**

| EcoMetrix - Denison Mine 2016 | | | | Large Lakes | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LA-1 | | | LA-7 | | | LA-7A | | | LA-8 | | | LA-9 | | | LB-3 | | | LAB-1 | | | LAB-2 | | | |
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | Reference Median |
| Nematoda | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 3 | 0 | 7 | 2 | 9 | 0.00 |
| Microturbellaria | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0.00 |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Oligochaeta | Naididae | Tubificinae | | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 25 | 9 | 77 | 14 | 45 | 41 | 5 | 5 | 1 | 1.00 |
| Oligochaeta | Naididae | Naidinae | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 20 | 3 | 0 | 0 | 0 | 0 | 0.00 |
| Gastropoda | Lymnaeidae | | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.00 |
| Gastropoda | Planorbidae | | *Gyraulus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Gastropoda | Valvatidae | | *Valvata sincera* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Pelecypoda | Pisidiidae | | (i/d) | 0 | 2 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 6 | 51 | 12 | 34 | 21 | 14 | 13 | 32 | 40 | 1.00 |
| Pelecypoda | Pisidiidae | | *Pisidium* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 17 | 12 | 13 | 6 | 4 | 5 | 6 | 14 | 0.50 |
| Acari - Hydrachnidia | | | (i/d) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 0 | 0.00 |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Acari - Hydrachnidia | Pionidae | | *Piona* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 8 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0.00 |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 1 | 0 | 1 | 0 | 0.00 |
| Ostracoda | | | | 2 | 2 | 0 | 7 | 17 | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 1 | 8 | 0 | 4 | 1 | 1 | 1 | 0 | 0 | 1.00 |
| Copepoda-Cyclopoida | | | | 1 | 4 | 5 | 4 | 1 | 1 | 0 | 14 | 2 | 0 | 0 | 0 | 4 | 4 | 1 | 8 | 0 | 4 | 2 | 11 | 14 | 3 | 0 | 4 | 2.50 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | 18 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Cladocera | Chydoridae | | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Cladocera | Chydoridae | | *Eurycercus* | 1 | 0 | 0 | 1 | 3 | 6 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0.00 |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0.00 |
| Cladocera | Macrothricidae | | | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 0.00 |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Cladocera | Sididae | | *Latona setifera* | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0.00 |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Ephemeroptera | Baetiscidae | | *Baetisca* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0.00 |
| Ephemeroptera | Caenidae | | *Caenis* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.00 |
| Ephemeroptera | Ephemeridae | | *Ephemera* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 29 | 0.00 |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.00 |
| Trichoptera | Hydroptilidae | | *Oxyethira* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.00 |
| Trichoptera | Leptoceridae | | *Mystacides* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0.00 |
| Trichoptera | Leptoceridae | | *Oecetis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0.00 |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0.00 |
| Trichoptera | Phryganeidae | | *Agrypnia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.00 |

**Table A-8**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Number of Individuals per Taxonomic Unit and Reference Median**

| EcoMetrix - Denison Mine 2016 | | | | Large Lakes | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LA-1 | | | LA-7 | | | LA-7A | | | LA-8 | | | LA-9 | | | LB-3 | | | LAB-1 | | | LAB-2 | | | |
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | Reference Median |
| Megaloptera | Sialidae | | *Sialis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.00 |
| Diptera | Chaoboridae | | *Chaoborus* | 26 | 24 | 18 | 0 | 1 | 2 | 1 | 1 | 1 | 3 | 5 | 6 | 8 | 51 | 41 | 80 | 14 | 14 | 0 | 0 | 1 | 0 | 0 | 0 | 2.50 |
| Diptera | Chironomidae - pupa | | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 12 | 7 | 26 | 17 | 106 | 79 | 8 | 48 | 5 | 1 | 5 | 8 | 4 | 24 | 45 | 16 | 17 | 46 | 3 | 35 | 54 | 7 | 1 | 2 | 14.00 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 6 | 9 | 0 | 32 | 3 | 9 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 1 | 0 | 0 | 2 | 2 | 1 | 2 | 0 | 3 | 2 | 2 | 1 | 3 | 0 | 0 | 0 | 3 | 2 | 2 | 1 | 5 | 6 | 5 | 7 | 2.00 |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 8 | 0 | 0 | 49 | 53 | 126 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 0 | 7 | 0 | 9 | 25 | 49 | 8 | 2 | 20 | 10 | 31 | 18 | 5 | 0 | 0 | 15 | 18 | 3 | 34 | 3 | 14 | 1 | 0 | 1 | 7.50 |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 33 | 23 | 24 | 0.00 |
| Diptera | Chironomidae | Chironomini | *Tribelos* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 11 | 0.00 |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 6 | 20 | 5 | 0 | 17 | 10 | 18 | 7 | 15 | 16 | 8 | 8 | 59 | 16 | 15 | 43 | 114 | 44 | 12 | 21 | 12 | 10 | 3 | 44 | 15.00 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 8 | 0 | 58 | 1 | 3 | 4 | 1 | 49 | 0.00 |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1286 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0.00 |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 16 | 0.00 |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 2 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 15 | 0 | 1 | 2 | 140 | 5 | 106 | 12 | 18 | 23 | 21 | 336 | 1.50 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.00 |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.00 |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0.00 |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 0 | 0.00 |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 1 | 0.00 |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| Terrestrial | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.00 |

**Table A-9**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Number of Individuals per Taxonomic Group**

| Major Taxon | Family | LA-1 | | | LA-5 | | | | | LA-6 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | #1 | #2 | #3 | #1 | #2 | #3 | #4 | #5 | #1 | #2 | #3 | #4 | #5 |
| Total | | 1014 | 1043 | 886 | 10457 | 5271 | 9929 | 14086 | 8243 | 3171 | 11414 | 8514 | 19143 | 8571 |
| Average | | 981 | | | 9597 | | | | | 10163 | | | | |
| Standard deviation | | 84 | | | 3223 | | | | | 5838 | | | | |
| | | | | | | | | | | | | | | |
| Nematoda | Nematoda | 0 | 0 | 0 | 14 | 0 | 71 | 0 | 0 | 43 | 0 | 57 | 114 | 0 |
| Microturbellaria | Microturbellaria | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 |
| Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | Naididae | 0 | 0 | 43 | 114 | 29 | 0 | 0 | 57 | 0 | 0 | 186 | 343 | 0 |
| Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | Pisidiidae | 0 | 29 | 0 | 214 | 543 | 86 | 43 | 1,071 | 29 | 357 | 114 | 143 | 229 |
| Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 171 | 0 | 14 | 71 | 0 | 29 |
| Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Pionidae | 0 | 0 | 0 | 0 | 71 | 14 | 0 | 0 | 0 | 0 | 0 | 86 | 0 |
| Acari - Hydrachnidia | Unionicolidae | 0 | 0 | 0 | 0 | 29 | 14 | 114 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ostracoda | Ostracoda | 29 | 29 | 0 | 257 | 229 | 286 | 571 | 57 | 57 | 114 | 471 | 2,514 | 371 |
| Copepoda-Cyclopoida | Copepoda-Cyclopoida | 14 | 57 | 71 | 229 | 586 | 457 | 114 | 171 | 71 | 0 | 114 | 343 | 343 |
| Cladocera | Holopedidae | 257 | 14 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Chydoridae | 14 | 0 | 0 | 4,186 | 771 | 5,386 | 9,871 | 1,171 | 2,214 | 7,129 | 4,357 | 10,871 | 2,600 |
| Cladocera | Ilyocryptidae | 0 | 0 | 0 | 114 | 0 | 0 | 114 | 0 | 14 | 0 | 0 | 229 | 343 |
| Cladocera | Macrothricidae | 0 | 0 | 0 | 3,214 | 571 | 2,343 | 2,171 | 1,086 | 57 | 857 | 1,829 | 1,943 | 1,029 |
| Cladocera | Polyphemidae | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Sididae | 14 | 0 | 0 | 0 | 0 | 57 | 0 | 114 | 14 | 0 | 114 | 0 | 0 |
| Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 571 | 0 |
| Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 14 |
| Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | Caenidae | 0 | 0 | 0 | 557 | 686 | 143 | 0 | 400 | 0 | 100 | 143 | 157 | 2,443 |
| Ephemeroptera | Ephemeridae | 0 | 14 | 0 | 0 | 271 | 0 | 0 | 271 | 0 | 14 | 43 | 14 | 0 |
| Trichoptera | Hydroptilidae | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 14 |
| Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Ceratopogonidae | 0 | 0 | 0 | 29 | 43 | 14 | 0 | 43 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chaoboridae | 371 | 343 | 257 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Chironomidae | 300 | 543 | 457 | 1,500 | 1,429 | 1,057 | 1,086 | 3,414 | 671 | 2,829 | 1,014 | 1,814 | 1,157 |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-9**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Number of Individuals per Taxonomic Group**

| Major Taxon | Family | LA-7 | | | LA-7A | | | LA-8 | | | LA-9 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 |
| Total | | 800 | 2529 | 2214 | 543 | 1171 | 686 | 557 | 843 | 614 | 1986 | 1386 | 1529 |
| Average | | | 1848 | | | 800 | | | 671 | | | 1633 | |
| Standard deviation | | | 921 | | | 330 | | | 151 | | | 313 | |
| | | | | | | | | | | | | | |
| Nematoda | Nematoda | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hirudinea | Erpobdellidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | Naididae | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 14 | 0 | 57 | 0 | 0 |
| Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | Valvatidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | Pisidiidae | 43 | 29 | 14 | 0 | 0 | 0 | 0 | 14 | 14 | 14 | 0 | 14 |
| Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 |
| Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Limnesiidae | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| Acari - Hydrachnidia | Pionidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 0 |
| Acari - Hydrachnidia | Unionicolidae | 14 | 0 | 14 | 0 | 0 | 0 | 14 | 0 | 0 | 14 | 0 | 0 |
| Ostracoda | Ostracoda | 100 | 243 | 43 | 0 | 71 | 0 | 0 | 0 | 0 | 186 | 0 | 0 |
| Copepoda-Cyclopoida | Copepoda-Cyclopoida | 57 | 14 | 14 | 0 | 200 | 29 | 0 | 0 | 0 | 57 | 57 | 14 |
| Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Chydoridae | 14 | 43 | 86 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 |
| Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Macrothricidae | 0 | 29 | 0 | 0 | 0 | 0 | 14 | 14 | 0 | 0 | 0 | 0 |
| Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Sididae | 29 | 0 | 0 | 0 | 57 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | Caenidae | 0 | 0 | 14 | 0 | 0 | 0 | 14 | 0 | 0 | 43 | 0 | 0 |
| Ephemeroptera | Ephemeridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 | 0 | 0 |
| Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Molannidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera | Sialidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 |
| Diptera | Chaoboridae | 0 | 14 | 29 | 14 | 14 | 14 | 43 | 71 | 86 | 114 | 729 | 586 |
| Diptera | Chironomidae | 543 | 2,143 | 2,000 | 514 | 814 | 629 | 471 | 714 | 500 | 1,314 | 600 | 914 |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-9**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Number of Individuals per Taxonomic Group**

| Major Taxon | Family | LB-3 | | | LAB-1 | | | LAB-2 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | #1 | #2 | #3 | #1 | #2 | #3 | #1 | #2 | #3 |
| Total | | 3029 | 25114 | 3229 | 5286 | 2471 | 2757 | 2729 | 2600 | 10557 |
| Average | | | 10457 | | | 3505 | | | 5295 | |
| Standard deviation | | | 12694 | | | 1549 | | | 4557 | |
| | | | | | | | | | | |
| Nematoda | Nematoda | 0 | 0 | 0 | 129 | 43 | 0 | 100 | 29 | 129 |
| Microturbellaria | Microturbellaria | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 |
| Hirudinea | Erpobdellidae | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | Naididae | 400 | 129 | 1,100 | 486 | 686 | 586 | 71 | 71 | 14 |
| Gastropoda | Lymnaeidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| Gastropoda | Planorbidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | Valvatidae | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | Pisidiidae | 114 | 971 | 343 | 671 | 386 | 257 | 257 | 543 | 771 |
| Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | 0 | 114 | 0 | 14 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Arenuridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Hygrobaetidae | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 57 | 0 |
| Acari - Hydrachnidia | Lebertiidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Limnesiidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Oxidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | Pionidae | 0 | 114 | 0 | 14 | 14 | 14 | 14 | 0 | 14 |
| Acari - Hydrachnidia | Unionicolidae | 0 | 0 | 14 | 14 | 29 | 14 | 0 | 14 | 0 |
| Ostracoda | Ostracoda | 14 | 114 | 0 | 57 | 14 | 14 | 14 | 0 | 0 |
| Copepoda-Cyclopoida | Copepoda-Cyclopoida | 114 | 0 | 57 | 29 | 157 | 200 | 43 | 0 | 57 |
| Cladocera | Holopedidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Chydoridae | 0 | 114 | 0 | 0 | 0 | 0 | 43 | 0 | 0 |
| Cladocera | Ilyocryptidae | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 |
| Cladocera | Macrothricidae | 0 | 114 | 0 | 29 | 0 | 0 | 57 | 0 | 0 |
| Cladocera | Polyphemidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | Sididae | 29 | 0 | 0 | 0 | 14 | 0 | 29 | 0 | 0 |
| Amphipoda | Gammaridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amphipoda | Hyalellidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | Baetiscidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 |
| Ephemeroptera | Caenidae | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| Ephemeroptera | Ephemeridae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 429 |
| Trichoptera | Hydroptilidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | Lepidosomatidae | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| Trichoptera | Leptoceridae | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 29 | 71 |
| Trichoptera | Molannidae | 0 | 0 | 0 | 14 | 0 | 0 | 29 | 0 | 0 |
| Trichoptera | Phryganeidae | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| Megaloptera | Sialidae | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | Ceratopogonidae | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| Diptera | Chaoboridae | 1,143 | 200 | 200 | 0 | 0 | 14 | 0 | 0 | 0 |
| Diptera | Chironomidae | 1,200 | 23,229 | 1,500 | 3,814 | 1,114 | 1,643 | 1,986 | 1,743 | 9,014 |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-10**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Percent Abundance per Taxonomic Group**

| | | LA-1 | | | LA-5 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Major Taxon** | **Family** | **#1** | **#2** | **#3** | **#1** | **#2** | **#3** | **#4** | **#5** |
| **Total** | | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| | | | | | | | | | |
| Nematoda | Nematoda | - | - | - | 0.1% | - | 0.7% | - | - |
| Microturbellaria | Microturbellaria | - | - | - | 0.1% | - | - | - | 0.2% |
| Hirudinea | Erpobdellidae | - | - | - | - | - | - | - | - |
| Oligochaeta | Naididae | - | - | 4.8% | 1.1% | 0.5% | - | - | 0.7% |
| Gastropoda | Lymnaeidae | - | - | - | - | - | - | - | - |
| Gastropoda | Planorbidae | - | - | - | - | - | - | - | 0.7% |
| Gastropoda | Valvatidae | - | - | - | - | - | - | - | - |
| Pelecypoda | Pisidiidae | - | 2.7% | - | 2.0% | 10.3% | 0.9% | 0.3% | 13.0% |
| Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Arenuridae | - | - | - | 0.1% | - | - | - | 0.2% |
| Acari - Hydrachnidia | Hygrobaetidae | - | - | - | - | 0.3% | - | - | 2.1% |
| Acari - Hydrachnidia | Lebertiidae | - | - | - | - | - | - | - | 0.7% |
| Acari - Hydrachnidia | Limnesiidae | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Oxidae | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Pionidae | - | - | - | - | 1.4% | 0.1% | - | - |
| Acari - Hydrachnidia | Unionicolidae | - | - | - | - | 0.5% | 0.1% | 0.8% | - |
| Ostracoda | Ostracoda | 2.8% | 2.7% | - | 2.5% | 4.3% | 2.9% | 4.1% | 0.7% |
| Copepoda-Cyclopoida | Copepoda-Cyclopoida | 1.4% | 5.5% | 8.1% | 2.2% | 11.1% | 4.6% | 0.8% | 2.1% |
| Cladocera | Holopedidae | 25.4% | 1.4% | 6.5% | - | - | - | - | - |
| Cladocera | Chydoridae | 1.4% | - | - | 40.0% | 14.6% | 54.2% | 70.1% | 14.2% |
| Cladocera | Ilyocryptidae | - | - | - | 1.1% | - | - | 0.8% | - |
| Cladocera | Macrothricidae | - | - | - | 30.7% | 10.8% | 23.6% | 15.4% | 13.2% |
| Cladocera | Polyphemidae | 1.4% | - | - | - | - | - | - | - |
| Cladocera | Sididae | 1.4% | - | - | - | - | 0.6% | - | 1.4% |
| Amphipoda | Gammaridae | - | - | - | - | - | - | - | - |
| Amphipoda | Hyalellidae | - | - | - | - | - | - | - | 0.2% |
| Ephemeroptera | Baetiscidae | - | - | - | - | - | - | - | - |
| Ephemeroptera | Caenidae | - | - | - | 5.3% | 13.0% | 1.4% | - | 4.9% |
| Ephemeroptera | Ephemeridae | - | 1.4% | - | - | 5.1% | - | - | 3.3% |
| Trichoptera | Hydroptilidae | - | 1.4% | - | - | - | - | - | - |
| Trichoptera | Lepidosomatidae | - | - | - | - | - | - | - | - |
| Trichoptera | Leptoceridae | - | - | - | - | - | - | - | 0.7% |
| Trichoptera | Molannidae | - | - | - | - | - | - | - | - |
| Trichoptera | Phryganeidae | - | - | - | - | - | - | - | - |
| Megaloptera | Sialidae | - | - | - | - | - | - | - | - |
| Diptera | Ceratopogonidae | - | - | - | 0.3% | 0.8% | 0.1% | - | 0.5% |
| Diptera | Chaoboridae | 36.6% | 32.9% | 29.0% | - | - | - | - | - |
| Diptera | Chironomidae | 29.6% | 52.1% | 51.6% | 14.3% | 27.1% | 10.6% | 7.7% | 41.4% |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-10**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Percent Abundance per Taxonomic Group**

| | | LA-6 | | | | | LA-7 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Major Taxon** | **Family** | **#1** | **#2** | **#3** | **#4** | **#5** | **#1** | **#2** | **#3** |
| **Total** | | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| | | | | | | | | | |
| Nematoda | Nematoda | 1.4% | - | 0.7% | 0.6% | - | - | - | - |
| Microturbellaria | Microturbellaria | - | - | - | - | - | - | - | - |
| Hirudinea | Erpobdellidae | - | - | - | - | - | - | - | - |
| Oligochaeta | Naididae | - | - | 2.2% | 1.8% | - | - | - | - |
| Gastropoda | Lymnaeidae | - | - | - | - | - | - | - | - |
| Gastropoda | Planorbidae | - | - | - | - | - | - | - | - |
| Gastropoda | Valvatidae | - | - | - | - | - | - | - | - |
| Pelecypoda | Pisidiidae | 0.9% | 3.1% | 1.3% | 0.7% | 2.7% | 5.4% | 1.1% | 0.6% |
| Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Arenuridae | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Hygrobaetidae | - | 0.1% | 0.8% | - | 0.3% | - | - | - |
| Acari - Hydrachnidia | Lebertiidae | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Limnesiidae | - | - | - | - | - | - | 0.6% | - |
| Acari - Hydrachnidia | Oxidae | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Pionidae | - | - | - | 0.4% | - | - | - | - |
| Acari - Hydrachnidia | Unionicolidae | - | - | - | - | - | 1.8% | - | 0.6% |
| Ostracoda | Ostracoda | 1.8% | 1.0% | 5.5% | 13.1% | 4.3% | 12.5% | 9.6% | 1.9% |
| Copepoda-Cyclopoida | Copepoda-Cyclopoida | 2.3% | - | 1.3% | 1.8% | 4.0% | 7.1% | 0.6% | 0.6% |
| Cladocera | Holopedidae | - | - | - | - | - | - | - | - |
| Cladocera | Chydoridae | 69.8% | 62.5% | 51.2% | 56.8% | 30.3% | 1.8% | 1.7% | 3.9% |
| Cladocera | Ilyocryptidae | 0.5% | - | - | 1.2% | 4.0% | - | - | - |
| Cladocera | Macrothricidae | 1.8% | 7.5% | 21.5% | 10.1% | 12.0% | - | 1.1% | - |
| Cladocera | Polyphemidae | - | - | - | - | - | - | - | - |
| Cladocera | Sididae | 0.5% | - | 1.3% | - | - | 3.6% | - | - |
| Amphipoda | Gammaridae | - | - | - | 3.0% | - | - | - | - |
| Amphipoda | Hyalellidae | - | - | - | - | 0.2% | - | - | - |
| Ephemeroptera | Baetiscidae | - | - | - | - | - | - | - | - |
| Ephemeroptera | Caenidae | - | 0.9% | 1.7% | 0.8% | 28.5% | - | - | 0.6% |
| Ephemeroptera | Ephemeridae | - | 0.1% | 0.5% | 0.1% | - | - | - | - |
| Trichoptera | Hydroptilidae | - | - | - | - | - | - | - | - |
| Trichoptera | Lepidosomatidae | - | - | - | - | - | - | - | - |
| Trichoptera | Leptoceridae | - | - | - | - | 0.2% | - | - | - |
| Trichoptera | Molannidae | - | - | - | - | - | - | - | - |
| Trichoptera | Phryganeidae | - | - | - | - | - | - | - | - |
| Megaloptera | Sialidae | - | - | - | - | - | - | - | - |
| Diptera | Ceratopogonidae | - | - | - | - | - | - | - | - |
| Diptera | Chaoboridae | - | - | - | - | - | - | 0.6% | 1.3% |
| Diptera | Chironomidae | 21.2% | 24.8% | 11.9% | 9.5% | 13.5% | 67.9% | 84.7% | 90.3% |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-10**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Percent Abundance per Taxonomic Group**

| | | LA-7A | | | LA-8 | | | LA-9 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Major Taxon** | **Family** | **#1** | **#2** | **#3** | **#1** | **#2** | **#3** | **#1** | **#2** | **#3** |
| **Total** | | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| | | | | | | | | | | |
| Nematoda | Nematoda | - | 1.2% | - | - | - | - | - | - | - |
| Microturbellaria | Microturbellaria | - | - | - | - | - | - | - | - | - |
| Hirudinea | Erpobdellidae | - | - | - | - | - | - | - | - | - |
| Oligochaeta | Naididae | 2.6% | - | - | - | 1.7% | - | 2.9% | - | - |
| Gastropoda | Lymnaeidae | - | - | - | - | - | - | - | - | - |
| Gastropoda | Planorbidae | - | - | - | - | - | - | - | - | - |
| Gastropoda | Valvatidae | - | - | - | - | - | - | - | - | - |
| Pelecypoda | Pisidiidae | - | - | - | - | 1.7% | 2.3% | 0.7% | - | 0.9% |
| Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | - | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Arenuridae | - | - | - | - | - | - | 1.4% | - | - |
| Acari - Hydrachnidia | Hygrobaetidae | - | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Lebertiidae | - | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Limnesiidae | - | - | - | - | - | 2.3% | - | - | - |
| Acari - Hydrachnidia | Oxidae | - | - | - | - | - | - | 0.7% | - | - |
| Acari - Hydrachnidia | Pionidae | - | - | - | - | - | - | 2.9% | - | - |
| Acari - Hydrachnidia | Unionicolidae | - | - | - | 2.6% | - | - | 0.7% | - | - |
| Ostracoda | Ostracoda | - | 6.1% | - | - | - | - | 9.4% | - | - |
| Copepoda-Cyclopoida | Copepoda-Cyclopoida | - | 17.1% | 4.2% | - | - | - | 2.9% | 4.1% | 0.9% |
| Cladocera | Holopedidae | - | - | - | - | - | - | - | - | - |
| Cladocera | Chydoridae | - | - | - | - | 1.7% | - | - | - | - |
| Cladocera | Ilyocryptidae | - | - | - | - | - | - | - | - | - |
| Cladocera | Macrothricidae | - | - | - | 2.6% | 1.7% | - | - | - | - |
| Cladocera | Polyphemidae | - | - | - | - | - | - | - | - | - |
| Cladocera | Sididae | - | 4.9% | 2.1% | - | - | - | - | - | - |
| Amphipoda | Gammaridae | - | - | - | - | - | - | - | - | - |
| Amphipoda | Hyalellidae | - | - | - | - | - | - | - | - | - |
| Ephemeroptera | Baetiscidae | - | - | - | - | - | - | - | - | - |
| Ephemeroptera | Caenidae | - | - | - | 2.6% | - | - | 2.2% | - | - |
| Ephemeroptera | Ephemeridae | - | - | - | - | - | - | 2.2% | - | - |
| Trichoptera | Hydroptilidae | - | - | - | - | - | - | - | - | - |
| Trichoptera | Lepidosomatidae | - | - | - | - | - | - | - | - | - |
| Trichoptera | Leptoceridae | - | - | - | - | - | - | - | - | - |
| Trichoptera | Molannidae | - | - | - | - | - | - | - | - | - |
| Trichoptera | Phryganeidae | - | - | - | - | - | - | - | - | - |
| Megaloptera | Sialidae | - | - | - | - | - | - | 0.7% | - | - |
| Diptera | Ceratopogonidae | - | - | - | - | - | - | 1.4% | - | - |
| Diptera | Chaoboridae | 2.6% | 1.2% | 2.1% | 7.7% | 8.5% | 14.0% | 5.8% | 52.6% | 38.3% |
| Diptera | Chironomidae | 94.7% | 69.5% | 91.7% | 84.6% | 84.7% | 81.4% | 66.2% | 43.3% | 59.8% |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-10**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Percent Abundance per Taxonomic Group**

| | | LB-3 | | | LAB-1 | | | LAB-2 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Major Taxon** | **Family** | **#1** | **#2** | **#3** | **#1** | **#2** | **#3** | **#1** | **#2** | **#3** |
| **Total** | | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |
| | | | | | | | | | | |
| Nematoda | Nematoda | - | - | - | 2.4% | 1.7% | - | 3.7% | 1.1% | 1.2% |
| Microturbellaria | Microturbellaria | - | - | - | - | - | 0.5% | - | - | - |
| Hirudinea | Erpobdellidae | - | - | - | 0.3% | - | - | - | - | - |
| Oligochaeta | Naididae | 13.2% | 0.5% | 34.1% | 9.2% | 27.7% | 21.2% | 2.6% | 2.7% | 0.1% |
| Gastropoda | Lymnaeidae | - | - | - | - | - | - | - | - | 0.1% |
| Gastropoda | Planorbidae | - | - | - | - | - | - | - | - | - |
| Gastropoda | Valvatidae | 0.5% | - | - | - | - | - | - | - | - |
| Pelecypoda | Pisidiidae | 3.8% | 3.9% | 10.6% | 12.7% | 15.6% | 9.3% | 9.4% | 20.9% | 7.3% |
| Acari - Hydrachnidia | Acari - Hydrachnidia (immature) | - | 0.5% | - | 0.3% | - | - | - | - | - |
| Acari - Hydrachnidia | Arenuridae | - | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Hygrobaetidae | - | - | - | - | - | - | 1.0% | 2.2% | - |
| Acari - Hydrachnidia | Lebertiidae | - | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Limnesiidae | - | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Oxidae | - | - | - | - | - | - | - | - | - |
| Acari - Hydrachnidia | Pionidae | - | 0.5% | - | 0.3% | 0.6% | 0.5% | 0.5% | - | 0.1% |
| Acari - Hydrachnidia | Unionicolidae | - | - | 0.4% | 0.3% | 1.2% | 0.5% | - | 0.5% | - |
| Ostracoda | Ostracoda | 0.5% | 0.5% | - | 1.1% | 0.6% | 0.5% | 0.5% | - | - |
| Copepoda-Cyclopoida | Copepoda-Cyclopoida | 3.8% | - | 1.8% | 0.5% | 6.4% | 7.3% | 1.6% | - | 0.5% |
| Cladocera | Holopedidae | - | - | - | - | - | - | - | - | - |
| Cladocera | Chydoridae | - | 0.5% | - | - | - | - | 1.6% | - | - |
| Cladocera | Ilyocryptidae | - | - | - | - | 0.6% | - | - | - | - |
| Cladocera | Macrothricidae | - | 0.5% | - | 0.5% | - | - | 2.1% | - | - |
| Cladocera | Polyphemidae | - | - | - | - | - | - | - | - | - |
| Cladocera | Sididae | 0.9% | - | - | - | 0.6% | - | 1.0% | - | - |
| Amphipoda | Gammaridae | - | - | - | - | - | - | - | - | - |
| Amphipoda | Hyalellidae | - | - | - | - | - | - | - | - | - |
| Ephemeroptera | Baetiscidae | - | - | - | - | - | - | - | 0.5% | - |
| Ephemeroptera | Caenidae | - | 0.1% | - | - | - | - | - | - | 0.1% |
| Ephemeroptera | Ephemeridae | - | - | - | - | - | - | - | 3.8% | 4.1% |
| Trichoptera | Hydroptilidae | - | - | - | - | - | - | - | - | - |
| Trichoptera | Lepidosomatidae | - | - | - | - | - | - | 0.5% | - | - |
| Trichoptera | Leptoceridae | - | - | - | - | - | - | 1.0% | 1.1% | 0.7% |
| Trichoptera | Molannidae | - | - | - | 0.3% | - | - | 1.0% | - | - |
| Trichoptera | Phryganeidae | - | - | - | - | - | - | 0.5% | - | - |
| Megaloptera | Sialidae | - | - | 0.4% | - | - | - | - | - | - |
| Diptera | Ceratopogonidae | - | - | - | - | - | - | - | - | 0.3% |
| Diptera | Chaoboridae | 37.7% | 0.8% | 6.2% | - | - | 0.5% | - | - | - |
| Diptera | Chironomidae | 39.6% | 92.5% | 46.5% | 72.2% | 45.1% | 59.6% | 72.8% | 67.0% | 85.4% |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-11**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Feeding Groups Summary**

| Metric | Feeding Group | | LA-1 | | | | LA-5 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | #1 | #2 | #3 | Average | #1 | #2 | #3 | #4 | #5 | Average |
| **Density (individuals/m$^3$)** | | | 1,014 | 1,043 | 886 | 981 | 10,457 | 5,271 | 9,929 | 14,086 | 8,243 | 9,597 |
| **Taxa Richness** | | | 11 | 10 | 7 | 9.3 | 22 | 27 | 18 | 10 | 29 | 21 |
| **Simpson's Evenness** | | | 0.38 | 0.43 | 0.51 | 0.44 | 0.16 | 0.40 | 0.15 | 0.17 | 0.27 | 0.23 |
| **Simpson's Diversity** | | | 0.76 | 0.79 | 0.72 | 0.76 | 0.74 | 0.91 | 0.64 | 0.48 | 0.88 | 0.73 |
| **Bray-Curtis Dissimilarity** | | | 0.58 | 0.38 | 0.53 | 0.50 | 0.20 | 0.59 | 0.19 | 0.40 | 0.57 | 0.39 |
| | **Feeding Group** | | | | | | | | | | | |
| **Number of Individuals** | Collector-Filterer | CF | 343 | 129 | 143 | 205 | 8357 | 2286 | 8571 | 12271 | 2943 | 6886 |
| | Collector-Gatherer | CG | 200 | 186 | 414 | 267 | 1214 | 2586 | 886 | 1343 | 4157 | 2037 |
| | Omnivore | OMN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | PRED | 471 | 629 | 329 | 476 | 614 | 343 | 471 | 457 | 814 | 540 |
| | Scraper | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 11 |
| | Shredder | SHR | 0 | 100 | 0 | 33 | 271 | 57 | 0 | 14 | 271 | 123 |
| | Total | | 1014 | 1043 | 886 | 981 | 10457 | 5271 | 9929 | 14086 | 8243 | 9597 |
| | | | | | | | | | | | | |
| **Relative Abundance** | Collector-Filterer | CF | 34% | 12% | 16% | 21% | 80% | 43% | 86% | 87% | 36% | 66% |
| | Collector-Gatherer | CG | 20% | 18% | 47% | 28% | 12% | 49% | 9% | 10% | 50% | 26% |
| | Omnivore | OMN | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Predator | PRED | 46% | 60% | 37% | 48% | 6% | 7% | 5% | 3% | 10% | 6% |
| | Scraper | SCR | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0.69% | 0.14% |
| | Shredder | SHR | 0% | 10% | 0% | 3% | 3% | 1% | 0% | 0% | 3% | 1% |
| | Total | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **Major Taxon** | **Genus/Species/Feeding Group** | | | | | | | | | | | |
| Nematoda | | PRED | 0 | 0 | 0 | 0 | 14 | 0 | 71 | 0 | 0 | 17 |
| Microturbellaria | | PRED | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 14 | 6 |
| Hirudinea | *Erpobdella punctata* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | | CG | 0 | 0 | 43 | 14 | 0 | 29 | 0 | 0 | 57 | 17 |
| Oligochaeta | | CG | 0 | 0 | 0 | 0 | 114 | 0 | 0 | 0 | 0 | 23 |
| Gastropoda | (i/d) | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | *Gyraulus* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 11 |
| Gastropoda | *Valvata sincera* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | (i/d) | CG | 0 | 29 | 0 | 10 | 114 | 400 | 86 | 43 | 1,029 | 334 |
| Pelecypoda | *Pisidium* | CG | 0 | 0 | 0 | 0 | 100 | 143 | 0 | 0 | 43 | 57 |
| Acari - Hydrachnidia | (i/d) | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Arrenurus* | PRED | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 14 | 6 |
| Acari - Hydrachnidia | *Hygrobates* | PRED | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 171 | 37 |
| Acari - Hydrachnidia | *Lebertia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 11 |
| Acari - Hydrachnidia | *Limnesia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Oxus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Piona* | PRED | 0 | 0 | 0 | 0 | 0 | 71 | 14 | 0 | 0 | 17 |
| Acari - Hydrachnidia | *Unionicola* | PRED | 0 | 0 | 0 | 0 | 0 | 29 | 14 | 114 | 0 | 31 |
| Ostracoda | | CG | 29 | 29 | 0 | 19 | 257 | 229 | 286 | 571 | 57 | 280 |
| Copepoda-Cyclopoida | | CF | 14 | 57 | 71 | 48 | 229 | 586 | 457 | 114 | 171 | 311 |
| Cladocera | *Holopedium gibberum* | CF | 257 | 14 | 57 | 110 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | - | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | *Eurycercus* | CF | 14 | 0 | 0 | 5 | 4,186 | 771 | 5,386 | 9,871 | 1,171 | 4,277 |
| Cladocera | *Ilyocryptus* | CF | 0 | 0 | 0 | 0 | 114 | 0 | 0 | 114 | 0 | 46 |
| Cladocera | | CF | 0 | 0 | 0 | 0 | 3,214 | 571 | 2,343 | 2,171 | 1,086 | 1,877 |
| Cladocera | *Polyphemus pediculus* | CF | 14 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | *Latona setifera* | CF | 14 | 0 | 0 | 5 | 0 | 0 | 57 | 0 | 114 | 34 |
| Amphipoda | *Gammarus lacustris* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amphipoda | *Hyalella azteca* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 3 |
| Ephemeroptera | *Baetisca* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Caenis* | CG | 0 | 0 | 0 | 0 | 557 | 686 | 143 | 0 | 400 | 357 |
| Ephemeroptera | *Ephemera* | CG | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 | 271 | 54 |
| Ephemeroptera | *Hexagenia limbata* | CG | 0 | 0 | 0 | 0 | 0 | 271 | 0 | 0 | 0 | 54 |
| Trichoptera | *Oxyethira* | CG | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Lepidostoma* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Mystacides* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 11 |
| Trichoptera | *Oecetis* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Molannodes / Molanna* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Agrypnia* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera | *Sialis* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Bezzia* | PRED | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 3 |
| Diptera | *Probezzia* | PRED | 0 | 0 | 0 | 0 | 29 | 29 | 14 | 0 | 43 | 23 |
| Diptera | *Chaoborus* | PRED | 371 | 343 | 257 | 324 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Chironomus* | CG | 171 | 100 | 371 | 214 | 43 | 0 | 271 | 729 | 0 | 209 |
| Diptera | *Cladopelma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 57 | 17 |
| Diptera | *Cryptochironomus* | PRED | 14 | 0 | 0 | 5 | 114 | 43 | 143 | 300 | 286 | 177 |
| Diptera | *Cryptotendipes* | CG | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 3 |
| Diptera | *Demicryptochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 14 | 11 |
| Diptera | *Dicrotendipes* | CG | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 3 |
| Diptera | *Endochironomus* | SHR | 0 | 0 | 0 | 0 | 29 | 57 | 0 | 0 | 271 | 71 |
| Diptera | *Microtendipes* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Nilothauma* | CG | 0 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 17 |
| Diptera | *Parachironomus* | PRED | 0 | 0 | 0 | 0 | 14 | 29 | 0 | 0 | 57 | 20 |
| Diptera | *Paracladopelma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 11 |
| Diptera | *Polypedilum* | SHR | 0 | 100 | 0 | 33 | 243 | 0 | 0 | 14 | 0 | 51 |
| Diptera | *Stenochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 3 |
| Diptera | *Stictochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 529 | 57 | 0 | 2,014 | 520 |
| Diptera | *Tribelos* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Pseudochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Ablabesmyia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 11 |
| Diptera | *Guttipelopia guttipennis* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Procladius* | PRED | 86 | 286 | 71 | 148 | 414 | 114 | 214 | 43 | 114 | 180 |
| Diptera | *Tanypus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Thienemannimyia* gr. | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Cladotanytarsus* | CF | 0 | 0 | 0 | 0 | 29 | 14 | 186 | 0 | 14 | 49 |
| Diptera | *Corynocera* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Neostempellina* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paratanytarsus* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Tanytarsus* | CF | 29 | 57 | 14 | 33 | 586 | 343 | 143 | 0 | 386 | 291 |
| Diptera | *Cricotopus/Orthocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Epoicocladius* | CG | 0 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 9 |
| Diptera | *Heterotanytarsus* | CG | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 0 | 6 |
| Diptera | *Heterotrissocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paracladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Psectrocladius* | CG | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 3 |
| Diptera | *Potthastia longimana* group | CG | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 86 | 29 |
| Diptera | *Monodiamesa* | CG | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 0 | 6 |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-11**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Feeding Groups Summary**

| Metric | Feeding Group | | LA-6 | | | | | | LA-7 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | #1 | #2 | #3 | #4 | #5 | Average | #1 | #2 | #3 | Average |
| **Density (individuals/m$^3$)** | | | 3,171 | 11,414 | 8,514 | 19,143 | 8,571 | 10,163 | 786 | 2,529 | 2,214 | 1,843 |
| **Taxa Richness** | | | 14 | 15 | 21 | 16 | 20 | 17 | 10 | 11 | 11 | 11 |
| **Simpson's Evenness** | | | 0.13 | 0.15 | 0.15 | 0.17 | 0.28 | 0.18 | 0.51 | 0.21 | 0.23 | 0.32 |
| **Simpson's Diversity** | | | 0.50 | 0.59 | 0.70 | 0.64 | 0.83 | 0.65 | 0.84 | 0.60 | 0.63 | 0.69 |
| **Bray-Curtis Dissimilarity** | | | 0.44 | 0.34 | 0.13 | 0.47 | 0.44 | 0.37 | 0.46 | 0.62 | 0.63 | 0.57 |
| **Feeding Group** | | | | | | | | | | | | |
| **Number of Individuals** | Collector-Filterer | CF | 2643 | 8471 | 7000 | 15014 | 4686 | 7563 | 100 | 86 | 114 | 100 |
| | Collector-Gatherer | CG | 357 | 2314 | 1114 | 3743 | 3314 | 2169 | 429 | 1786 | 1200 | 1138 |
| | Omnivore | OMN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | PRED | 157 | 400 | 386 | 386 | 514 | 369 | 129 | 300 | 200 | 210 |
| | Scraper | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | SHR | 14 | 229 | 14 | 0 | 57 | 63 | 129 | 357 | 700 | 395 |
| | Total | | 3171 | 11414 | 8514 | 19143 | 8571 | 10163 | 786 | 2529 | 2214 | 1843 |
| **Relative Abundance** | Collector-Filterer | CF | 83% | 74% | 82% | 78% | 55% | 75% | 13% | 3% | 5% | 7% |
| | Collector-Gatherer | CG | 11% | 20% | 13% | 20% | 39% | 21% | 55% | 71% | 54% | 60% |
| | Omnivore | OMN | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Predator | PRED | 5% | 4% | 5% | 2% | 6% | 4% | 16% | 12% | 9% | 12% |
| | Scraper | SCR | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Shredder | SHR | 0% | 2% | 0% | 0% | 1% | 1% | 16% | 14% | 32% | 21% |
| | Total | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **Major Taxon** | **Genus/Species/Feeding Group** | | | | | | | | | | | |
| Nematoda | | PRED | 43 | 0 | 57 | 114 | 0 | 43 | 0 | 0 | 0 | 0 |
| Microturbellaria | | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hirudinea | *Erpobdella punctata* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | | CG | 0 | 0 | 14 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| Oligochaeta | | CG | 0 | 0 | 171 | 343 | 0 | 103 | 0 | 0 | 0 | 0 |
| Gastropoda | (i/d) | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | *Gyraulus* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | *Valvata sincera* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | (i/d) | CG | 29 | 314 | 29 | 57 | 143 | 114 | 43 | 14 | 14 | 24 |
| Pelecypoda | *Pisidium* | CG | 0 | 43 | 86 | 86 | 86 | 60 | 0 | 14 | 0 | 5 |
| Acari - Hydrachnidia | (i/d) | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Arrenurus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Hygrobates* | PRED | 0 | 14 | 71 | 0 | 29 | 23 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Lebertia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Limnesia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 |
| Acari - Hydrachnidia | *Oxus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Piona* | PRED | 0 | 0 | 0 | 86 | 0 | 17 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Unionicola* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 14 | 10 |
| Ostracoda | | CG | 57 | 114 | 471 | 2,514 | 371 | 706 | 100 | 243 | 43 | 129 |
| Copepoda-Cyclopoida | | CF | 71 | 0 | 114 | 343 | 343 | 174 | 57 | 14 | 14 | 29 |
| Cladocera | *Holopedium gibberum* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | - | CF | 0 | 114 | 114 | 0 | 457 | 137 | 0 | 0 | 0 | 0 |
| Cladocera | *Eurycercus* | CF | 2,214 | 7,014 | 4,243 | 10,871 | 2,143 | 5,297 | 14 | 43 | 86 | 48 |
| Cladocera | *Ilyocryptus* | CF | 14 | 0 | 0 | 229 | 343 | 117 | 0 | 0 | 0 | 0 |
| Cladocera | | CF | 57 | 857 | 1,829 | 1,943 | 1,029 | 1,143 | 0 | 29 | 0 | 10 |
| Cladocera | *Polyphemus pediculus* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | *Latona setifera* | CF | 14 | 0 | 114 | 0 | 0 | 26 | 29 | 0 | 0 | 10 |
| Amphipoda | *Gammarus lacustris* | CG | 0 | 0 | 0 | 571 | 0 | 114 | 0 | 0 | 0 | 0 |
| Amphipoda | *Hyalella azteca* | CG | 0 | 0 | 0 | 0 | 14 | 3 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Baetisca* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Caenis* | CG | 0 | 100 | 143 | 157 | 2,443 | 569 | 0 | 0 | 14 | 5 |
| Ephemeroptera | *Ephemera* | CG | 0 | 14 | 43 | 14 | 0 | 14 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Hexagenia limbata* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Oxyethira* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Lepidostoma* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Mystacides* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Oecetis* | PRED | 0 | 0 | 0 | 0 | 14 | 3 | 0 | 0 | 0 | 0 |
| Trichoptera | *Molannodes / Molanna* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Agrypnia* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera | *Sialis* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Bezzia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Probezzia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Chaoborus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 29 | 14 |
| Diptera | *Chironomus* | CG | 257 | 1,729 | 57 | 0 | 86 | 426 | 243 | 1,514 | 1,129 | 962 |
| Diptera | *Cladopelma* | CG | 0 | 0 | 71 | 0 | 14 | 17 | 0 | 0 | 0 | 0 |
| Diptera | *Cryptochironomus* | PRED | 29 | 129 | 100 | 143 | 200 | 120 | 29 | 29 | 14 | 24 |
| Diptera | *Cryptotendipes* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Demicryptochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Dicrotendipes* | CG | 0 | 0 | 0 | 0 | 129 | 26 | 0 | 0 | 0 | 0 |
| Diptera | *Endochironomus* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Microtendipes* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Nilothauma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Parachironomus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paracladopelma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Polypedilum* | SHR | 14 | 229 | 14 | 0 | 57 | 63 | 129 | 357 | 700 | 395 |
| Diptera | *Stenochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Stictochironomus* | CG | 14 | 0 | 0 | 0 | 0 | 3 | 14 | 0 | 0 | 5 |
| Diptera | *Tribelos* | CG | 0 | 0 | 0 | 0 | 29 | 6 | 0 | 0 | 0 | 0 |
| Diptera | *Pseudochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Ablabesmyia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Guttipelopia guttipennis* | PRED | 0 | 57 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| Diptera | *Procladius* | PRED | 86 | 200 | 157 | 43 | 271 | 151 | 0 | 243 | 143 | 129 |
| Diptera | *Tanypus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Thienemannimyia* gr. | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 29 |
| Diptera | *Cladotanytarsus* | CF | 71 | 57 | 471 | 929 | 357 | 377 | 0 | 0 | 14 | 5 |
| Diptera | *Corynocera* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Neostempellina* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paratanytarsus* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Tanytarsus* | CF | 200 | 429 | 114 | 700 | 14 | 291 | 0 | 0 | 0 | 0 |
| Diptera | *Cricotopus/Orthocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Epoicocladius* | CG | 0 | 0 | 29 | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| Diptera | *Heterotanytarsus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Heterotrissocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paracladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 10 |
| Diptera | *Psectrocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Potthastia longimana* group | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Monodiamesa* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-11**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Feeding Groups Summary**

| Metric | Feeding Group | | LA-7A | | | | LA-8 | | | | LA-9 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | #1 | #2 | #3 | Average | #1 | #2 | #3 | Average | #1 | #2 | #3 | Average |
| **Density (individuals/m$^3$)** | | | 543 | 1,171 | 686 | 800 | 543 | 843 | 614 | 667 | 1,986 | 1,386 | 1,529 | 1,633 |
| **Taxa Richness** | | | 6 | 8 | 8 | 7.3 | 10 | 12 | 7 | 9.7 | 21 | 6 | 5 | 11 |
| **Simpson's Evenness** | | | 0.53 | 0.32 | 0.43 | 0.43 | 0.35 | 0.25 | 0.54 | 0.38 | 0.23 | 0.45 | 0.41 | 0.36 |
| **Simpson's Diversity** | | | 0.68 | 0.61 | 0.71 | 0.67 | 0.74 | 0.69 | 0.73 | 0.72 | 0.79 | 0.63 | 0.66 | 0.69 |
| **Bray-Curtis Dissimilarity** | | | 0.20 | 0.58 | 0.31 | 0.36 | 0.34 | 0.50 | 0.40 | 0.41 | 0.63 | 0.53 | 0.56 | 0.57 |
| **Feeding Group** | | | | | | | | | | | | | | |
| **Number of Individuals** | Collector-Filterer | CF | 0 | 257 | 57 | 105 | 29 | 43 | 0 | 24 | 329 | 57 | 29 | 138 |
| | Collector-Gatherer | CG | 129 | 757 | 71 | 319 | 43 | 114 | 129 | 95 | 429 | 371 | 657 | 486 |
| | Omnivore | OMN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | PRED | 300 | 129 | 271 | 233 | 329 | 229 | 229 | 262 | 1157 | 957 | 843 | 986 |
| | Scraper | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shredder | SHR | 114 | 29 | 286 | 143 | 143 | 457 | 257 | 286 | 71 | 0 | 0 | 24 |
| | Total | | 543 | 1171 | 686 | 800 | 543 | 843 | 614 | 667 | 1986 | 1386 | 1529 | 1633 |
| | | | | | | | | | | | | | | |
| **Relative Abundance** | Collector-Filterer | CF | 0% | 22% | 8% | 10% | 5% | 5% | 0% | 3% | 17% | 4% | 2% | 8% |
| | Collector-Gatherer | CG | 24% | 65% | 10% | 33% | 8% | 14% | 21% | 14% | 22% | 27% | 43% | 30% |
| | Omnivore | OMN | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Predator | PRED | 55% | 11% | 40% | 35% | 61% | 27% | 37% | 42% | 58% | 69% | 55% | 61% |
| | Scraper | SCR | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Shredder | SHR | 21% | 2% | 42% | 22% | 26% | 54% | 42% | 41% | 4% | 0% | 0% | 1% |
| | Total | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **Major Taxon** | **Genus/Species/Feeding Group** | | | | | | | | | | | | | |
| Nematoda | | PRED | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Microturbellaria | | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hirudinea | *Erpobdella punctata* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oligochaeta | | CG | 14 | 0 | 0 | 5 | 0 | 14 | 0 | 5 | 57 | 0 | 0 | 19 |
| Oligochaeta | | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | (i/d) | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | *Gyraulus* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | *Valvata sincera* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | (i/d) | CG | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 0 | 0 | 14 | 5 |
| Pelecypoda | *Pisidium* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 | 14 | 0 | 0 | 5 |
| Acari - Hydrachnidia | (i/d) | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Arrenurus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 10 |
| Acari - Hydrachnidia | *Hygrobates* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Lebertia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Limnesia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Oxus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 |
| Acari - Hydrachnidia | *Piona* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 19 |
| Acari - Hydrachnidia | *Unionicola* | PRED | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 | 14 | 0 | 0 | 5 |
| Ostracoda | | CG | 0 | 71 | 0 | 24 | 0 | 0 | 0 | 0 | 186 | 0 | 0 | 62 |
| Copepoda-Cyclopoida | | CF | 0 | 200 | 29 | 76 | 0 | 0 | 0 | 0 | 57 | 57 | 14 | 43 |
| Cladocera | *Holopedium gibberum* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | - | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | *Eurycercus* | CF | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 |
| Cladocera | *Ilyocryptus* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | | CF | 0 | 0 | 0 | 0 | 14 | 14 | 0 | 10 | 0 | 0 | 0 | 0 |
| Cladocera | *Polyphemus pediculus* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | *Latona setifera* | CF | 0 | 57 | 14 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amphipoda | *Gammarus lacustris* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amphipoda | *Hyalella azteca* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Baetisca* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Caenis* | CG | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 | 43 | 0 | 0 | 14 |
| Ephemeroptera | *Ephemera* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Hexagenia limbata* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 14 |
| Trichoptera | *Oxyethira* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Lepidostoma* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Mystacides* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Oecetis* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Molannodes / Molanna* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Agrypnia* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Megaloptera | *Sialis* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 |
| Diptera | *Bezzia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Probezzia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 10 |
| Diptera | *Chaoborus* | PRED | 14 | 14 | 14 | 14 | 43 | 71 | 86 | 67 | 114 | 729 | 586 | 476 |
| Diptera | *Chironomus* | CG | 114 | 686 | 71 | 290 | 14 | 71 | 114 | 67 | 57 | 343 | 643 | 348 |
| Diptera | *Cladopelma* | CG | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 0 | 14 | 0 | 5 |
| Diptera | *Cryptochironomus* | PRED | 29 | 0 | 43 | 24 | 29 | 29 | 14 | 24 | 43 | 0 | 0 | 14 |
| Diptera | *Cryptotendipes* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Demicryptochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Dicrotendipes* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Endochironomus* | SHR | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 |
| Diptera | *Microtendipes* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Nilothauma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Parachironomus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paracladopelma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Polypedilum* | SHR | 114 | 29 | 286 | 143 | 143 | 443 | 257 | 281 | 71 | 0 | 0 | 24 |
| Diptera | *Stenochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Stictochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 |
| Diptera | *Tribelos* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 |
| Diptera | *Pseudochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Ablabesmyia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Guttipelopia guttipennis* | PRED | 0 | 0 | 0 | 0 | 14 | 14 | 0 | 10 | 0 | 0 | 43 | 14 |
| Diptera | *Procladius* | PRED | 257 | 100 | 214 | 190 | 229 | 114 | 114 | 152 | 843 | 229 | 214 | 429 |
| Diptera | *Tanypus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Thienemannimyia* gr. | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Cladotanytarsus* | CF | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 57 | 0 | 0 | 19 |
| Diptera | *Corynocera* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Neostempellina* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paratanytarsus* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Tanytarsus* | CF | 0 | 0 | 14 | 5 | 14 | 0 | 0 | 5 | 214 | 0 | 14 | 76 |
| Diptera | *Cricotopus/Orthocladius* | CG | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| Diptera | *Epoicocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Heterotanytarsus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Heterotrissocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Paracladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Psectrocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Potthastia longimana* group | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 |
| Diptera | *Monodiamesa* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-11**
**Baseline Benthic Invertebrate Community Collected in September 2016**
**Feeding Groups Summary**

| Metric | Feeding Group | | LB-3 | | | | LAB-1 | | | | LAB-2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | #1 | #2 | #3 | Average | #1 | #2 | #3 | Average | #1 | #2 | #3 | Average |
| **Density (individuals/m$^3$)** | | | 3,029 | 25,114 | 3,229 | 10,457 | 5,286 | 2,471 | 2,757 | 3,505 | 2,729 | 2,600 | 10,557 | 5,295 |
| **Taxa Richness** | | | 14 | 18 | 13 | 15 | 24 | 19 | 15 | 19 | 27 | 20 | 25 | 24 |
| **Simpson's Evenness** | | | 0.31 | 0.09 | 0.35 | 0.25 | 0.28 | 0.33 | 0.40 | 0.34 | 0.29 | 0.31 | 0.14 | 0.25 |
| **Simpson's Diversity** | | | 0.79 | 0.45 | 0.79 | 0.68 | 0.86 | 0.85 | 0.84 | 0.85 | 0.88 | 0.85 | 0.75 | 0.82 |
| **Bray-Curtis Dissimilarity** | | | 0.64 | 0.95 | 0.69 | 0.76 | 0.85 | 0.63 | 0.64 | 0.71 | 0.77 | 0.91 | 0.93 | 0.87 |
| | **Feeding Group** | | | | | | | | | | | | | |
| **Number of Individuals** | Collector-Filterer | CF | 171 | 20714 | 171 | 7019 | 2514 | 371 | 500 | 1129 | 557 | 329 | 5843 | 2243 |
| | Collector-Gatherer | CG | 843 | 2043 | 2100 | 1662 | 1857 | 1643 | 1757 | 1752 | 1686 | 2029 | 3786 | 2500 |
| | Omnivore | OMN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Predator | PRED | 1786 | 2100 | 914 | 1600 | 414 | 414 | 300 | 376 | 414 | 243 | 900 | 519 |
| | Scraper | SCR | 14 | 0 | 0 | 5 | 14 | 0 | 0 | 5 | 29 | 0 | 14 | 14 |
| | Shredder | SHR | 214 | 257 | 43 | 171 | 486 | 43 | 200 | 243 | 43 | 0 | 14 | 19 |
| | Total | | 3029 | 25114 | 3229 | 10457 | 5286 | 2471 | 2757 | 3505 | 2729 | 2600 | 10557 | 5295 |
| | | | | | | | | | | | | | | |
| **Relative Abundance** | Collector-Filterer | CF | 6% | 82% | 5% | 31% | 48% | 15% | 18% | 27% | 20% | 13% | 55% | 29% |
| | Collector-Gatherer | CG | 28% | 8% | 65% | 34% | 35% | 66% | 64% | 55% | 62% | 78% | 36% | 59% |
| | Omnivore | OMN | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Predator | PRED | 59% | 8% | 28% | 32% | 8% | 17% | 11% | 12% | 15% | 9% | 9% | 11% |
| | Scraper | SCR | 0.47% | 0% | 0% | 0% | 0.27% | 0% | 0% | 0% | 1.05% | 0% | 0.14% | 0% |
| | Shredder | SHR | 7% | 1% | 1% | 3% | 9% | 2% | 7% | 6% | 2% | 0% | 0% | 1% |
| | Total | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **Major Taxon** | **Genus/Species/Feeding Group** | | | | | | | | | | | | | |
| Nematoda | | PRED | 0 | 0 | 0 | 0 | 129 | 43 | 0 | 57 | 100 | 29 | 129 | 86 |
| Microturbellaria | | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 | 0 | 0 | 0 | 0 |
| Hirudinea | *Erpobdella punctata* | PRED | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| Oligochaeta | | CG | 357 | 129 | 1,100 | 529 | 200 | 643 | 586 | 476 | 71 | 71 | 14 | 52 |
| Oligochaeta | | CG | 43 | 0 | 0 | 14 | 286 | 43 | 0 | 110 | 0 | 0 | 0 | 0 |
| Gastropoda | (i/d) | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 |
| Gastropoda | *Gyraulus* | SCR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gastropoda | *Valvata sincera* | SCR | 14 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pelecypoda | (i/d) | CG | 86 | 729 | 171 | 329 | 486 | 300 | 200 | 329 | 186 | 457 | 571 | 405 |
| Pelecypoda | *Pisidium* | CG | 29 | 243 | 171 | 148 | 186 | 86 | 57 | 110 | 71 | 86 | 200 | 119 |
| Acari - Hydrachnidia | (i/d) | PRED | 0 | 114 | 0 | 38 | 14 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Arrenurus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Hygrobates* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 57 | 0 | 29 |
| Acari - Hydrachnidia | *Lebertia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Limnesia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Oxus* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acari - Hydrachnidia | *Piona* | PRED | 0 | 114 | 0 | 38 | 14 | 14 | 14 | 14 | 14 | 0 | 14 | 10 |
| Acari - Hydrachnidia | *Unionicola* | PRED | 0 | 0 | 14 | 5 | 14 | 29 | 14 | 19 | 0 | 14 | 0 | 5 |
| Ostracoda | | CG | 14 | 114 | 0 | 43 | 57 | 14 | 14 | 29 | 14 | 0 | 0 | 5 |
| Copepoda-Cyclopoida | | CF | 114 | 0 | 57 | 57 | 29 | 157 | 200 | 129 | 43 | 0 | 57 | 33 |
| Cladocera | *Holopedium gibberum* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | - | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | *Eurycercus* | CF | 0 | 114 | 0 | 38 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 14 |
| Cladocera | *Ilyocryptus* | CF | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 |
| Cladocera | | CF | 0 | 114 | 0 | 38 | 29 | 0 | 0 | 10 | 57 | 0 | 0 | 19 |
| Cladocera | *Polyphemus pediculus* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cladocera | *Latona setifera* | CF | 29 | 0 | 0 | 10 | 0 | 14 | 0 | 5 | 29 | 0 | 0 | 10 |
| Amphipoda | *Gammarus lacustris* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amphipoda | *Hyalella azteca* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ephemeroptera | *Baetisca* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 |
| Ephemeroptera | *Caenis* | CG | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 |
| Ephemeroptera | *Ephemera* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 414 | 171 |
| Ephemeroptera | *Hexagenia limbata* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 |
| Trichoptera | *Oxyethira* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trichoptera | *Lepidostoma* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 |
| Trichoptera | *Mystacides* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 71 | 24 |
| Trichoptera | *Oecetis* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 29 | 0 | 19 |
| Trichoptera | *Molannodes / Molanna* | SCR | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 | 29 | 0 | 0 | 10 |
| Trichoptera | *Agrypnia* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 |
| Megaloptera | *Sialis* | PRED | 0 | 0 | 14 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Bezzia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Probezzia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 10 |
| Diptera | *Chaoborus* | PRED | 1,143 | 200 | 200 | 514 | 0 | 0 | 14 | 5 | 0 | 0 | 0 | 0 |
| Diptera | *Chironomus* | CG | 229 | 243 | 657 | 376 | 43 | 500 | 771 | 438 | 100 | 14 | 29 | 48 |
| Diptera | *Cladopelma* | CG | 86 | 129 | 0 | 71 | 457 | 43 | 129 | 210 | 0 | 0 | 0 | 0 |
| Diptera | *Cryptochironomus* | PRED | 0 | 43 | 29 | 24 | 29 | 14 | 71 | 38 | 86 | 71 | 100 | 86 |
| Diptera | *Cryptotendipes* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Demicryptochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Dicrotendipes* | CG | 0 | 429 | 0 | 143 | 114 | 0 | 0 | 38 | 700 | 757 | 1,800 | 1086 |
| Diptera | *Endochironomus* | SHR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Microtendipes* | CF | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 33 | 0 | 0 | 0 | 0 |
| Diptera | *Nilothauma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 |
| Diptera | *Parachironomus* | PRED | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| Diptera | *Paracladopelma* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 5 |
| Diptera | *Polypedilum* | SHR | 214 | 257 | 43 | 171 | 486 | 43 | 200 | 243 | 14 | 0 | 14 | 10 |
| Diptera | *Stenochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Stictochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 5 | 471 | 329 | 343 | 381 |
| Diptera | *Tribelos* | CG | 0 | 14 | 0 | 5 | 14 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| Diptera | *Pseudochironomus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 71 | 157 | 81 |
| Diptera | *Ablabesmyia* | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 |
| Diptera | *Guttipelopia guttipennis* | PRED | 29 | 0 | 0 | 10 | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 |
| Diptera | *Procladius* | PRED | 614 | 1,629 | 629 | 957 | 171 | 300 | 171 | 214 | 143 | 43 | 629 | 271 |
| Diptera | *Tanypus* | PRED | 0 | 0 | 29 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Thienemannimyia* gr. | PRED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Cladotanytarsus* | CF | 0 | 114 | 0 | 38 | 829 | 14 | 43 | 295 | 57 | 14 | 700 | 257 |
| Diptera | *Corynocera* | CF | 0 | 18,371 | 43 | 6,138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Neostempellina* | CF | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 57 | 24 |
| Diptera | *Paratanytarsus* | CF | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 | 0 | 0 | 229 | 76 |
| Diptera | *Tanytarsus* | CF | 29 | 2,000 | 71 | 700 | 1,514 | 171 | 257 | 648 | 329 | 300 | 4,800 | 1810 |
| Diptera | *Cricotopus/Orthocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 19 |
| Diptera | *Epoicocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Heterotanytarsus* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 19 |
| Diptera | *Heterotrissocladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 57 | 0 | 24 |
| Diptera | *Paracladius* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diptera | *Psectrocladius* | CG | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 5 | 29 | 29 | 0 | 19 |
| Diptera | *Potthastia longimana* group | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 43 | 14 | 24 |
| Diptera | *Monodiamesa* | CG | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note:
Samples were collected between September 10 and 21, 2016

**Table A-12**
**Baseline Benthic Invertebrate Chemistry Collected September 2016**

| Parameters | | | Moisture | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | | % | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g |
| Baseline Bentic Invertebrate Chemistry Characteristics | | Count | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| | | # Less than RDL | 0 | 0 | 9 | 0 | 0 | 4 | 1 | 0 | 8 | 0 | 0 | 0 | 0 |
| | | Min | 82 | 39 | 0.1 | 0.43 | 4.7 | 0.01 | 1 | 0.1 | 0.5 | 0.12 | 5.3 | 390 | 0.05 |
| | | Mean | 87 | 128 | 0.1 | 1.2 | 90 | 0.013 | 3.1 | 0.17 | 0.51 | 0.97 | 8.5 | 1089 | 0.17 |
| | | Max | 91 | 250 | 0.1 | 2.6 | 167 | 0.03 | 7 | 0.25 | 0.6 | 3.7 | 15 | 1800 | 0.34 |
| | | Geomean | 87 | 110 | 0.1 | 1.0 | 53 | 0.012 | 2.4 | 0.17 | 0.51 | 0.54 | 8.0 | 939 | 0.14 |
| | | SD | 2.8 | 71 | 1.5E-17 | 0.68 | 62 | 0.0071 | 2.2 | 0.048 | 0.033 | 1.2 | 3.5 | 556 | 0.11 |
| **Location** | **Benthic Invertebrate** | **Sample Date** | | | | | | | | | | | | | |
| LA-1 | Caddisfly | 18-Sep-19 | 91 | 93 | <0.1 | 1.8 | 142 | 0.01 | 4.0 | 0.19 | <0.5 | 0.99 | 7.1 | 1300 | 0.17 |
| LA-5 | Caddisfly | 19-Sep-16 | 87 | 120 | <0.1 | 1.5 | 85 | <0.01 | 1.0 | 0.18 | 0.6 | 0.48 | 6.3 | 1000 | 0.34 |
| LA-6 | Caddisfly | 18-Sep-16 | 87 | 140 | <0.1 | 2.6 | 167 | 0.02 | 3.0 | 0.25 | <0.5 | 0.68 | 5.3 | 1800 | 0.33 |
| LA-7 | Caddisfly | 20-Sep-16 | 87 | 78 | <0.1 | 0.74 | 49 | <0.01 | 2.0 | 0.13 | <0.5 | 0.16 | 6.9 | 410 | 0.08 |
| LA-7A | Caddisfly | 20-Sep-16 | 89 | 150 | <0.1 | 1.2 | 80 | 0.01 | 3.0 | 0.22 | <0.5 | 0.44 | 8.5 | 1200 | 0.2 |
| LA-8 | Dragonfly | 18-Sep-16 | 84 | 39 | <0.1 | 0.43 | 4.7 | <0.01 | <1 | 0.13 | <0.5 | 0.12 | 15 | 390 | 0.05 |
| LA-9 | Dragonfly | 18-Sep-16 | 82 | 62 | <0.1 | 0.68 | 4.8 | <0.01 | 1.0 | 0.1 | <0.5 | 0.18 | 14 | 500 | 0.06 |
| LAB-1 | Caddisfly | 19-Sep-16 | 89 | 250 | <0.1 | 0.9 | 111 | 0.03 | 6.0 | 0.16 | <0.5 | 2.0 | 6.8 | 1800 | 0.16 |
| LAB-2 | Caddisfly | 21-Sep-16 | 89 | 220 | <0.1 | 0.81 | 164 | 0.01 | 7.0 | 0.2 | <0.5 | 3.7 | 6.6 | 1400 | 0.13 |

Notes:
Results are for one sample per lake assessed
Samples were collected between September 18 and 21, 2016
Results are on a dry weight basis

**Table A-12**
**Baseline Benthic Invertebrate Chemistry Collected September 2016**

| Parameters | | | Manganese | Molybdenum | Nickel | Selenium | Silver | Strontium | Thallium | Tin | Titanium | Uranium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g | µg/g |
| Baseline Bentic Invertebrate Chemistry Characteristics | | Count | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| | | # Less than RDL | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 9 | 0 | 0 | 0 | 0 |
| | | Min | 57 | 0.1 | 0.17 | 0.36 | 0.02 | 3.6 | 0.05 | 0.05 | 1 | 0.012 | 0.1 | 91 |
| | | Mean | 884 | 0.53 | 1.24 | 0.60 | 0.054444 | 10 | 0.05 | 0.05 | 4.0 | 0.069 | 0.4 | 138 |
| | | Max | 1900 | 1.2 | 2.7 | 1 | 0.12 | 20 | 0.05 | 0.05 | 9.1 | 0.16 | 0.7 | 190 |
| | | Geomean | 481 | 0.44 | 0.77 | 0.56 | 0.044702 | 9.2 | 0.05 | 0.05 | 3.3 | 0.051 | 0.34 | 134 |
| | | SD | 774 | 0.32 | 1.1 | 0.22 | 0.037118 | 4.8 | 7.35981E-18 | 7.36E-18 | 2.6 | 0.048 | 0.21 | 33 |
| **Location** | **Benthic Invertebrate** | **Sample Date** | | | | | | | | | | | | |
| LA-1 | Caddisfly | 18-Sep-19 | 1900 | 0.5 | 2.7 | 0.53 | 0.02 | 10 | <0.05 | <0.05 | 2.6 | 0.081 | 0.4 | 150 |
| LA-5 | Caddisfly | 19-Sep-16 | 790 | 0.4 | 0.75 | 0.50 | 0.06 | 11 | <0.05 | <0.05 | 3.0 | 0.062 | 0.4 | 150 |
| LA-6 | Caddisfly | 18-Sep-16 | 1030 | 0.6 | 1.3 | 0.52 | 0.03 | 10 | <0.05 | <0.05 | 4.1 | 0.087 | 0.4 | 110 |
| LA-7 | Caddisfly | 20-Sep-16 | 146 | 0.5 | 0.19 | 0.50 | 0.05 | 7.5 | <0.05 | <0.05 | 3.0 | 0.023 | 0.2 | 150 |
| LA-7A | Caddisfly | 20-Sep-16 | 385 | 0.6 | 0.85 | 0.67 | 0.05 | 11 | <0.05 | <0.05 | 9.1 | 0.08 | 0.5 | 160 |
| LA-8 | Dragonfly | 18-Sep-16 | 88 | 0.1 | 0.17 | 0.91 | 0.12 | 3.6 | <0.05 | <0.05 | 1.0 | 0.012 | 0.1 | 91 |
| LA-9 | Dragonfly | 18-Sep-16 | 57 | 0.2 | 0.2 | 1.0 | 0.11 | 5.3 | <0.05 | <0.05 | 1.4 | 0.014 | 0.2 | 92 |
| LAB-1 | Caddisfly | 19-Sep-16 | 1850 | 1.2 | 2.3 | 0.37 | 0.02 | 14 | <0.05 | <0.05 | 5.6 | 0.099 | 0.7 | 150 |
| LAB-2 | Caddisfly | 21-Sep-16 | 1710 | 0.7 | 2.7 | 0.36 | 0.03 | 20 | <0.05 | <0.05 | 6.4 | 0.16 | 0.7 | 190 |

Notes:
Results are for one sample per lake assessed
Samples were collected between September 18 and 21, 2016
Results are on a dry weight basis

**Table A-12**
**Baseline Benthic Invertebrate Chemistry Collected September 2016**

| Parameters | | | Lead-210 | Polonium-210 | Radium-226 | Thorium-228 | Thorium-230 | Thorium-232 |
|---|---|---|---|---|---|---|---|---|
| Unit | | | Bq/g | Bq/g | Bq/g | Bq/g | Bq/g | Bq/g |
| Baseline Bentic Invertebrate Chemistry Characteristics | | Count | 9 | 9 | 9 | 9 | 9 | 9 |
| | | # Less than RDL | 8 | 0 | 3 | 9 | 9 | 9 |
| | | Min | 0.02 | 0.03 | 0.005 | 0.009 | 0.009 | 0.009 |
| | | Mean | 0.036 | 0.073 | 0.013 | 0.018 | 0.018 | 0.018 |
| | | Max | 0.06 | 0.12 | 0.02 | 0.03 | 0.03 | 0.03 |
| | | Geomean | 0.033 | 0.069 | 0.012 | 0.016 | 0.016 | 0.016 |
| | | SD | 0.014 | 0.027 | 0.0058 | 0.0068 | 0.0068 | 0.0068 |
| **Location** | **Benthic Invertebrate** | **Sample Date** | | | | | | |
| LA-1 | Caddisfly | 18-Sep-19 | <0.05 | 0.06 | 0.02 | <0.02 | <0.02 | <0.02 |
| LA-5 | Caddisfly | 19-Sep-16 | <0.04 | 0.09 | 0.01 | <0.02 | <0.02 | <0.02 |
| LA-6 | Caddisfly | 18-Sep-16 | <0.02 | 0.061 | 0.015 | <0.009 | <0.009 | <0.009 |
| LA-7 | Caddisfly | 20-Sep-16 | <0.04 | 0.08 | <0.01 | <0.02 | <0.02 | <0.02 |
| LA-7A | Caddisfly | 20-Sep-16 | <0.06 | 0.12 | <0.01 | <0.03 | <0.03 | <0.03 |
| LA-8 | Dragonfly | 18-Sep-16 | <0.02 | 0.06 | <0.005 | <0.01 | <0.01 | <0.01 |
| LA-9 | Dragonfly | 18-Sep-16 | <0.02 | 0.1 | 0.008 | <0.01 | <0.01 | <0.01 |
| LAB-1 | Caddisfly | 19-Sep-16 | 0.03 | 0.06 | 0.02 | <0.02 | <0.02 | <0.02 |
| LAB-2 | Caddisfly | 21-Sep-16 | <0.04 | 0.03 | 0.02 | <0.02 | <0.02 | <0.02 |

Notes:
Results are for one sample per lake assessed
Samples were collected between September 18 and 21, 2016
Results are on a dry weight basis

## Table A-13
## Baseline Fish Catch Summary

| Watershed | Waterbody | Station | Date | Reported by | Method | Sets | Effort[1] | Lake Chub | Spottail Shiner | Longnose Sucker | White Sucker | Lake Whitefish | Lake Trout | Arctic Grayling | Northern Pike | Burbot | Ninespine Stickleback | Slimy Sculpin | Yellow Perch | Walleye |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake Stations** | | | | | | | | | | | | | | | | | | | | |
| Icelander River | LA-1 | LA-1 | 12-Aug-12 | Golder | Visual | - | - | - | - | - | x | - | - | - | - | - | - | - | - | - |
| | | | 14-Sep-16 | EcoMetrix | Minnow Trap | 8 | 48 | - | - | - | - | | - | - | - | - | - | - | - | - |
| | | | 17-Sep-16 | EcoMetrix | Gillnet | 2 | 19 | - | 4 | - | 2 | 11 | - | - | 4 | - | - | - | 2 | 14 |
| | | | 18-Sep-16 | EcoMetrix | Gillnet | 2 | 44 | - | 11 | 2 | 5 | 17 | 1 | - | 5 | - | - | - | 2 | 21 |
| | | | 18-Sep-16 | EcoMetrix | Seine | 1 | - | - | - | - | - | | - | - | 3 | - | - | - | - | - |
| | | | 19-Sep-16 | EcoMetrix | Gillnet | 4 | 18.5 | - | - | - | 4 | 6 | - | - | 4 | - | - | - | - | 13 |
| | | | 20-Sep-16 | EcoMetrix | Gillnet | 3 | 8 | - | - | 1 | 3 | 1 | - | - | 3 | - | - | - | - | 6 |
| | | | 27-May-17 | EcoMetrix | Angling | - | 4.5 | - | - | - | - | - | - | - | 5 | - | - | - | - | - |
| | | | 27-May-17 | EcoMetrix | Gillnet | 1 | 4 | - | - | - | 9 | 1 | - | - | 2 | - | - | - | - | 1 |
| | LA-5 | LA-5 | 13-Aug-12 | Golder | Visual | - | - | - | - | - | x | - | - | - | x | - | - | - | - | - |
| | | | 10-Sep-16 | EcoMetrix | Gillnet | 1 | 8 | - | 4 | - | 2 | 1 | - | - | 7 | - | - | - | - | - |
| | | | 11-Sep-16 | EcoMetrix | Gillnet | 1 | 9.5 | - | - | - | 9 | 1 | - | - | 4 | - | - | - | - | - |
| | | | 11-Sep-16 | EcoMetrix | Minnow Trap | 8 | 80 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 13-Sep-16 | EcoMetrix | Seine | 1 | - | - | 13 | - | 1 | - | - | - | - | - | 2 | - | - | - |
| | | | 30-May-17 | EcoMetrix | Angling | - | 4.5 | - | - | - | - | - | - | - | 2 | - | - | - | - | 2 |
| | | | 30-May-17 | EcoMetrix | Gillnet | 1 | 3 | - | - | - | 6 | 1 | - | - | 3 | - | - | - | - | 9 |
| | LA-6 | LA-6 | 13-Aug-12 | Golder | Visual | - | - | - | - | - | - | - | - | - | x | - | - | - | - | - |
| | | | 16-Sep-16 | EcoMetrix | Gillnet | 1 | 20 | - | 6 | - | 12 | 1 | - | - | 8 | - | - | - | - | 1 |
| | | | 16-Sep-16 | EcoMetrix | Minnow Trap | 8 | 416 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 29-May-17 | EcoMetrix | Gillnet | 1 | - | - | - | - | 20 | - | - | - | - | - | - | - | - | - |
| | | | 29-May-17 | EcoMetrix | Angling | - | 1.75 | - | - | - | - | - | - | - | 9 | - | - | - | - | - |
| | | | 30-May-17 | EcoMetrix | Angling | - | 4 | - | - | - | - | - | - | - | 9 | - | - | - | - | 2 |
| | Kratchkowsky Lake | LA-7/7A | 12-Sep-16 | EcoMetrix | Minnow Trap | 3 | 24 | - | - | - | - | | - | - | - | - | - | - | - | - |
| | | | 19-Sep-16 | EcoMetrix | Gillnet | 2 | 15.5 | - | 9 | - | 13 | 14 | - | - | 5 | - | - | - | - | 4 |
| | | | 20-Sep-16 | EcoMetrix | Gillnet | 1 | 23 | - | 9 | - | 22 | 18 | - | - | 8 | - | x | - | - | 4 |
| | | | 31-May-17 | EcoMetrix | Angling | - | 9 | - | - | - | - | | - | - | 10 | - | - | - | - | 3 |
| | | | 31-May-17 | EcoMetrix | Gillnet | 4 | 11 | - | - | - | 25 | 2 | - | - | 19 | - | - | - | - | 6 |
| | LA-8 | LA-8 | 16-Sep-16 | EcoMetrix | Gillnet | 3 | 17 | - | - | - | 3 | 17 | - | - | 9 | - | 1 | - | x | - |
| | LA-9 | LA-9 | 17-Sep-16 | EcoMetrix | Gillnet | 1 | 3 | - | 9 | - | 4 | 10 | - | - | 2 | - | - | - | 4 | 3 |
| | | | 18-Sep-16 | EcoMetrix | Dipnet | - | - | - | - | - | - | | - | - | - | - | 13 | - | - | - |
| | Pond-2 | PA-2 | 19-Sep-16 | EcoMetrix | Gillnet | 1 | 4 | - | - | - | 1 | 17 | | - | 3 | - | - | - | - | - |
| | Pond-3 | PA-3 | 20-Sep-16 | EcoMetrix | Gillnet | 1 | 3 | no fish collected | | | | | | | | | | | | |
| Williams Lake | Williams Lake | LB-3 | 8-Aug-12 | Golder | Visual | - | - | x | x | - | - | - | - | - | x | - | - | - | x | - |
| | | | 30-May-17 | EcoMetrix | Angling | - | - | - | - | - | - | - | - | - | x | - | - | - | - | x |
| | Russell Lake | LAB-1 | 8-Nov-12 | Golder | Visual | - | - | - | - | - | - | - | - | - | x | - | x | - | - | - |
| | | | 20-Sep-16 | EcoMetrix | Gillnet | 1 | 9 | - | 2 | - | - | 5 | - | - | 1 | - | x | - | - | 2 |
| | | | 21-Sep-16 | EcoMetrix | Gillnet | 1 | 2 | - | - | - | 4 | | 1 | - | 2 | - | - | - | - | 2 |
| | | | 28-May-17 | EcoMetrix | Gillnet | 2 | 4 | - | - | - | - | 4 | 1 | - | 1 | - | - | - | - | - |
| | | | 1-Jun-17 | EcoMetrix | Gillnet | 2 | 3.5 | - | - | - | - | 10 | - | - | 9 | - | - | - | - | - |
| | | LAB-2 | 20-Sep-16 | EcoMetrix | Gillnet | 1 | 4 | - | - | - | - | 2 | - | - | - | - | - | - | - | 4 |
| | | | 21-Sep-16 | EcoMetrix | Gillnet | 1 | 29.5 | - | - | - | 7 | 8 | 2 | - | 2 | x | x | - | - | 28 |

**Stream Stations**

| Watershed | Waterbody | Station | Date | Reported by | Method | Sets | Effort[1] | Lake Chub | Spottail Shiner | Longnose Sucker | White Sucker | Lake Whitefish | Lake Trout | Arctic Grayling | Northern Pike | Burbot | Ninespine Stickleback | Slimy Sculpin | Yellow Perch | Walleye |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Icelander River | SA-1 | SA-1 | 17-Sep-16 | EcoMetrix | Electrofishing | - | 1144 | 10 | - | 4 | 1 | | | x | - | 23 | - | 4 | - | - |
| | | | 28-May-17 | EcoMetrix | Angling | - | 2 | - | - | - | - | 1 | - | - | 10 | - | - | - | - | - |
| | | | 28-May-17 | EcoMetrix | Gillnet | 1 | n/a | - | - | 12 | - | - | - | - | x | - | - | - | - | - |
| | SA-2 | SA-2 | 16-Sep-16 | EcoMetrix | Electrofishing | | 1271 | 13 | - | - | 2 | | | 2 | 3 | 7 | - | 70 | - | - |
| | | | 27-May-17 | EcoMetrix | Gillnet | 2 | n/a | - | - | - | 18 | - | - | - | - | - | - | - | - | x |
| | SA-4 | SA-4 | 10-Sep-16 | EcoMetrix | Electrofishing | - | 1749 | 5 | - | 1 | 21 | - | - | 2 | 1 | 9 | 23 | 19 | - | - |
| | | | 26-May-17 | EcoMetrix | Electrofishing | - | 758 | x | x | - | 16 | - | - | - | x | - | - | x | - | - |
| | | | 1-Jun-17 | EcoMetrix | Visual | - | - | x | - | - | - | - | - | - | - | - | - | - | - | - |
| | SA-5 | SA-5 | 9-Sep-16 | EcoMetrix | Electrofishing | - | 2314 | 6 | - | - | 4 | - | - | - | - | 26 | 1 | 17 | - | x |
| | | | 29-May-17 | EcoMetrix | Gillnet | 1 | n/a | - | - | 1 | 18 | - | - | - | - | - | - | - | - | x |
| | | | 1-Jun-17 | EcoMetrix | Visual | - | - | x | - | - | x | - | - | - | - | - | - | - | - | - |
| | SA-6 | SA-6 | 12-Sep-16 | EcoMetrix | Electrofishing | - | 1531 | - | 15 | 1 | - | - | - | - | - | 6 | 2 | - | - | - |
| | | | 29-May-17 | EcoMetrix | Gillnet | 1 | n/a | - | - | - | 3 | - | - | - | 5 | - | - | - | - | 1 |
| | | | 30-May-17 | EcoMetrix | Visual | - | - | - | - | - | 2 | - | - | - | 6 | - | - | - | - | - |
| | RC-1 | RC-1 | 14-Sep-16 | EcoMetrix | Electrofishing | - | 1719 | 60 | - | - | 21 | - | - | - | 1 | 16 | - | 1 | 2 | - |
| | | | 29-May-17 | EcoMetrix | Electrofishing | - | 675 | 33 | - | - | 14 | - | - | - | 1 | 5 | - | - | - | - |
| Williams Lake | SB-1 | SB-1 | 17-Sep-16 | EcoMetrix | Electrofishing | - | 752 | - | - | - | - | | | - | - | 8 | - | - | - | - |

Notes
[1] - Electrofishing (seconds), Gillnetting (hours), Minnow Trapping (hours), Angling (angler/hrs),
n/a - not applicable (gillnet used like a seine to capture fish observed)
x - species observed but not collected

**Table A-14**
**Key Baseline Lake Features**

| Site | LA-1 | | LA-5 | | LA-6 | | LA-7A | LA-7 | PA-2 | PA-3 | LA-8 | LA-9 | LB-3 | LAB-1* | | LAB-2* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Key Features** | | | | | | | | | | | | | | | | |
| Survey Date(s) | 12-Aug-12 | 14-Sep-16 | 13-Aug-12 | 11-Sep-16 | 13-Aug-12 | 13-Sep-16 | 11-Sep-16 | 9-Aug-12 | 19-Sep-16 | 20-Sep-16 | 15-Sep-16 | 17-Sep-16 | 8-Aug-12 | 12-Aug-12 | 15-Sep-16 | 20-Sep-16 |
| Surface Area ($m^2$) | 1,485,480 | - | 324,049 | - | 262,740 | - | 2,433,413 | 795,937 | 84,323 | 44,869 | 2,082,140 | 1,379,406 | 1,522,984 | 751,485 | - | 1,516,617 |
| Volume ($m^3$) | 8,189,320 | - | 332,502 | - | 413,505 | - | 12,712,684 | - | 122,617 | 38,845 | 7,467,381 | 6,410,916 | 6,933,788 | - | - | 6,079,370 |
| Lake Elevation | 494.37 | 494.39 | 500.04 | 500.06 | 500.06 | 500.07 | 520.53 | 520.48 | 510.46 | 517.36 | 520.86 | 514.25 | 518.52 | 488.17 | 488.26 | 488.26 |
| Maximum Depth (m) | 9.67 | - | 4.07 | - | 2.71 | - | 21.8 | 6.78 | 3.2 | 2.7 | 10.2 | 11.2 | 17.82 | 18.78 | - | 20.6 |
| Mean Depth (m) | 5.5 | - | 1.1 | - | 1.6 | - | 5.2 | 2.9 | 1.5 | 0.9 | 3.6 | 4.6 | 4.6 | 3.0 | - | 4.0 |
| Secchi Depth (m) | 1.5 | 2.1 | 2.2 | 1.8 | 2 | 1.75 | 2.2 | 1.75 | bottom | 1.6 | 1.6 | 1.5 | 3.5 | 3.5 | 3.1 | 2.9 |
| **Fish Species Observed** | | | | | | | | | | | | | | | | |
| Lake Chub | | | | | | | | | | | | | x | | | |
| Spottail Shiner | | x | | x | | x | x | | | | | x | x | | x | |
| Longnose Sucker | | x | | | | | | | | | | | | | | |
| White Sucker | x | x | x | x | | x | x | | x | | x | x | | | x | x |
| Lake Whitefish | | x | | x | | x | x | | x | | x | x | | | x | x |
| Lake Trout | | x | | | | | | | | | | | | | x | x |
| Northern Pike | | x | x | x | x | x | x | | x | | x | x | x | x | x | x |
| Burbot | | | | | | | | | | | | | | | | x |
| Ninespine Stickleback | | | | x | | | x | | | | x | x | | x | x | x |
| Yellow Perch | | x | | | | | | | | | x | x | x | | | |
| Walleye | | x | | x | | x | x | | | | | x | | | | x |
| **Aquatic Plants Observed** | | | | | | | | | | | | | | | | |
| Submergent | | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Emergent | x | x | x | x | x | x | | x | x | x | x | x | x | x | x | x |
| Floating | | | | | | | x | | x | x | x | x | | | | x |

Note
* indicates for the assessed portion of the lake

**Table A-15**
**Baseline Stream Spawning Habitat**

| | | | SA-1 | SA-2 | SA-4 | SA-5 | SA-6 | RC-1 | SB-1 |
|---|---|---|---|---|---|---|---|---|---|
| **Station Characteristics** | Location | | u/s of Russel Lake; d/s of McArthur River Mine Road | u/s of Lake LA-1 | u/s and d/s of Fox Lake Tote Road | u/s and d/s of Fox Lake Tote Road | d/s of Lake LA-6; u/s of Lake LA-5 | d/s of Kratchkowsky Lake | u/s of Russel Lake |
| | Coordinates | Latitude | 57 28.918 | 57 30.070 | 57 31.456 | 57 31.442 | 57 30.883 | 57 31.545 | 57 26.347 |
| | | Longitude | -105 19.647 | -105 21.476 | -105 23.084 | -105 22.180 | -105 22.171 | -105 24.578 | -105 23.923 |
| **Station Data** | Flow Velocity (m/s) | | 1.25 | 1 | 0.5 | 0.4 | 0.2 | 0.75 | 0.2 |
| | Length (m) | | 195 | 285 | 100 | 300 | 390 | 305 | 280 |
| | Mean Width (m) | | 10 | 9 | 7 | 15 | 14 | 3.5 | 8 |
| | Mean Depth (m) | | 0.35 | 0.35 | 0.25 | 0.4 | 0.7 | 0.3 | 0.5 |
| **Habitat Characteristics** | Bank Stability (%) | Highly Unstable | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Moderately Unstable | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Stable | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| | Stream Morphology (% total surface area) | Pool | 15 | 5 | 20 | 25 | 20 | 10 | 50 |
| | | Riffle | 60 | 90 | 60 | 30 | 0 | 30 | 0 |
| | | Cascade | 0 | 0 | 0 | 0 | 0 | p | 0 |
| | | Run | 20 | 5 | 20 | 40 | 75 | 60 | 40 |
| | | Flat | 5 | p | p | 5 | 5 | p | 10 |
| | Stream Gradient (% reach) | High | 60 | 60 | 50 | 0 | 0 | 70 | 0 |
| | | Modrate | 25 | 35 | 35 | 70 | 0 | 25 | 25 |
| | | Low | 15 | 5 | 15 | 30 | 100 | 5 | 75 |
| | Stream Channel Type (% Reach) | Straight | 0 | 0 | 30 | 70 | 0 | 0 | 0 |
| | | Meandering | 95 | 75 | 25 | 0 | 100 | 100 | 35 |
| | | Braided | 5 | 20 | 30 | 5 | 0 | 0 | 15 |
| | | Ponded | 0 | 5 | 15 | 25 | 0 | 0 | 50 |
| | Stream Canopy (% Stream Shaded) | Dense | 0 | 50 | 50 | 0 | 0 | 90 | 0 |
| | | Partly Open | 85 | 50 | 35 | 80 | 60 | 10 | 25 |
| | | Open | 15 | 0 | 15 | 20 | 40 | 0 | 75 |
| | Instream Cover (% Total surface area) | Undercut Banks | 5 | 5 | 5 | 5 | 5 | 5 | 0 |
| | | Boulder | 10 | 15 | 25 | 10 | 5 | 10 | p |
| | | Logs & Trees | p | p | 5 | p | 5 | 5 | p |
| | | Log Jams | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| | | Deep Pool | 10 | p | 10 | 20 | 15 | 5 | 5 |
| | | Aquatic Macrophyte | 5 | p | 15 | 20 | 5 | 5 | 75 |
| | Substrate Types (%) | Bedrock | 0 | 0 | 0 | 0 | 0 | p | 0 |
| | | Boulder | 55 | 45 | 80 | 50 | 10 | 35 | 5 |
| | | Cobble | 25 | 40 | 10 | 25 | 0 | 55 | 0 |
| | | Gravel | 5 | 5 | 5 | 0 | 0 | 5 | 0 |
| | | Sand | 15 | p | 5 | 25 | 85 | 5 | 10 |
| | | Silt | 0 | p | 0 | 0 | 5 | p | 0 |
| | | Clay | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Marl | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Muck | 0 | 0 | 0 | 0 | 0 | 0 | 85 |
| | | Detritus | p | 0 | p | 0 | 0 | 0 | 0 |
| | Terrain Characteristics (%) | Cultivated | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Meadow | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Lawn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Urban | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Forested Lowland | 25 | 10 | 30 | 30 | 50 | 0 | 100 |
| | | Marsh | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Beaver Pond | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Bog | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Swamp | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Forested Upland | 75 | 90 | 70 | 70 | 50 | 100 | 0 |
| | Dominant Terrestrial Vegetation | | jack pine, black spruce, sweet gale, willow | sweet gale, Labrador tea, alder, black spruce, jack pine, willow | sweet gale, Labrador tea, alder, black spruce, jack pine, willow | sweet gale, Labrador tea, alder, jack pine, black spruce | sweet gale, Labrador tea, black spruce, jack pine | black spruce, jack pine, sweet gale, Labrador tea, moss, lichen, willow, alder | tamarack, black spruce, sweet gale |
| | Dominant Aquatic Vegetation | | sedges | sedge, algae, horsetail | horsetail, pondweed, moss, sedge, burreed, spike rush | pondweeds, burred, cala, sedge | sponge, algae, pondweed, sedges, horsetail, sedge | sedge, algae, burreed | burreed, pond lily, pondweed, calla, sedges |
| | Adjacent Land Use | | mining exploration, outfitters | mining exploration | mining exploration, access road | access road | mining exploration, drill site | mining exploration, drilling, access road | mining exploration, access road |
| | Sediment Overlaying Substrate | | Slight | None | None | None | Slight | Slight | Heavy |
| | Algae Overlaying Substrate | | Slight | Moderate | Slight | None | Moderate | Slight | None |
| | Barriers/Obstacles Observed | | None | None | None | None | None | None | None |

**Table A-15**
**Baseline Stream Spawning Habitat**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Station Characteristics** | Station Number | | **SA-1** | **SA-2** | **SA-4** | **SA-5** | **SA-6** | **RC-1** | **SB-1** |
| | Location | | u/s of Russel Lake; d/s of McArthur River Mine Road | u/s of Lake LA-1 | u/s and d/s of Fox Lake Tote Road | u/s and d/s of Fox Lake Tote Road | d/s of Lake LA-6; u/s of Lake LA-5 | d/s of Kratchkowsky Lake | u/s of Russel Lake |
| | Coordinates | Latitude | 57 28.918 | 57 30.070 | 57 31.456 | 57 31.442 | 57 30.883 | 57 31.545 | 57 26.347 |
| | | Longitude | -105 19.647 | -105 21.476 | -105 23.084 | -105 22.180 | -105 22.171 | -105 24.578 | -105 23.923 |
| **Weather** | Cloud Cover (%) | | 100 | 95 | 100 | 100 | 100 | 100 | 100 |
| | Air Temprature (°C) | | 13 | 13 | 8 | 5 | 6 | 11 | 12 |
| | Precipitation | | Light | None | Moderate | Moderate | None | None | Light |
| | Recent Precipitation | | Light | Light | Light | Light | Light | Light | Light |
| **Chemical Parameters** | Time | | 16:30 | 14:50 | 11:45 | 15:30 | 10:50 | 10:50 | 10:30 |
| | Water Temp (°C) | | 12.26 | 12.13 | 11.05 | 13.59 | 8.91 | 10.64 | 10.6 |
| | DO (mg/L) | | 10.63 | 10.64 | 9.58 | 9.52 | 10.92 | 10.23 | 8.41 |
| | DO (%) | | 99.4 | 98.9 | 87 | 91.6 | 93.6 | 92 | 75.2 |
| | Conductivity (us/cm) | | 15 | 15 | 16 | 20 | 22 | 21 | 15 |
| | Sp Cond (us/cm) | | 20 | 19 | 22 | 26 | 32 | 30 | 20 |
| | pH | | 7.01 | 6.89 | 6.71 | 5.96 | 5.83 | 6.92 | 5.98 |
| | Total Dissolved Solids (g/L) | | 13 | 13 | 14 | 17 | - | - | - |
| | Water Colour | | Yellow/Brown | Colourless | Colourless, Yellow/Brown | Colourless, Yellow/Brown | Yellow/Brown | Yellow/Brown | Yellow/Brown |
| | Water Clarity | | Clear | Turbid (slight) | Clear | Clear | Clear | Clear | Clear |
| **Biological Characteristics** | Benthic Community | Sampling Method | Visual | Visual | Visual | Visual | Visual | Visual | N/A |
| | | Methodology | Qualitative | Qualitative | Qualitative | Qualitative | Qualitative | Qualitative | N/A |
| | | Notes | stonefly nymph | stonefly nymph, caddisfly larvae | stonefly nymph, dragonfly nymph, caddisfly larvae | dragonfly nymph, stonefly nymph | dragonfly nymph, snail, *Hexagenia* mayfly | stonefly nymph, snail, caddisfly larvae | N/A |
| | Fish Community | Sampling Method | Electrofisher; Dipnet | Electrofisher; Dipnet; Visual | Electrofisher; Dipnet | Electrofisher; Dipnet; Visual | Electrofisher | Electrofisher; Dipnet; Visual | Electrofisher |
| | | Methodology | Qualitative | Qualitative | Qualitative | Qualitative | Qualitative | Qualitative | Qualitative |
| | | Notes | Arctic Grayling observed. Burbot, Slimy Sculpin, White Sucker, Longnose Sucker, Lake Chub collected. | Arctic Grayling, Northern Pike, Slimy Sculpin, Lake Chub, White Sucker, Burbot collected. | Arctic Grayling, White Sucker, Slimy Sculpin, Ninespine Stickleback, Lake Chub, Northern Pike, Burbot, Longnose Sucker collected. | Adult Walleye observed. Burbot, Slimy Sculpin, White Sucker, Lake Chub, Ninespine Stickleback collected. | Burbot, Spottail Shiner, Ninespine Stickleback, Longnose Sucker collected. | Lake Chub, Burbot, White Sucker, Northern Pike, Yellow Perch, Slimy Sculpin collected. | Burbot collected. |

Notes:
u/s - upstream
d/s - downstream
p = present/observed

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-1 | Gillnet | 19-Sep-2016 | - | Lake Trout | 825 | 755 | 3610 | - | Adult | Female | 3 |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 202 | 177 | 80 | - | Juvenile | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 248 | 220 | 129.5 | - | Juvenile | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 308 | 370 | 240 | - | Juvenile | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 328 | 290 | 350 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 350 | 305 | 400 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 352 | 315 | 380 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 377 | 329 | 490 | - | Adult | Female | 4 |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 381 | 334 | 460 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 387 | 338 | 560 | - | Adult | Male | 3 |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 398 | 345 | 510 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 406 | 355 | 600 | - | Adult | Female | 4 |
| LA-1 | Gillnet | 18-Sep-2016 | - | Lake Whitefish | 228 | 203 | 100 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 319 | 230 | 320 | - | Adult | Female | 4 |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 261 | 230 | 160 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 325 | 236 | 310 | - | Adult | Female | 4 |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 301 | 262 | 210 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 297 | 263 | 210 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 315 | 278 | 260 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 326 | 287 | 290 | - | Adult | Female | 4 |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 334 | 294 | 300 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 345 | 305 | 360 | - | Adult | Female | 3 |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 384 | 340 | 480 | - | Adult | Male | 2 |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 406 | 353 | 620 | - | Adult | Female | 3 |
| LA-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 420 | 371 | 660 | - | Adult | Female | 4 |
| LA-1 | Gillnet | 27-May-2017 | - | Lake Whitefish | 306 | 268 | 220 | - | Juvenile | - | - |
| LA-1 | Gillnet | 18-Sep-2016 | - | Longnose Sucker | 433 | 406 | 930 | - | Adult | - | - |
| LA-1 | Gillnet | 18-Sep-2016 | - | Longnose Sucker | 492 | 463 | 1220 | - | Adult | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Longnose Sucker | 468 | 437 | 1200 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | 2016-NP2 | Northern Pike | 576 | 540 | 1180 | 4 | Adult | Male | 2 |
| LA-1 | Gillnet | 17-Sep-2016 | 2016-NP5 | Northern Pike | 678 | 639 | 1910 | 6 | Adult | Male | 2 |
| LA-1 | Gillnet | 17-Sep-2016 | 2016-NP4 | Northern Pike | 677 | 640 | 1650 | 8 | Adult | Male | 2 |
| LA-1 | Gillnet | 17-Sep-2016 | 2016-NP1 | Northern Pike | 772 | 730 | 2510 | 3 | Adult | Female | 2 |
| LA-1 | Gillnet | 17-Sep-2016 | 2016-NP3 | Northern Pike | 930 | 882 | 5180 | 11 | Adult | Female | 2 |
| LA-1 | Seine | 18-Sep-2016 | - | Northern Pike | 172 | 161 | - | - | Juvenile | - | - |
| LA-1 | Seine | 18-Sep-2016 | - | Northern Pike | 192 | 181 | - | - | Juvenile | - | - |
| LA-1 | Seine | 18-Sep-2016 | - | Northern Pike | 196 | 182 | - | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Northern Pike | 727 | 695 | 2420 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Northern Pike | 746 | 715 | 2440 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Northern Pike | 782 | 740 | 2750 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Northern Pike | 814 | 772 | 2700 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Northern Pike | 852 | 805 | 3560 | - | Adult | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Northern Pike | 774 | 730 | 2740 | - | Adult | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Northern Pike | 824 | 783 | 3130 | - | Adult | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Northern Pike | 819 | 785 | 3160 | - | Adult | - | - |
| LA-1 | Angling | 27-May-2017 | - | Northern Pike | 563 | 529 | 1060 | - | Juvenile | - | - |
| LA-1 | Angling | 27-May-2017 | LA1-NP3 | Northern Pike | 710 | 671 | 2100 | 7 | Adult | Male | 5 |
| LA-1 | Angling | 27-May-2017 | LA1-NP2 | Northern Pike | 728 | 690 | 2190 | 9 | Adult | Male | 5 |
| LA-1 | Angling | 27-May-2017 | LA1-NP1 | Northern Pike | 769 | 731 | 2470 | 6 | Adult | Female | 5 |
| LA-1 | Gillnet | 27-May-2017 | LA1-NP4 | Northern Pike | 668 | 629 | 1550 | 5 | Adult | Female | 5 |
| LA-1 | Gillnet | 27-May-2017 | - | Northern Pike | 795 | 758 | 2730 | - | Adult | Female | 5 |
| LA-1 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 87 | 79 | 6 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 94 | 85 | 7.9 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 105 | 93 | 11.2 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 113 | 102 | 15.1 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 429 | 404 | 690 | - | Adult | Male | 2 |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 458 | 430 | 830 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 471 | 450 | 1010 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 480 | 455 | 950 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 493 | 458 | 1003 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 497 | 467 | 950 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 515 | 490 | 1009 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 534 | 505 | 1360 | - | Adult | Female | 3 |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 537 | 509 | 1540 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 536 | 511 | 1260 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 555 | 527 | 1720 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 558 | 528 | 1440 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 598 | 561 | 2160 | - | Adult | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Walleye | 598 | 570 | 1880 | - | Adult | - | - |
| LA-1 | Gillnet | 18-Sep-2016 | - | Walleye | 377 | 357 | 470 | - | Juvenile | - | - |
| LA-1 | Gillnet | 18-Sep-2016 | - | Walleye | 404 | 378 | 580 | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 348 | 329 | 370 | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 357 | 331 | 390 | - | Juvenile | - | - |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 361 | 337 | 400 | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 360 | 342 | 410 | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 399 | 378 | 550 | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 425 | 402 | 610 | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 451 | 425 | 790 | - | Juvenile | Female | 1 |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 465 | 434 | 820 | - | Juvenile | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 487 | 460 | 990 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 495 | 470 | 980 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 503 | 474 | 1000 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 515 | 487 | 1100 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 524 | 497 | 1170 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 535 | 505 | 1150 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 532 | 508 | 1370 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 539 | 510 | 1380 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 543 | 516 | 1430 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 569 | 535 | 1580 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 561 | 535 | 1500 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 581 | 552 | 1520 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 604 | 576 | 1610 | - | Adult | Female | 2 |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 612 | 580 | 1980 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 608 | 582 | 1930 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 611 | 582 | 1650 | - | Adult | - | - |
| LA-1 | Gillnet | 19-Sep-2016 | - | Walleye | 648 | 618 | 2020 | - | Adult | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Walleye | 392 | 370 | 510 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Walleye | 430 | 405 | 660 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Walleye | 466 | 440 | 920 | - | Adult | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Walleye | 478 | 450 | 820 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Walleye | 508 | 479 | 1130 | - | Adult | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | Walleye | 586 | 551 | 1760 | - | Adult | - | - |
| LA-1 | Gillnet | 27-May-2017 | - | Walleye | 513 | 485 | 1140 | - | Adult | Female | 5 |
| LA-1 | Gillnet | 17-Sep-2016 | - | White Sucker | 162 | 153 | 58.7 | - | Juvenile | Female | 1 |
| LA-1 | Gillnet | 17-Sep-2016 | 2016-WS1 | White Sucker | 428 | 390 | 780 | 8 | Adult | Female | 3 |
| LA-1 | Gillnet | 18-Sep-2016 | - | White Sucker | 325 | 300 | 290 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | White Sucker | 316 | 289 | 330 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | 2016-WS4 | White Sucker | 329 | 297 | 320 | 5 | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | - | White Sucker | 327 | 300 | 370 | - | Juvenile | - | - |
| LA-1 | Gillnet | 20-Sep-2016 | 2016-WS3 | White Sucker | 355 | 327 | 500 | 10 | Adult | Female | 2 |
| LA-1 | Gillnet | 20-Sep-2016 | 2016-WS1 | White Sucker | 356 | 329 | 520 | 6 | Adult | Female | 2 |
| LA-1 | Gillnet | 20-Sep-2016 | 2016-WS2 | White Sucker | 367 | 341 | 520 | 8 | Adult | Female | 2 |
| LA-1 | Gillnet | 20-Sep-2016 | 2016-WS4 | White Sucker | 388 | 347 | 580 | 5 | Adult | Female | 3 |
| LA-1 | Gillnet | 20-Sep-2016 | 2016-WS3 | White Sucker | 385 | 352 | 540 | 8 | Adult | Female | 3 |
| LA-1 | Gillnet | 20-Sep-2016 | 2016-WS2 | White Sucker | 382 | 356 | 620 | 10 | Adult | Female | 3 |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 214 | 197 | 70 | - | Juvenile | - | - |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 275 | 254 | 190 | - | Juvenile | - | - |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 298 | 278 | 210 | - | Juvenile | - | - |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 305 | 280 | 290 | - | Juvenile | - | - |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 321 | 297 | 300 | - | Juvenile | Female | 1 |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 325 | 300 | 290 | - | Juvenile | Female | 1 |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 350 | 320 | 390 | - | Juvenile | Female | 1 |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 312 | 344 | 390 | - | Juvenile | Female | 1 |
| LA-1 | Gillnet | 27-May-2017 | - | White Sucker | 395 | 360 | 590 | - | Adult | Female | 2 |
| LA-1 | Gillnet | 17-Sep-2016 | - | Yellow Perch | 55 | 53 | 1.6 | - | YOY | - | - |
| LA-1 | Gillnet | 17-Sep-2016 | - | Yellow Perch | 90 | 85 | 7.7 | - | Juvenile | - | - |
| LA-5 | Gillnet | 10-Sep-2016 | - | Lake Whitefish | 361 | 320 | 495.4 | - | Adult | Female | 4.5 |
| LA-5 | Gillnet | 11-Sep-2016 | - | Lake Whitefish | 394 | 349 | 760 | - | Adult | Male | 2 |
| LA-5 | Gillnet | 30-May-2016 | - | Lake Whitefish | 275 | 245 | 180 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Ninespine Stickleback | 48 | 48 | 0.2 | - | Adult | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Ninespine Stickleback | 63 | 62 | 0.8 | - | Adult | - | - |
| LA-5 | Gillnet | 10-Sep-2016 | - | Northern Pike | 473 | 445 | 531.4 | - | Adult | Male | 2 |
| LA-5 | Gillnet | 10-Sep-2016 | - | Northern Pike | 500 | 464 | 700 | - | Adult | - | - |
| LA-5 | Gillnet | 10-Sep-2016 | 2016-NP1 | Northern Pike | 595 | 560 | 1200 | 3 | Adult | Male | 3 |
| LA-5 | Gillnet | 10-Sep-2016 | 2016-NP4 | Northern Pike | 853 | 809 | 3720 | 12 | Adult | Male | 3 |
| LA-5 | Gillnet | 10-Sep-2016 | 2016-NP2 | Northern Pike | 910 | 863 | 4150 | 10 | Adult | Female | 3 |
| LA-5 | Gillnet | 10-Sep-2016 | 2016-NP5 | Northern Pike | 990 | 940 | 6000 | 13 | Adult | Female | 3 |
| LA-5 | Gillnet | 10-Sep-2016 | 2016-NP3 | Northern Pike | 1006 | 968 | 4100 | 12 | Adult | Female | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | - | Northern Pike | 549 | 517 | 900 | - | Adult | - | - |
| LA-5 | Gillnet | 11-Sep-2016 | - | Northern Pike | 788 | 757 | - | - | Adult | - | - |
| LA-5 | Gillnet | 11-Sep-2016 | - | Northern Pike | 880 | 840 | 4200 | - | Adult | - | - |
| LA-5 | Gillnet | 11-Sep-2016 | - | Northern Pike | 916 | 869 | - | - | Adult | - | - |
| LA-5 | Angling | 30-May-2017 | - | Northern Pike | - | - | 3990 | - | Adult | - | - |
| LA-5 | Gillnet | 30-May-2017 | - | Northern Pike | 447 | 418 | 560 | - | Juvenile | - | - |
| LA-5 | Gillnet | 30-May-2017 | - | Northern Pike | 560 | 520 | 1060 | - | Juvenile | - | - |
| LA-5 | Gillnet | 30-May-2017 | - | Northern Pike | 570 | 534 | 1060 | - | Adult | Male | 1 |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-5 | Gillnet | 10-Sep-2016 | - | Spottail Shiner | 89 | 81 | 5.8 | - | Adult | - | - |
| LA-5 | Gillnet | 10-Sep-2016 | - | Spottail Shiner | 90 | 81 | 6.1 | - | Adult | Female | - |
| LA-5 | Gillnet | 10-Sep-2016 | - | Spottail Shiner | 93 | 84 | 8.6 | - | Adult | Male | - |
| LA-5 | Gillnet | 10-Sep-2016 | - | Spottail Shiner | 96 | 86 | 7.3 | - | Adult | Male | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 39 | 37 | 0.2 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 42 | 39 | 0.2 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 42 | 39 | 0.2 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 42 | 40 | 0.3 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 45 | 42 | 0.3 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 48 | 44 | 0.4 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 48 | 44 | 0.2 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 47 | 44 | 0.3 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 49 | 45 | 0.4 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 49 | 45 | 0.5 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 48 | 45 | 0.3 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 49 | 46 | 0.4 | - | Juvenile | - | - |
| LA-5 | Seine | 13-Sep-2016 | - | Spottail Shiner | 52 | 47 | 0.6 | - | Juvenile | - | - |
| LA-5 | Angling | 30-May-2017 | - | Walleye | - | - | - | - | Adult | Male | 4 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 466 | 434 | 750 | - | Adult | Male | 5 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 483 | 456 | 940 | - | Juvenile | Male | 2 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 512 | 484 | 1010 | - | Adult | Male | 5 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 529 | 495 | 1090 | - | Adult | Male | 5 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 531 | 504 | 1050 | - | Juvenile | Female | 1 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 488 | 522 | 1070 | - | Adult | Male | 4 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 555 | 523 | 1350 | - | Adult | Male | 5 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 566 | 528 | 1290 | - | Adult | Male | 5 |
| LA-5 | Gillnet | 30-May-2017 | - | Walleye | 576 | 541 | 1540 | - | Adult | Male | 5 |
| LA-5 | Gillnet | 10-Sep-2016 | 2016-WS1 | White Sucker | 376 | 340 | 587 | 4 | Adult | Male | 3 |
| LA-5 | Gillnet | 10-Sep-2016 | 2016-WS1 | White Sucker | 373 | 343 | 534.1 | 9 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | - | White Sucker | 56 | 53 | 0.6 | - | YOY | - | - |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS3 | White Sucker | 369 | 341 | 561.7 | 10 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS5 | White Sucker | 375 | 347 | 559.2 | 9 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS2 | White Sucker | 372 | 349 | 591.5 | 10 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | - | White Sucker | 379 | 350 | 598.3 | 6 | Adult | Female | 2 |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS4 | White Sucker | 382 | 350 | 582.6 | 13 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS5 | White Sucker | 386 | 357 | 600 | 10 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS3 | White Sucker | 429 | 393 | 750 | 8 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS2 | White Sucker | 429 | 396 | 780 | 12 | Adult | Male | 3 |
| LA-5 | Gillnet | 11-Sep-2016 | 2016-WS4 | White Sucker | 430 | 397 | 700 | 13 | Adult | Male | 3 |
| LA-5 | Gillnet | 30-May-2017 | - | White Sucker | 308 | 284 | 280 | - | Juvenile | - | - |
| LA-5 | Gillnet | 30-May-2017 | - | White Sucker | 345 | 321 | 380 | - | Juvenile | Female | 1 |
| LA-5 | Gillnet | 30-May-2017 | - | White Sucker | 363 | 333 | 470 | - | Adult | Male | 4 |
| LA-5 | Gillnet | 30-May-2017 | LA1-WS2 | White Sucker | 403 | 366 | 620 | 7 | Adult | Female | 5 |
| LA-5 | Gillnet | 30-May-2017 | LA1-WS1 | White Sucker | 409 | 377 | 700 | 7 | Adult | Female | 5 |
| LA-5 | Gillnet | 30-May-2017 | - | White Sucker | 430 | 393 | 760 | - | Adult | Female | 5 |
| LA-6 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 402 | 355 | 680 | - | Juvenile | Female | 1 |
| LA-6 | Gillnet | 16-Sep-2016 | - | Northern Pike | 192 | 182 | 33 | - | YOY | - | - |
| LA-6 | Gillnet | 16-Sep-2016 | - | Northern Pike | 200 | 189 | 38.4 | - | YOY | - | - |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-NP1 | Northern Pike | 343 | 316 | 460 | 3 | Adult | Male | 2 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-NP1 | Northern Pike | 543 | 508 | 860 | 3 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-NP4 | Northern Pike | 900 | 859 | 5330 | 9 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-NP2 | Northern Pike | 928 | 885 | 5630 | 10 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-NP5 | Northern Pike | 935 | 890 | 5340 | 11 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-NP3 | Northern Pike | 982 | 935 | 5610 | 10 | Adult | Female | 3 |
| LA-6 | Angling | 29-May-2017 | LA6-NP1 | Northern Pike | 650 | 618 | 1730 | - | Adult | Male | 5 |
| LA-6 | Gillnet | 16-Sep-2016 | - | Spottail Shiner | 68 | 62 | 1.6 | - | Juvenile | - | - |
| LA-6 | Gillnet | 16-Sep-2016 | - | Spottail Shiner | 69 | 63 | 1.8 | - | Juvenile | Male | 1 |
| LA-6 | Gillnet | 16-Sep-2016 | - | Spottail Shiner | 72 | 66 | 1.8 | - | Juvenile | Male | 1 |
| LA-6 | Gillnet | 16-Sep-2016 | - | Spottail Shiner | 91 | 83 | 5.3 | - | Adult | - | - |
| LA-6 | Gillnet | 16-Sep-2016 | - | Spottail Shiner | 103 | 92 | 6.9 | - | Adult | - | - |
| LA-6 | Gillnet | 16-Sep-2016 | - | Walleye | 536 | 510 | 1330 | - | Adult | Female | 3 |
| LA-6 | Angling | 30-May-2017 | - | Walleye | 531 | 496 | 1050 | - | Adult | Female | 5 |
| LA-6 | Angling | 30-May-2017 | - | Walleye | 521 | 496 | 1110 | - | Adult | Female | 5 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS3 | White Sucker | 362 | 327 | 1040 | 12 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS5 | White Sucker | 369 | 338 | 570 | 6 | Adult | Male | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS1 | White Sucker | 367 | 339 | 530 | 8 | Adult | Male | 2 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS3 | White Sucker | 387 | 350 | 660 | 6 | Adult | Male | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | - | White Sucker | 400 | 366 | 740 | - | Adult | Female | 2 |
| LA-6 | Gillnet | 16-Sep-2016 | - | White Sucker | 403 | 372 | 690 | - | Adult | Male | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS4 | White Sucker | 418 | 382 | 820 | 10 | Adult | Male | 2 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS1 | White Sucker | 430 | 390 | 850 | 8 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS2 | White Sucker | 424 | 390 | 810 | 8 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS4 | White Sucker | 431 | 395 | 910 | 10 | Adult | Female | 3 |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS2 | White Sucker | 442 | 405 | 940 | 10 | Adult | Female | 3 |
| LA-6 | Gillnet | 16-Sep-2016 | 2016-WS5 | White Sucker | 460 | 427 | 1110 | 9 | Adult | Female | 3 |
| LA-6 | Gillnet | 29-May-2017 | LA6-WS1 | White Sucker | 409 | 355 | 680 | 10 | Adult | Male | 3 |
| LA-6 | Gillnet | 29-May-2017 | LA6-WS1 | White Sucker | 425 | 386 | 790 | 9 | Adult | Female | 3 |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 100 | 90 | - | - | YOY | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 183 | 154 | 50 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 203 | 175 | 70 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 205 | 184 | 80 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 287 | 251 | 190 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 315 | 278 | 240 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 336 | 300 | 330 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 335 | 300 | - | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 379 | 333 | 480 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 385 | 340 | 470 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 390 | 350 | 430 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 410 | 365 | 600 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 430 | 382 | 670 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 445 | 395 | 840 | - | Adult | Female | 3 |
| LA-7 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 442 | 396 | 850 | - | Adult | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 204 | 180 | 63 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 289 | 252 | 190 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 420 | 365 | 590 | - | Adult | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 445 | 395 | 730 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Lake Whitefish | 322 | 285 | 310 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Lake Whitefish | 340 | 299 | 310 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-NP2 | Northern Pike | 772 | 732 | 2620 | - | Adult | Male | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-NP5 | Northern Pike | 729 | 690 | 2430 | 8 | Adult | Male | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-NP3 | Northern Pike | 681 | 621 | 1650 | 7 | Adult | Male | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-NP4 | Northern Pike | 720 | 683 | 2050 | 8 | Adult | Female | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-NP1 | Northern Pike | 783 | 745 | 2840 | 10 | Adult | Male | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | Northern Pike | 596 | 560 | 1100 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | Northern Pike | 653 | 635 | 1680 | - | Adult | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | Northern Pike | 794 | 745 | 1930 | - | Adult | - | - |
| LA-7 | Angling | 31-May-2017 | LA7-NP1 | Northern Pike | 760 | 713 | 2630 | 9 | Adult | Female | 5 |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 524 | 456 | 830 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 548 | 516 | 950 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 580 | 550 | 990 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 596 | 558 | 1250 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 608 | 570 | 1160 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 635 | 600 | 1680 | - | Adult | Female | 5 |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 645 | 610 | 1620 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 669 | 630 | 1540 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | LA7-NP2 | Northern Pike | 698 | 642 | 2130 | 9 | Adult | Male | 5 |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 691 | 648 | 1910 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 701 | 660 | 1960 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 726 | 678 | 1850 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | LA7-NP3 | Northern Pike | 735 | 693 | 2230 | 7 | Adult | Female | 5 |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 743 | 699 | 2030 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 750 | 710 | 2490 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 774 | 734 | 2660 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 812 | 772 | 2780 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Northern Pike | 895 | 845 | 4710 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 60 | 55 | - | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 66 | 58 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 80 | 72 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 92 | 83 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 78 | 84 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 95 | 85 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 100 | 90 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 102 | 94 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Spottail Shiner | 105 | 96 | - | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Walleye | 125 | 117 | - | - | YOY | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Walleye | 496 | 460 | 990 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Walleye | 568 | 532 | 1160 | - | Adult | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | Walleye | 551 | 518 | 1290 | - | Adult | - | - |
| LA-7 | Angling | 31-May-2017 | - | Walleye | - | - | - | - | Juvenile | - | - |
| LA-7 | Angling | 31-May-2017 | - | Walleye | - | - | - | - | Adult | Male | 4 |
| LA-7 | Angling | 31-May-2017 | - | Walleye | - | - | 1800 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Walleye | 330 | 309 | 310 | - | Juvenile | - | 1 |
| LA-7 | Gillnet | 31-May-2017 | - | Walleye | 358 | 335 | 360 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Walleye | 430 | 402 | 590 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Walleye | 482 | 448 | 880 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | Walleye | 565 | 533 | 1370 | - | Adult | Male | 5 |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-7 | Gillnet | 31-May-2017 | - | Walleye | 620 | 588 | 1920 | - | Adult | Female | 5 |
| LA-7 | Gillnet | 19-Sep-2016 | - | White Sucker | 205 | 190 | 95 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | White Sucker | 208 | 193 | 110 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | White Sucker | 270 | 251 | 200 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | White Sucker | 277 | 258 | 240 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | White Sucker | 280 | 260 | 220 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | - | White Sucker | 300 | 281 | 360 | - | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-WS5 | White Sucker | 336 | 311 | 350 | 5 | Juvenile | - | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-WS3 | White Sucker | 340 | 312 | 440 | 8 | Adult | Female | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-WS3 | White Sucker | 339 | 312 | 400 | 8 | Adult | Male | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-WS2 | White Sucker | 340 | 313 | 400 | 9 | Adult | Male | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-WS1 | White Sucker | 351 | 326 | 420 | 9 | Adult | Female | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-WS2 | White Sucker | 360 | 333 | 480 | 9 | Adult | Female | - |
| LA-7 | Gillnet | 19-Sep-2016 | 2016-WS1 | White Sucker | 371 | 340 | 500 | 8 | Adult | Female | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | White Sucker | 234 | 217 | 130 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | White Sucker | 257 | 236 | 200 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | White Sucker | 270 | 250 | 200 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | White Sucker | 277 | 260 | 230 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | White Sucker | 285 | 263 | 230 | - | Juvenile | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | - | White Sucker | 333 | 305 | 350 | - | Adult | - | - |
| LA-7 | Gillnet | 20-Sep-2016 | 2016-WS4 | White Sucker | 339 | 313 | 380 | 5 | Juvenile | Female | 1 |
| LA-7 | Gillnet | 20-Sep-2016 | 2016-WS4 | White Sucker | 368 | 337 | 490 | 9 | Adult | Female | 3 |
| LA-7 | Gillnet | 20-Sep-2016 | 2016-WS5 | White Sucker | 404 | 371 | 730 | 10 | Adult | Female | 3 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 278 | 260 | 210 | - | Juvenile | Male | 4 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 290 | 270 | 210 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 293 | 272 | 290 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 294 | 273 | 210 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 298 | 273 | 250 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 308 | 278 | 250 | - | Juvenile | - | 1 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 307 | 279 | 290 | - | Juvenile | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 306 | 280 | 310 | - | Adult | Male | 4 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 320 | 298 | 360 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 324 | 298 | 360 | - | Adult | Female | 2 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 322 | 299 | 360 | - | Adult | Male | 4 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 324 | 300 | 360 | - | Adult | Male | 3.5 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 333 | 304 | 320 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 334 | 309 | 380 | - | Adult | Female | 1 |
| LA-7 | Gillnet | 31-May-2017 | LA7-WS1 | White Sucker | 339 | 309 | 430 | 8 | Adult | Female | 3.5 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 340 | 312 | 410 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | LA7-WS1 | White Sucker | 346 | 314 | 430 | 5 | Adult | Female | 3 |
| LA-7 | Gillnet | 31-May-2017 | LA7-WS1 | White Sucker | 351 | 320 | 430 | 9 | Adult | Male | 3.5 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 355 | 326 | 390 | - | Adult | Male | 5 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 359 | 327 | 510 | - | Adult | Female | - |
| LA-7 | Gillnet | 31-May-2017 | LA7-WS2 | White Sucker | 352 | 330 | 460 | 7 | Adult | Female | 3.5 |
| LA-7 | Gillnet | 31-May-2017 | LA7-WS2 | White Sucker | 359 | 334 | 480 | 8 | Adult | Female | 3.5 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 365 | 335 | 460 | - | Adult | - | - |
| LA-7 | Gillnet | 31-May-2017 | LA7-WS2 | White Sucker | 373 | 340 | 430 | 9 | Adult | Female | 3.5 |
| LA-7 | Gillnet | 31-May-2017 | - | White Sucker | 388 | 348 | 350 | - | Adult | Female | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 304 | 263 | 220 | - | Juvenile | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 383 | 340 | 570 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 397 | 349 | 550 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 417 | 365 | 600 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 432 | 385 | 770 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 445 | 394 | 810 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 451 | 401 | 950 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 474 | 418 | 1000 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 483 | 431 | 1170 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 489 | 432 | 1200 | - | Adult | Male | 4 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 501 | 449 | 1240 | - | Adult | Female | 2 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 505 | 449 | 1410 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 505 | 451 | 1330 | - | Adult | Female | 3 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 518 | 459 | 1540 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 521 | 459 | 1380 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 521 | 465 | 1280 | - | Adult | - | 3 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 565 | 510 | 1950 | - | Adult | Female | 4 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Lake Whitefish | 686 | 648 | 2040 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Ninespine Stickleback | 59 | - | 1.6 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 612 | 574 | 1410 | - | Juvenile | - | 2 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 621 | 585 | 1280 | - | Adult | Female | 2 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 631 | 594 | 1590 | - | Adult | Female | 2 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 660 | 626 | 1440 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 681 | 640 | 1920 | - | Juvenile | - | 2 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 727 | 681 | 2110 | - | Juvenile | - | 2 |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 761 | 715 | 2520 | - | Juvenile | - | 2 |
| LA-8 | Gillnet | 16-Sep-2016 | - | Northern Pike | 765 | 724 | 2280 | - | Adult | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | White Sucker | 179 | 161 | 49.9 | - | Juvenile | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | White Sucker | 229 | 206 | 110 | - | Juvenile | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | White Sucker | 254 | 235 | 146.9 | - | Juvenile | - | - |
| LA-8 | Gillnet | 16-Sep-2016 | - | Yellow Perch | - | 42 | 1.1 | - | YOY | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 210 | 185 | 69.9 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 212 | 186 | 69.9 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 266 | 231 | 132 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 265 | 232 | 140.7 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 316 | 275 | 252.1 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 317 | 278 | 252.3 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 402 | 357 | 540 | - | Adult | - | 3 |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 415 | 364 | 570 | - | Adult | - | 3 |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 457 | 399 | 820 | - | Adult | - | 3 |
| LA-9 | Gillnet | 17-Sep-2016 | - | Lake Whitefish | 496 | 439 | 1256 | - | Adult | - | 3 |
| LA-9 | Gillnet | 17-Sep-2016 | - | Northern Pike | 224 | 211 | 62 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Northern Pike | 364 | 340 | 393.6 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 65 | 52 | 2 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 68 | 62 | 3 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 90 | 80 | 6.4 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 92 | 81 | 7.3 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 91 | 81 | 6 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 94 | 83 | 6.5 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 97 | 86 | 7.9 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 96 | 86 | 7.1 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Spottail Shiner | 98 | 90 | 10.1 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Walleye | 531 | 491 | 1280 | - | Adult | - | 2 |
| LA-9 | Gillnet | 17-Sep-2016 | - | Walleye | 535 | 500 | 1340 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Walleye | 572 | 536 | 1450 | - | Adult | - | 2 |
| LA-9 | Gillnet | 17-Sep-2016 | - | White Sucker | 130 | 120 | 18.9 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | White Sucker | 265 | 242 | 184.1 | - | Juvenile | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | White Sucker | 346 | 312 | 387.5 | - | Adult | Male | 4 |
| LA-9 | Gillnet | 17-Sep-2016 | - | White Sucker | 377 | 358 | 567 | - | Adult | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Yellow Perch | 51 | 48 | 1.5 | - | YOY | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Yellow Perch | 51 | 48 | 1.3 | - | YOY | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Yellow Perch | 55 | 51 | 1.8 | - | YOY | - | - |
| LA-9 | Gillnet | 17-Sep-2016 | - | Yellow Perch | 54 | 51 | 1.4 | - | YOY | - | - |
| LAB-1 | Gillnet | 21-Sep-2016 | - | Lake Trout | 700 | 636 | 2850 | - | Adult | - | - |
| LAB-1 | Gillnet | 28-May-2017 | - | Lake Trout | 720 | 658 | 3160 | - | Adult | - | - |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 240 | 210 | 110.3 | - | Juvenile | - | - |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 404 | 351 | 510 | - | Adult | - | - |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 508 | 453 | 1200 | - | Adult | - | - |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 534 | 469 | 1390 | - | Adult | - | - |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 541 | 488 | 1550 | - | Adult | - | - |
| LAB-1 | Gillnet | 28-May-2017 | - | Lake Whitefish | 329 | 286 | 290 | - | Juvenile | - | - |
| LAB-1 | Gillnet | 28-May-2017 | - | Lake Whitefish | 496 | 428 | 1180 | - | Adult | - | - |
| LAB-1 | Gillnet | 28-May-2017 | - | Lake Whitefish | 495 | 443 | 1230 | - | Adult | - | - |
| LAB-1 | Gillnet | 28-May-2017 | - | Lake Whitefish | 524 | 469 | 1430 | - | Adult | Female | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 362 | 320 | 360 | - | Juvenile | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 387 | 342 | 470 | - | Juvenile | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 439 | 386 | 670 | - | Juvenile | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 472 | 418 | 1040 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 475 | 420 | 1020 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 598 | 430 | 2070 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 502 | 440 | 1190 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 511 | 452 | 1130 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 539 | 482 | 1300 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Lake Whitefish | 536 | 482 | 1350 | - | Adult | - | - |
| LAB-1 | Gillnet | 20-Sep-2016 | 2016-NP1 | Northern Pike | 796 | 756 | 3390 | 9 | Adult | Female | 2 |
| LAB-1 | Gillnet | 28-May-2017 | LAB-NP1 | Northern Pike | 661 | 628 | 1710 | 5 | Adult | Male | 5 |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 631 | 588 | 1540 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 647 | 608 | 1580 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 662 | 627 | 1730 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 690 | 650 | 2150 | - | Adult | Male | 4.5 |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 711 | 665 | 2090 | - | Adult | Male | 5 |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 732 | 695 | 2410 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 750 | 707 | 2630 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 880 | 833 | 4000 | - | Adult | - | - |
| LAB-1 | Gillnet | 01-Jun-2017 | - | Northern Pike | 1015 | 962 | 5760 | - | Adult | Female | 5 |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Spottail Shiner | 83 | 76 | 6.3 | - | Juvenile | Male | 1 |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Spottail Shiner | 94 | 86 | 9.6 | - | Adult | Male | 3 |
| LAB-1 | Gillnet | 20-Sep-2016 | - | Walleye | 562 | 526 | 1610 | - | Adult | - | - |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LAB-1 | Gillnet | 20-Sep-2016 | - | Walleye | 591 | 555 | 1830 | - | Adult | - | - |
| LAB-1 | Gillnet | 21-Sep-2016 | - | Walleye | 453 | 430 | 830 | - | Juvenile | - | - |
| LAB-1 | Gillnet | 21-Sep-2016 | - | Walleye | 506 | 477 | 1200 | - | Adult | - | - |
| LAB-1 | Gillnet | 21-Sep-2016 | - | Walleye | 546 | 512 | 1520 | - | Adult | Male | 3 |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Lake Trout | 526 | 484 | 1160 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Lake Trout | 643 | 579 | 2700 | - | Adult | Male | 3 |
| LAB-2 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 262 | 231 | 125 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 20-Sep-2016 | - | Lake Whitefish | 511 | 452 | 1070 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Lake Whitefish | 375 | 331 | 390 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Lake Whitefish | 316 | 276 | 274.5 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Lake Whitefish | 324 | 287 | 254.4 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Lake Whitefish | 337 | 298 | 319.4 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Lake Whitefish | 500 | 446 | 1210 | - | Juvenile | Male | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Lake Whitefish | 515 | 454 | 1290 | - | Juvenile | Male | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-NP2 | Northern Pike | 723 | 684 | 1590 | 12 | Adult | Female | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-NP3 | Northern Pike | 822 | 776 | 3900 | 8 | Adult | Female | 3 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-NP5 | Northern Pike | 840 | 794 | 3690 | 8 | Adult | Female | 3 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-NP4 | Northern Pike | 843 | 799 | 3850 | 11 | Adult | Female | 3 |
| LAB-2 | Gillnet | 20-Sep-2016 | - | Walleye | 593 | 563 | 1940 | - | Adult | - | - |
| LAB-2 | Gillnet | 20-Sep-2016 | - | Walleye | 611 | 572 | 2140 | - | Adult | - | - |
| LAB-2 | Gillnet | 20-Sep-2016 | - | Walleye | 618 | 576 | 2190 | - | Adult | - | - |
| LAB-2 | Gillnet | 20-Sep-2016 | - | Walleye | 637 | 600 | 2180 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 380 | 357 | 490 | - | Juvenile | Male | 1 |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 397 | 375 | 570 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 409 | 384 | 620 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 473 | 445 | 970 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 499 | 475 | 1140 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 505 | 477 | 1310 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 552 | 511 | 1550 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 571 | 540 | 1660 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 611 | 574 | 1800 | - | Adult | - | - |
| LAB-2 | Gillnet | 21-Sep-2016 | - | Walleye | 633 | 601 | 2330 | - | Adult | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Walleye | 340 | 321 | 333.1 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Walleye | 377 | 353 | 460.9 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Walleye | 426 | 399 | 650 | - | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Walleye | 531 | 500 | 1550 | - | Adult | Female | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Walleye | 533 | 502 | 1260 | - | Adult | Female | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | - | Walleye | 623 | 583 | 2330 | - | Adult | Female | 3 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS4 | White Sucker | 299 | 276 | 289.6 | 7 | Juvenile | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS1 | White Sucker | 302 | 279 | 289.5 | 5 | Juvenile | Female | 1 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS2 | White Sucker | 311 | 290 | 328.3 | 5 | Adult | Female | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | - | White Sucker | 321 | 293 | 379.4 | - | Adult | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS5 | White Sucker | 327 | 305 | 377.4 | 4 | Adult | - | - |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS4 | White Sucker | 332 | 306 | 399.9 | 5 | Adult | Male | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS3 | White Sucker | 333 | 306 | 379 | 6 | Adult | Female | 3 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS5 | White Sucker | 332 | 307 | 402.4 | 5 | Adult | Male | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS2 | White Sucker | 346 | 319 | 444 | 5 | Adult | Female | 3 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS3 | White Sucker | 356 | 329 | 454.9 | 7 | Adult | Male | 2 |
| LAB-2 | Gillnet | 22-Sep-2016 | 2016-WS1 | White Sucker | 380 | 349 | 555.8 | 10 | Adult | Female | 2 |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 252 | 219 | 134 | - | Juvenile | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 290 | 255 | 200 | - | Juvenile | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 304 | 263 | 228 | - | Juvenile | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 332 | 290 | 300 | - | Juvenile | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 335 | 291 | 340 | - | Juvenile | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 336 | 291 | 305 | - | Juvenile | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 342 | 296 | 330 | - | Adult | Male | 3 |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 379 | 330 | 460 | - | Adult | Male | 3 |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 387 | 340 | 470 | - | Adult | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 419 | 367 | 580 | - | Adult | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 440 | 390 | 655 | - | Adult | Female | 4 |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 443 | 390 | 780 | - | Adult | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 485 | 434 | 1140 | - | Adult | Female | 4 |
| PA-2 | Gillnet | 19-Sep-2016 | - | Lake Whitefish | 491 | 436 | 1020 | - | Adult | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Northern Pike | 556 | 522 | 810 | - | Adult | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | Northern Pike | 838 | 800 | 3600 | - | Adult | - | - |
| PA-2 | Gillnet | 19-Sep-2016 | - | White Sucker | 445 | 403 | 930 | - | Adult | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Burbot | 132 | - | 13.8 | - | Juvenile | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Burbot | 103 | - | 7.1 | - | YOY | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Burbot | 201 | - | 48.6 | - | Juvenile | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Lake Chub | 45 | 42 | 1 | - | YOY | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Lake Chub | 54 | 50 | 1.5 | - | YOY | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Lake Chub | 78 | 72 | 4.8 | - | Juvenile | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Lake Chub | 96 | 87 | 8.6 | - | Juvenile | - | - |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RC1 | Electrofishing | 19-Sep-2016 | - | Lake Chub | 103 | 96 | 10.8 | - | Adult | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Lake Chub | 142 | 131 | 27.8 | - | Adult | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Northern Pike | 452 | 425 | 625 | - | Juvenile | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Slimy Sculpin | 99 | - | 12.2 | - | Adult | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | White Sucker | 109 | 102 | 11.9 | - | Juvenile | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | White Sucker | 121 | 111 | 16.5 | - | Juvenile | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Yellow Perch | 77 | 73 | 4.4 | - | Juvenile | - | - |
| RC1 | Electrofishing | 19-Sep-2016 | - | Yellow Perch | 77 | 74 | 4.9 | - | Juvenile | - | - |
| RC-1 | Electrofishing | 29-May-2017 | - | Northern Pike | - | 370 | - | - | Juvenile | - | - |
| RC-1 | Electrofishing | 29-May-2017 | - | White Sucker | 280 | 260 | 180 | - | Juvenile | - | - |
| RC-1 | Electrofishing | 29-May-2017 | - | White Sucker | 321 | 300 | 320 | - | Juvenile | Male | 1 |
| RC-1 | Electrofishing | 29-May-2017 | - | White Sucker | 330 | 310 | 440 | - | Juvenile | Female | 1 |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 92 | - | 4.5 | - | YOY | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 212 | - | 49.2 | - | Juvenile | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 111 | - | 8.2 | - | YOY | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 123 | - | 12.3 | - | Juvenile | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Lake Chub | 77 | 71 | 3.9 | - | Juvenile | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Lake Chub | 102 | 95 | 10.2 | - | Adult | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Lake Chub | 127 | 117 | 20.7 | - | Adult | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Longnose Sucker | 138 | 129 | 23.5 | - | Juvenile | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Longnose Sucker | 159 | 150 | 40.8 | - | Juvenile | - | - |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 449 | 420 | 950 | - | Adult | Male | 4 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 476 | 440 | 1205 | - | Adult | Male | 4 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 473 | 445 | 1175 | - | Adult | Male | 4 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 491 | 450 | 1260 | - | Adult | Male | 3.5 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 495 | 450 | 1340 | - | Adult | Male | 4 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 495 | 460 | 1450 | - | Adult | Male | 3.5 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 516 | 480 | 1420 | - | Adult | Male | 4 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 526 | 491 | 1860 | - | Adult | Female | 3.5 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 534 | 495 | 1850 | - | Adult | Female | 3.5 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 541 | 501 | 1620 | - | Adult | Male | 4 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 549 | 507 | 1920 | - | Adult | Male | 4 |
| SA-1 | Gillnet | 28-May-2017 | - | Longnose Sucker | 566 | 530 | 2110 | - | Adult | Male | 3.5 |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Slimy Sculpin | 103 | - | 12.5 | - | Adult | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | Slimy Sculpin | 114 | - | 19.8 | - | Adult | - | - |
| SA-1 | Electrofishing | 17-Sep-2016 | - | White Sucker | 121 | 113 | 16.9 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Arctic Grayling | 213 | 232 | 110.1 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Arctic Grayling | 295 | 272 | 275 | - | Adult | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Burbot | 112 | - | 9 | - | YOY | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Burbot | 156 | - | 20 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Burbot | 112 | - | 7.3 | - | YOY | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Burbot | 270 | - | 101.6 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Lake Chub | 50 | 44 | 1.1 | - | YOY | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Lake Chub | 70 | 64 | 2.7 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Lake Chub | 90 | 81 | 6 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Lake Chub | 120 | 111 | 18.6 | - | Adult | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Lake Chub | 128 | 120 | 24.9 | - | Adult | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Northern Pike | 153 | 145 | 15.8 | - | YOY | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Northern Pike | 165 | 156 | 30.8 | - | YOY | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Northern Pike | 198 | 209 | 62.4 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Slimy Sculpin | 40 | - | 1 | - | YOY | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Slimy Sculpin | 58 | - | 2.3 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Slimy Sculpin | 82 | - | 7.3 | - | Adult | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Slimy Sculpin | 39 | - | 0.6 | - | YOY | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Slimy Sculpin | 51 | - | 1.4 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | Slimy Sculpin | 103 | - | 15 | - | Adult | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | White Sucker | 121 | 119 | 16.8 | - | Juvenile | - | - |
| SA-2 | Electrofishing | 16-Sep-2016 | - | White Sucker | 126 | 119 | 19.5 | - | Juvenile | - | - |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 338 | 316 | 350 | - | Adult | Male | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 370 | 338 | 480 | - | Adult | Male | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 368 | 338 | 440 | - | Adult | Male | 5 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 368 | 339 | 490 | - | Adult | Male | 4.5 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 370 | 340 | 490 | - | Adult | Male | 5 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 366 | 343 | 500 | - | Adult | Male | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 377 | 346 | 450 | - | Adult | Male | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 383 | 353 | 560 | - | Adult | Male | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 385 | 357 | 550 | - | Adult | Male | 5 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 394 | 365 | 720 | - | Adult | Female | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 401 | 367 | 640 | - | Adult | Male | 4.5 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 395 | 370 | 590 | - | Adult | Male | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 408 | 370 | 680 | 8 | Adult | Male | 4.5 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 412 | 377 | 590 | 8 | Adult | Male | 4.5 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 415 | 383 | 640 | - | Adult | Female | 4.5 |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 439 | 398 | 680 | - | Adult | Female | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 482 | 443 | 1430 | 9 | Adult | Male | 4 |
| SA-2 | Gillnet | 27-May-2017 | - | White Sucker | 390 | 356 | 560 | - | Adult | Male | 4.5 |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Arctic Grayling | 142 | 130 | 24.2 | - | Juvenile | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Arctic Grayling | 262 | 239 | 164 | - | Adult | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Burbot | 182 | - | 38.9 | - | Juvenile | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Burbot | 117 | - | 8.6 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Burbot | 135 | - | 13.6 | - | Juvenile | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Burbot | 101 | - | 5.5 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Lake Chub | 47 | 44 | 1.0 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Lake Chub | 52 | 48 | 1.2 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Lake Chub | 105 | 95 | 9.6 | - | Adult | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Lake Chub | 113 | 104 | 12.3 | - | Adult | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Longnose Sucker | 138 | 128 | 22.3 | - | Juvenile | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Ninespine Stickleback | 47 | 46 | 0.6 | - | Adult | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Ninespine Stickleback | 55 | 54 | 0.8 | - | Adult | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Northern Pike | 141 | 132 | 14.5 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Slimy Sculpin | 106 | - | 16.8 | - | Adult | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Slimy Sculpin | 83 | - | 6.1 | - | Adult | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Slimy Sculpin | 36 | - | 0.5 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Slimy Sculpin | 35 | - | 0.4 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Slimy Sculpin | 52 | - | 1.5 | - | Juvenile | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | Slimy Sculpin | 59 | - | 5.6 | - | Juvenile | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | White Sucker | 69 | 64 | 2.2 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | White Sucker | 78 | 73 | 3.8 | - | YOY | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | White Sucker | 110 | 104 | 11.8 | - | Juvenile | - | - |
| SA-4 | Electrofishing | 10-Sep-2016 | - | White Sucker | 142 | 132 | 27 | - | Juvenile | - | - |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 329 | 301 | 290 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 326 | 302 | 340 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 335 | 310 | 380 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 364 | 336 | 440 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 365 | 342 | 500 | - | Adult | Male | 4.5 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 386 | 349 | 430 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 391 | 354 | 610 | - | Adult | Male | 5 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 388 | 357 | 520 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 393 | 361 | 600 | - | Adult | Female | 4.5 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 402 | 367 | 650 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 407 | 376 | 690 | - | Adult | Female | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 415 | 381 | 650 | - | Adult | Male | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 412 | 383 | 570 | - | Adult | Female | 4.5 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 425 | 395 | 700 | - | Adult | Female | 4 |
| SA-4 | Gillnet | 26-May-2017 | - | White Sucker | 437 | 398 | 970 | - | Adult | Female | 4 |
| SA-4 | Gillnet | 28-May-2017 | - | White Sucker | 374 | 344 | 510 | - | Adult | Male | 5 |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Slimy Sculpin | 4.8 | - | 1.3 | - | YOY | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Slimy Sculpin | 4.8 | - | 1.3 | - | YOY | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Slimy Sculpin | 9.3 | - | 8.6 | - | Adult | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Slimy Sculpin | 9.7 | - | 10.0 | - | Adult | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Slimy Sculpin | 9.1 | - | 8.3 | - | Adult | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Burbot | 17.6 | - | 29.9 | - | Juvenile | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Burbot | 9.5 | - | 4.9 | - | YOY | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Burbot | 29 | - | 136 | - | Juvenile | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | White Sucker | 7.2 | 6.8 | 3.1 | - | YOY | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | White Sucker | 13.0 | 12.0 | 19.7 | - | Juvenile | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | White Sucker | 11.6 | 10.7 | 14.6 | - | Juvenile | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Ninespine Stickleback | 5.4 | 5.3 | 1.0 | - | Adult | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Lake Chub | 10.4 | 9.5 | 8.8 | - | Juvenile | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Lake Chub | 11.8 | 11.0 | 16.8 | - | Adult | - | - |
| SA-5 | Electrofishing | 09-Sep-2016 | - | Lake Chub | 11.5 | 10.5 | 14.2 | - | Adult | - | - |
| SA-5 | Gillnet | 29 May 2017 | - | Longnose Sucker | 417 | 388 | 720 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 333 | 298 | 350 | - | Adult | Female | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 326 | 300 | 310 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 334 | 304 | 370 | - | Adult | Female | 5 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 343 | 310 | 300 | - | Adult | Male | 5 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 344 | 315 | 370 | - | Adult | Female | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 350 | 318 | 340 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 354 | 325 | 370 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 370 | 335 | 470 | - | Adult | Female | 5 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 374 | 341 | 520 | - | Adult | Female | 5 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 380 | 348 | 510 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 386 | 348 | 570 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 380 | 351 | 570 | - | Adult | Female | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 379 | 351 | 530 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 383 | 355 | 550 | - | Adult | Male | 4 |

**Table A-16**
**Baseline Detailed Fish Collection Data**

| Waterbody | Method | Date | Sample Number | Species | Total Length (mm) | Fork Length (mm) | Weight (g) | Age (y) | Age Class* | Sex | Spawning Condition** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 400 | 365 | 530 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 401 | 370 | 660 | - | Adult | Male | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 418 | 379 | 770 | - | Adult | Female | 4 |
| SA-5 | Gillnet | 29 May 2017 | - | White Sucker | 413 | 380 | 720 | - | Adult | Male | 4 |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Burbot | 81 | - | 3.0 | - | YOY | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Burbot | 148 | - | 19.4 | - | Juvenile | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Burbot | 92 | - | 4.9 | - | YOY | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Burbot | 117 | - | 8.9 | - | Juvenile | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Longnose Sucker | 71 | 66 | 3.7 | - | YOY | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Ninespine Stickleback | 42 | 41 | 0.4 | - | Adult | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Ninespine Stickleback | 48 | 46 | 0.5 | - | Adult | - | - |
| SA-6 | Gillnet | 29 May 2017 | - | Northern Pike | 491 | 461 | 700 | - | Juvenile | - | - |
| SA-6 | Gillnet | 29 May 2017 | - | Northern Pike | 506 | 476 | 700 | - | Juvenile | - | - |
| SA-6 | Gillnet | 29 May 2017 | - | Northern Pike | 545 | 509 | 930 | - | Juvenile | - | - |
| SA-6 | Gillnet | 29 May 2017 | - | Northern Pike | 560 | 524 | 850 | - | Juvenile | - | - |
| SA-6 | Gillnet | 29 May 2017 | - | Northern Pike | 566 | 528 | 1010 | - | Juvenile | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Spottail Shiner | 23 | 21 | 0.2 | - | YOY | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Spottail Shiner | 36 | 31 | 0.3 | - | YOY | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Spottail Shiner | 85 | 76 | 5.9 | - | Adult | - | - |
| SA-6 | Electrofishing | 12-Sep-2016 | - | Spottail Shiner | 81 | 76 | 5.1 | - | Adult | - | - |
| SA-6 | Gillnet | 29 May 2017 | - | Walleye | 542 | 515 | 1100 | - | Adult | Male | 5 |
| SA-6 | Gillnet | 29 May 2017 | - | White Sucker | 360 | 332 | 420 | - | Adult | Female | 5 |
| SA-6 | Gillnet | 29 May 2017 | - | White Sucker | 403 | 365 | 670 | - | Adult | Male | 4 |
| SA-6 | Gillnet | 29 May 2017 | - | White Sucker | 420 | 391 | 700 | - | Adult | Female | 4 |
| SB-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 84 | - | 3.8 | - | YOY | - | - |
| SB-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 203 | - | 40.3 | - | Juvenile | - | - |
| SB-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 96 | - | 6.7 | - | YOY | - | - |
| SB-1 | Electrofishing | 17-Sep-2016 | - | Burbot | 172 | - | 33.3 | - | Juvenile | - | - |

* - YOY = young-of-the-year
** - 1. Immature; 2. Early Development; 3. Late Development; 4. Ripe; 5. Spent

**Table A-17**
**Baseline Fish Flesh Chemistry**

| Parameter | | | Moisture | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | | | % | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g |
| **Northern Pike** | | | | | | | | | | | | |
| | | **Count** | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| | | **# Less than DL** | 0 | 18 | 34 | 27 | 6 | 34 | 34 | 34 | 33 | 23 |
| | | **Min** | 75 | <0.5 | <0.02 | <0.01 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | | **Mean** | 78 | 0.64 | <0.02 | 0.011 | 0.042 | <0.002 | <0.2 | <0.002 | 0.10 | 0.0044 |
| | | **75th** | 79 | 0.70 | <0.02 | 0.010 | 0.063 | <0.002 | <0.2 | <0.002 | 0.10 | 0.0043 |
| | | **95th** | 81 | 1.2 | <0.02 | 0.020 | 0.12 | <0.002 | <0.2 | <0.002 | 0.13 | 0.019 |
| | | **Max** | 82 | 1.3 | <0.02 | 0.020 | 0.18 | <0.002 | <0.2 | <0.002 | 0.20 | 0.034 |
| | | **Geomean** | 78 | 0.62 | <0.02 | 0.011 | 0.030 | <0.002 | <0.2 | <0.002 | 0.10 | 0.0030 |
| | | **SD** | 1.3 | 0.21 | 7.0E-18 | 0.0033 | 0.037 | 1.3E-18 | 8.5E-17 | 1.3E-18 | 0.017 | 0.0060 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | | | |
| LA-1 | 2016-NP1-T | 17-Sep-2016 | 78 | 1.0 | <0.02 | <0.01 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP2-T | 17-Sep-2016 | 79 | 0.7 | <0.02 | <0.01 | 0.10 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP3-T | 17-Sep-2016 | 76 | 0.8 | <0.02 | <0.01 | 0.04 | <0.002 | <0.2 | <0.002 | <0.1 | 0.002 |
| | 2016-NP4-T | 17-Sep-2016 | 80 | <0.5 | <0.02 | <0.01 | 0.03 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP5-T | 17-Sep-2016 | 78 | <0.5 | <0.02 | <0.01 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LA1-NP1 | 27-May-2017 | 78 | <0.5 | <0.02 | <0.01 | 0.02 | <0.002 | <0.2 | <0.002 | 0.2 | 0.005 |
| | LA1-NP2 | 27-May-2017 | 80 | <0.5 | <0.02 | <0.01 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LA1-NP3 | 27-May-2017 | 78 | <0.5 | <0.02 | <0.01 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LA1-NP4 | 27-May-2017 | 79 | <0.5 | <0.02 | <0.01 | 0.03 | <0.002 | <0.2 | <0.002 | <0.1 | 0.004 |
| LA-5 | 2016-NP1-T | 10-Sep-2016 | 78 | 1.3 | <0.02 | 0.01 | 0.06 | <0.002 | <0.2 | <0.002 | <0.1 | 0.009 |
| | 2016-NP2-T | 10-Sep-2016 | 79 | 0.7 | <0.02 | <0.01 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP3-T | 10-Sep-2016 | 78 | 0.6 | <0.02 | <0.01 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP4-T | 10-Sep-2016 | 78 | 0.6 | <0.02 | <0.01 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | 0.014 |
| | 2016-NP5-T | 10-Sep-2016 | 81 | <0.5 | <0.02 | <0.01 | 0.01 | <0.002 | <0.2 | <0.002 | <0.1 | 0.009 |
| LA-6 | 2016-NP1-T | 16-Sep-2016 | 79 | 0.7 | <0.02 | <0.01 | 0.07 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP2-T | 16-Sep-2016 | 77 | 1.0 | <0.02 | <0.01 | 0.04 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP3-T | 16-Sep-2016 | 78 | 0.7 | <0.02 | <0.01 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP4-T | 16-Sep-2016 | 76 | 0.9 | <0.02 | <0.01 | 0.07 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP5-T | 16-Sep-2016 | 75 | 1.1 | <0.02 | <0.01 | 0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LA6-NP1 | 29-May-2017 | 79 | <0.5 | <0.02 | 0.02 | 0.09 | <0.002 | <0.2 | <0.002 | <0.1 | 0.010 |
| LA-7 | 2016-NP2-T | 19-Sep-2016 | 77 | <0.5 | <0.02 | <0.01 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP3-T | 19-Sep-2016 | 78 | 1.0 | <0.02 | <0.01 | 0.10 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP4-T | 19-Sep-2016 | 77 | 0.7 | <0.02 | <0.01 | 0.07 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP5-T | 19-Sep-2016 | 77 | 0.6 | <0.02 | <0.01 | 0.06 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP1-T | 19-Sep-2016 | 78 | 0.5 | <0.02 | <0.01 | 0.03 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LA7-NP1 | 31-May-2017 | 77 | <0.5 | <0.02 | <0.01 | 0.01 | <0.002 | <0.2 | <0.002 | <0.1 | 0.004 |
| | LA7-NP2 | 31-May-2017 | 79 | <0.5 | <0.02 | <0.01 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | 0.005 |
| | LA7-NP3 | 31-May-2017 | 79 | <0.5 | <0.02 | <0.01 | 0.06 | <0.002 | <0.2 | <0.002 | <0.1 | 0.034 |
| LAB | 2016-NP1-T | 20-Sep-2016 | 77 | <0.5 | <0.02 | <0.01 | 0.18 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP2-T | 21-Sep-2016 | 82 | <0.5 | <0.02 | 0.01 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP3-T | 21-Sep-2016 | 77 | <0.5 | <0.02 | 0.01 | 0.08 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP4-T | 21-Sep-2016 | 77 | <0.5 | <0.02 | 0.02 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-NP5-T | 21-Sep-2016 | 78 | <0.5 | <0.02 | 0.02 | 0.06 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LAB-NP1 | 28-May-2017 | 79 | <0.5 | <0.02 | 0.02 | 0.04 | <0.002 | <0.2 | <0.002 | <0.1 | 0.008 |
| **White Sucker** | | | | | | | | | | | | |
| | | **Count** | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| | | **# Less than DL** | 0 | 16 | 31 | 2 | 1 | 31 | 31 | 31 | 29 | 15 |
| | | **Min** | 76 | <0.5 | <0.02 | <0.01 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | | **Mean** | 79 | 0.57 | <0.02 | 0.03 | 0.08 | <0.002 | <0.2 | <0.002 | 0.10 | 0.007 |
| | | **75th** | 80 | 0.60 | <0.02 | 0.05 | 0.14 | <0.002 | <0.2 | <0.002 | 0.10 | 0.007 |
| | | **95th** | 81 | 0.90 | <0.02 | 0.06 | 0.24 | <0.002 | <0.2 | <0.002 | 0.14 | 0.039 |
| | | **Max** | 82 | 0.90 | <0.02 | 0.06 | 0.25 | <0.002 | <0.2 | <0.002 | 0.20 | 0.056 |
| | | **Geomean** | 79 | 0.56 | <0.02 | 0.031 | 0.056 | <0.002 | <0.2 | <0.002 | 0.10 | 0.0041 |
| | | **SD** | 1.3 | 0.12 | 7.054E-18 | 0.015 | 0.068 | 1.3E-18 | 8.5E-17 | 1.3E-18 | 0.018 | 0.011 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | | | |
| LA-1 | 2016-WS1-T | 17-Sep-2016 | 79 | 0.8 | <0.02 | 0.03 | 0.15 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS2-T | 20-Sep-2016 | 79 | 0.5 | <0.02 | 0.01 | 0.12 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS3-T | 20-Sep-2016 | 80 | 0.5 | <0.02 | 0.02 | 0.25 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS4-T | 20-Sep-2016 | 80 | <0.5 | <0.02 | 0.05 | 0.20 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LA1-WS1 | 27-May-2017 | 76 | <0.5 | <0.02 | 0.03 | 0.07 | <0.002 | <0.2 | <0.002 | 0.2 | 0.005 |
| | LA1-WS2 | 27-May-2017 | 78 | <0.5 | <0.02 | <0.01 | 0.06 | <0.002 | <0.2 | <0.002 | <0.1 | 0.014 |
| LA-5 | 2016-WS1-T | 10-Sep-2016 | 80 | 0.7 | <0.02 | 0.04 | 0.01 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS2-T | 11-Sep-2016 | 80 | 0.6 | <0.02 | 0.03 | 0.07 | <0.002 | <0.2 | <0.002 | <0.1 | 0.005 |
| | 2016-WS2-T | 11-Sep-2016 | 77 | 0.8 | <0.02 | 0.04 | 0.17 | <0.002 | <0.2 | <0.002 | <0.1 | 0.003 |
| | 2016-WS3-T | 11-Sep-2016 | 79 | 0.5 | <0.02 | 0.04 | 0.14 | <0.002 | <0.2 | <0.002 | <0.1 | 0.002 |
| | 2016-WS4-T | 11-Sep-2016 | 78 | 0.9 | <0.02 | 0.03 | 0.03 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS5-T | 11-Sep-2016 | 77 | <0.5 | <0.02 | 0.04 | 0.04 | <0.002 | <0.2 | <0.002 | <0.1 | 0.007 |
| | LA5-WS1 | 30-May-2017 | 79 | <0.5 | <0.02 | 0.02 | <0.01 | <0.002 | <0.2 | <0.002 | <0.1 | 0.009 |
| LA-6 | 2016-WS1-T | 16-Sep-2016 | 79 | 0.9 | <0.02 | 0.05 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS2-T | 16-Sep-2016 | 78 | 0.6 | <0.02 | 0.02 | 0.05 | <0.002 | <0.2 | <0.002 | <0.1 | 0.056 |
| | 2016-WS3-T | 16-Sep-2016 | 78 | 0.6 | <0.02 | 0.06 | 0.05 | <0.002 | <0.2 | <0.002 | <0.1 | 0.027 |
| | 2016-WS4-T | 16-Sep-2016 | 77 | 0.7 | <0.02 | 0.04 | 0.04 | <0.002 | <0.2 | <0.002 | <0.1 | 0.006 |
| | 2016-WS5-T | 16-Sep-2016 | 76 | 0.6 | <0.02 | 0.06 | 0.05 | <0.002 | <0.2 | <0.002 | <0.1 | 0.021 |
| | LA6-WS1 | 29-May-2017 | 79 | <0.5 | <0.02 | 0.02 | 0.04 | <0.002 | <0.2 | <0.002 | <0.1 | 0.007 |
| LA-7 | 2016-WS1-T | 19-Sep-2016 | 80 | 0.5 | <0.02 | 0.04 | 0.15 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS2-T | 19-Sep-2016 | 78 | 0.5 | <0.02 | 0.05 | 0.12 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS3-T | 19-Sep-2016 | 79 | <0.5 | <0.02 | 0.05 | 0.24 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS4-T | 20-Sep-2016 | 80 | <0.5 | <0.02 | 0.05 | 0.14 | <0.002 | <0.2 | <0.002 | <0.1 | 0.002 |
| | 2016-WS5-T | 20-Sep-2016 | 79 | <0.5 | <0.02 | 0.04 | 0.05 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | LA7-WS1 | 31-May-2017 | 80 | <0.5 | <0.02 | 0.03 | 0.05 | <0.002 | <0.2 | <0.002 | <0.1 | 0.004 |
| | LA7-WS2 | 31-May-2017 | 82 | <0.5 | <0.02 | 0.02 | 0.03 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| LAB | 2016-WS1-T | 21-Sep-2016 | 81 | <0.5 | <0.02 | <0.01 | 0.03 | <0.002 | <0.2 | <0.002 | <0.1 | 0.018 |
| | 2016-WS2-T | 21-Sep-2016 | 80 | <0.5 | <0.02 | 0.04 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS3-T | 21-Sep-2016 | 79 | <0.5 | <0.02 | 0.02 | 0.02 | <0.002 | <0.2 | <0.002 | <0.1 | 0.01 |
| | 2016-WS4-T | 21-Sep-2016 | 78 | <0.5 | <0.02 | 0.02 | 0.04 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |
| | 2016-WS5-T | 21-Sep-2016 | 78 | <0.5 | <0.02 | 0.05 | 0.03 | <0.002 | <0.2 | <0.002 | <0.1 | <0.002 |

Results are reported on a "raw (wet) weight" basis

**Table A-17**
**Baseline Fish Flesh Chemistry**

| Parameter | | | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Strontium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g |
| Northern Pike | | | | | | | | | | | | |
| | | Count | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| | | # Less than DL | 0 | 0 | 21 | 0 | 0 | 33 | 27 | 0 | 33 | 0 |
| | | Min | 0.08 | 0.80 | <0.002 | 0.07 | 0.05 | <0.02 | <0.01 | 0.15 | <0.002 | 0.04 |
| | | Mean | 0.21 | 2.4 | 0.0028 | 0.12 | 0.19 | <0.02 | 0.014 | 0.23 | 0.002 | 0.27 |
| | | 75th | 0.24 | 3.4 | 0.0020 | 0.12 | 0.23 | <0.02 | 0.010 | 0.24 | 0.002 | 0.32 |
| | | 95th | 0.51 | 5.4 | 0.010 | 0.21 | 0.44 | <0.02 | 0.040 | 0.42 | 0.002 | 1.1 |
| | | Max | 0.55 | 6.4 | 0.011 | 0.23 | 0.48 | <0.02 | 0.070 | 0.53 | 0.002 | 1.1 |
| | | Geomean | 0.19 | 2.1 | 0.0024 | 0.11 | 0.16 | <0.02 | 0.012 | 0.22 | 0.002 | 0.19 |
| | | SD | 0.12 | 1.4 | 0.0021 | 0.036 | 0.10 | 7.0E-18 | 0.011 | 0.074 | 1.3E-18 | 0.26 |
| Location | Sample No. | Sample Date | | | | | | | | | | |
| LA-1 | 2016-NP1-T | 17-Sep-2016 | 0.16 | 1.9 | 0.003 | 0.10 | 0.11 | <0.02 | <0.01 | 0.23 | <0.002 | 0.10 |
| | 2016-NP2-T | 17-Sep-2016 | 0.14 | 2.0 | <0.002 | 0.11 | 0.082 | <0.02 | <0.01 | 0.20 | <0.002 | 0.15 |
| | 2016-NP3-T | 17-Sep-2016 | 0.17 | 3.0 | <0.002 | 0.12 | 0.25 | <0.02 | <0.01 | 0.25 | <0.002 | 0.28 |
| | 2016-NP4-T | 17-Sep-2016 | 0.23 | 6.4 | <0.002 | 0.08 | 0.43 | <0.02 | <0.01 | 0.20 | <0.002 | 0.11 |
| | 2016-NP5-T | 17-Sep-2016 | 0.18 | 2.7 | <0.002 | 0.11 | 0.10 | <0.02 | <0.01 | 0.24 | <0.002 | 0.07 |
| | LA1-NP1 | 27-May-2017 | 0.30 | 3.5 | <0.002 | 0.09 | 0.15 | <0.02 | 0.02 | 0.19 | <0.002 | 0.25 |
| | LA1-NP2 | 27-May-2017 | 0.28 | 3.5 | <0.002 | 0.09 | 0.23 | <0.02 | <0.01 | 0.20 | <0.002 | 0.11 |
| | LA1-NP3 | 27-May-2017 | 0.55 | 5.0 | <0.002 | 0.13 | 0.081 | <0.02 | 0.03 | 0.20 | 0.002 | 0.39 |
| | LA1-NP4 | 27-May-2017 | 0.48 | 3.2 | 0.002 | 0.10 | 0.075 | <0.02 | <0.01 | 0.24 | <0.002 | 0.58 |
| LA-5 | 2016-NP1-T | 10-Sep-2016 | 0.14 | 2.3 | 0.004 | 0.11 | 0.047 | <0.02 | 0.01 | 0.17 | <0.002 | 0.14 |
| | 2016-NP2-T | 10-Sep-2016 | 0.11 | 1.1 | <0.002 | 0.11 | 0.16 | <0.02 | <0.01 | 0.15 | <0.002 | 0.37 |
| | 2016-NP3-T | 10-Sep-2016 | 0.11 | 0.8 | <0.002 | 0.08 | 0.23 | <0.02 | <0.01 | 0.19 | <0.002 | 0.16 |
| | 2016-NP4-T | 10-Sep-2016 | 0.09 | 1.0 | <0.002 | 0.11 | 0.15 | <0.02 | 0.02 | 0.17 | <0.002 | 0.1 |
| | 2016-NP5-T | 10-Sep-2016 | 0.09 | 0.9 | <0.002 | 0.12 | 0.23 | <0.02 | <0.01 | 0.17 | <0.002 | 0.29 |
| LA-6 | 2016-NP1-T | 16-Sep-2016 | 0.23 | 2.4 | 0.004 | 0.23 | 0.074 | <0.02 | <0.01 | 0.20 | <0.002 | 0.75 |
| | 2016-NP2-T | 16-Sep-2016 | 0.16 | 1.6 | 0.002 | 0.10 | 0.18 | <0.02 | <0.01 | 0.21 | <0.002 | 0.13 |
| | 2016-NP3-T | 16-Sep-2016 | 0.15 | 1.5 | <0.002 | 0.08 | 0.30 | <0.02 | <0.01 | 0.23 | <0.002 | 0.09 |
| | 2016-NP4-T | 16-Sep-2016 | 0.18 | 1.4 | 0.002 | 0.10 | 0.14 | <0.02 | <0.01 | 0.20 | <0.002 | 0.15 |
| | 2016-NP5-T | 16-Sep-2016 | 0.15 | 1.5 | 0.002 | 0.11 | 0.30 | <0.02 | <0.01 | 0.22 | <0.002 | 0.14 |
| | LA6-NP1 | 29-May-2017 | 0.16 | 1.4 | <0.002 | 0.18 | 0.17 | <0.02 | 0.02 | 0.19 | <0.002 | 1.1 |
| LA-7 | 2016-NP2-T | 19-Sep-2016 | 0.18 | 2.4 | <0.002 | 0.09 | 0.31 | <0.02 | <0.01 | 0.23 | <0.002 | 0.07 |
| | 2016-NP3-T | 19-Sep-2016 | 0.31 | 4.2 | 0.011 | 0.12 | 0.14 | <0.02 | <0.01 | 0.20 | <0.002 | 0.20 |
| | 2016-NP4-T | 19-Sep-2016 | 0.20 | 2.2 | 0.01 | 0.12 | 0.11 | <0.02 | <0.01 | 0.21 | <0.002 | 0.12 |
| | 2016-NP5-T | 19-Sep-2016 | 0.21 | 2.5 | 0.004 | 0.11 | 0.16 | <0.02 | <0.01 | 0.21 | <0.002 | 0.26 |
| | 2016-NP1-T | 19-Sep-2016 | 0.29 | 3.5 | 0.004 | 0.13 | 0.18 | <0.02 | <0.01 | 0.23 | <0.002 | 0.36 |
| | LA7-NP1 | 31-May-2017 | 0.21 | 1.0 | <0.002 | 0.07 | 0.067 | <0.02 | <0.01 | 0.17 | <0.002 | 0.26 |
| | LA7-NP2 | 31-May-2017 | 0.50 | 3.4 | <0.002 | 0.07 | 0.11 | <0.02 | 0.02 | 0.18 | <0.002 | 0.31 |
| | LA7-NP3 | 31-May-2017 | 0.23 | 2.2 | <0.002 | 0.15 | 0.085 | <0.02 | 0.07 | 0.17 | <0.002 | 1.1 |
| LAB | 2016-NP1-T | 20-Sep-2016 | 0.13 | 1.3 | 0.002 | 0.08 | 0.24 | <0.02 | <0.01 | 0.38 | <0.002 | 0.04 |
| | 2016-NP2-T | 21-Sep-2016 | 0.14 | 4.7 | <0.002 | 0.10 | 0.48 | <0.02 | <0.01 | 0.25 | <0.002 | 0.07 |
| | 2016-NP3-T | 21-Sep-2016 | 0.17 | 1.4 | 0.002 | 0.18 | 0.37 | <0.02 | <0.01 | 0.53 | <0.002 | 0.20 |
| | 2016-NP4-T | 21-Sep-2016 | 0.09 | 0.8 | <0.002 | 0.11 | 0.20 | <0.02 | <0.01 | 0.30 | <0.002 | 0.04 |
| | 2016-NP5-T | 21-Sep-2016 | 0.08 | 1.2 | <0.002 | 0.12 | 0.21 | <0.02 | <0.01 | 0.36 | <0.002 | 0.10 |
| | LAB-NP1 | 28-May-2017 | 0.46 | 4.4 | <0.002 | 0.20 | 0.14 | <0.02 | <0.01 | 0.30 | <0.002 | 0.43 |
| White Sucker | | | | | | | | | | | | |
| | | Count | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| | | # Less than DL | 0 | 0 | 14 | 0 | 0 | 31 | 19 | 0 | 30 | 0 |
| | | Min | 0.16 | 1.3 | <0.002 | 0.09 | 0.012 | <0.02 | <0.01 | 0.15 | <0.002 | 0.05 |
| | | Mean | 0.29 | 3.1 | 0.003 | 0.23 | 0.034 | <0.02 | 0.019 | 0.26 | 0.0025 | 0.44 |
| | | 75th | 0.38 | 3.5 | 0.003 | 0.23 | 0.045 | <0.02 | 0.020 | 0.30 | 0.0020 | 0.40 |
| | | 95th | 0.64 | 6.0 | 0.0072 | 0.86 | 0.072 | <0.02 | 0.092 | 0.51 | 0.0084 | 2.5 |
| | | Max | 0.66 | 6.2 | 0.0090 | 1.1 | 0.076 | <0.02 | 0.11 | 0.56 | 0.018 | 2.5 |
| | | Geomean | 0.27 | 2.9 | 0.0025 | 0.19 | 0.030 | <0.02 | 0.014 | 0.25 | 0.0021 | 0.26 |
| | | SD | 0.13 | 1.2 | 0.0015 | 0.20 | 0.017 | 7.1E-18 | 0.022 | 0.095 | 0.0029 | 0.60 |
| Location | Sample No. | Sample Date | | | | | | | | | | |
| LA-1 | 2016-WS1-T | 17-Sep-2016 | 0.17 | 3.1 | 0.002 | 1.1 | 0.023 | <0.02 | <0.01 | 0.30 | <0.002 | 2.5 |
| | 2016-WS2-T | 20-Sep-2016 | 0.17 | 2.2 | 0.003 | 0.18 | 0.04 | <0.02 | <0.01 | 0.30 | <0.002 | 0.28 |
| | 2016-WS3-T | 20-Sep-2016 | 0.25 | 3.1 | 0.004 | 0.41 | 0.028 | <0.02 | <0.01 | 0.29 | <0.002 | 1.0 |
| | 2016-WS4-T | 20-Sep-2016 | 0.25 | 2.9 | 0.009 | 0.17 | 0.022 | <0.02 | <0.01 | 0.23 | <0.002 | 0.84 |
| | LA1-WS1 | 27-May-2017 | 0.62 | 4.6 | 0.003 | 0.12 | 0.068 | <0.02 | 0.11 | 0.21 | <0.002 | 0.24 |
| | LA1-WS2 | 27-May-2017 | 0.24 | 3.0 | <0.002 | 0.15 | 0.046 | <0.02 | 0.02 | 0.30 | 0.018 | 0.22 |
| LA-5 | 2016-WS1-T | 10-Sep-2016 | 0.16 | 2.3 | 0.004 | 0.14 | 0.014 | <0.02 | 0.01 | 0.17 | <0.002 | 0.11 |
| | 2016-WS2-T | 11-Sep-2016 | 0.27 | 2.8 | 0.006 | 0.21 | 0.055 | <0.02 | 0.02 | 0.19 | <0.002 | 0.06 |
| | 2016-WS2-T | 11-Sep-2016 | 0.27 | 5.9 | <0.002 | 0.16 | 0.076 | <0.02 | 0.02 | 0.24 | <0.002 | 0.63 |
| | 2016-WS3-T | 11-Sep-2016 | 0.40 | 2.4 | 0.002 | 0.12 | 0.049 | <0.02 | 0.03 | 0.20 | <0.002 | 0.20 |
| | 2016-WS4-T | 11-Sep-2016 | 0.28 | 2.6 | 0.002 | 0.16 | 0.045 | <0.02 | <0.01 | 0.28 | <0.002 | 0.22 |
| | 2016-WS5-T | 11-Sep-2016 | 0.42 | 6.2 | 0.002 | 0.15 | 0.028 | <0.02 | 0.01 | 0.25 | <0.002 | 0.28 |
| | LA5-WS1 | 30-May-2017 | 0.42 | 5.6 | 0.002 | 0.70 | 0.051 | <0.02 | 0.02 | 0.23 | <0.002 | 2.5 |
| LA-6 | 2016-WS1-T | 16-Sep-2016 | 0.28 | 2.6 | 0.002 | 0.13 | 0.035 | <0.02 | <0.01 | 0.18 | <0.002 | 0.22 |
| | 2016-WS2-T | 16-Sep-2016 | 0.20 | 2.8 | 0.002 | 0.09 | 0.044 | <0.02 | 0.08 | 0.22 | <0.002 | 0.20 |
| | 2016-WS3-T | 16-Sep-2016 | 0.24 | 1.7 | <0.002 | 0.28 | 0.024 | <0.02 | 0.04 | 0.24 | <0.002 | 0.68 |
| | 2016-WS4-T | 16-Sep-2016 | 0.38 | 3.1 | <0.002 | 0.11 | 0.07 | <0.02 | <0.01 | 0.21 | <0.002 | 0.12 |
| | 2016-WS5-T | 16-Sep-2016 | 0.42 | 2.6 | 0.003 | 0.22 | 0.025 | <0.02 | 0.03 | 0.20 | <0.002 | 0.40 |
| | LA6-WS1 | 29-May-2017 | 0.28 | 3.5 | <0.002 | 0.10 | 0.044 | <0.02 | <0.01 | 0.24 | <0.002 | 0.16 |
| LA-7 | 2016-WS1-T | 19-Sep-2016 | 0.20 | 3.2 | <0.002 | 0.15 | 0.018 | <0.02 | <0.01 | 0.23 | <0.002 | 0.35 |
| | 2016-WS2-T | 19-Sep-2016 | 0.50 | 3.6 | 0.004 | 0.33 | 0.02 | <0.02 | <0.01 | 0.22 | <0.002 | 0.61 |
| | 2016-WS3-T | 19-Sep-2016 | 0.25 | 3.0 | 0.005 | 0.23 | 0.019 | <0.02 | <0.01 | 0.20 | <0.002 | 0.14 |
| | 2016-WS4-T | 20-Sep-2016 | 0.19 | 2.3 | 0.003 | 0.14 | 0.012 | <0.02 | <0.01 | 0.15 | <0.002 | 0.16 |
| | 2016-WS5-T | 20-Sep-2016 | 0.21 | 3.6 | <0.002 | 0.14 | 0.021 | <0.02 | <0.01 | 0.22 | <0.002 | 0.27 |
| | LA7-WS1 | 31-May-2017 | 0.66 | 5.3 | <0.002 | 0.09 | 0.027 | <0.02 | 0.01 | 0.18 | <0.002 | 0.15 |
| | LA7-WS2 | 31-May-2017 | 0.17 | 2.2 | <0.002 | 0.12 | 0.014 | <0.02 | <0.01 | 0.18 | <0.002 | 0.32 |
| LAB | 2016-WS1-T | 21-Sep-2016 | 0.16 | 1.3 | <0.002 | 0.16 | 0.043 | <0.02 | <0.01 | 0.48 | <0.002 | 0.07 |
| | 2016-WS2-T | 21-Sep-2016 | 0.32 | 2.3 | <0.002 | 0.42 | 0.025 | <0.02 | <0.01 | 0.33 | <0.002 | 0.33 |
| | 2016-WS3-T | 21-Sep-2016 | 0.18 | 1.8 | <0.002 | 0.28 | 0.022 | <0.02 | <0.01 | 0.56 | <0.002 | 0.14 |
| | 2016-WS4-T | 21-Sep-2016 | 0.21 | 1.8 | <0.002 | 0.17 | 0.021 | <0.02 | <0.01 | 0.46 | <0.002 | 0.05 |
| | 2016-WS5-T | 21-Sep-2016 | 0.26 | 2.1 | <0.002 | 0.18 | 0.022 | <0.02 | <0.01 | 0.38 | <0.002 | 0.12 |

Results are reported on a "raw (wet) weight" basis

**Table A-17**
**Baseline Fish Flesh Chemistry**

| Parameter | | | Thallium | Tin | Titanium | Uranium | Vanadium | Zinc | Lead-210 | Polonium-210 | Radium-226 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | | | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | Bq/g | Bq/g | Bq/g |
| **Northern Pike** | | | | | | | | | | | |
| | | **Count** | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 25 |
| | | **# Less than DL** | 34 | 33 | 8 | 32 | 34 | 0 | 33 | 1 | 22 |
| | | **Min** | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.1 | <0.001 | <0.0002 | <0.00003 |
| | | **Mean** | <0.01 | 0.010 | 0.019 | 0.0010 | <0.02 | 5.3 | 0.001 | 0.0010 | 0.00013 |
| | | **75th** | <0.01 | 0.010 | 0.020 | 0.0010 | <0.02 | 6.5 | 0.001 | 0.0012 | 0.00009 |
| | | **95th** | <0.01 | 0.013 | 0.040 | 0.0013 | <0.02 | 9.7 | 0.001 | 0.0027 | 0.00076 |
| | | **Max** | <0.01 | 0.020 | 0.040 | 0.0020 | <0.02 | 9.8 | 0.001 | 0.0030 | 0.0010 |
| | | **Geomean** | <0.01 | 0.010 | 0.017 | 0.0010 | <0.02 | 5.0 | 0.001 | 0.00087 | 9.0E-05 |
| | | **SD** | 3.5E-18 | 0.0017 | 0.0089 | 0.000171 | 7.0E-18 | 2.0 | 6.6E-19 | 0.00064 | 0.00019 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | | |
| LA-1 | 2016-NP1-T | 17-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.5 | <0.001 | 0.0008 | |
| | 2016-NP2-T | 17-Sep-2016 | <0.01 | <0.01 | 0.03 | <0.001 | <0.02 | 3.9 | <0.001 | 0.0015 | |
| | 2016-NP3-T | 17-Sep-2016 | <0.01 | <0.01 | 0.04 | <0.001 | <0.02 | 9.0 | <0.001 | 0.0008 | <0.00007 |
| | 2016-NP4-T | 17-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 4.1 | <0.001 | 0.0009 | |
| | 2016-NP5-T | 17-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 6.2 | <0.001 | 0.001 | |
| | LA1-NP1 | 27-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 5.3 | <0.001 | <0.0002 | <0.00007 |
| | LA1-NP2 | 27-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 9.7 | 0.001 | 0.0002 | <0.00006 |
| | LA1-NP3 | 27-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 8.6 | <0.001 | 0.0007 | <0.0002 |
| | LA1-NP4 | 27-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 8.0 | <0.001 | 0.0008 | <0.0002 |
| LA-5 | 2016-NP1-T | 10-Sep-2016 | <0.01 | <0.01 | 0.04 | <0.001 | <0.02 | 4.4 | <0.001 | 0.0021 | 0.0002 |
| | 2016-NP2-T | 10-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.1 | <0.001 | 0.0004 | <0.00007 |
| | 2016-NP3-T | 10-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.8 | <0.001 | 0.0005 | <0.00009 |
| | 2016-NP4-T | 10-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.5 | <0.001 | 0.0002 | <0.00006 |
| | 2016-NP5-T | 10-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.3 | <0.001 | 0.0005 | <0.00006 |
| LA-6 | 2016-NP1-T | 16-Sep-2016 | <0.01 | <0.01 | 0.02 | 0.002 | <0.02 | 4.1 | <0.001 | 0.0026 | |
| | 2016-NP2-T | 16-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 4.0 | <0.001 | 0.0006 | <0.00009 |
| | 2016-NP3-T | 16-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 3.1 | <0.001 | 0.0006 | <0.00007 |
| | 2016-NP4-T | 16-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.9 | <0.001 | 0.0009 | <0.00007 |
| | 2016-NP5-T | 16-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 4.3 | <0.001 | 0.0008 | <0.00006 |
| | LA6-NP1 | 29-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 4.6 | <0.001 | 0.001 | <0.00008 |
| LA-7 | 2016-NP2-T | 19-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 5.4 | <0.001 | 0.0008 | |
| | 2016-NP3-T | 19-Sep-2016 | <0.01 | <0.01 | 0.03 | <0.001 | <0.02 | 4.2 | <0.001 | 0.0011 | <0.00007 |
| | 2016-NP4-T | 19-Sep-2016 | <0.01 | <0.01 | 0.04 | <0.001 | <0.02 | 4.7 | <0.001 | 0.0012 | |
| | 2016-NP5-T | 19-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 5.2 | <0.001 | 0.0015 | <0.00007 |
| | 2016-NP1-T | 19-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 5.3 | <0.001 | 0.0012 | |
| | LA7-NP1 | 31-May-2017 | <0.01 | 0.02 | 0.01 | <0.001 | <0.02 | 5.0 | <0.001 | 0.0011 | <0.00007 |
| | LA7-NP2 | 31-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 7.4 | <0.001 | 0.0006 | <0.0002 |
| | LA7-NP3 | 31-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 6.5 | <0.001 | 0.0009 | <0.00009 |
| LAB | 2016-NP1-T | 20-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.9 | <0.001 | 0.002 | <0.001 |
| | 2016-NP2-T | 21-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 6.5 | <0.001 | 0.0017 | |
| | 2016-NP3-T | 21-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.7 | <0.001 | 0.003 | <0.00007 |
| | 2016-NP4-T | 21-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 4.0 | <0.001 | 0.001 | 0.00007 |
| | 2016-NP5-T | 21-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 8.6 | <0.001 | 0.001 | <0.00003 |
| | LAB-NP1 | 28-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 9.8 | <0.001 | 0.0012 | <0.00007 |
| **White Sucker** | | | | | | | | | | | |
| | | **Count** | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 25 |
| | | **# Less than DL** | 31 | 30 | 10 | 30 | 31 | 0 | 29 | 0 | 24 |
| | | **Min** | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 2.7 | <0.001 | 0.001 | <0.00006 |
| | | **Mean** | <0.01 | <0.01 | 0.016 | 0.0012 | <0.02 | 4.0 | 0.0010 | 0.0013 | 0.00010 |
| | | **75th** | <0.01 | <0.01 | 0.020 | 0.0010 | <0.02 | 4.5 | 0.0010 | 0.0016 | 0.00009 |
| | | **95th** | <0.01 | <0.01 | 0.046 | 0.0030 | <0.02 | 6.1 | 0.0014 | 0.0023 | 0.00034 |
| | | **Max** | <0.01 | <0.01 | 0.070 | 0.0060 | <0.02 | 6.5 | 0.0020 | 0.0025 | 0.00040 |
| | | **Geomean** | <0.01 | <0.01 | 0.014 | 0.0011 | <0.02 | 3.9 | 0.0010 | 0.0012 | 8.5E-05 |
| | | **SD** | 3.5E-18 | 3.53E-18 | 0.012 | 0.000898 | 7.1E-18 | 0.89 | 0.00018 | 0.00048 | 6.9E-05 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | | |
| LA-1 | 2016-WS1-T | 17-Sep-2016 | <0.01 | <0.01 | 0.03 | <0.001 | <0.02 | 4.2 | <0.001 | 0.001 | <0.00008 |
| | 2016-WS2-T | 20-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.6 | 0.001 | 0.0012 | <0.00008 |
| | 2016-WS3-T | 20-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.8 | <0.001 | 0.0006 | |
| | 2016-WS4-T | 20-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 4.6 | <0.001 | 0.0015 | <0.00009 |
| | LA1-WS1 | 27-May-2017 | <0.01 | <0.01 | 0.03 | <0.001 | <0.02 | 4.9 | <0.001 | 0.0008 | <0.0002 |
| | LA1-WS2 | 27-May-2017 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 3.9 | <0.001 | 0.0008 | <0.00008 |
| LA-5 | 2016-WS1-T | 10-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 2.8 | <0.001 | 0.0006 | <0.00009 |
| | 2016-WS2-T | 11-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 3.9 | <0.001 | 0.0008 | <0.00007 |
| | 2016-WS2-T | 11-Sep-2016 | <0.01 | <0.01 | 0.07 | <0.001 | <0.02 | 5.4 | <0.001 | 0.0006 | <0.00009 |
| | 2016-WS3-T | 11-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 4.9 | <0.001 | 0.001 | |
| | 2016-WS4-T | 11-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 4.1 | <0.001 | 0.0016 | <0.00006 |
| | 2016-WS5-T | 11-Sep-2016 | <0.01 | <0.01 | <0.01 | 0.006 | <0.02 | 3.9 | <0.001 | 0.001 | <0.00008 |
| | LA5-WS1 | 30-May-2017 | <0.01 | <0.01 | 0.03 | <0.001 | <0.02 | 6.5 | <0.001 | 0.0011 | <0.00007 |
| LA-6 | 2016-WS1-T | 16-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.2 | <0.001 | 0.0014 | <0.00006 |
| | 2016-WS2-T | 16-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 4.3 | <0.001 | 0.0018 | <0.00006 |
| | 2016-WS3-T | 16-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.0 | <0.001 | 0.0008 | |
| | 2016-WS4-T | 16-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 3.9 | <0.001 | 0.0011 | <0.0001 |
| | 2016-WS5-T | 16-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.9 | <0.001 | 0.0015 | <0.00008 |
| | LA6-WS1 | 29-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.2 | <0.001 | 0.0012 | <0.0001 |
| LA-7 | 2016-WS1-T | 19-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 3.3 | <0.001 | 0.0014 | |
| | 2016-WS2-T | 19-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 4.9 | 0.002 | 0.0017 | <0.00008 |
| | 2016-WS3-T | 19-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 4.5 | <0.001 | 0.0025 | |
| | 2016-WS4-T | 20-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.2 | <0.001 | 0.0018 | <0.00008 |
| | 2016-WS5-T | 20-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 3.5 | <0.001 | 0.0019 | <0.00008 |
| | LA7-WS1 | 31-May-2017 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 5.8 | <0.001 | 0.0008 | <0.00007 |
| | LA7-WS2 | 31-May-2017 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 2.7 | <0.001 | 0.0011 | <0.00007 |
| LAB | 2016-WS1-T | 21-Sep-2016 | <0.01 | <0.01 | 0.01 | <0.001 | <0.02 | 3.0 | <0.001 | 0.0008 | <0.00007 |
| | 2016-WS2-T | 21-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.9 | <0.001 | 0.0012 | <0.00008 |
| | 2016-WS3-T | 21-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.2 | <0.001 | 0.0019 | <0.00007 |
| | 2016-WS4-T | 21-Sep-2016 | <0.01 | <0.01 | 0.02 | <0.001 | <0.02 | 3.3 | <0.001 | 0.0021 | 0.0004 |
| | 2016-WS5-T | 21-Sep-2016 | <0.01 | <0.01 | <0.01 | <0.001 | <0.02 | 3.8 | <0.001 | 0.0013 | |

Results are reported on a "raw (wet) weight" basis

**Table A-17**
**Baseline Fish Flesh Chemistry**

| Parameter | | | Thorium-228 | Thorium-230 | Thorium-232 |
|---|---|---|---|---|---|
| Unit | | | Bq/g | Bq/g | Bq/g |
| **Northern Pike** | | | | | |
| | | **Count** | 14 | 25 | 14 |
| | | **# Less than DL** | 14 | 24 | 14 |
| | | **Min** | <0.0001 | <0.00006 | <0.0001 |
| | | **Mean** | <0.00019 | 0.00016 | <0.00019 |
| | | **75th** | <0.00023 | 0.0002 | <0.00023 |
| | | **95th** | na | 0.0004 | na |
| | | **Max** | <0.0004 | 0.0004 | <0.0004 |
| | | **Geomean** | <0.00016 | 0.00014 | <0.00016 |
| | | **SD** | 0.00011 | 0.00009 | 0.00011 |
| **Location** | **Sample No.** | **Sample Date** | | | |
| LA-1 | 2016-NP1-T | 17-Sep-2016 | | | |
| | 2016-NP2-T | 17-Sep-2016 | | | |
| | 2016-NP3-T | 17-Sep-2016 | | <0.0001 | |
| | 2016-NP4-T | 17-Sep-2016 | | | |
| | 2016-NP5-T | 17-Sep-2016 | | | |
| | LA1-NP1 | 27-May-2017 | <0.0001 | <0.0001 | <0.0001 |
| | LA1-NP2 | 27-May-2017 | <0.0001 | <0.0001 | <0.0001 |
| | LA1-NP3 | 27-May-2017 | <0.0004 | <0.0004 | <0.0004 |
| | LA1-NP4 | 27-May-2017 | <0.0004 | <0.0004 | <0.0004 |
| LA-5 | 2016-NP1-T | 10-Sep-2016 | <0.0002 | <0.0002 | <0.0002 |
| | 2016-NP2-T | 10-Sep-2016 | <0.0001 | <0.0001 | <0.0001 |
| | 2016-NP3-T | 10-Sep-2016 | <0.0002 | <0.0002 | <0.0002 |
| | 2016-NP4-T | 10-Sep-2016 | <0.0001 | <0.0001 | <0.0001 |
| | 2016-NP5-T | 10-Sep-2016 | <0.0001 | <0.0001 | <0.0001 |
| LA-6 | 2016-NP1-T | 16-Sep-2016 | | | |
| | 2016-NP2-T | 16-Sep-2016 | | <0.0002 | |
| | 2016-NP3-T | 16-Sep-2016 | | <0.0001 | |
| | 2016-NP4-T | 16-Sep-2016 | | <0.0001 | |
| | 2016-NP5-T | 16-Sep-2016 | | 0.0002 | |
| | LA6-NP1 | 29-May-2017 | <0.0002 | <0.0002 | <0.0002 |
| LA-7 | 2016-NP2-T | 19-Sep-2016 | | | |
| | 2016-NP3-T | 19-Sep-2016 | | <0.0001 | |
| | 2016-NP4-T | 19-Sep-2016 | | | |
| | 2016-NP5-T | 19-Sep-2016 | | <0.0001 | |
| | 2016-NP1-T | 19-Sep-2016 | | | |
| | LA7-NP1 | 31-May-2017 | <0.0001 | <0.0001 | <0.0001 |
| | LA7-NP2 | 31-May-2017 | <0.0003 | <0.0003 | <0.0003 |
| | LA7-NP3 | 31-May-2017 | <0.0002 | <0.0002 | <0.0002 |
| LAB | 2016-NP1-T | 20-Sep-2016 | | <0.0002 | |
| | 2016-NP2-T | 21-Sep-2016 | | | |
| | 2016-NP3-T | 21-Sep-2016 | | <0.0001 | |
| | 2016-NP4-T | 21-Sep-2016 | | <0.0001 | |
| | 2016-NP5-T | 21-Sep-2016 | | <0.00006 | |
| | LAB-NP1 | 28-May-2017 | <0.0001 | <0.0001 | <0.0001 |
| **White Sucker** | | | | | |
| | | **Count** | 8 | 25 | 8 |
| | | **# Less than DL** | 8 | 25 | 8 |
| | | **Min** | <0.0001 | <0.0001 | <0.0001 |
| | | **Mean** | <0.00016 | <0.00017 | <0.00016 |
| | | **75th** | <0.0002 | <0.0002 | <0.0002 |
| | | **95th** | na | <0.00027 | na |
| | | **Max** | <0.0003 | <0.0003 | <0.0003 |
| | | **Geomean** | <0.00015 | <0.00015838 | <0.00015 |
| | | **SD** | 7.4E-05 | 5.6E-05 | 7.4E-05 |
| **Location** | **Sample No.** | **Sample Date** | | | |
| LA-1 | 2016-WS1-T | 17-Sep-2016 | | <0.0002 | |
| | 2016-WS2-T | 20-Sep-2016 | | <0.0002 | |
| | 2016-WS3-T | 20-Sep-2016 | | | |
| | 2016-WS4-T | 20-Sep-2016 | | <0.0002 | |
| | LA1-WS1 | 27-May-2017 | <0.0003 | <0.0003 | <0.0003 |
| | LA1-WS2 | 27-May-2017 | <0.0002 | <0.0002 | <0.0002 |
| LA-5 | 2016-WS1-T | 10-Sep-2016 | <0.0002 | <0.0002 | <0.0002 |
| | 2016-WS2-T | 11-Sep-2016 | <0.0001 | <0.0001 | <0.0001 |
| | 2016-WS2-T | 11-Sep-2016 | | <0.0002 | |
| | 2016-WS3-T | 11-Sep-2016 | | | |
| | 2016-WS4-T | 11-Sep-2016 | | <0.0001 | |
| | 2016-WS5-T | 11-Sep-2016 | | <0.0002 | |
| | LA5-WS1 | 30-May-2017 | <0.0001 | <0.0001 | <0.0001 |
| LA-6 | 2016-WS1-T | 16-Sep-2016 | | <0.0001 | |
| | 2016-WS2-T | 16-Sep-2016 | | <0.0001 | |
| | 2016-WS3-T | 16-Sep-2016 | | | |
| | 2016-WS4-T | 16-Sep-2016 | | <0.0002 | |
| | 2016-WS5-T | 16-Sep-2016 | | <0.0002 | |
| | LA6-WS1 | 29-May-2017 | <0.0002 | <0.0002 | <0.0002 |
| LA-7 | 2016-WS1-T | 19-Sep-2016 | | | |
| | 2016-WS2-T | 19-Sep-2016 | | <0.0002 | |
| | 2016-WS3-T | 19-Sep-2016 | | | |
| | 2016-WS4-T | 20-Sep-2016 | | <0.0002 | |
| | 2016-WS5-T | 20-Sep-2016 | | <0.0002 | |
| | LA7-WS1 | 31-May-2017 | <0.0001 | <0.0001 | <0.0001 |
| | LA7-WS2 | 31-May-2017 | <0.0001 | <0.0001 | <0.0001 |
| LAB | 2016-WS1-T | 21-Sep-2016 | | <0.0001 | |
| | 2016-WS2-T | 21-Sep-2016 | | <0.0002 | |
| | 2016-WS3-T | 21-Sep-2016 | | <0.0001 | |
| | 2016-WS4-T | 21-Sep-2016 | | <0.0002 | |
| | 2016-WS5-T | 21-Sep-2016 | | | |

Results are reported on a "raw (wet) weight" basis

**Table A-18**
**Baseline Fish Bone Chemistry**

| Parameter | | | Moisture | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium |
|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | | % | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g |
| **Northern Pike** | | | | | | | | | | |
| | | **Count** | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| | | **# Less than DL** | 0 | 9 | 34 | 19 | 0 | 34 | 34 | 34 |
| | | **Min** | 48 | <0.5 | <0.05 | <0.02 | 1.9 | <0.01 | <0.5 | <0.01 |
| | | **Mean** | 57 | 0.83 | <0.05 | 0.022 | 4.9 | <0.01 | <0.5 | <0.01 |
| | | **75th** | 61 | 1.1 | <0.05 | 0.02 | 6.425 | <0.01 | <0.5 | <0.01 |
| | | **95th** | 65 | 1.425 | <0.05 | 0.035 | 8.45 | <0.01 | <0.5 | <0.01 |
| | | **Max** | 67 | 1.5 | <0.05 | 0.05 | 9.8 | <0.01 | <0.5 | <0.01 |
| | | **Geomean** | 57 | 0.77 | <0.05 | 0.022 | 4.6 | <0.01 | <0.5 | <0.01 |
| | | **SD** | 4.9 | 0.31 | 2.1E-17 | 0.0061 | 1.8 | 3.5E-18 | 0.0 | 0.0 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | |
| LA-1 | 2016-NP5-B | 17-Sep-2016 | 58 | <0.5 | <0.05 | <0.02 | 4.5 | <0.01 | <0.5 | <0.01 |
| | 2016-NP4-B | 17-Sep-2016 | 56 | 0.5 | <0.05 | <0.02 | 9.8 | <0.01 | <0.5 | <0.01 |
| | 2016-NP1-B | 17-Sep-2016 | 57 | 1.0 | <0.05 | 0.03 | 4.4 | <0.01 | <0.5 | <0.01 |
| | 2016-NP2-B | 17-Sep-2016 | 65 | 1.3 | <0.05 | 0.03 | 5.0 | <0.01 | <0.5 | <0.01 |
| | 2016-NP3-B | 17-Sep-2016 | 49 | 0.6 | <0.05 | <0.02 | 4.4 | <0.01 | <0.5 | <0.01 |
| | LA1-NP1 | 27-May-2017 | 60 | <0.5 | <0.05 | <0.02 | 5.5 | <0.01 | <0.5 | <0.01 |
| | LA1-NP2 | 27-May-2017 | 61 | <0.5 | <0.05 | <0.02 | 2.2 | <0.01 | <0.5 | <0.01 |
| | LA1-NP3 | 27-May-2017 | 63 | <0.5 | <0.05 | <0.02 | 5.4 | <0.01 | <0.5 | <0.01 |
| | LA1-NP4 | 27-May-2017 | 62 | <0.5 | <0.05 | <0.02 | 3.3 | <0.01 | <0.5 | <0.01 |
| LA-5 | 2016-NP1-B | 10-Sep-2016 | 59 | 1.3 | <0.05 | 0.03 | 7.2 | <0.01 | <0.5 | <0.01 |
| | 2016-NP2-B | 10-Sep-2016 | 61 | 0.8 | <0.05 | 0.03 | 6.7 | <0.01 | <0.5 | <0.01 |
| | 2016-NP3-B | 10-Sep-2016 | 59 | <0.5 | <0.05 | 0.02 | 6.4 | <0.01 | <0.5 | <0.01 |
| | 2016-NP4-B | 10-Sep-2016 | 58 | <0.5 | <0.05 | 0.02 | 7.2 | <0.01 | <0.5 | <0.01 |
| | 2016-NP5-B | 10-Sep-2016 | 60 | 0.7 | <0.05 | 0.02 | 7.2 | <0.01 | <0.5 | <0.01 |
| LA-6 | 2016-NP1-B | 16-Sep-2016 | 61 | 1.5 | <0.05 | <0.02 | 6.8 | <0.01 | <0.5 | <0.01 |
| | 2016-NP2-B | 16-Sep-2016 | 51 | 0.8 | <0.05 | 0.02 | 5.8 | <0.01 | <0.5 | <0.01 |
| | 2016-NP3-B | 16-Sep-2016 | 51 | 0.9 | <0.05 | 0.02 | 2.9 | <0.01 | <0.5 | <0.01 |
| | 2016-NP4-B | 16-Sep-2016 | 54 | 0.9 | <0.05 | 0.03 | 5.2 | <0.01 | <0.5 | <0.01 |
| | 2016-NP5-B | 16-Sep-2016 | 50 | 1.2 | <0.05 | 0.02 | 6.2 | <0.01 | <0.5 | <0.01 |
| | LA6-NP1 | 29-May-2017 | 62 | 1.4 | <0.05 | <0.02 | 8.0 | <0.01 | <0.5 | <0.01 |
| LA-7 | 2016-NP1-B | 19-Sep-2016 | 53 | 0.7 | <0.05 | <0.02 | 4.4 | <0.01 | <0.5 | <0.01 |
| | 2016-NP2-B | 19-Sep-2016 | 54 | 0.8 | <0.05 | <0.02 | 6.5 | <0.01 | <0.5 | <0.01 |
| | 2016-NP3-B | 19-Sep-2016 | 58 | 0.7 | <0.05 | <0.02 | 4.6 | <0.01 | <0.5 | <0.01 |
| | 2016-NP4-B | 19-Sep-2016 | 56 | 0.9 | <0.05 | <0.02 | 3.4 | <0.01 | <0.5 | <0.01 |
| | 2016-NP5-B | 19-Sep-2016 | 56 | <0.5 | <0.05 | <0.02 | 4.2 | <0.01 | <0.5 | <0.01 |
| | LA7-NP1 | 31-May-2017 | 56 | 0.7 | <0.05 | <0.02 | 4.9 | <0.01 | <0.5 | <0.01 |
| | LA7-NP2 | 31-May-2017 | 51 | <0.5 | <0.05 | 0.02 | 4.1 | <0.01 | <0.5 | <0.01 |
| | LA7-NP3 | 31-May-2017 | 67 | 0.5 | <0.05 | <0.02 | 4.5 | <0.01 | <0.5 | <0.01 |
| LAB | 2016-NP1-B | 20-Sep-2016 | 53 | 1.2 | <0.05 | <0.02 | 2.7 | <0.01 | <0.5 | <0.01 |
| | 2016-NP2-B | 21-Sep-2016 | 58 | 1.2 | <0.05 | <0.02 | 3.7 | <0.01 | <0.5 | <0.01 |
| | 2016-NP3-B | 21-Sep-2016 | 48 | 1.0 | <0.05 | 0.02 | 2.5 | <0.01 | <0.5 | <0.01 |
| | 2016-NP4-B | 21-Sep-2016 | 49 | 0.9 | <0.05 | 0.02 | 2.6 | <0.01 | <0.5 | <0.01 |
| | 2016-NP5-B | 21-Sep-2016 | 56 | 1.3 | <0.05 | <0.02 | 3.3 | <0.01 | <0.5 | <0.01 |
| | LAB-NP1 | 28-May-2017 | 65 | 0.8 | <0.05 | 0.05 | 1.9 | <0.01 | <0.5 | <0.01 |
| **White Sucker** | | | | | | | | | | |
| | | **Count** | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| | | **# Less than DL** | 0 | 6 | 30 | 12 | 0 | 30 | 30 | 30 |
| | | **Min** | 50 | <0.5 | <0.05 | <0.02 | 1.3 | <0.01 | <0.5 | <0.01 |
| | | **Mean** | 57 | 0.87 | <0.05 | 0.033 | 4.3 | <0.01 | <0.5 | <0.01 |
| | | **75th** | 60 | 1.125 | <0.05 | 0.05 | 5.425 | <0.01 | <0.5 | <0.01 |
| | | **95th** | 65 | 1.645 | <0.05 | 0.0645 | 7.84 | <0.01 | <0.5 | <0.01 |
| | | **Max** | 65 | 1.7 | <0.05 | 0.07 | 8.5 | <0.01 | <0.5 | <0.01 |
| | | **Geomean** | 56 | 0.81 | <0.05 | 0.030 | 4.0 | <0.01 | <0.5 | <0.01 |
| | | **SD** | 4.2 | 0.34 | 2.1E-17 | 0.016 | 1.7 | 3.5E-18 | 0.0 | 3.5E-18 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | |
| LA-1 | 2016-WS1-B | 17-Sep-2016 | 58 | 0.6 | <0.05 | <0.02 | 5.5 | <0.01 | <0.5 | <0.01 |
| | 2016-WS2-B | 20-Sep-2016 | 56 | 1.2 | <0.05 | <0.02 | 3.2 | <0.01 | <0.5 | <0.01 |
| | 2016-WS3-B | 20-Sep-2016 | 60 | 1.4 | <0.05 | 0.03 | 3.6 | <0.01 | <0.5 | <0.01 |
| | 2016-WS4-B | 20-Sep-2016 | 58 | 0.8 | <0.05 | <0.02 | 3.6 | <0.01 | <0.5 | <0.01 |
| | LA1-WS1 | 27-May-2017 | 53 | <0.5 | <0.05 | <0.02 | 7.3 | <0.01 | <0.5 | <0.01 |
| | LA1-WS2 | 27-May-2017 | 53 | <0.5 | <0.05 | <0.02 | 5.4 | <0.01 | <0.5 | <0.01 |
| LA-5 | 2016-WS1-B | 10-Sep-2016 | 58 | 1.2 | <0.05 | 0.05 | 4.4 | <0.01 | <0.5 | <0.01 |
| | 2016-WS2-B | 11-Sep-2016 | 53 | 1.7 | <0.05 | 0.05 | 6.4 | <0.01 | <0.5 | <0.01 |
| | 2016-WS3-B | 11-Sep-2016 | 52 | 0.7 | <0.05 | 0.05 | 8.5 | <0.01 | <0.5 | <0.01 |
| | 2016-WS4-B | 11-Sep-2016 | 50 | 0.7 | <0.05 | 0.04 | 3.0 | <0.01 | <0.5 | <0.01 |
| | 2016-WS5-B | 11-Sep-2016 | 54 | 1.2 | <0.05 | 0.06 | 6.9 | <0.01 | <0.5 | <0.01 |
| | LA5-WS1 | 30-May-2017 | 57 | 1.0 | <0.05 | 0.02 | 4.4 | <0.01 | <0.5 | <0.01 |
| LA-6 | 2016-WS1-B | 16-Sep-2016 | 53 | 1.0 | <0.05 | 0.06 | 5.5 | <0.01 | <0.5 | <0.01 |
| | 2016-WS2-B | 16-Sep-2016 | 53 | 0.8 | <0.05 | 0.04 | 3.8 | <0.01 | <0.5 | <0.01 |
| | 2016-WS3-B | 16-Sep-2016 | 52 | 0.9 | <0.05 | 0.07 | 4.8 | <0.01 | <0.5 | <0.01 |
| | 2016-WS4-B | 16-Sep-2016 | 53 | 0.9 | <0.05 | 0.05 | 3.8 | <0.01 | <0.5 | <0.01 |
| | 2016-WS5-B | 16-Sep-2016 | 51 | 0.8 | <0.05 | 0.05 | 3.6 | <0.01 | <0.5 | <0.01 |
| | LA6-WS1 | 29-May-2017 | 62 | <0.5 | <0.05 | <0.02 | 5.6 | <0.01 | <0.5 | <0.01 |
| LA-7 | 2016-WS1-B | 19-Sep-2016 | 57 | 0.8 | <0.05 | 0.02 | 3.4 | <0.01 | <0.5 | <0.01 |
| | 2016-WS2-B | 19-Sep-2016 | 52 | 0.8 | <0.05 | 0.04 | 4.3 | <0.01 | <0.5 | <0.01 |
| | 2016-WS3-B | 19-Sep-2016 | 56 | <0.5 | <0.05 | <0.02 | 5.1 | <0.01 | <0.5 | <0.01 |
| | 2016-WS4-B | 20-Sep-2016 | 58 | 1.1 | <0.05 | <0.02 | 3.7 | <0.01 | <0.5 | <0.01 |
| | 2016-WS5-B | 20-Sep-2016 | 56 | 0.6 | <0.05 | 0.02 | 2.6 | <0.01 | <0.5 | <0.01 |
| | LA7-WS1 | 31-May-2017 | 60 | <0.5 | <0.05 | 0.03 | 5.2 | <0.01 | <0.5 | <0.01 |
| | LA7-WS2 | 31-May-2017 | 65 | 1.6 | <0.05 | 0.02 | 4.7 | <0.01 | <0.5 | <0.01 |
| LAB | 2016-WS1-B | 21-Sep-2016 | 60 | 0.7 | <0.05 | <0.02 | 2.1 | <0.01 | <0.5 | <0.01 |
| | 2016-WS2-B | 21-Sep-2016 | 64 | 0.5 | <0.05 | 0.03 | 1.3 | <0.01 | <0.5 | <0.01 |
| | 2016-WS3-B | 21-Sep-2016 | 61 | <0.5 | <0.05 | <0.02 | 2.1 | <0.01 | <0.5 | <0.01 |
| | 2016-WS4-B | 21-Sep-2016 | 63 | 0.7 | <0.05 | <0.02 | 2.4 | <0.01 | <0.5 | <0.01 |
| | 2016-WS5-B | 21-Sep-2016 | 61 | 1.4 | <0.05 | 0.03 | 2.4 | <0.01 | <0.5 | <0.01 |

Results are reported on a "raw (wet) weight" basis

**Table A-18**
**Baseline Fish Bone Chemistry**

| Parameter | | | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g |
| **Northern Pike** | | | | | | | | | | | | |
| | | **Count** | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| | | **# Less than DL** | 33 | 0 | 0 | 0 | 13 | 0 | 0 | 34 | 14 | 0 |
| | | **Min** | <0.2 | 0.04 | 0.06 | 1.4 | <0.01 | 5.4 | 0.01 | <0.05 | <0.02 | 0.09 |
| | | **Mean** | 0.21 | 0.10 | 0.34 | 9.7 | 0.016 | 14 | 0.047 | <0.05 | 0.036 | 0.16 |
| | | **75th** | 0.2 | 0.1225 | 0.51 | 6.825 | 0.02 | 17.5 | 0.0525 | <0.05 | 0.05 | 0.185 |
| | | **95th** | 0.25 | 0.165 | 0.7 | 47.25 | 0.04 | 35 | 0.155 | <0.05 | 0.1 | 0.2475 |
| | | **Max** | 0.4 | 0.18 | 0.82 | 150 | 0.04 | 41 | 0.2 | <0.05 | 0.13 | 0.27 |
| | | **Geomean** | 0.20 | 0.099 | 0.28 | 5.5 | 0.014 | 13 | 0.038 | <0.05 | 0.030 | 0.15 |
| | | **SD** | 0.034 | 0.033 | 0.19 | 25 | 0.0089 | 7.6 | 0.039 | 2.1E-17 | 0.027 | 0.045 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | | | |
| LA-1 | 2016-NP5-B | 17-Sep-2016 | <0.2 | 0.07 | 0.48 | 6.8 | 0.02 | 20 | 0.03 | <0.05 | <0.02 | 0.18 |
| | 2016-NP4-B | 17-Sep-2016 | <0.2 | 0.11 | 0.50 | 4.9 | 0.04 | 19 | 0.13 | <0.05 | <0.02 | 0.14 |
| | 2016-NP1-B | 17-Sep-2016 | <0.2 | 0.09 | 0.64 | 7.7 | 0.02 | 20 | 0.03 | <0.05 | 0.05 | 0.16 |
| | 2016-NP2-B | 17-Sep-2016 | <0.2 | 0.07 | 0.82 | 4.8 | 0.02 | 15 | 0.02 | <0.05 | <0.02 | 0.16 |
| | 2016-NP3-B | 17-Sep-2016 | <0.2 | 0.1 | 0.66 | 6.0 | 0.03 | 12 | 0.06 | <0.05 | <0.02 | 0.16 |
| | LA1-NP1 | 27-May-2017 | <0.2 | 0.16 | 0.16 | 2.7 | 0.04 | 14 | 0.03 | <0.05 | 0.06 | 0.12 |
| | LA1-NP2 | 27-May-2017 | <0.2 | 0.05 | 0.32 | 5.6 | <0.01 | 5.7 | 0.2 | <0.05 | 0.07 | 0.20 |
| | LA1-NP3 | 27-May-2017 | <0.2 | 0.12 | 0.28 | 4.4 | <0.01 | 16 | 0.02 | <0.05 | 0.09 | 0.16 |
| | LA1-NP4 | 27-May-2017 | <0.2 | 0.07 | 0.27 | 3.2 | <0.01 | 9.4 | 0.04 | <0.05 | 0.04 | 0.20 |
| LA-5 | 2016-NP1-B | 10-Sep-2016 | <0.2 | 0.06 | 0.16 | 11 | 0.01 | 17 | 0.02 | <0.05 | 0.03 | 0.17 |
| | 2016-NP2-B | 10-Sep-2016 | <0.2 | 0.1 | 0.09 | 4.2 | <0.01 | 14 | 0.03 | <0.05 | <0.02 | 0.10 |
| | 2016-NP3-B | 10-Sep-2016 | <0.2 | 0.1 | 0.08 | 1.4 | <0.01 | 12 | 0.04 | <0.05 | <0.02 | 0.09 |
| | 2016-NP4-B | 10-Sep-2016 | <0.2 | 0.09 | 0.09 | 3.7 | 0.01 | 13 | 0.04 | <0.05 | <0.02 | 0.10 |
| | 2016-NP5-B | 10-Sep-2016 | <0.2 | 0.1 | 0.08 | 3.6 | 0.01 | 12 | 0.06 | <0.05 | <0.02 | 0.11 |
| LA-6 | 2016-NP1-B | 16-Sep-2016 | <0.2 | 0.13 | 0.63 | 6.8 | 0.03 | 13 | 0.03 | <0.05 | 0.09 | 0.16 |
| | 2016-NP2-B | 16-Sep-2016 | <0.2 | 0.08 | 0.57 | 3.6 | 0.02 | 9.2 | 0.03 | <0.05 | <0.02 | 0.13 |
| | 2016-NP3-B | 16-Sep-2016 | <0.2 | 0.04 | 0.55 | 3.9 | 0.02 | 6.0 | 0.08 | <0.05 | <0.02 | 0.16 |
| | 2016-NP4-B | 16-Sep-2016 | <0.2 | 0.09 | 0.55 | 3.3 | 0.02 | 11 | 0.03 | <0.05 | <0.02 | 0.12 |
| | 2016-NP5-B | 16-Sep-2016 | <0.2 | 0.11 | 0.54 | 4.2 | 0.02 | 11 | 0.04 | <0.05 | <0.02 | 0.11 |
| | LA6-NP1 | 29-May-2017 | <0.2 | 0.12 | 0.26 | 8.6 | <0.01 | 15 | 0.06 | <0.05 | 0.07 | 0.15 |
| LA-7 | 2016-NP1-B | 19-Sep-2016 | <0.2 | 0.07 | 0.43 | 13 | 0.02 | 7.8 | 0.04 | <0.05 | <0.02 | 0.13 |
| | 2016-NP2-B | 19-Sep-2016 | 0.4 | 0.11 | 0.32 | 6.9 | 0.01 | 9.2 | 0.07 | <0.05 | <0.02 | 0.15 |
| | 2016-NP3-B | 19-Sep-2016 | <0.2 | 0.08 | 0.31 | 4.5 | 0.01 | 8.6 | 0.05 | <0.05 | <0.02 | 0.13 |
| | 2016-NP4-B | 19-Sep-2016 | <0.2 | 0.07 | 0.30 | 3.5 | 0.01 | 5.4 | 0.03 | <0.05 | <0.02 | 0.12 |
| | 2016-NP5-B | 19-Sep-2016 | <0.2 | 0.1 | 0.26 | 5.1 | <0.01 | 11 | 0.02 | <0.05 | <0.02 | 0.12 |
| | LA7-NP1 | 31-May-2017 | <0.2 | 0.14 | 0.30 | 7.5 | <0.01 | 6.8 | 0.01 | <0.05 | 0.13 | 0.12 |
| | LA7-NP2 | 31-May-2017 | <0.2 | 0.13 | 0.25 | 7.6 | <0.01 | 6.0 | 0.04 | <0.05 | 0.05 | 0.13 |
| | LA7-NP3 | 31-May-2017 | <0.2 | 0.11 | 0.21 | 6.1 | <0.01 | 7.8 | 0.03 | <0.05 | 0.03 | 0.14 |
| LAB | 2016-NP1-B | 20-Sep-2016 | <0.2 | 0.14 | 0.06 | 3.3 | <0.01 | 20 | 0.02 | <0.05 | <0.02 | 0.21 |
| | 2016-NP2-B | 21-Sep-2016 | <0.2 | 0.12 | 0.23 | 6.1 | 0.01 | 24 | 0.14 | <0.05 | <0.02 | 0.22 |
| | 2016-NP3-B | 21-Sep-2016 | <0.2 | 0.18 | 0.21 | 6.6 | 0.01 | 33 | 0.03 | <0.05 | 0.03 | 0.27 |
| | 2016-NP4-B | 21-Sep-2016 | <0.2 | 0.14 | 0.29 | 5.1 | 0.03 | 19 | 0.02 | <0.05 | <0.02 | 0.20 |
| | 2016-NP5-B | 21-Sep-2016 | <0.2 | 0.16 | 0.31 | 4.4 | <0.01 | 41 | 0.02 | <0.05 | <0.02 | 0.24 |
| | LAB-NP1 | 28-May-2017 | <0.2 | 0.12 | 0.44 | 150 | <0.01 | 17 | 0.05 | <0.05 | 0.06 | 0.24 |
| **White Sucker** | | | | | | | | | | | | |
| | | **Count** | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| | | **# Less than DL** | 30 | 0 | 0 | 0 | 9 | 0 | 10 | 25 | 16 | 0 |
| | | **Min** | <0.2 | 0.05 | 0.2 | 4 | 0.01 | 6.4 | <0.01 | <0.05 | <0.02 | 0.13 |
| | | **Mean** | <0.2 | 0.091 | 0.59 | 17 | 0.025 | 27 | 0.016 | 0.071 | 0.038 | 0.23 |
| | | **75th** | <0.2 | 0.1225 | 0.775 | 11.25 | 0.03 | 35.25 | 0.02 | 0.05 | 0.05 | 0.2225 |
| | | **95th** | <0.2 | 0.16 | 1.5 | 133.5 | 0.0945 | 67 | 0.03 | 0.21 | 0.1245 | 0.5185 |
| | | **Max** | <0.2 | 0.17 | 1.6 | 150 | 0.1 | 68 | 0.03 | 0.23 | 0.13 | 0.59 |
| | | **Geomean** | <0.2 | 0.085 | 0.52 | 10 | 0.018 | 23 | 0.015 | 0.061 | 0.031 | 0.21 |
| | | **SD** | 8.5E-17 | 0.035 | 0.35 | 32 | 0.025 | 16 | 0.007 | 0.050 | 0.029 | 0.11 |
| **Location** | **Sample No.** | **Sample Date** | | | | | | | | | | |
| LA-1 | 2016-WS1-B | 17-Sep-2016 | <0.2 | 0.1 | 0.42 | 5.2 | 0.01 | 35 | 0.01 | <0.05 | <0.02 | 0.18 |
| | 2016-WS2-B | 20-Sep-2016 | <0.2 | 0.06 | 0.46 | 8.9 | 0.03 | 30 | 0.02 | <0.05 | <0.02 | 0.26 |
| | 2016-WS3-B | 20-Sep-2016 | <0.2 | 0.06 | 0.40 | 8.6 | 0.01 | 20 | 0.01 | <0.05 | <0.02 | 0.18 |
| | 2016-WS4-B | 20-Sep-2016 | <0.2 | 0.06 | 0.45 | 7.9 | 0.01 | 18 | 0.02 | <0.05 | 0.12 | 0.20 |
| | LA1-WS1 | 27-May-2017 | <0.2 | 0.14 | 0.27 | 4.1 | <0.01 | 10 | <0.01 | <0.05 | 0.03 | 0.13 |
| | LA1-WS2 | 27-May-2017 | <0.2 | 0.11 | 0.38 | 9.8 | <0.01 | 27 | 0.02 | <0.05 | 0.05 | 0.21 |
| LA-5 | 2016-WS1-B | 10-Sep-2016 | <0.2 | 0.05 | 0.26 | 9.8 | 0.01 | 21 | 0.02 | <0.05 | <0.02 | 0.16 |
| | 2016-WS2-B | 11-Sep-2016 | <0.2 | 0.13 | 1.6 | 6.7 | 0.09 | 24 | 0.03 | <0.05 | 0.04 | 0.20 |
| | 2016-WS3-B | 11-Sep-2016 | <0.2 | 0.17 | 1.4 | 18 | 0.07 | 38 | <0.01 | <0.05 | 0.07 | 0.14 |
| | 2016-WS4-B | 11-Sep-2016 | <0.2 | 0.06 | 1.2 | 9.3 | 0.06 | 18 | 0.03 | <0.05 | <0.02 | 0.22 |
| | 2016-WS5-B | 11-Sep-2016 | <0.2 | 0.14 | 1.1 | 7.4 | 0.05 | 35 | 0.02 | <0.05 | 0.05 | 0.23 |
| | LA5-WS1 | 30-May-2017 | <0.2 | 0.10 | 0.37 | 9.4 | 0.01 | 22 | 0.01 | <0.05 | 0.07 | 0.18 |
| LA-6 | 2016-WS1-B | 16-Sep-2016 | <0.2 | 0.12 | 0.93 | 8.1 | 0.04 | 33 | 0.02 | <0.05 | 0.04 | 0.17 |
| | 2016-WS2-B | 16-Sep-2016 | <0.2 | 0.08 | 0.79 | 4.0 | 0.03 | 17 | 0.03 | <0.05 | 0.03 | 0.18 |
| | 2016-WS3-B | 16-Sep-2016 | <0.2 | 0.06 | 0.84 | 16 | 0.02 | 18 | 0.02 | <0.05 | <0.02 | 0.22 |
| | 2016-WS4-B | 16-Sep-2016 | <0.2 | 0.1 | 0.73 | 4.9 | 0.02 | 26 | 0.02 | <0.05 | 0.03 | 0.15 |
| | 2016-WS5-B | 16-Sep-2016 | <0.2 | 0.1 | 0.77 | 9.7 | 0.03 | 27 | 0.03 | <0.05 | 0.02 | 0.18 |
| | LA6-WS1 | 29-May-2017 | <0.2 | 0.13 | 0.42 | 13 | <0.01 | 36 | 0.02 | <0.05 | 0.08 | 0.20 |
| LA-7 | 2016-WS1-B | 19-Sep-2016 | <0.2 | 0.05 | 0.40 | 6.4 | 0.01 | 11 | 0.01 | <0.05 | <0.02 | 0.20 |
| | 2016-WS2-B | 19-Sep-2016 | <0.2 | 0.07 | 0.36 | 7.4 | 0.02 | 13 | 0.01 | <0.05 | <0.02 | 0.19 |
| | 2016-WS3-B | 19-Sep-2016 | <0.2 | 0.07 | 0.28 | 7.1 | <0.01 | 12 | <0.01 | <0.05 | <0.02 | 0.15 |
| | 2016-WS4-B | 20-Sep-2016 | <0.2 | 0.07 | 0.20 | 8.0 | <0.01 | 13 | <0.01 | <0.05 | <0.02 | 0.18 |
| | 2016-WS5-B | 20-Sep-2016 | <0.2 | 0.05 | 0.40 | 15 | <0.01 | 12 | 0.02 | <0.05 | <0.02 | 0.20 |
| | LA7-WS1 | 31-May-2017 | <0.2 | 0.15 | 0.33 | 150 | <0.01 | 16 | <0.01 | <0.05 | 0.13 | 0.16 |
| | LA7-WS2 | 31-May-2017 | <0.2 | 0.06 | 0.50 | 120 | <0.01 | 6.4 | <0.01 | <0.05 | 0.05 | 0.16 |
| LAB | 2016-WS1-B | 21-Sep-2016 | <0.2 | 0.13 | 0.50 | 12 | 0.02 | 41 | 0.02 | 0.15 | <0.02 | 0.45 |
| | 2016-WS2-B | 21-Sep-2016 | <0.2 | 0.05 | 0.38 | 6.8 | <0.01 | 45 | <0.01 | 0.23 | <0.02 | 0.46 |
| | 2016-WS3-B | 21-Sep-2016 | <0.2 | 0.1 | 0.45 | 8.2 | 0.01 | 67 | <0.01 | 0.2 | <0.02 | 0.59 |
| | 2016-WS4-B | 21-Sep-2016 | <0.2 | 0.07 | 0.66 | 8.7 | 0.1 | 68 | <0.01 | 0.13 | <0.02 | 0.39 |
| | 2016-WS5-B | 21-Sep-2016 | <0.2 | 0.09 | 0.55 | 11 | 0.01 | 49 | <0.01 | 0.17 | <0.02 | 0.32 |

Results are reported on a "raw (wet) weight" basis

**Table A-18**
**Baseline Fish Bone Chemistry**

| Parameter | | | Silver | Strontium | Thallium | Tin | Titanium | Uranium | Vanadium | Zinc | Lead-210 | Polonium-210 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit | | | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | ug/g | Bq/g | Bq/g |
| **Northern Pike** | | | | | | | | | | | | |
| | | Count | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| | | # Less than DL | 34 | 0 | 34 | 33 | 0 | 34 | 34 | 0 | 33 | 5 |
| | | Min | <0.01 | 39 | <0.02 | <0.02 | 0.02 | <0.01 | <0.05 | 30 | <0.002 | <0.0005 |
| | | Mean | <0.01 | 113 | <0.02 | 0.021 | 0.11 | <0.01 | <0.05 | 48 | 0.002 | 0.00090 |
| | | 75th | <0.01 | 136 | <0.02 | 0.02 | 0.165 | <0.01 | <0.05 | 60.5 | 0.002 | 0.001 |
| | | 95th | <0.01 | 165 | <0.02 | 0.0275 | 0.3625 | <0.01 | <0.05 | 77.5 | 0.002 | 0.00225 |
| | | Max | <0.01 | 173 | <0.02 | 0.05 | 0.46 | <0.01 | <0.05 | 85 | 0.002 | 0.003 |
| | | Geomean | <0.01 | 106 | <0.02 | 0.021 | 0.072 | <0.01 | <0.05 | 46 | 0.002 | 0.00080 |
| | | SD | 3.5E-18 | 35 | 7.0E-18 | 0.0051 | 0.11 | 3.5E-18 | 2.1E-17 | 14 | 1.3E-18 | 0.00055 |
| Location | Sample No. | Sample Date | | | | | | | | | | |
| LA-1 | 2016-NP5-B | 17-Sep-2016 | <0.01 | 97 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 62 | <0.002 | 0.0008 |
| | 2016-NP4-B | 17-Sep-2016 | <0.01 | 173 | <0.02 | <0.02 | 0.02 | <0.01 | <0.05 | 60 | <0.002 | 0.001 |
| | 2016-NP1-B | 17-Sep-2016 | <0.01 | 118 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 47 | <0.002 | <0.0005 |
| | 2016-NP2-B | 17-Sep-2016 | <0.01 | 118 | <0.02 | <0.02 | 0.06 | <0.01 | <0.05 | 49 | <0.002 | 0.001 |
| | 2016-NP3-B | 17-Sep-2016 | <0.01 | 133 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 43 | <0.002 | <0.0005 |
| | LA1-NP1 | 27-May-2017 | <0.01 | 146 | <0.02 | <0.02 | 0.21 | <0.01 | <0.05 | 45 | <0.002 | 0.0005 |
| | LA1-NP2 | 27-May-2017 | <0.01 | 41 | <0.02 | <0.02 | 0.31 | <0.01 | <0.05 | 32 | <0.002 | 0.0005 |
| | LA1-NP3 | 27-May-2017 | <0.01 | 117 | <0.02 | <0.02 | 0.24 | <0.01 | <0.05 | 64 | <0.002 | 0.0007 |
| | LA1-NP4 | 27-May-2017 | <0.01 | 67 | <0.02 | <0.02 | 0.33 | <0.01 | <0.05 | 34 | <0.002 | 0.0008 |
| LA-5 | 2016-NP1-B | 10-Sep-2016 | <0.01 | 121 | <0.02 | <0.02 | 0.06 | <0.01 | <0.05 | 54 | <0.002 | 0.003 |
| | 2016-NP2-B | 10-Sep-2016 | <0.01 | 155 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 36 | <0.002 | <0.0005 |
| | 2016-NP3-B | 10-Sep-2016 | <0.01 | 162 | <0.02 | <0.02 | 0.05 | <0.01 | <0.05 | 32 | <0.002 | 0.0008 |
| | 2016-NP4-B | 10-Sep-2016 | <0.01 | 156 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 41 | <0.002 | 0.001 |
| | 2016-NP5-B | 10-Sep-2016 | <0.01 | 156 | <0.02 | <0.02 | 0.06 | <0.01 | <0.05 | 30 | <0.002 | 0.0007 |
| LA-6 | 2016-NP1-B | 16-Sep-2016 | <0.01 | 125 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 56 | <0.002 | 0.002 |
| | 2016-NP2-B | 16-Sep-2016 | <0.01 | 111 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 38 | <0.002 | 0.0006 |
| | 2016-NP3-B | 16-Sep-2016 | <0.01 | 50 | <0.02 | <0.02 | 0.06 | <0.01 | <0.05 | 36 | <0.002 | 0.002 |
| | 2016-NP4-B | 16-Sep-2016 | <0.01 | 109 | <0.02 | <0.02 | 0.02 | <0.01 | <0.05 | 34 | <0.002 | 0.0005 |
| | 2016-NP5-B | 16-Sep-2016 | <0.01 | 128 | <0.02 | <0.02 | 0.05 | <0.01 | <0.05 | 44 | <0.002 | <0.0005 |
| | LA6-NP1 | 29-May-2017 | <0.01 | 113 | <0.02 | <0.02 | 0.24 | <0.01 | <0.05 | 46 | <0.002 | 0.0008 |
| LA-7 | 2016-NP1-B | 19-Sep-2016 | <0.01 | 97 | <0.02 | <0.02 | 0.10 | <0.01 | <0.05 | 51 | <0.002 | 0.0008 |
| | 2016-NP2-B | 19-Sep-2016 | <0.01 | 149 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 67 | <0.002 | 0.0008 |
| | 2016-NP3-B | 19-Sep-2016 | <0.01 | 132 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 70 | <0.002 | 0.001 |
| | 2016-NP4-B | 19-Sep-2016 | <0.01 | 114 | <0.02 | <0.02 | 0.08 | <0.01 | <0.05 | 31 | <0.002 | 0.0006 |
| | 2016-NP5-B | 19-Sep-2016 | <0.01 | 145 | <0.02 | <0.02 | 0.05 | <0.01 | <0.05 | 85 | <0.002 | 0.0006 |
| | LA7-NP1 | 31-May-2017 | <0.01 | 132 | <0.02 | 0.05 | 0.14 | <0.01 | <0.05 | 43 | <0.002 | <0.0005 |
| | LA7-NP2 | 31-May-2017 | <0.01 | 105 | <0.02 | <0.02 | 0.15 | <0.01 | <0.05 | 44 | 0.002 | 0.0008 |
| | LA7-NP3 | 31-May-2017 | <0.01 | 127 | <0.02 | <0.02 | 0.33 | <0.01 | <0.05 | 39 | <0.002 | 0.002 |
| LAB | 2016-NP1-B | 20-Sep-2016 | <0.01 | 67 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 46 | <0.002 | 0.0005 |
| | 2016-NP2-B | 21-Sep-2016 | <0.01 | 60 | <0.02 | <0.02 | 0.21 | <0.01 | <0.05 | 62 | <0.002 | 0.001 |
| | 2016-NP3-B | 21-Sep-2016 | <0.01 | 77 | <0.02 | <0.02 | 0.06 | <0.01 | <0.05 | 75 | <0.002 | 0.0009 |
| | 2016-NP4-B | 21-Sep-2016 | <0.01 | 90 | <0.02 | <0.02 | 0.02 | <0.01 | <0.05 | 46 | <0.002 | 0.0009 |
| | 2016-NP5-B | 21-Sep-2016 | <0.01 | 100 | <0.02 | <0.02 | 0.10 | <0.01 | <0.05 | 63 | <0.002 | 0.0006 |
| | LAB-NP1 | 28-May-2017 | <0.01 | 39 | <0.02 | <0.02 | 0.46 | <0.01 | <0.05 | 31 | <0.002 | 0.001 |
| **White Sucker** | | | | | | | | | | | | |
| | | Count | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| | | # Less than DL | 29 | 0 | 30 | 29 | 1 | 29 | 30 | 0 | 28 | 1 |
| | | Min | <0.01 | 40 | <0.02 | <0.02 | 0.02 | 0.01 | 0.05 | 11 | <0.002 | <0.0005 |
| | | Mean | 0.010 | 123 | <0.02 | 0.02 | 0.157333 | 0.01 | 0.05 | 20 | 0.0023 | 0.0030 |
| | | 75th | 0.01 | 164.25 | <0.02 | 0.02 | 0.095 | 0.01 | 0.05 | 22 | 0.002 | 0.004 |
| | | 95th | 0.0145 | 199 | <0.02 | 0.02 | 1.05 | 0.01 | 0.05 | 30 | 0.0059 | 0.00645 |
| | | Max | 0.02 | 211 | <0.02 | 0.02 | 1.7 | 0.01 | 0.05 | 33 | 0.007 | 0.007 |
| | | Geomean | 0.010 | 115 | <0.02 | 0.02 | 0.069 | 0.01 | 0.05 | 19 | 0.0021 | 0.0025 |
| | | SD | 0.001826 | 43 | 7.06E-18 | 7.06E-18 | 0.32 | 3.5E-18 | 2.1E-17 | 4.3 | 0.0010 | 0.0016 |
| Location | Sample No. | Sample Date | | | | | | | | | | |
| LA-1 | 2016-WS1-B | 17-Sep-2016 | <0.01 | 175 | <0.02 | <0.02 | 0.06 | <0.01 | <0.05 | 19 | 0.007 | 0.002 |
| | 2016-WS2-B | 20-Sep-2016 | <0.01 | 111 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 16 | <0.002 | 0.004 |
| | 2016-WS3-B | 20-Sep-2016 | <0.01 | 120 | <0.02 | <0.02 | 0.09 | <0.01 | <0.05 | 18 | <0.002 | 0.002 |
| | 2016-WS4-B | 20-Sep-2016 | <0.01 | 117 | <0.02 | <0.02 | 0.05 | <0.01 | <0.05 | 20 | <0.002 | 0.004 |
| | LA1-WS1 | 27-May-2017 | <0.01 | 188 | <0.02 | <0.02 | 0.40 | <0.01 | <0.05 | 18 | <0.002 | 0.001 |
| | LA1-WS2 | 27-May-2017 | 0.02 | 119 | <0.02 | <0.02 | 0.52 | <0.01 | <0.05 | 21 | <0.002 | 0.002 |
| LA-5 | 2016-WS1-B | 10-Sep-2016 | <0.01 | 125 | <0.02 | <0.02 | 0.05 | <0.01 | <0.05 | 15 | <0.002 | 0.002 |
| | 2016-WS2-B | 11-Sep-2016 | <0.01 | 175 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 23 | <0.002 | 0.001 |
| | 2016-WS3-B | 11-Sep-2016 | <0.01 | 211 | <0.02 | <0.02 | 0.02 | <0.01 | <0.05 | 33 | <0.002 | 0.003 |
| | 2016-WS4-B | 11-Sep-2016 | <0.01 | 87 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 17 | <0.002 | 0.003 |
| | 2016-WS5-B | 11-Sep-2016 | <0.01 | 190 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 27 | <0.002 | 0.002 |
| | LA5-WS1 | 30-May-2017 | <0.01 | 107 | <0.02 | <0.02 | 0.25 | <0.01 | <0.05 | 20 | <0.002 | 0.001 |
| LA-6 | 2016-WS1-B | 16-Sep-2016 | <0.01 | 145 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 21 | <0.002 | 0.003 |
| | 2016-WS2-B | 16-Sep-2016 | <0.01 | 92 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 16 | <0.002 | 0.002 |
| | 2016-WS3-B | 16-Sep-2016 | <0.01 | 132 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 21 | <0.002 | 0.002 |
| | 2016-WS4-B | 16-Sep-2016 | <0.01 | 100 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 16 | <0.002 | 0.004 |
| | 2016-WS5-B | 16-Sep-2016 | <0.01 | 126 | <0.02 | <0.02 | 0.05 | <0.01 | <0.05 | 16 | <0.002 | 0.004 |
| | LA6-WS1 | 29-May-2017 | <0.01 | 165 | <0.02 | <0.02 | 0.23 | <0.01 | <0.05 | 22 | <0.002 | 0.002 |
| LA-7 | 2016-WS1-B | 19-Sep-2016 | <0.01 | 122 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 18 | <0.002 | 0.004 |
| | 2016-WS2-B | 19-Sep-2016 | <0.01 | 164 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 22 | <0.002 | 0.007 |
| | 2016-WS3-B | 19-Sep-2016 | <0.01 | 150 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 21 | <0.002 | 0.006 |
| | 2016-WS4-B | 20-Sep-2016 | <0.01 | 120 | <0.02 | <0.02 | 0.09 | <0.01 | <0.05 | 18 | <0.002 | 0.005 |
| | 2016-WS5-B | 20-Sep-2016 | <0.01 | 100 | <0.02 | <0.02 | <0.02 | <0.01 | <0.05 | 16 | 0.005 | 0.004 |
| | LA7-WS1 | 31-May-2017 | <0.01 | 172 | <0.02 | <0.02 | 0.48 | <0.01 | <0.05 | 21 | <0.002 | 0.002 |
| | LA7-WS2 | 31-May-2017 | <0.01 | 67 | <0.02 | 0.02 | 1.7 | <0.01 | <0.05 | 11 | <0.002 | 0.001 |
| LAB | 2016-WS1-B | 21-Sep-2016 | <0.01 | 75 | <0.02 | <0.02 | 0.09 | 0.01 | <0.05 | 26 | <0.002 | 0.005 |
| | 2016-WS2-B | 21-Sep-2016 | <0.01 | 40 | <0.02 | <0.02 | 0.03 | <0.01 | <0.05 | 16 | <0.002 | 0.003 |
| | 2016-WS3-B | 21-Sep-2016 | <0.01 | 72 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 24 | <0.002 | <0.0005 |
| | 2016-WS4-B | 21-Sep-2016 | <0.01 | 69 | <0.02 | <0.02 | 0.04 | <0.01 | <0.05 | 24 | <0.002 | 0.003 |
| | 2016-WS5-B | 21-Sep-2016 | <0.01 | 61 | <0.02 | <0.02 | 0.11 | <0.01 | <0.05 | 21 | <0.002 | 0.004 |

Results are reported on a "raw (wet) weight" basis

**Table A-18**
**Baseline Fish Bone Chemistry**

| Parameter | | | Radium-226 | Thorium-228 | Thorium-230 | Thorium-232 |
|---|---|---|---|---|---|---|
| Unit | | | Bq/g | Bq/g | Bq/g | Bq/g |
| **Northern Pike** | | | | | | |
| | | **Count** | 34 | 14 | 34 | 14 |
| | | **# Less than DL** | 31 | 14 | 34 | 14 |
| | | **Min** | <0.0006 | <0.001 | <0.001 | <0.001 |
| | | **Mean** | 0.0010 | 0.0019 | <0.00205882 | 0.0019 |
| | | **75th** | 0.001 | 0.002 | <0.002 | 0.002 |
| | | **95th** | 0.00225 | na | <0.003 | na |
| | | **Max** | 0.003 | 0.003 | <0.003 | 0.003 |
| | | **Geomean** | 0.00099 | 0.0018 | <0.00199694 | 0.0018 |
| | | **SD** | 0.00040 | 0.00053 | 0.00049 | 0.00053 |
| **Location** | **Sample No.** | **Sample Date** | | | | |
| LA-1 | 2016-NP5-B | 17-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP4-B | 17-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP1-B | 17-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP2-B | 17-Sep-2016 | <0.0009 | | <0.002 | |
| | 2016-NP3-B | 17-Sep-2016 | <0.001 | | <0.003 | |
| | LA1-NP1 | 27-May-2017 | <0.001 | <0.002 | <0.002 | <0.002 |
| | LA1-NP2 | 27-May-2017 | <0.0009 | <0.002 | <0.002 | <0.002 |
| | LA1-NP3 | 27-May-2017 | <0.0007 | <0.001 | <0.001 | <0.001 |
| | LA1-NP4 | 27-May-2017 | <0.0009 | <0.002 | <0.002 | <0.002 |
| LA-5 | 2016-NP1-B | 10-Sep-2016 | <0.001 | <0.002 | <0.002 | <0.002 |
| | 2016-NP2-B | 10-Sep-2016 | <0.0008 | <0.002 | <0.002 | <0.002 |
| | 2016-NP3-B | 10-Sep-2016 | <0.0009 | <0.002 | <0.002 | <0.002 |
| | 2016-NP4-B | 10-Sep-2016 | <0.0009 | <0.002 | <0.002 | <0.002 |
| | 2016-NP5-B | 10-Sep-2016 | 0.002 | <0.002 | <0.002 | <0.002 |
| LA-6 | 2016-NP1-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP2-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP3-B | 16-Sep-2016 | <0.001 | | <0.003 | |
| | 2016-NP4-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP5-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | LA6-NP1 | 29-May-2017 | <0.0009 | <0.002 | <0.002 | <0.002 |
| LA-7 | 2016-NP1-B | 19-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP2-B | 19-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP3-B | 19-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP4-B | 19-Sep-2016 | 0.001 | | <0.002 | |
| | 2016-NP5-B | 19-Sep-2016 | 0.003 | | <0.002 | |
| | LA7-NP1 | 31-May-2017 | <0.001 | <0.002 | <0.002 | <0.002 |
| | LA7-NP2 | 31-May-2017 | <0.001 | <0.003 | <0.003 | <0.003 |
| | LA7-NP3 | 31-May-2017 | <0.0006 | <0.001 | <0.001 | <0.001 |
| LAB | 2016-NP1-B | 20-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP2-B | 21-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-NP3-B | 21-Sep-2016 | <0.001 | | <0.003 | |
| | 2016-NP4-B | 21-Sep-2016 | <0.001 | | <0.003 | |
| | 2016-NP5-B | 21-Sep-2016 | <0.001 | | <0.002 | |
| | LAB-NP1 | 28-May-2017 | <0.0007 | <0.001 | <0.001 | <0.001 |
| **White Sucker** | | | | | | |
| | | **Count** | 30 | 7 | 30 | 7 |
| | | **# Less than DL** | 28 | 7 | 29 | 7 |
| | | **Min** | <0.0008 | <0.002 | <0.002 | <0.002 |
| | | **Mean** | 0.0010 | <0.002 | 0.0020 | <0.002 |
| | | **75th** | 0.001 | <0.002 | 0.002 | <0.002 |
| | | **95th** | 0.001 | na | 0.00245 | na |
| | | **Max** | 0.001 | <0.002 | 0.003 | <0.002 |
| | | **Geomean** | 0.0010 | <0.002 | 0.0020 | <0.002 |
| | | **SD** | 7.8E-05 | 0 | 0.00018 | 0 |
| **Location** | **Sample No.** | **Sample Date** | | | | |
| LA-1 | 2016-WS1-B | 17-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS2-B | 20-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS3-B | 20-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS4-B | 20-Sep-2016 | <0.001 | | <0.002 | |
| | LA1-WS1 | 27-May-2017 | <0.0009 | <0.002 | <0.002 | <0.002 |
| | LA1-WS2 | 27-May-2017 | <0.001 | <0.002 | <0.002 | <0.002 |
| LA-5 | 2016-WS1-B | 10-Sep-2016 | 0.001 | <0.002 | <0.002 | <0.002 |
| | 2016-WS2-B | 11-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS3-B | 11-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS4-B | 11-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS5-B | 11-Sep-2016 | <0.001 | | <0.002 | |
| | LA5-WS1 | 30-May-2017 | <0.0008 | <0.002 | <0.002 | <0.002 |
| LA-6 | 2016-WS1-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS2-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS3-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS4-B | 16-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS5-B | 16-Sep-2016 | <0.001 | | 0.003 | |
| | LA6-WS1 | 29-May-2017 | <0.0008 | <0.002 | <0.002 | <0.002 |
| LA-7 | 2016-WS1-B | 19-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS2-B | 19-Sep-2016 | <0.0009 | | <0.002 | |
| | 2016-WS3-B | 19-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS4-B | 20-Sep-2016 | 0.001 | | <0.002 | |
| | 2016-WS5-B | 20-Sep-2016 | <0.001 | | <0.002 | |
| | LA7-WS1 | 31-May-2017 | <0.001 | <0.002 | <0.002 | <0.002 |
| | LA7-WS2 | 31-May-2017 | <0.0009 | <0.002 | <0.002 | <0.002 |
| LAB | 2016-WS1-B | 21-Sep-2016 | <0.001 | | <0.002 | |
| | 2016-WS2-B | 21-Sep-2016 | <0.0008 | | <0.002 | |
| | 2016-WS3-B | 21-Sep-2016 | <0.0008 | | <0.002 | |
| | 2016-WS4-B | 21-Sep-2016 | <0.0008 | | <0.002 | |
| | 2016-WS5-B | 21-Sep-2016 | <0.0009 | | <0.002 | |

Results are reported on a "raw (wet) weight" basis

# Appendix B 2016-2018 Analytical Laboratory Reports

B-1: Lake Surface Water Quality
B-2: Lake Sediment Grain Size Analysis
B-3: Lake Sediment Quality
B-4: Lake Plankton Community
B-5: Benthic Taxonomy Data
B-6: Benthic Invertebrate Chemistry
B-7: Fish Flesh and Bone Chemistry
B-8: Environmental DNA Laboratory Report

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-10860

Sep 29, 2016

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-13-2016 Client P.O.: 16-2285

---

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman, Supervisor

Lab Section 2 results have been authorized by Melissa Tackaberry-Syed, Supervisor

Lab Section 3 results have been authorized by Pat Moser, Supervisor

Lab Sections 4 and 5 results have been authorized by Vicky Snook, Supervisor

Lab Section 6 results have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as

    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-10860

Sep 29, 2016

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-13-2016 Client P.O.: 16-2285

**28877 09/10/2016 LB-3T *WATER***
**28878 09/10/2016 LB-3B *WATER***
**28879 09/10/2016 LA-5 *WATER***

| Analyte | Units | 28877 | 28878 | 28879 |
|---|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | | |
| Bicarbonate | mg/L | 10 | 17 | 8 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.2 | 0.8 | 0.3 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 7.11 | 6.42 | 6.95 |
| Specific conductivity | uS/cm | 18 | 32 | 19 |
| Sum of ions | mg/L | 14 | 24 | 12 |
| Total alkalinity | mg/L | 8 | 14 | 7 |
| Total hardness | mg/L | 5 | 6 | 5 |
| Ammonia as nitrogen | mg/L | 0.02 | 1.2 | 0.07 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.20 | 1.6 | 0.19 |
| Mercury | ng/L | <1 | 10 | <1 |
| Organic carbon | mg/L | 2.7 | 4.4 | 2.2 |
| Organic carbon, dissolved | mg/L | 2.6 | 4.2 | 2.1 |
| Fluoride | mg/L | 0.02 | 0.02 | 0.02 |
| Total dissolved solids | mg/L | 24 | 33 | 22 |
| Total suspended solids | mg/L | 2 | 23 | 4 |
| **Lab Section 2 (ICP)** | | | | |
| Calcium | mg/L | 1.3 | 1.8 | 1.2 |
| Magnesium | mg/L | 0.4 | 0.5 | 0.4 |
| Potassium | mg/L | 0.2 | 0.3 | 0.2 |
| Sodium | mg/L | 1.4 | 1.6 | 1.4 |
| Sulfate | mg/L | 0.7 | 0.5 | 0.6 |
| Aluminum | mg/L | 0.0016 | 0.0086 | 0.0078 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | 0.1 | 0.3 | 0.1 |
| Barium | mg/L | 0.0028 | 0.0095 | 0.0027 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-10860

Sep 29, 2016

EcoMetrix Inc.

**28877 09/10/2016 LB-3T *WATER***
**28878 09/10/2016 LB-3B *WATER***
**28879 09/10/2016 LA-5 *WATER***

| Analyte | Units | 28877 | 28878 | 28879 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Cadmium | mg/L | <0.00001 | 0.00002 | 0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | 0.0002 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.062 | 9.5 | 0.19 |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.012 | 0.34 | 0.020 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | 0.0003 | <0.0001 |
| Selenium | mg/L | <0.0001 | 0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.011 | 0.016 | 0.012 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | 0.0005 | <0.0001 |
| Zinc | mg/L | <0.0005 | 0.0029 | <0.0005 |
| Phosphorus | mg/L | <0.01 | 0.17 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | 0.15 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | 0.02 | 0.005 |
| Radium-226 | Bq/L | <0.005 | 0.007 | 0.008 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | 0.02 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-10860

Sep 29, 2016

EcoMetrix Inc.

**28880 09/10/2016 LA-7 *WATER***

| Analyte | Units | 28880 |
|---|---|---|
| **Lab Section 1 (Inorganics)** | | |
| Bicarbonate | mg/L | 10 |
| Carbonate | mg/L | <1 |
| Chloride | mg/L | 0.5 |
| Hydroxide | mg/L | <1 |
| P. alkalinity | mg/L | <1 |
| pH | pH units | 7.14 |
| Specific conductivity | uS/cm | 21 |
| Sum of ions | mg/L | 14 |
| Total alkalinity | mg/L | 8 |
| Total hardness | mg/L | 5 |
| Ammonia as nitrogen | mg/L | 0.01 |
| Nitrate | mg/L | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.32 |
| Mercury | ng/L | <1 |
| Organic carbon | mg/L | 2.4 |
| Organic carbon, dissolved | mg/L | 2.2 |
| Fluoride | mg/L | 0.02 |
| Total dissolved solids | mg/L | 22 |
| Total suspended solids | mg/L | 4 |
| **Lab Section 2 (ICP)** | | |
| Calcium | mg/L | 1.4 |
| Magnesium | mg/L | 0.4 |
| Potassium | mg/L | 0.2 |
| Sodium | mg/L | 1.6 |
| Sulfate | mg/L | 0.4 |
| Aluminum | mg/L | 0.0036 |
| Antimony | mg/L | <0.0002 |
| Arsenic | ug/L | 0.1 |
| Barium | mg/L | 0.0024 |
| Beryllium | mg/L | <0.0001 |
| Boron | mg/L | <0.01 |
| Cadmium | mg/L | <0.00001 |
| Chromium | mg/L | <0.0005 |
| Cobalt | mg/L | <0.0001 |
| Copper | mg/L | <0.0002 |
| Iron | mg/L | 0.13 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-10860

Sep 29, 2016

EcoMetrix Inc.

**28880 09/10/2016 LA-7 *WATER***

| Analyte | Units | 28880 |
|---|---|---|
| **Lab Section 2 (ICP)** | | |
| Lead | mg/L | <0.0001 |
| Manganese | mg/L | 0.015 |
| Molybdenum | mg/L | <0.0001 |
| Nickel | mg/L | <0.0001 |
| Selenium | mg/L | <0.0001 |
| Silver | mg/L | <0.00005 |
| Strontium | mg/L | 0.014 |
| Thallium | mg/L | <0.0002 |
| Tin | mg/L | <0.0001 |
| Titanium | mg/L | <0.0002 |
| Uranium | ug/L | <0.1 |
| Vanadium | mg/L | <0.0001 |
| Zinc | mg/L | <0.0005 |
| Phosphorus | mg/L | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | |
| Lead-210 | Bq/L | <0.02 |
| Polonium-210 | Bq/L | <0.005 |
| Radium-226 | Bq/L | <0.005 |
| Thorium-228 | Bq/L | <0.01 |
| Thorium-230 | Bq/L | 0.01 |
| Thorium-232 | Bq/L | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11057

Sep 27, 2016

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-15-2016 Client P.O.: 16-2285

---

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman, Supervisor

Lab Section 2 results have been authorized by Melissa Tackaberry-Syed, Supervisor

Lab Section 3 results have been authorized by Pat Moser, Supervisor

Lab Sections 4 and 5 results have been authorized by Vicky Snook, Supervisor

Lab Section 6 results have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as

    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11057

Sep 27, 2016

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-15-2016 Client P.O.: 16-2285

**29148 09/13/2016 LB-1 *WATER***
**29149 09/13/2016 LB-2 *WATER***
**29150 09/14/2016 LA-1 *WATER***

| Analyte | Units | 29148 | 29149 | 29150 |
|---|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | | |
| Bicarbonate | mg/L | 5 | 8 | 10 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.1 | 0.2 | 0.4 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 6.70 | 6.74 | 6.79 |
| Specific conductivity | uS/cm | 18 | 20 | 19 |
| Sum of ions | mg/L | 9 | 12 | 14 |
| Total alkalinity | mg/L | 4 | 7 | 8 |
| Total hardness | mg/L | 5 | 5 | 5 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 | <0.01 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.28 | 0.35 | 0.38 |
| Mercury | ng/L | <1 | <1 | <1 |
| Organic carbon | mg/L | 3.4 | 3.6 | 2.3 |
| Organic carbon, dissolved | mg/L | 3.6 | 3.5 | 2.1 |
| Fluoride | mg/L | 0.02 | <0.01 | <0.01 |
| Total dissolved solids | mg/L | 19 | 19 | 18 |
| Total suspended solids | mg/L | 2 | <1 | 4 |
| **Lab Section 2 (ICP)** | | | | |
| Calcium | mg/L | 1.2 | 1.3 | 1.2 |
| Magnesium | mg/L | 0.4 | 0.4 | 0.4 |
| Potassium | mg/L | 0.2 | 0.2 | 0.2 |
| Sodium | mg/L | 1.4 | 1.4 | 1.5 |
| Sulfate | mg/L | 0.7 | 0.5 | 0.7 |
| Aluminum | mg/L | 0.011 | 0.0096 | 0.0039 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | 0.1 | 0.1 | <0.1 |
| Barium | mg/L | 0.0033 | 0.0033 | 0.0030 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11057

Sep 27, 2016

EcoMetrix Inc.

**29148 09/13/2016 LB-1 *WATER***
**29149 09/13/2016 LB-2 *WATER***
**29150 09/14/2016 LA-1 *WATER***

| Analyte | Units | 29148 | 29149 | 29150 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Cadmium | mg/L | 0.00002 | 0.00001 | 0.00003 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.084 | 0.15 | 0.27 |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.0044 | 0.0094 | 0.023 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.0001 | 0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.013 | 0.013 | 0.013 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | 0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | 0.03 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 | <0.005 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11057

Sep 27, 2016

EcoMetrix Inc.

**29151 09/14/2016 LA-8 *WATER***
**29152 09/13/2016 DUP1 *WATER***
**29153 09/12/2016 LA-6 *WATER***

| Analyte | Units | 29151 | 29152 | 29153 |
|---|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | | |
| Bicarbonate | mg/L | 2 | 11 | 4 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.3 | 0.2 | 0.4 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 6.79 | 6.73 | 6.71 |
| Specific conductivity | uS/cm | 17 | 18 | 18 |
| Sum of ions | mg/L | 6 | 15 | 8 |
| Total alkalinity | mg/L | 2 | 9 | 3 |
| Total hardness | mg/L | 5 | 5 | 5 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 | 0.04 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.61 | 0.33 | 0.43 |
| Mercury | ng/L | <1 | <1 | <1 |
| Organic carbon | mg/L | 2.2 | 3.6 | 2.3 |
| Organic carbon, dissolved | mg/L | 2.0 | 3.6 | 2.2 |
| Fluoride | mg/L | <0.01 | <0.01 | 0.02 |
| Total dissolved solids | mg/L | 21 | 18 | 14 |
| Total suspended solids | mg/L | 4 | <1 | 4 |
| **Lab Section 2 (ICP)** | | | | |
| Calcium | mg/L | 1.2 | 1.4 | 1.2 |
| Magnesium | mg/L | 0.4 | 0.4 | 0.4 |
| Potassium | mg/L | 0.2 | 0.2 | 0.2 |
| Sodium | mg/L | 1.3 | 1.4 | 1.4 |
| Sulfate | mg/L | 0.6 | 0.7 | 0.5 |
| Aluminum | mg/L | 0.0046 | 0.0098 | 0.0093 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | <0.1 | <0.1 |
| Barium | mg/L | 0.0029 | 0.0034 | 0.0027 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.14 | 0.15 | 0.21 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11057

Sep 27, 2016

EcoMetrix Inc.

**29151 09/14/2016 LA-8 *WATER***
**29152 09/13/2016 DUP1 *WATER***
**29153 09/12/2016 LA-6 *WATER***

| Analyte | Units | 29151 | 29152 | 29153 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.028 | 0.0092 | 0.017 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | 0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.012 | 0.013 | 0.012 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | 0.01 | 0.008 | <0.005 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11057

Sep 27, 2016

EcoMetrix Inc.

**29154 09/12/2016 LA-7A-T *WATER***
**29155 09/12/2016 LA-7A-B *WATER***

| Analyte | Units | 29154 | 29155 |
|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | |
| Bicarbonate | mg/L | 7 | 16 |
| Carbonate | mg/L | <1 | <1 |
| Chloride | mg/L | 0.6 | 0.6 |
| Hydroxide | mg/L | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 |
| pH | pH units | 6.89 | 6.46 |
| Specific conductivity | uS/cm | 21 | 32 |
| Sum of ions | mg/L | 12 | 23 |
| Total alkalinity | mg/L | 6 | 13 |
| Total hardness | mg/L | 5 | 7 |
| Ammonia as nitrogen | mg/L | <0.01 | 0.91 |
| Nitrate | mg/L | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.34 | 1.2 |
| Mercury | ng/L | <1 | 68 |
| Organic carbon | mg/L | 2.1 | 2.6 |
| Organic carbon, dissolved | mg/L | 2.1 | 2.6 |
| Fluoride | mg/L | <0.01 | <0.01 |
| Total dissolved solids | mg/L | 22 | 29 |
| Total suspended solids | mg/L | 3 | 13 |
| **Lab Section 2 (ICP)** | | | |
| Calcium | mg/L | 1.4 | 2.1 |
| Magnesium | mg/L | 0.4 | 0.5 |
| Potassium | mg/L | 0.2 | 0.2 |
| Sodium | mg/L | 1.7 | 1.7 |
| Sulfate | mg/L | 0.3 | 0.5 |
| Aluminum | mg/L | 0.0015 | 0.0033 |
| Antimony | mg/L | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | 0.2 |
| Barium | mg/L | 0.0025 | 0.0036 |
| Beryllium | mg/L | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 |
| Cadmium | mg/L | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 |
| Iron | mg/L | 0.085 | 5.2 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11057

Sep 27, 2016

EcoMetrix Inc.

**29154 09/12/2016 LA-7A-T *WATER***
**29155 09/12/2016 LA-7A-B *WATER***

| Analyte | Units | 29154 | 29155 |
|---|---|---|---|
| **Lab Section 2 (ICP)** | | | |
| Lead | mg/L | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.013 | 0.25 |
| Molybdenum | mg/L | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | 0.0002 |
| Silver | mg/L | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.014 | 0.018 |
| Thallium | mg/L | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | 0.0003 |
| Zinc | mg/L | <0.0005 | 0.0014 |
| Phosphorus | mg/L | <0.01 | 0.11 |
| Phosphorus, dissolved | mg/L | <0.01 | 0.10 |
| **Lab Section 4 (Radiochemistry)** | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | 0.008 |
| Radium-226 | Bq/L | <0.005 | 0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 29155
This sample was reanalyzed for Mercury. Reanalysis confirmed original results within the expected measurement uncertainty.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11119

Oct 05, 2016

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-19-2016 Client P.O.: 16-2285

---

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman, Supervisor

Lab Section 2 results have been authorized by Melissa Tackaberry-Syed, Supervisor

Lab Section 3 results have been authorized by Pat Moser, Supervisor

Lab Sections 4 and 5 results have been authorized by Vicky Snook, Supervisor

Lab Section 6 results have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as

    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11119

Oct 05, 2016

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-19-2016 Client P.O.: 16-2285

**29655 09/15/2016 LAB-1 *WATER***
**29656 09/16/2016 LA-9 *WATER***

| Analyte | Units | 29655 | 29656 |
|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | |
| Bicarbonate | mg/L | 8 | 5 |
| Carbonate | mg/L | <1 | <1 |
| Chloride | mg/L | <0.1 | 0.2 |
| Hydroxide | mg/L | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 |
| pH | pH units | 6.96 | 6.88 |
| Specific conductivity | uS/cm | 47 | 17 |
| Sum of ions | mg/L | 23 | 9 |
| Total alkalinity | mg/L | 7 | 4 |
| Total hardness | mg/L | 12 | 4 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 |
| Nitrate | mg/L | 0.05 | 0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.15 | 0.28 |
| Mercury | ng/L | <1 | <1 |
| Organic carbon | mg/L | 2.4 | 2.2 |
| Organic carbon, dissolved | mg/L | 2.4 | 2.1 |
| Fluoride | mg/L | 0.02 | 0.01 |
| Total dissolved solids | mg/L | 30 | 11 |
| Total suspended solids | mg/L | 1 | 3 |
| **Lab Section 2 (ICP)** | | | |
| Calcium | mg/L | 3.8 | 1.1 |
| Magnesium | mg/L | 0.6 | 0.3 |
| Potassium | mg/L | 0.3 | 0.1 |
| Sodium | mg/L | 1.8 | 1.4 |
| Sulfate | mg/L | 8.1 | 0.6 |
| Aluminum | mg/L | 0.0025 | 0.0016 |
| Antimony | mg/L | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | 0.1 |
| Barium | mg/L | 0.0035 | 0.0024 |
| Beryllium | mg/L | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11119

Oct 05, 2016

EcoMetrix Inc.

**29655 09/15/2016 LAB-1 *WATER***
**29656 09/16/2016 LA-9 *WATER***

| Analyte | Units | 29655 | 29656 |
|---|---|---|---|
| **Lab Section 2 (ICP)** | | | |
| Cadmium | mg/L | 0.00001 | 0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 |
| Iron | mg/L | 0.076 | 0.071 |
| Lead | mg/L | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.041 | 0.011 |
| Molybdenum | mg/L | 0.0013 | 0.0002 |
| Nickel | mg/L | 0.0001 | 0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.017 | 0.011 |
| Thallium | mg/L | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 |
| Radium-226 | Bq/L | 0.006 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

---

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman, Supervisor

Lab Section 2 results have been authorized by Melissa Tackaberry-Syed, Supervisor

Lab Section 3 results have been authorized by Pat Moser, Supervisor

Lab Sections 4 and 5 results have been authorized by Vicky Snook, Supervisor

Lab Section 6 results have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as

    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

**30215 09/19/2016 PA-3 *WATER***
**30216 09/20/2016 PA-2 *WATER***
**30217 09/21/2016 LA-2 *WATER***

| Analyte | Units | 30215 | 30216 | 30217 |
|---|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | | |
| Bicarbonate | mg/L | 5 | 7 | 11 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.4 | 0.3 | 0.7 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 6.74 | 7.03 | 7.19 |
| Specific conductivity | uS/cm | 18 | 20 | 22 |
| Sum of ions | mg/L | 10 | 12 | 16 |
| Total alkalinity | mg/L | 4 | 6 | 9 |
| Total hardness | mg/L | 4 | 5 | 5 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 | <0.01 |
| Nitrate | mg/L | <0.04 | 0.04 | 0.05 |
| Total Kjeldahl nitrogen | mg/L | 0.33 | 0.22 | 0.22 |
| Mercury | ng/L | 1 | <1 | <1 |
| Organic carbon | mg/L | 8.4 | 3.4 | 2.2 |
| Organic carbon, dissolved | mg/L | 8.4 | 3.4 | 2.2 |
| Fluoride | mg/L | 0.02 | 0.06 | <0.01 |
| Total dissolved solids | mg/L | 29 | 22 | 22 |
| Total suspended solids | mg/L | 2 | 2 | 2 |
| **Lab Section 2 (ICP)** | | | | |
| Calcium | mg/L | 1.0 | 1.2 | 1.3 |
| Magnesium | mg/L | 0.3 | 0.4 | 0.4 |
| Potassium | mg/L | 0.5 | 0.2 | 0.4 |
| Sodium | mg/L | 1.3 | 1.4 | 1.6 |
| Sulfate | mg/L | 1.1 | 1.1 | 0.6 |
| Aluminum | mg/L | 0.027 | 0.0096 | 0.0022 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | <0.1 | <0.1 |
| Barium | mg/L | 0.0026 | 0.0026 | 0.0029 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

**30215 09/19/2016 PA-3 *WATER***
**30216 09/20/2016 PA-2 *WATER***
**30217 09/21/2016 LA-2 *WATER***

| Analyte | Units | 30215 | 30216 | 30217 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.098 | 0.044 | 0.064 |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.0025 | 0.0026 | 0.0078 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.0002 | 0.0002 | 0.0003 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.010 | 0.012 | 0.015 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | 0.0003 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | 0.0001 | <0.0001 |
| Zinc | mg/L | 0.0006 | <0.0005 | 0.0011 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | 0.007 | <0.005 |
| Radium-226 | Bq/L | 0.006 | <0.005 | 0.006 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

**30218 09/21/2016 LA-3 *WATER***
**30219 09/21/2016 LA-4 *WATER***
**30220 09/21/2016 LAB-2 *WATER***

| Analyte | Units | 30218 | 30219 | 30220 |
|---|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | | |
| Bicarbonate | mg/L | 8 | 15 | 10 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.8 | 0.6 | 0.4 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 7.15 | 7.19 | 7.17 |
| Specific conductivity | uS/cm | 22 | 24 | 42 |
| Sum of ions | mg/L | 14 | 21 | 25 |
| Total alkalinity | mg/L | 7 | 12 | 8 |
| Total hardness | mg/L | 5 | 5 | 12 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 | <0.01 |
| Nitrate | mg/L | 0.05 | 0.05 | 0.05 |
| Total Kjeldahl nitrogen | mg/L | 0.25 | 0.24 | 0.29 |
| Mercury | ng/L | <1 | <1 | <1 |
| Organic carbon | mg/L | 2.3 | 1.4 | 2.2 |
| Organic carbon, dissolved | mg/L | 2.2 | 1.4 | 2.2 |
| Fluoride | mg/L | <0.01 | 0.02 | 0.03 |
| Total dissolved solids | mg/L | 22 | 26 | 35 |
| Total suspended solids | mg/L | 4 | 3 | 4 |
| **Lab Section 2 (ICP)** | | | | |
| Calcium | mg/L | 1.2 | 1.4 | 3.5 |
| Magnesium | mg/L | 0.4 | 0.4 | 0.7 |
| Potassium | mg/L | 0.8 | 0.6 | 0.8 |
| Sodium | mg/L | 1.5 | 1.7 | 1.7 |
| Sulfate | mg/L | 0.9 | 1.3 | 8.3 |
| Aluminum | mg/L | 0.0021 | 0.0017 | 0.0029 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | 0.1 | 0.1 |
| Barium | mg/L | 0.0030 | 0.0030 | 0.0034 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.072 | 0.020 | 0.039 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

**30218 09/21/2016 LA-3 *WATER***
**30219 09/21/2016 LA-4 *WATER***
**30220 09/21/2016 LAB-2 *WATER***

| Analyte | Units | 30218 | 30219 | 30220 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.0086 | 0.025 | 0.019 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | 0.0011 |
| Nickel | mg/L | 0.0002 | 0.0001 | 0.0003 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.014 | 0.015 | 0.016 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.0005 | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 | 0.007 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

**30221 09/21/2016 DUP-2 *WATER***
**30222 09/21/2016 FIELD BLANK *WATER***

| Analyte | Units | 30221 | 30222 |
|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | |
| Bicarbonate | mg/L | 10 | <1 |
| Carbonate | mg/L | <1 | <1 |
| Chloride | mg/L | 0.4 | <0.1 |
| Hydroxide | mg/L | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 |
| pH | pH units | 7.17 | 5.48 |
| Specific conductivity | uS/cm | 42 | <1 |
| Sum of ions | mg/L | 26 | <1 |
| Total alkalinity | mg/L | 8 | <1 |
| Total hardness | mg/L | 12 | <1 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 |
| Nitrate | mg/L | 0.05 | 0.06 |
| Total Kjeldahl nitrogen | mg/L | 0.30 | <0.05 |
| Mercury | ng/L | <1 | <1 |
| Organic carbon | mg/L | 2.2 | <0.2 |
| Organic carbon, dissolved | mg/L | 2.2 | <0.2 |
| Fluoride | mg/L | 0.03 | <0.01 |
| Total dissolved solids | mg/L | 35 | 1 |
| Total suspended solids | mg/L | 4 | 2 |
| **Lab Section 2 (ICP)** | | | |
| Calcium | mg/L | 3.7 | <0.1 |
| Magnesium | mg/L | 0.6 | <0.1 |
| Potassium | mg/L | 0.9 | <0.1 |
| Sodium | mg/L | 1.8 | <0.1 |
| Sulfate | mg/L | 8.2 | <0.2 |
| Aluminum | mg/L | 0.0027 | 0.0025 |
| Antimony | mg/L | <0.0002 | <0.0002 |
| Arsenic | ug/L | 0.1 | <0.1 |
| Barium | mg/L | 0.0031 | <0.0005 |
| Beryllium | mg/L | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 |
| Cadmium | mg/L | <0.00001 | 0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | 0.0009 |
| Iron | mg/L | 0.042 | 0.0038 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

**30221 09/21/2016 DUP-2 *WATER***
**30222 09/21/2016 FIELD BLANK *WATER***

| Analyte | Units | 30221 | 30222 |
|---|---|---|---|
| **Lab Section 2 (ICP)** | | | |
| Lead | mg/L | <0.0001 | 0.0004 |
| Manganese | mg/L | 0.023 | <0.0005 |
| Molybdenum | mg/L | 0.0010 | <0.0001 |
| Nickel | mg/L | 0.0002 | 0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.015 | <0.0005 |
| Thallium | mg/L | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 |
| Radium-226 | Bq/L | 0.006 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 30222
This sample was reanalyzed for Aluminum, Copper, Iron and Lead.
Reanalysis confirmed original results within the expected measurement uncertainty.

Added reanalysis note, as per client request. 10/26/2016 MTS.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

**30223 TRAVEL BLANK *WATER***

| Analyte | Units | 30223 |
|---|---|---|
| **Lab Section 1 (Inorganics)** | | |
| Bicarbonate | mg/L | <1 |
| Carbonate | mg/L | <1 |
| Chloride | mg/L | <0.1 |
| Hydroxide | mg/L | <1 |
| P. alkalinity | mg/L | <1 |
| pH | pH units | 5.39 |
| Specific conductivity | uS/cm | <1 |
| Sum of ions | mg/L | <1 |
| Total alkalinity | mg/L | <1 |
| Total hardness | mg/L | <1 |
| Ammonia as nitrogen | mg/L | <0.01 |
| Nitrate | mg/L | 0.06 |
| Total Kjeldahl nitrogen | mg/L | <0.05 |
| Mercury | ng/L | <1 |
| Organic carbon | mg/L | <0.2 |
| Fluoride | mg/L | <0.01 |
| Total dissolved solids | mg/L | <1 |
| Total suspended solids | mg/L | 2 |
| **Lab Section 2 (ICP)** | | |
| Calcium | mg/L | <0.1 |
| Magnesium | mg/L | <0.1 |
| Potassium | mg/L | <0.1 |
| Sodium | mg/L | <0.1 |
| Sulfate | mg/L | <0.2 |
| Aluminum | mg/L | 0.0013 |
| Antimony | mg/L | <0.0002 |
| Arsenic | ug/L | <0.1 |
| Barium | mg/L | <0.0005 |
| Beryllium | mg/L | <0.0001 |
| Boron | mg/L | <0.01 |
| Cadmium | mg/L | <0.00001 |
| Chromium | mg/L | <0.0005 |
| Cobalt | mg/L | <0.0001 |
| Copper | mg/L | <0.0002 |
| Iron | mg/L | <0.0005 |
| Lead | mg/L | <0.0001 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11423

Oct 26, 2016

EcoMetrix Inc.

**30223 TRAVEL BLANK *WATER***

| Analyte | Units | 30223 |
|---|---|---|
| **Lab Section 2 (ICP)** | | |
| Manganese | mg/L | <0.0005 |
| Molybdenum | mg/L | <0.0001 |
| Nickel | mg/L | 0.0001 |
| Selenium | mg/L | <0.0001 |
| Silver | mg/L | <0.00005 |
| Strontium | mg/L | <0.0005 |
| Thallium | mg/L | <0.0002 |
| Tin | mg/L | <0.0001 |
| Titanium | mg/L | <0.0002 |
| Uranium | ug/L | <0.1 |
| Vanadium | mg/L | <0.0001 |
| Zinc | mg/L | <0.0005 |
| Phosphorus | mg/L | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | |
| Lead-210 | Bq/L | <0.02 |
| Polonium-210 | Bq/L | <0.005 |
| Radium-226 | Bq/L | 0.006 |
| Thorium-228 | Bq/L | <0.01 |
| Thorium-230 | Bq/L | <0.01 |
| Thorium-232 | Bq/L | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-2955

Apr 03, 2018

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Gordan Ivanis

Date Samples Received: Mar-19-2018 Client P.O.:

---

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Sections 1 and 2 have been authorized by Keith Gipman, Supervisor
Results from Lab Section 3 have been authorized by Pat Moser, Supervisor
Results from Lab Sections 4 and 5 have been authorized by Vicky Snook, Supervisor
Results from Lab Section 6 have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

This is a final report.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-2955

Apr 03, 2018

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Gordan Ivanis

Date Samples Received: Mar-19-2018 Client P.O.:

**9451 03/17/2018 LA6 *WATER***
**9452 03/17/2018 LA6A *WATER***
**9453 03/16/2018 LA1T *WATER***

| Analyte | Units | 9451 | 9452 | 9453 |
|---|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | | |
| Bicarbonate | mg/L | 4 | 4 | 10 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.3 | 0.3 | 0.5 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 6.79 | 6.77 | 6.82 |
| Specific conductivity | uS/cm | 12 | 12 | 15 |
| Sum of ions | mg/L | 9 | 9 | 15 |
| Total alkalinity | mg/L | 3 | 3 | 8 |
| Total hardness | mg/L | 4 | 5 | 5 |
| Ammonia as nitrogen | mg/L | 0.02 | 0.02 | 0.03 |
| Nitrate | mg/L | 0.30 | 0.30 | 0.29 |
| Total Kjeldahl nitrogen | mg/L | 0.29 | 0.20 | 0.20 |
| Mercury | ng/L | 7 | 9 | 4 |
| Organic carbon | mg/L | 2.2 | 2.3 | 2.3 |
| Organic carbon, dissolved | mg/L | 2.2 | 2.2 | 2.2 |
| Fluoride | mg/L | 0.02 | 0.02 | 0.03 |
| Total dissolved solids | mg/L | 21 | 22 | 22 |
| Total suspended solids | mg/L | <1 | <1 | <1 |
| **Lab Section 2 (ICP)** | | | | |
| Calcium | mg/L | 1.1 | 1.2 | 1.4 |
| Magnesium | mg/L | 0.4 | 0.4 | 0.4 |
| Potassium | mg/L | 0.4 | 0.4 | 0.4 |
| Sodium | mg/L | 1.5 | 1.5 | 1.6 |
| Sulfate | mg/L | 0.7 | 0.8 | 0.8 |
| Aluminum | mg/L | 0.0058 | 0.0061 | 0.0046 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | 0.1 | <0.1 | <0.1 |
| Barium | mg/L | 0.0030 | 0.0030 | 0.0032 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-2955

Apr 03, 2018

EcoMetrix Inc.

**9451 03/17/2018 LA6 *WATER***
**9452 03/17/2018 LA6A *WATER***
**9453 03/16/2018 LA1T *WATER***

| Analyte | Units | 9451 | 9452 | 9453 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.031 | 0.032 | 0.037 |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.0024 | 0.0024 | 0.0039 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.012 | 0.012 | 0.014 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.0022 | 0.0016 | 0.0010 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-2955

Apr 03, 2018

EcoMetrix Inc.

**9454 03/16/2018 LA1B *WATER***
**9455 03/17/2018 FIELD BLANK *WATER***

| Analyte | Units | 9454 | 9455 |
|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | |
| Bicarbonate | mg/L | 6 | 1 |
| Carbonate | mg/L | <1 | <1 |
| Chloride | mg/L | 0.5 | <0.1 |
| Hydroxide | mg/L | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 |
| pH | pH units | 6.80 | 5.54 |
| Specific conductivity | uS/cm | 14 | <1 |
| Sum of ions | mg/L | 12 | 1 |
| Total alkalinity | mg/L | 5 | 1 |
| Total hardness | mg/L | 5 | <1 |
| Ammonia as nitrogen | mg/L | 0.02 | <0.01 |
| Nitrate | mg/L | 0.60 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.14 | <0.05 |
| Mercury | ng/L | 7 | 10 |
| Organic carbon | mg/L | 2.2 | <0.2 |
| Organic carbon, dissolved | mg/L | 2.2 | <0.2 |
| Fluoride | mg/L | 0.02 | <0.01 |
| Total dissolved solids | mg/L | 22 | <5 |
| Total suspended solids | mg/L | <1 | <1 |
| **Lab Section 2 (ICP)** | | | |
| Calcium | mg/L | 1.4 | <0.1 |
| Magnesium | mg/L | 0.4 | <0.1 |
| Potassium | mg/L | 0.4 | <0.1 |
| Sodium | mg/L | 1.6 | <0.1 |
| Sulfate | mg/L | 0.8 | <0.2 |
| Aluminum | mg/L | 0.0034 | 0.0013 |
| Antimony | mg/L | <0.0002 | <0.0002 |
| Arsenic | ug/L | 0.1 | <0.1 |
| Barium | mg/L | 0.0031 | <0.0005 |
| Beryllium | mg/L | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 |
| Cadmium | mg/L | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 |
| Iron | mg/L | 0.036 | <0.0005 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-2955

Apr 03, 2018

EcoMetrix Inc.

**9454 03/16/2018 LA1B *WATER***
**9455 03/17/2018 FIELD BLANK *WATER***

| Analyte | Units | 9454 | 9455 |
|---|---|---|---|
| **Lab Section 2 (ICP)** | | | |
| Lead | mg/L | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.0053 | <0.0005 |
| Molybdenum | mg/L | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.014 | <0.0005 |
| Thallium | mg/L | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.0016 | 0.0007 |
| Phosphorus | mg/L | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | |
| Lead-210 | Bq/L | 0.03 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 |
| Thorium-230 | Bq/L | 0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 9455
This sample was reanalyzed for Mercury. Reanalysis confirms original results are within the expected measurement uncertainty.
***Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-8051

Jul 20, 2018

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Goran Ivanis

Date Samples Received: Jul-04-2018 Client P.O.:

---

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Sections 1 and 2 have been authorized by Keith Gipman, Supervisor
Results from Lab Section 3 have been authorized by Pat Moser, Supervisor
Results from Lab Sections 4 and 5 have been authorized by Vicky Snook, Supervisor
Results from Lab Section 6 have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

This is a final report.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-8051

Jul 20, 2018

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Goran Ivanis

Date Samples Received: Jul-04-2018 Client P.O.:

**25959 07/02/2018 LA6T *WATER***
**25960 07/02/2018 LA6TDUP *WATER***
**25961 07/02/2018 LA1T *WATER***

| Analyte | Units | 25959 | 25960 | 25961 |
|---|---|---|---|---|
| **Lab Section 1 (Inorganics)** | | | | |
| Bicarbonate | mg/L | 8 | 7 | 8 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.3 | 0.3 | 0.4 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 6.75 | 6.68 | 6.71 |
| Specific conductivity | uS/cm | 9 | 9 | 9 |
| Sum of ions | mg/L | 12 | 11 | 12 |
| Total alkalinity | mg/L | 7 | 6 | 7 |
| Total hardness | mg/L | 4 | 4 | 4 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 | <0.01 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.28 | 0.32 | 0.33 |
| Mercury | ng/L | <1 | <1 | <1 |
| Organic carbon | mg/L | 2.2 | 2.2 | 2.2 |
| Organic carbon, dissolved | mg/L | 2.2 | 2.1 | 2.0 |
| Fluoride | mg/L | 0.08 | 0.08 | 0.08 |
| Total dissolved solids | mg/L | 23 | 22 | 26 |
| Total suspended solids | mg/L | 2 | 2 | 2 |
| **Lab Section 2 (ICP)** | | | | |
| Calcium | mg/L | 1.1 | 1.0 | 1.1 |
| Magnesium | mg/L | 0.2 | 0.3 | 0.3 |
| Potassium | mg/L | 0.3 | 0.3 | 0.4 |
| Sodium | mg/L | 1.4 | 1.4 | 1.4 |
| Sulfate | mg/L | 0.6 | 0.7 | 0.7 |
| Aluminum | mg/L | 0.0074 | 0.0063 | 0.0051 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | 0.1 | <0.1 | 0.1 |
| Barium | mg/L | 0.0024 | 0.0023 | 0.0023 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-8051

Jul 20, 2018

EcoMetrix Inc.

**25959 07/02/2018 LA6T *WATER***
**25960 07/02/2018 LA6TDUP *WATER***
**25961 07/02/2018 LA1T *WATER***

| Analyte | Units | 25959 | 25960 | 25961 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.096 | 0.078 | 0.052 |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.019 | 0.016 | 0.010 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.011 | 0.011 | 0.012 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | 0.005 | <0.005 | <0.005 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 25959
Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Note for Sample # 25960
Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

Note for Sample # 25961
Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-8051

Jul 20, 2018

EcoMetrix Inc.

**25962 07/02/2018 LA1B *WATER***

| Analyte | Units | 25962 |
|---|---|---|
| **Lab Section 1 (Inorganics)** | | |
| Bicarbonate | mg/L | 5 |
| Carbonate | mg/L | <1 |
| Chloride | mg/L | 0.4 |
| Hydroxide | mg/L | <1 |
| P. alkalinity | mg/L | <1 |
| pH | pH units | 6.62 |
| Specific conductivity | uS/cm | 10 |
| Sum of ions | mg/L | 9 |
| Total alkalinity | mg/L | 4 |
| Total hardness | mg/L | 4 |
| Ammonia as nitrogen | mg/L | <0.01 |
| Nitrate | mg/L | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.23 |
| Mercury | ng/L | 9 |
| Organic carbon | mg/L | 2.0 |
| Organic carbon, dissolved | mg/L | 1.9 |
| Fluoride | mg/L | 0.08 |
| Total dissolved solids | mg/L | 24 |
| Total suspended solids | mg/L | 2 |
| **Lab Section 2 (ICP)** | | |
| Calcium | mg/L | 1.1 |
| Magnesium | mg/L | 0.3 |
| Potassium | mg/L | 0.3 |
| Sodium | mg/L | 1.4 |
| Sulfate | mg/L | 0.7 |
| Aluminum | mg/L | 0.0040 |
| Antimony | mg/L | <0.0002 |
| Arsenic | ug/L | 0.1 |
| Barium | mg/L | 0.0026 |
| Beryllium | mg/L | <0.0001 |
| Boron | mg/L | <0.01 |
| Cadmium | mg/L | <0.00001 |
| Chromium | mg/L | <0.0005 |
| Cobalt | mg/L | <0.0001 |
| Copper | mg/L | <0.0002 |
| Iron | mg/L | 0.13 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-8051

Jul 20, 2018

EcoMetrix Inc.

**25962 07/02/2018 LA1B *WATER***

| Analyte | Units | 25962 |
|---|---|---|
| **Lab Section 2 (ICP)** | | |
| Lead | mg/L | <0.0001 |
| Manganese | mg/L | 0.013 |
| Molybdenum | mg/L | <0.0001 |
| Nickel | mg/L | <0.0001 |
| Selenium | mg/L | <0.0001 |
| Silver | mg/L | <0.00005 |
| Strontium | mg/L | 0.013 |
| Thallium | mg/L | <0.0002 |
| Tin | mg/L | <0.0001 |
| Titanium | mg/L | <0.0002 |
| Uranium | ug/L | <0.1 |
| Vanadium | mg/L | <0.0001 |
| Zinc | mg/L | 0.0013 |
| Phosphorus | mg/L | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | |
| Lead-210 | Bq/L | <0.02 |
| Polonium-210 | Bq/L | <0.005 |
| Radium-226 | Bq/L | <0.005 |
| Thorium-230 | Bq/L | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 25962
Time between sampling and receipt in lab exceeds the recommended 24 hours for Organic carbon, dissolved.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-8051

Jul 20, 2018

EcoMetrix Inc.

**25963 TRIP *WATER***

| Analyte | Units | 25963 |
|---|---|---|
| **Lab Section 1 (Inorganics)** | | |
| Bicarbonate | mg/L | 1 |
| Carbonate | mg/L | <1 |
| Chloride | mg/L | <0.1 |
| Hydroxide | mg/L | <1 |
| P. alkalinity | mg/L | <1 |
| pH | pH units | 5.07 |
| Specific conductivity | uS/cm | <1 |
| Sum of ions | mg/L | 1 |
| Total alkalinity | mg/L | 1 |
| Total hardness | mg/L | <1 |
| Ammonia as nitrogen | mg/L | <0.01 |
| Nitrate | mg/L | <0.04 |
| Total Kjeldahl nitrogen | mg/L | <0.05 |
| Mercury | ng/L | <1 |
| Organic carbon | mg/L | <0.2 |
| Fluoride | mg/L | 0.02 |
| Total dissolved solids | mg/L | <5 |
| Total suspended solids | mg/L | <1 |
| **Lab Section 2 (ICP)** | | |
| Calcium | mg/L | <0.1 |
| Magnesium | mg/L | <0.1 |
| Potassium | mg/L | <0.1 |
| Sodium | mg/L | <0.1 |
| Sulfate | mg/L | <0.2 |
| Aluminum | mg/L | 0.0013 |
| Antimony | mg/L | <0.0002 |
| Arsenic | ug/L | <0.1 |
| Barium | mg/L | <0.0005 |
| Beryllium | mg/L | <0.0001 |
| Boron | mg/L | <0.01 |
| Cadmium | mg/L | <0.00001 |
| Chromium | mg/L | <0.0005 |
| Cobalt | mg/L | <0.0001 |
| Copper | mg/L | <0.0002 |
| Iron | mg/L | <0.0005 |
| Lead | mg/L | <0.0001 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2018-8051

Jul 20, 2018

EcoMetrix Inc.

**25963 TRIP *WATER***

| Analyte | Units | 25963 |
|---|---|---|
| **Lab Section 2 (ICP)** | | |
| Manganese | mg/L | <0.0005 |
| Molybdenum | mg/L | <0.0001 |
| Nickel | mg/L | <0.0001 |
| Selenium | mg/L | <0.0001 |
| Silver | mg/L | <0.00005 |
| Strontium | mg/L | <0.0005 |
| Thallium | mg/L | <0.0002 |
| Tin | mg/L | <0.0001 |
| Titanium | mg/L | <0.0002 |
| Uranium | ug/L | <0.1 |
| Vanadium | mg/L | <0.0001 |
| Zinc | mg/L | <0.0005 |
| Phosphorus | mg/L | <0.01 |
| **Lab Section 4 (Radiochemistry)** | | |
| Lead-210 | Bq/L | <0.02 |
| Polonium-210 | Bq/L | <0.005 |
| Radium-226 | Bq/L | <0.005 |
| Thorium-230 | Bq/L | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30600_03.$av
2016-11577_30600_03.$av
File ID: 2016-11577
Sample ID: 30600
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30600_01.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30600_02.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30600_03.$ls

Volume Statistics (Arithmetic) 2016-11577_30600_03.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 28.42 µm | S.D.: | 31.34 µm |
| Median: | 17.82 µm | C.V.: | 110% |
| D(3,2): | 7.350 µm | Skewness: | 2.558 Right skewed |
| Mode: | 16.40 µm | Kurtosis: | 8.598 Leptokurtic |

$d_{10}$: 4.198 µm $d_{50}$: 17.82 µm $d_{90}$: 64.34 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.84 | Median: | 5.81 | Deviation: | 1.56 |
| Skewness: | 0.07 | Kurtosis: | 1.07 | | |

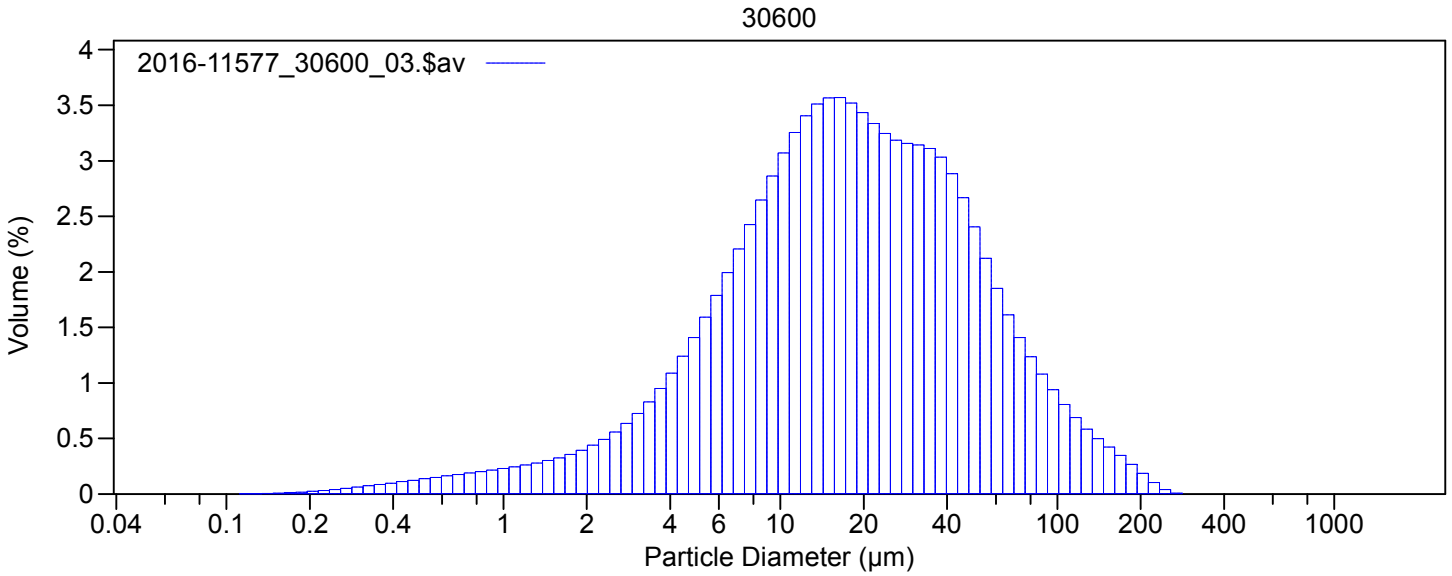
<80%
42.71 µm

2016-11577_30600_03.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 9.43 |
| 4 | 80.2 |
| 63 | 10.1 |
| 200 | 0.28 |
| 2000 | |

2016-11577_30600_03.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 9.43 |
| 4 | 80.2 |
| 63 | 10.1 |
| 200 | 0.28 |
| 2000 | 0 |


30600
2016-11577_30600_03.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30601_06.$av
2016-11577_30601_06.$av
File ID: 2016-11577
Sample ID: 30601
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30601_04.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30601_05.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30601_06.$ls

Volume Statistics (Arithmetic) 2016-11577_30601_06.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 35.29 µm | S.D.: | 72.21 µm |
| Median: | 15.55 µm | C.V.: | 205% |
| D(3,2): | 6.470 µm | Skewness: | 6.951 Right skewed |
| Mode: | 13.61 µm | Kurtosis: | 67.72 Leptokurtic |

$d_{10}$: 3.840 µm $d_{50}$: 15.55 µm $d_{90}$: 75.35 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.95 | Median: | 6.01 | Deviation: | 1.69 |
| Skewness: | -0.04 | Kurtosis: | 1.16 | | |

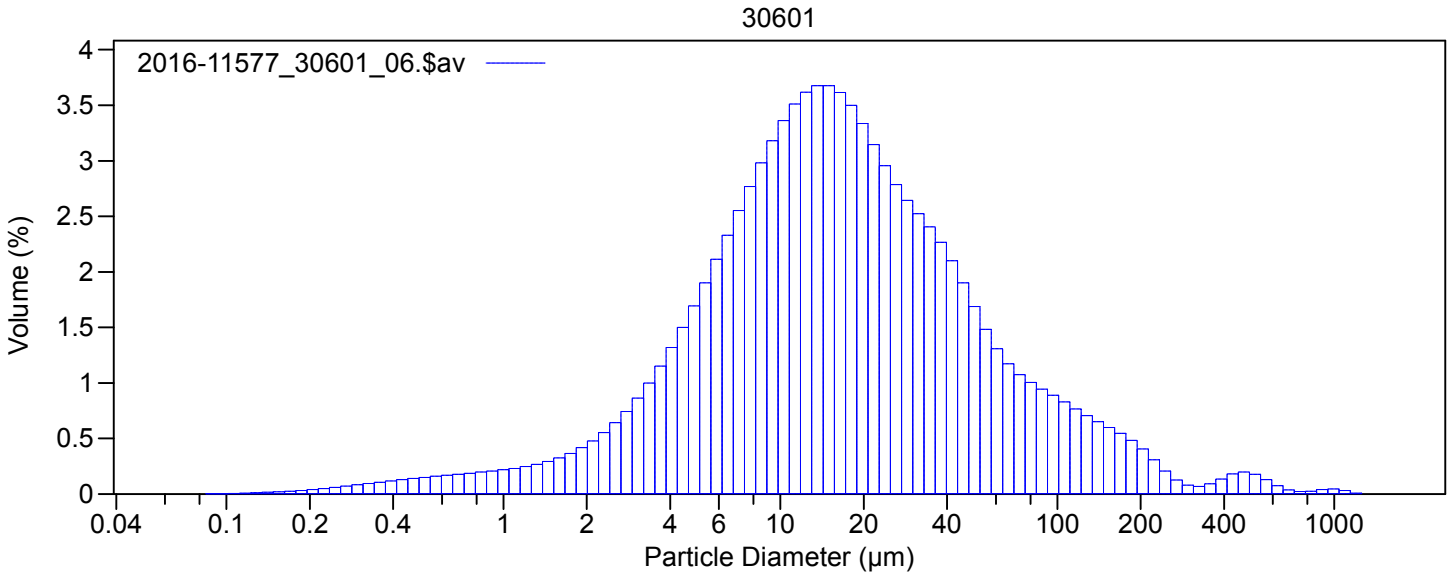
<80%
40.81 µm

2016-11577_30601_06.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 10.6 |
| 4 | 77.3 |
| 63 | 9.89 |
| 200 | 2.28 |
| 2000 | |

2016-11577_30601_06.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 10.6 |
| 4 | 77.3 |
| 63 | 9.89 |
| 200 | 2.28 |
| 2000 | 0 |


30601
2016-11577_30601_06.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30602_09.$av
2016-11577_30602_09.$av
File ID: 2016-11577
Sample ID: 30602
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30602_07.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30602_08.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30602_09.$ls

Volume Statistics (Arithmetic) 2016-11577_30602_09.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 135.8 µm | S.D.: | 152.4 µm |
| Median: | 89.13 µm | C.V.: | 112% |
| D(3,2): | 14.55 µm | Skewness: | 2.373 Right skewed |
| Mode: | 185.4 µm | Kurtosis: | 9.288 Leptokurtic |

$d_{10}$: 8.031 µm $d_{50}$: 89.13 µm $d_{90}$: 323.3 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 3.90 | Median: | 3.49 | Deviation: | 2.08 |
| Skewness: | 0.31 | Kurtosis: | 0.92 | | |

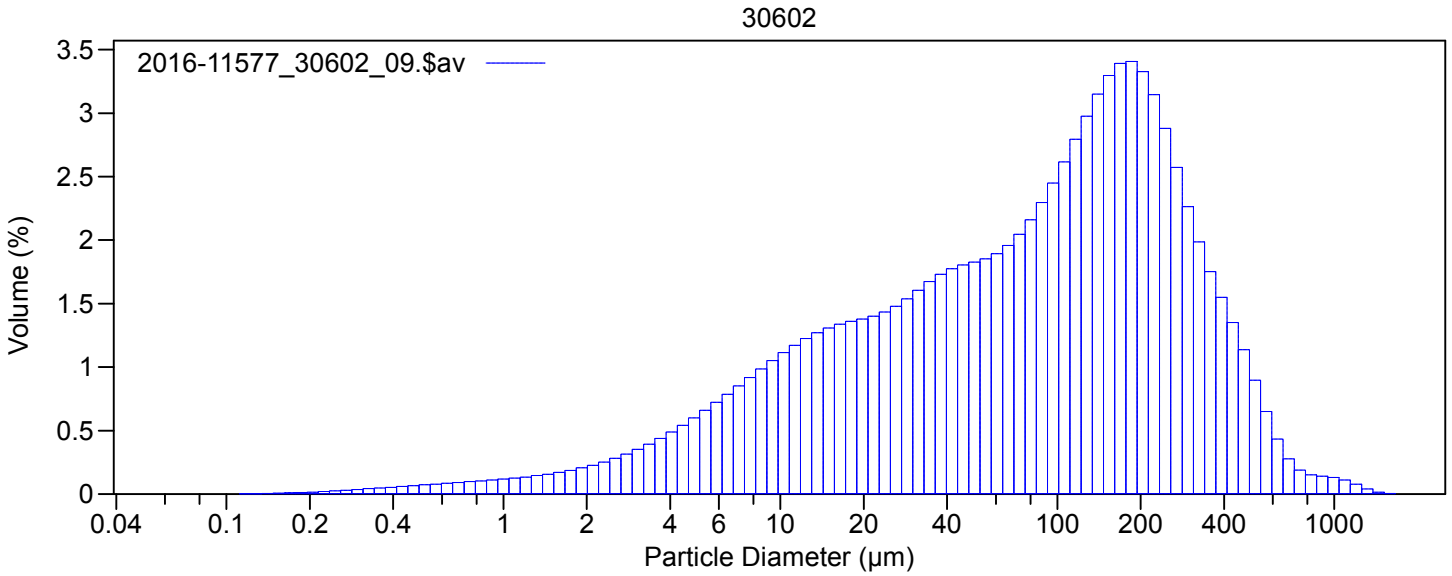
<80%
224.9 µm

2016-11577_30602_09.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 4.75 |
| 4 | 37.5 |
| 63 | 33.7 |
| 200 | 24.1 |
| 2000 | |

2016-11577_30602_09.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 4.75 |
| 4 | 37.5 |
| 63 | 33.7 |
| 200 | 24.1 |
| 2000 | 0 |


30602
2016-11577_30602_09.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30603_12.$av
2016-11577_30603_12.$av
File ID: 2016-11577
Sample ID: 30603
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30603_10.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30603_11.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30603_12.$ls

Volume Statistics (Arithmetic) 2016-11577_30603_12.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 121.7 µm | S.D.: | 120.8 µm |
| Median: | 96.72 µm | C.V.: | 99.2% |
| D(3,2): | 14.96 µm | Skewness: | 2.755 Right skewed |
| Mode: | 140.1 µm | Kurtosis: | 11.91 Leptokurtic |

$d_{10}$: 13.95 µm $d_{50}$: 96.72 µm $d_{90}$: 238.1 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 3.71 | Median: | 3.37 | Deviation: | 1.60 |
| Skewness: | 0.35 | Kurtosis: | 1.13 | | |

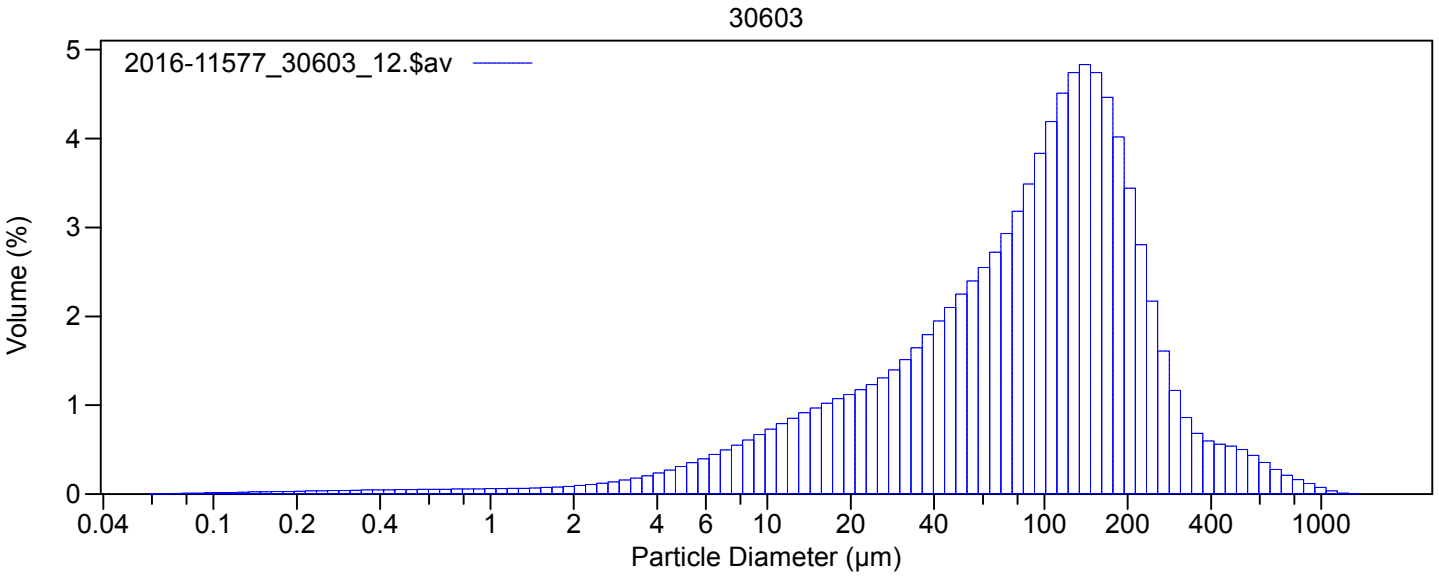
<80%
179.7 µm

2016-11577_30603_12.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 2.67 |
| 4 | 32.8 |
| 63 | 48.9 |
| 200 | 15.6 |
| 2000 | |

2016-11577_30603_12.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 2.67 |
| 4 | 32.8 |
| 63 | 48.9 |
| 200 | 15.6 |
| 2000 | 0 |


30603
2016-11577_30603_12.$av
Volume (%)
0
1
2
3
4
5
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30604_15.$av
2016-11577_30604_15.$av
File ID: 2016-11577
Sample ID: 30604
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30604_13.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30604_14.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30604_15.$ls

Volume Statistics (Arithmetic) 2016-11577_30604_15.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 20.33 µm | S.D.: | 26.25 µm |
| Median: | 12.17 µm | C.V.: | 129% |
| D(3,2): | 5.597 µm | Skewness: | 3.484 Right skewed |
| Mode: | 12.40 µm | Kurtosis: | 15.60 Leptokurtic |

$d_{10}$: 3.205 µm $d_{50}$: 12.17 µm $d_{90}$: 43.81 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 6.37 | Median: | 6.36 | Deviation: | 1.50 |
| Skewness: | 0.03 | Kurtosis: | 1.19 | | |

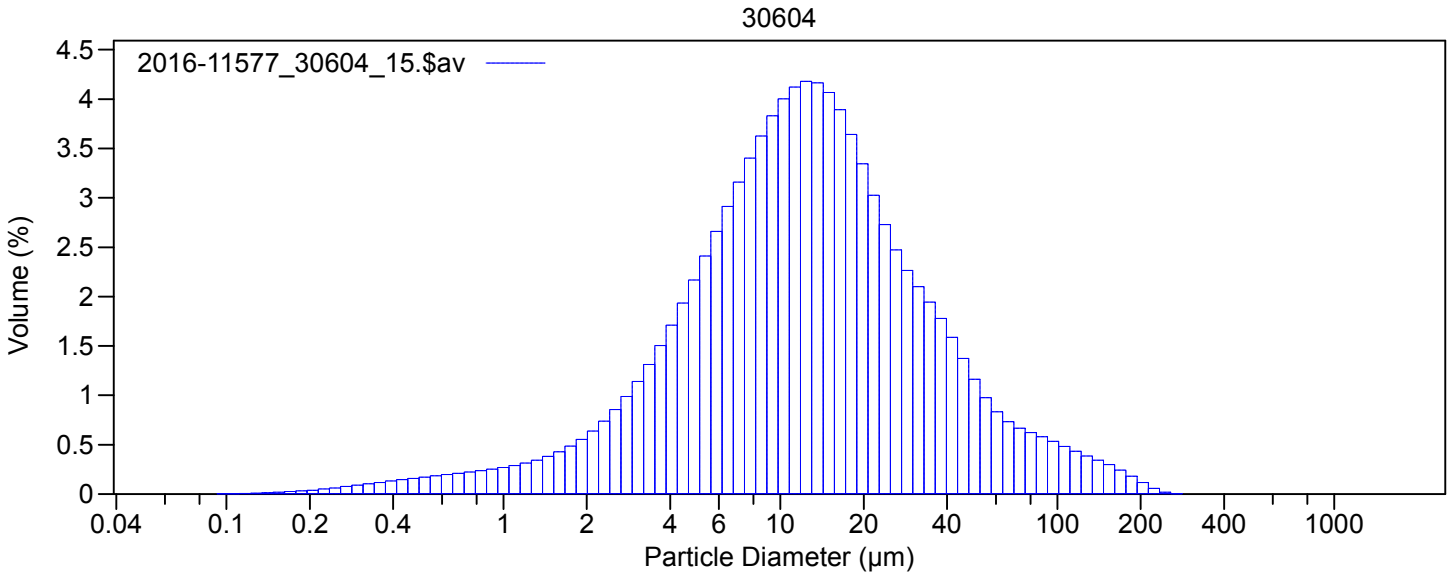
<80%
27.12 µm

2016-11577_30604_15.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 13.4 |
| 4 | 80.8 |
| 63 | 5.60 |
| 200 | 0.16 |
| 2000 | |

2016-11577_30604_15.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 13.4 |
| 4 | 80.8 |
| 63 | 5.60 |
| 200 | 0.16 |
| 2000 | 0 |


30604
2016-11577_30604_15.$av
Volume (%)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30605_18.$av
2016-11577_30605_18.$av
File ID: 2016-11577
Sample ID: 30605
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30605_16.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30605_17.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30605_18.$ls

Volume Statistics (Arithmetic) 2016-11577_30605_18.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 426.9 µm | S.D.: | 246.7 µm |
| Median: | 414.2 µm | C.V.: | 57.8% |
| D(3,2): | 30.38 µm | Skewness: | 0.388 Right skewed |
| Mode: | 471.1 µm | Kurtosis: | 0.313 Leptokurtic |

$d_{10}$: 33.74 µm $d_{50}$: 414.2 µm $d_{90}$: 748.2 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 1.38 | Median: | 1.27 | Deviation: | 1.44 |
| Skewness: | 0.44 | Kurtosis: | 2.74 | | |

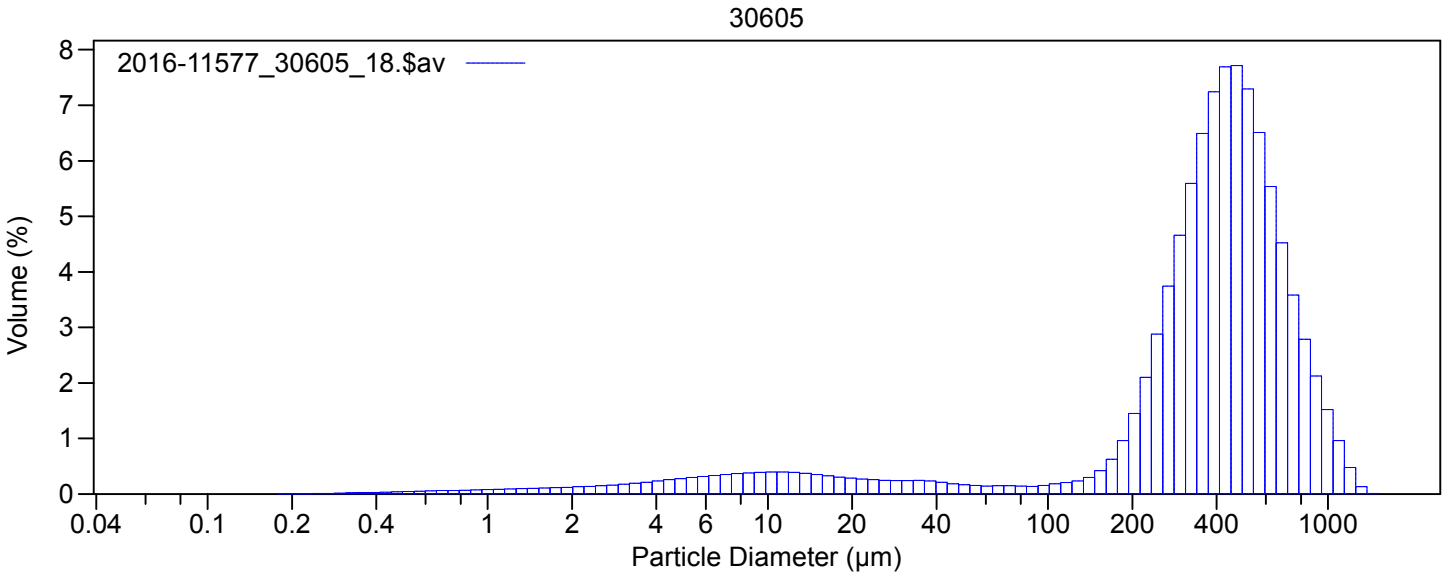
<80%
612.4 µm

2016-11577_30605_18.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 2.71 |
| 4 | 8.57 |
| 63 | 4.12 |
| 200 | 84.6 |
| 2000 | |

2016-11577_30605_18.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 2.71 |
| 4 | 8.57 |
| 63 | 4.12 |
| 200 | 84.6 |
| 2000 | 0 |


30605
2016-11577_30605_18.$av
Volume (%)
0
1
2
3
4
5
6
7
8
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30606_21.$av
2016-11577_30606_21.$av
File ID: 2016-11577
Sample ID: 30606
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 81 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30606_19.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30606_20.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30606_21.$ls

Volume Statistics (Arithmetic) 2016-11577_30606_21.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 426.6 µm | S.D.: | 269.2 µm |
| Median: | 416.9 µm | C.V.: | 63.1% |
| D(3,2): | 26.21 µm | Skewness: | 0.388 Right skewed |
| Mode: | 471.1 µm | Kurtosis: | -0.034 Platykurtic |

$d_{10}$: 30.38 µm $d_{50}$: 416.9 µm $d_{90}$: 780.9 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 1.70 | Median: | 1.26 | Deviation: | 1.64 |
| Skewness: | 0.56 | Kurtosis: | 2.11 | | |

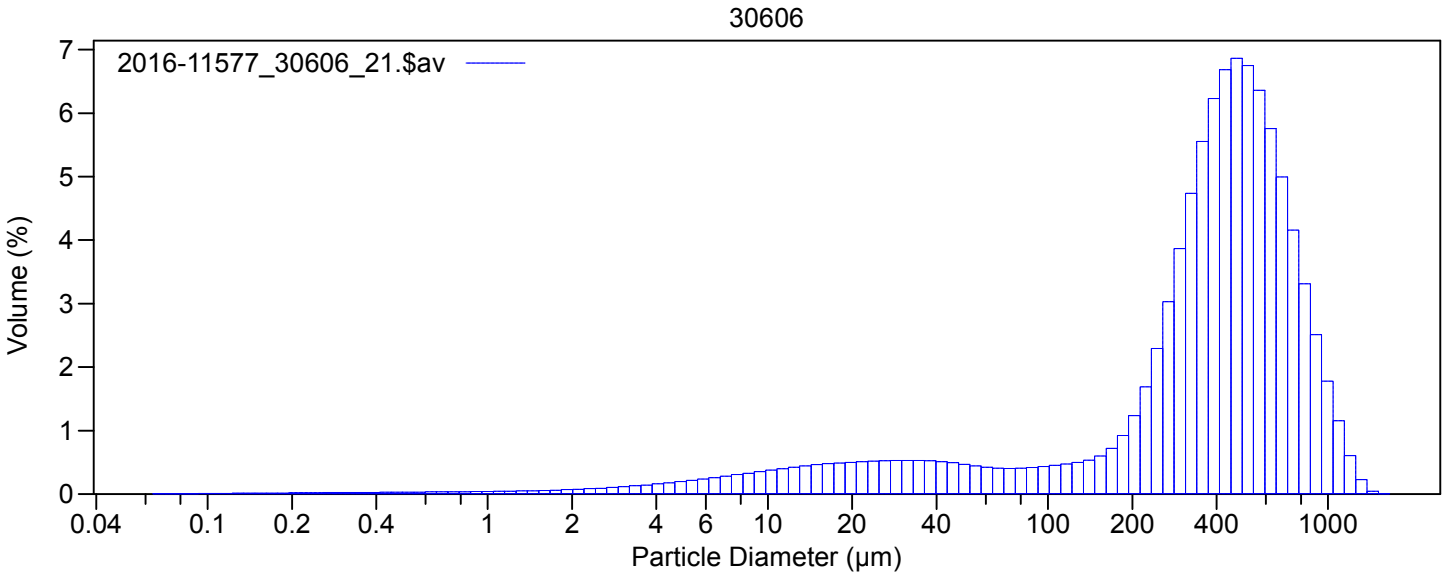
<80%
640.8 µm

2016-11577_30606_21.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 1.83 |
| 4 | 12.0 |
| 63 | 6.68 |
| 200 | 79.5 |
| 2000 | |

2016-11577_30606_21.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 1.83 |
| 4 | 12.0 |
| 63 | 6.68 |
| 200 | 79.5 |
| 2000 | 0 |


30606
2016-11577_30606_21.$av
Volume (%)
0
1
2
3
4
5
6
7
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30607_24.$av
2016-11577_30607_24.$av
File ID: 2016-11577
Sample ID: 30607
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 82 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30607_22.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30607_23.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30607_24.$ls

Volume Statistics (Arithmetic) 2016-11577_30607_24.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 31.45 µm | S.D.: | 54.97 µm |
| Median: | 14.07 µm | C.V.: | 175% |
| D(3,2): | 5.788 µm | Skewness: | 4.730 Right skewed |
| Mode: | 12.40 µm | Kurtosis: | 29.33 Leptokurtic |

$d_{10}$: 3.322 µm $d_{50}$: 14.07 µm $d_{90}$: 71.09 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 6.09 | Median: | 6.15 | Deviation: | 1.75 |
| Skewness: | -0.04 | Kurtosis: | 1.16 | | |

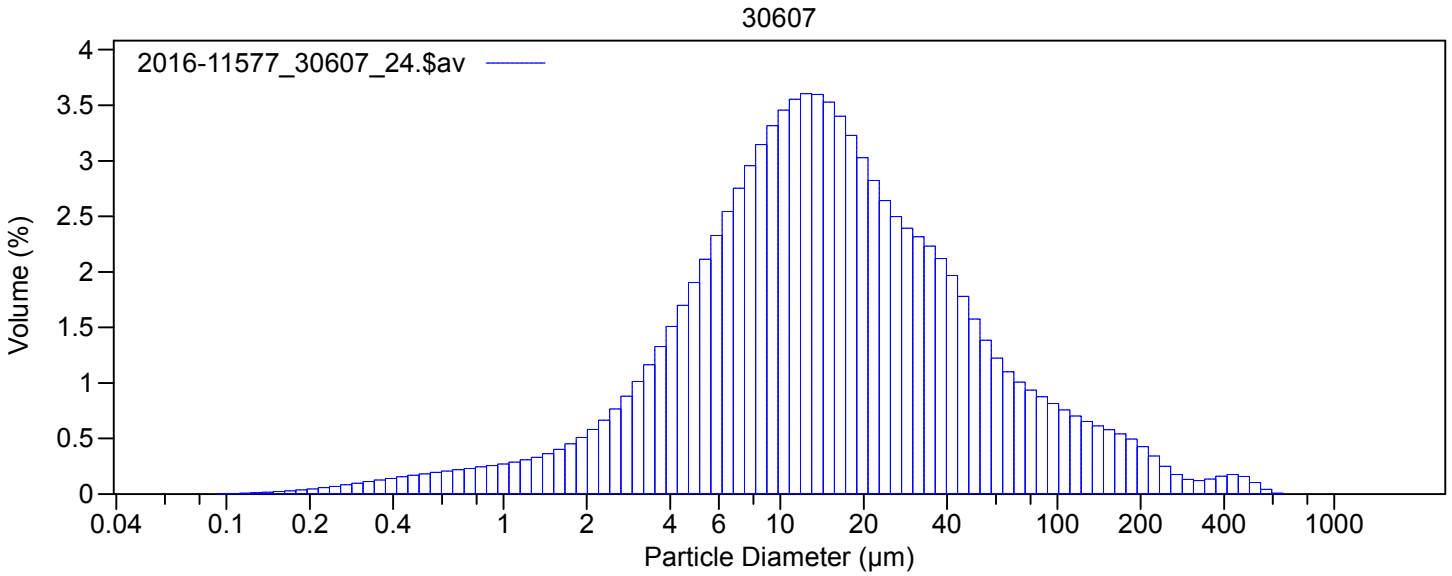
<80%
38.52 µm

2016-11577_30607_24.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 12.6 |
| 4 | 76.0 |
| 63 | 9.30 |
| 200 | 2.11 |
| 2000 | |

2016-11577_30607_24.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 12.6 |
| 4 | 76.0 |
| 63 | 9.30 |
| 200 | 2.11 |
| 2000 | 0 |


30607
2016-11577_30607_24.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30608_27.$av
2016-11577_30608_27.$av
File ID: 2016-11577
Sample ID: 30608
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30608_25.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30608_26.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30608_27.$ls

Volume Statistics (Arithmetic) 2016-11577_30608_27.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 454.8 µm | S.D.: | 260.2 µm |
| Median: | 439.0 µm | C.V.: | 57.2% |
| D(3,2): | 33.14 µm | Skewness: | 0.345 Right skewed |
| Mode: | 471.1 µm | Kurtosis: | 0.031 Leptokurtic |

$d_{10}$: 71.38 µm $d_{50}$: 439.0 µm $d_{90}$: 802.7 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 1.31 | Median: | 1.19 | Deviation: | 1.42 |
| Skewness: | 0.44 | Kurtosis: | 2.48 | | |

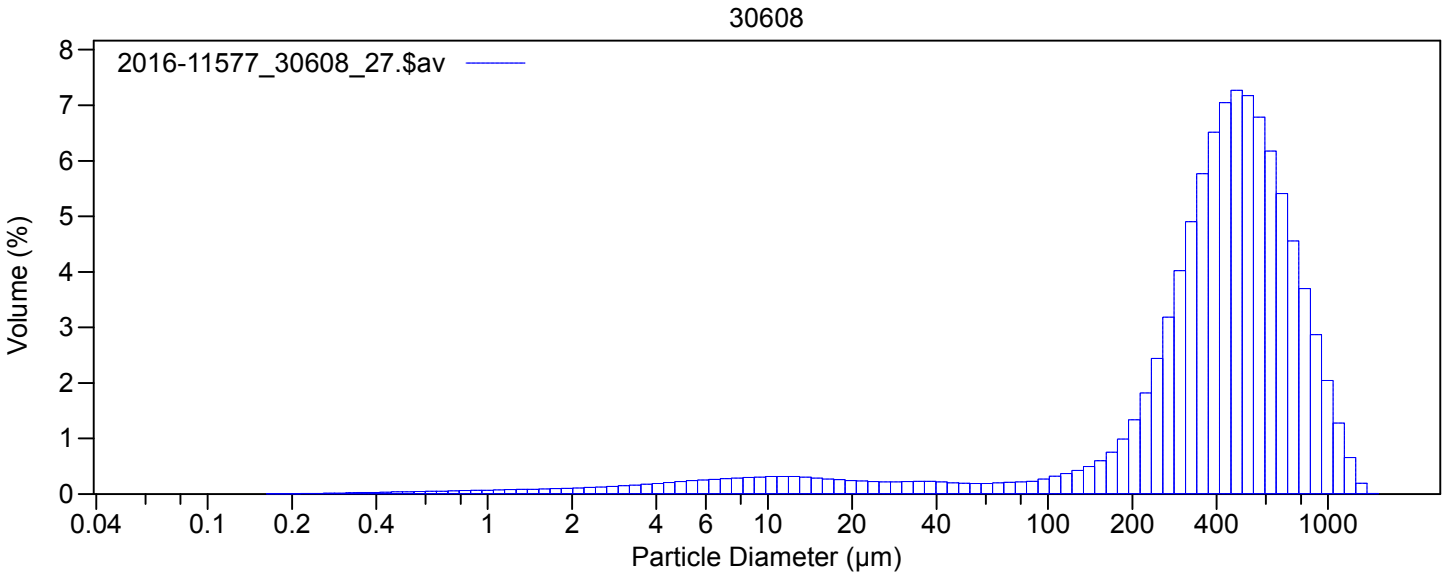
<80%
661.5 µm

2016-11577_30608_27.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 2.36 |
| 4 | 7.37 |
| 63 | 5.51 |
| 200 | 84.8 |
| 2000 | |

2016-11577_30608_27.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 2.36 |
| 4 | 7.37 |
| 63 | 5.51 |
| 200 | 84.8 |
| 2000 | 0 |


30608
2016-11577_30608_27.$av
Volume (%)
0
1
2
3
4
5
6
7
8
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30609a_30.$av
2016-11577_30609a_30.$av
File ID: 2016-11577
Sample ID: 30609a
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30609a_28.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30609a_29.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30609a_30.$ls

Volume Statistics (Arithmetic) 2016-11577_30609a_30.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 434.8 µm | S.D.: | 253.8 µm |
| Median: | 420.8 µm | C.V.: | 58.4% |
| D(3,2): | 33.49 µm | Skewness: | 0.403 Right skewed |
| Mode: | 471.1 µm | Kurtosis: | 0.192 Leptokurtic |

$d_{10}$: 54.43 µm $d_{50}$: 420.8 µm $d_{90}$: 768.2 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 1.40 | Median: | 1.25 | Deviation: | 1.31 |
| Skewness: | 0.43 | Kurtosis: | 2.16 | | |

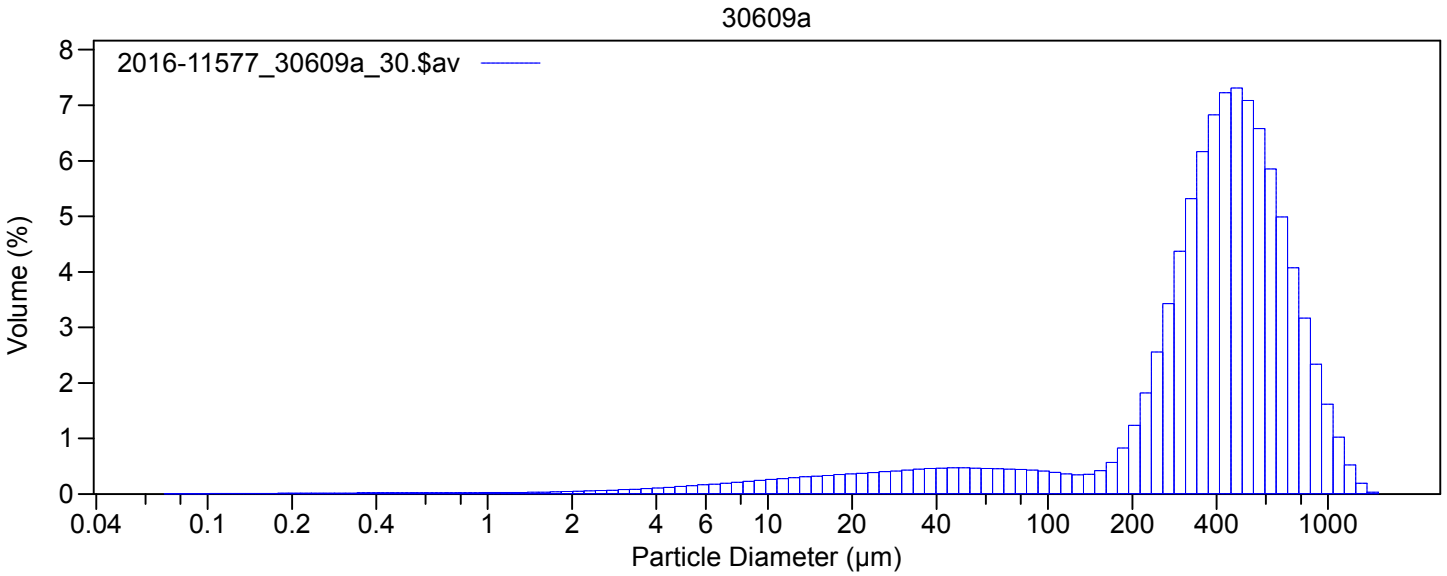
<80%
632.9 µm

2016-11577_30609a_30.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 1.27 |
| 4 | 9.46 |
| 63 | 5.90 |
| 200 | 83.4 |
| 2000 | |

2016-11577_30609a_30.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 1.27 |
| 4 | 9.46 |
| 63 | 5.90 |
| 200 | 83.4 |
| 2000 | 0 |


30609a
2016-11577_30609a_30.$av
Volume (%)
0
1
2
3
4
5
6
7
8
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30610_36.$av
2016-11577_30610_36.$av
File ID: 2016-11577
Sample ID: 30610
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 81 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30610_34.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30610_35.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30610_36.$ls

Volume Statistics (Arithmetic) 2016-11577_30610_36.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 25.38 µm | S.D.: | 32.57 µm |
| Median: | 14.15 µm | C.V.: | 128% |
| D(3,2): | 5.937 µm | Skewness: | 3.027 Right skewed |
| Mode: | 13.61 µm | Kurtosis: | 11.71 Leptokurtic |

$d_{10}$: 3.381 µm $d_{50}$: 14.15 µm $d_{90}$: 60.29 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 6.12 | Median: | 6.14 | Deviation: | 1.64 |
| Skewness: | 0.01 | Kurtosis: | 1.16 | | |

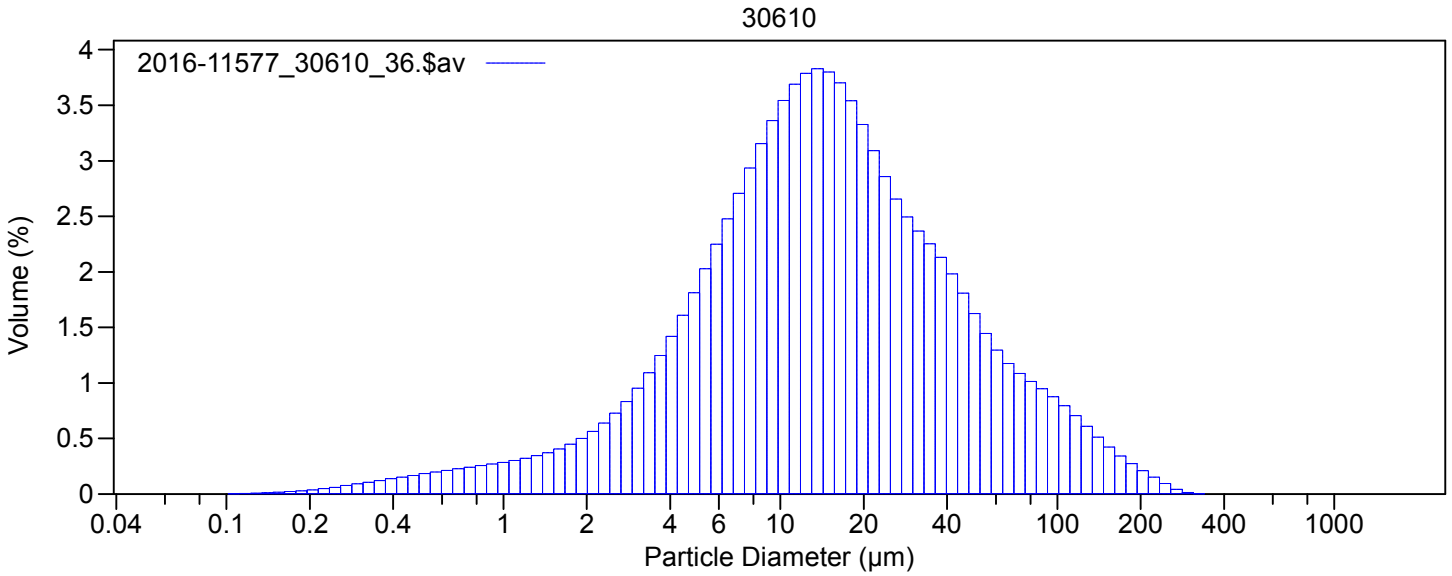
<80%
35.62 µm

2016-11577_30610_36.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 12.2 |
| 4 | 78.4 |
| 63 | 8.93 |
| 200 | 0.45 |
| 2000 | |

2016-11577_30610_36.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 12.2 |
| 4 | 78.4 |
| 63 | 8.93 |
| 200 | 0.45 |
| 2000 | 0 |


30610
2016-11577_30610_36.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30611_39.$av
2016-11577_30611_39.$av
File ID: 2016-11577
Sample ID: 30611
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 82 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30611_37.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30611_38.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30611_39.$ls

Volume Statistics (Arithmetic) 2016-11577_30611_39.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 103.6 µm | S.D.: | 144.1 µm |
| Median: | 55.28 µm | C.V.: | 139% |
| D(3,2): | 11.53 µm | Skewness: | 3.307 Right skewed |
| Mode: | 140.1 µm | Kurtosis: | 14.82 Leptokurtic |

$d_{10}$: 6.132 µm $d_{50}$: 55.28 µm $d_{90}$: 230.0 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 4.45 | Median: | 4.18 | Deviation: | 2.09 |
| Skewness: | 0.19 | Kurtosis: | 0.91 | | |

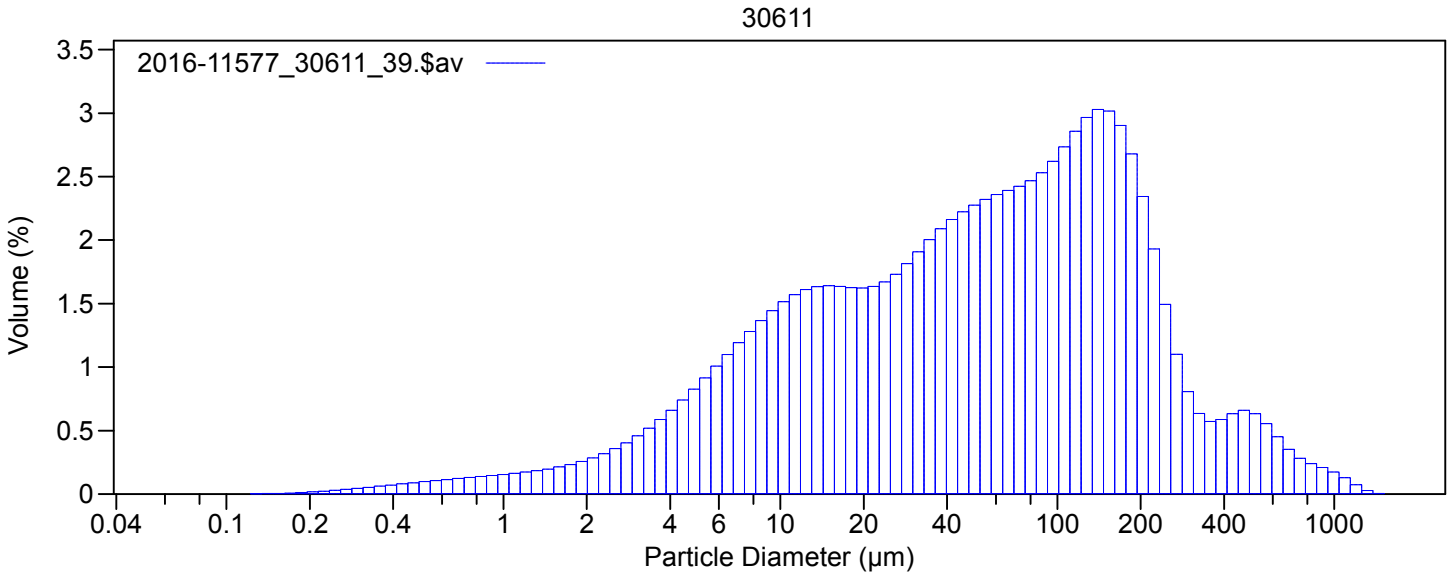
<80%
158.7 µm

2016-11577_30611_39.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 6.14 |
| 4 | 47.2 |
| 63 | 33.5 |
| 200 | 13.2 |
| 2000 | |

2016-11577_30611_39.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 6.14 |
| 4 | 47.2 |
| 63 | 33.5 |
| 200 | 13.2 |
| 2000 | 0 |


30611
2016-11577_30611_39.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30612_42.$av
2016-11577_30612_42.$av
File ID: 2016-11577
Sample ID: 30612
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30612_40.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30612_41.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30612_42.$ls

Volume Statistics (Arithmetic) 2016-11577_30612_42.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 21.38 µm | S.D.: | 25.03 µm |
| Median: | 13.82 µm | C.V.: | 117% |
| D(3,2): | 5.873 µm | Skewness: | 3.223 Right skewed |
| Mode: | 14.94 µm | Kurtosis: | 14.29 Leptokurtic |

$d_{10}$: 2.962 µm $d_{50}$: 13.82 µm $d_{90}$: 46.89 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 6.22 | Median: | 6.18 | Deviation: | 1.55 |
| Skewness: | 0.11 | Kurtosis: | 1.28 | | |

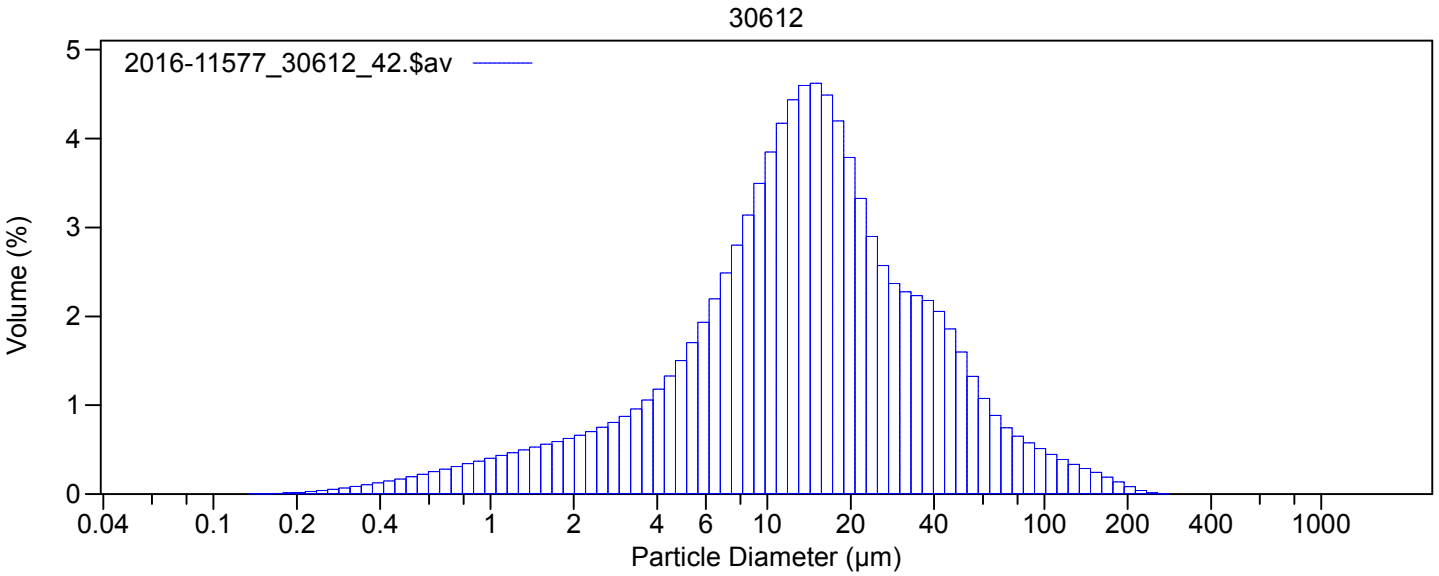
<80%
30.26 µm

2016-11577_30612_42.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 13.2 |
| 4 | 81.2 |
| 63 | 5.51 |
| 200 | 0.12 |
| 2000 | |

2016-11577_30612_42.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 13.2 |
| 4 | 81.2 |
| 63 | 5.51 |
| 200 | 0.12 |
| 2000 | 0 |


30612
2016-11577_30612_42.$av
Volume (%)
0
1
2
3
4
5
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30613_03.$av
2016-11577_30613_03.$av
File ID: 2016-11577
Sample ID: 30613
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30613_01.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30613_02.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30613_03.$ls

Volume Statistics (Arithmetic) 2016-11577_30613_03.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 25.41 µm | S.D.: | 31.22 µm |
| Median: | 14.91 µm | C.V.: | 123% |
| D(3,2): | 6.055 µm | Skewness: | 2.915 Right skewed |
| Mode: | 14.94 µm | Kurtosis: | 10.61 Leptokurtic |

$d_{10}$: 3.460 µm $d_{50}$: 14.91 µm $d_{90}$: 58.48 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 6.06 | Median: | 6.07 | Deviation: | 1.62 |
| Skewness: | 0.04 | Kurtosis: | 1.20 | | |

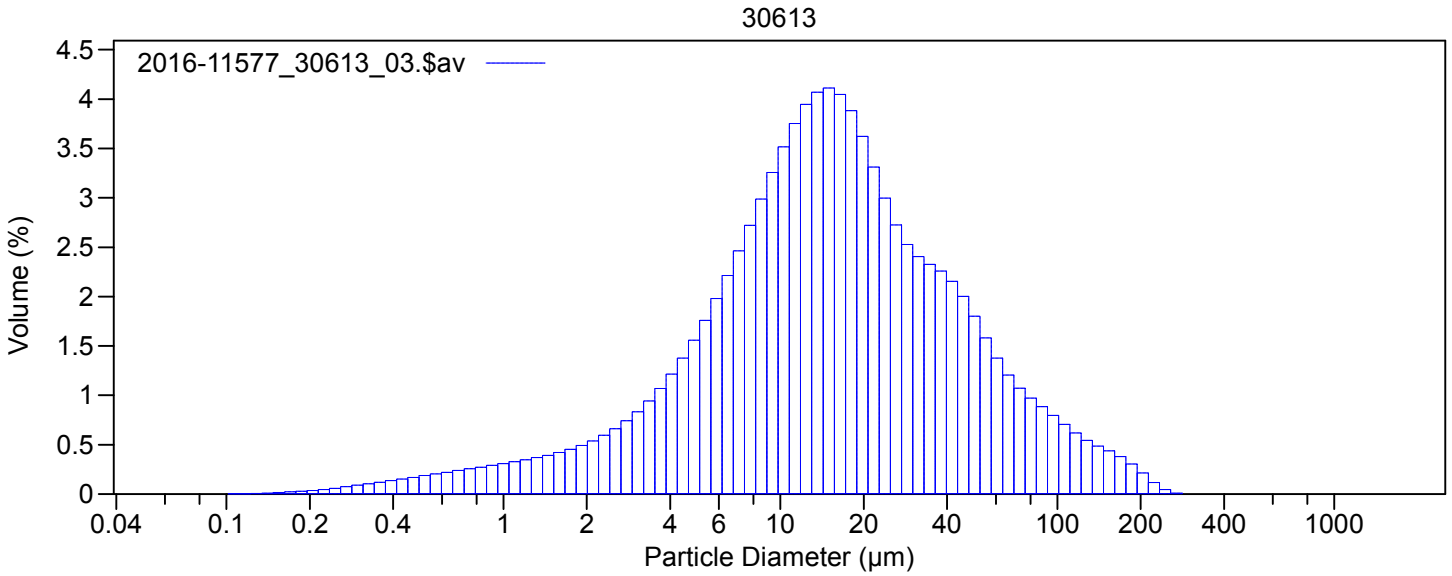
<80%
36.20 µm

2016-11577_30613_03.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 11.7 |
| 4 | 79.4 |
| 63 | 8.58 |
| 200 | 0.32 |
| 2000 | |

2016-11577_30613_03.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 11.7 |
| 4 | 79.4 |
| 63 | 8.58 |
| 200 | 0.32 |
| 2000 | 0 |


30613
2016-11577_30613_03.$av
Volume (%)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30614_06.$av
2016-11577_30614_06.$av
File ID: 2016-11577
Sample ID: 30614
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30614_04.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30614_05.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30614_06.$ls

Volume Statistics (Arithmetic) 2016-11577_30614_06.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 122.7 µm | S.D.: | 317.2 µm |
| Median: | 21.29 µm | C.V.: | 258% |
| D(3,2): | 7.888 µm | Skewness: | 3.736 Right skewed |
| Mode: | 14.94 µm | Kurtosis: | 14.01 Leptokurtic |

$d_{10}$: 5.231 µm $d_{50}$: 21.29 µm $d_{90}$: 220.9 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.37 | Median: | 5.55 | Deviation: | 2.14 |
| Skewness: | -0.23 | Kurtosis: | 1.40 | | |

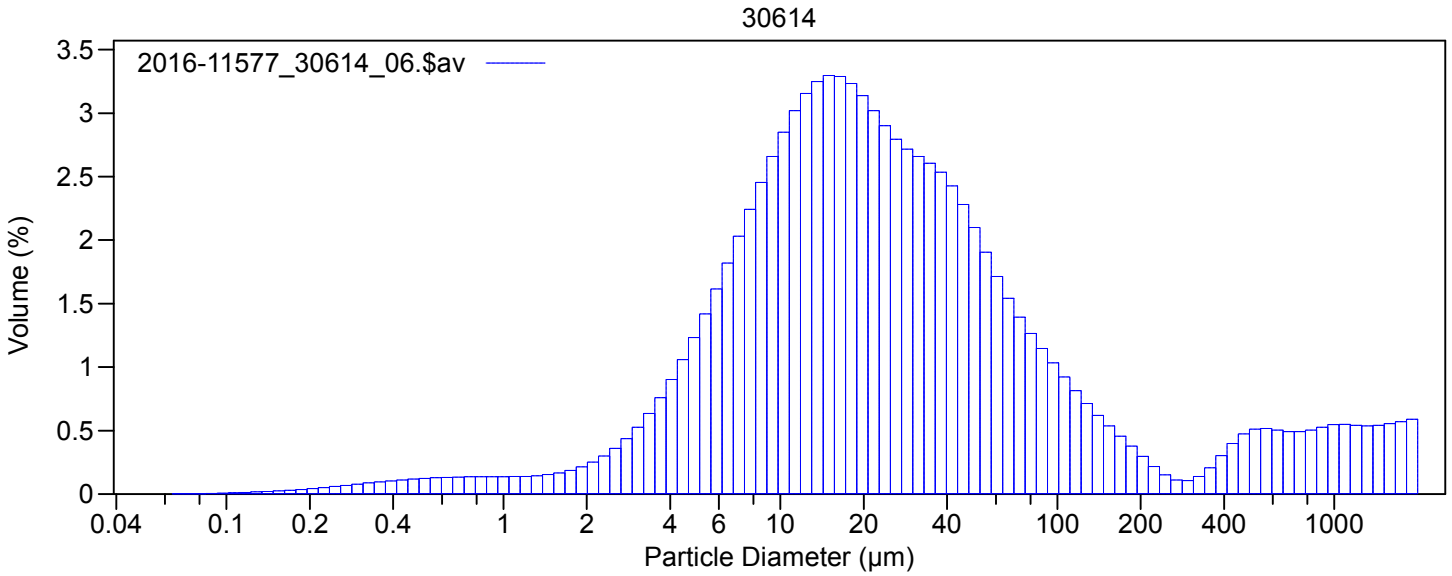
<80%
68.25 µm

2016-11577_30614_06.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 6.79 |
| 4 | 71.9 |
| 63 | 11.0 |
| 200 | 10.3 |
| 2000 | |

2016-11577_30614_06.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 6.79 |
| 4 | 71.9 |
| 63 | 11.0 |
| 200 | 10.3 |
| 2000 | 0 |


30614
2016-11577_30614_06.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30615_09.$av
2016-11577_30615_09.$av
File ID: 2016-11577
Sample ID: 30615
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 81 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30615_07.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30615_08.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30615_09.$ls

Volume Statistics (Arithmetic) 2016-11577_30615_09.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 89.83 µm | S.D.: | 204.8 µm |
| Median: | 33.96 µm | C.V.: | 228% |
| D(3,2): | 10.44 µm | Skewness: | 5.984 Right skewed |
| Mode: | 18.00 µm | Kurtosis: | 41.21 Leptokurtic |

$d_{10}$: 6.678 µm $d_{50}$: 33.96 µm $d_{90}$: 174.4 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 4.85 | Median: | 4.88 | Deviation: | 1.85 |
| Skewness: | -0.00 | Kurtosis: | 0.91 | | |

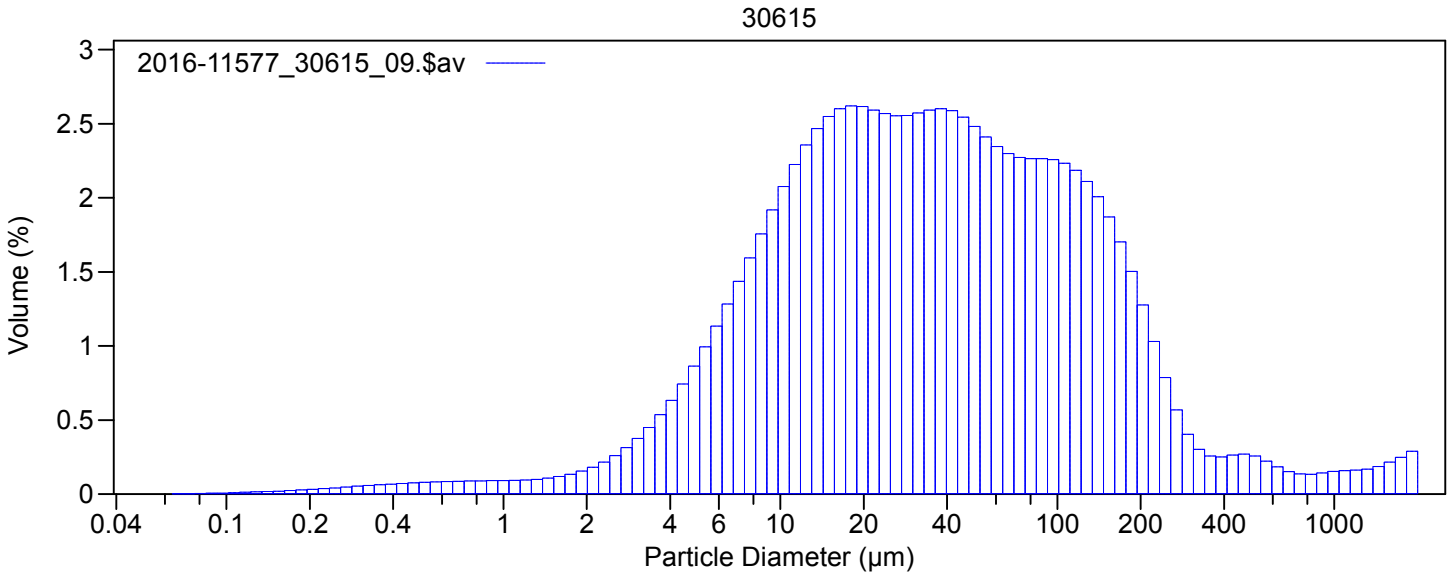
<80%
109.2 µm

2016-11577_30615_09.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 4.75 |
| 4 | 61.9 |
| 63 | 25.5 |
| 200 | 7.83 |
| 2000 | |

2016-11577_30615_09.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 4.75 |
| 4 | 61.9 |
| 63 | 25.5 |
| 200 | 7.83 |
| 2000 | 0 |


30615
2016-11577_30615_09.$av
Volume (%)
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30616_12.$av
2016-11577_30616_12.$av
File ID: 2016-11577
Sample ID: 30616
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30616_10.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30616_11.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30616_12.$ls

Volume Statistics (Arithmetic) 2016-11577_30616_12.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 260.3 µm | S.D.: | 227.5 µm |
| Median: | 220.3 µm | C.V.: | 87.4% |
| D(3,2): | 22.77 µm | Skewness: | 1.082 Right skewed |
| Mode: | 356.1 µm | Kurtosis: | 1.254 Leptokurtic |

$d_{10}$: 13.53 µm $d_{50}$: 220.3 µm $d_{90}$: 568.5 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 2.85 | Median: | 2.18 | Deviation: | 2.06 |
| Skewness: | 0.48 | Kurtosis: | 1.00 | | |

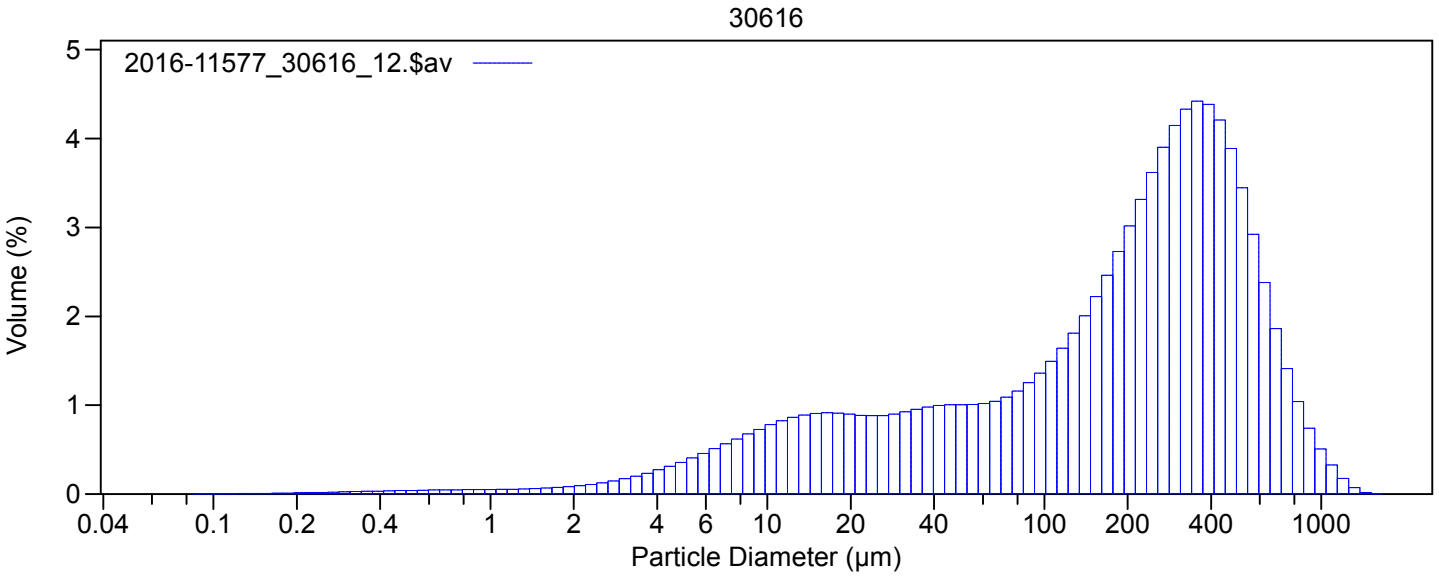
<80%
438.2 µm

2016-11577_30616_12.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 2.34 |
| 4 | 23.2 |
| 63 | 21.3 |
| 200 | 53.2 |
| 2000 | |

2016-11577_30616_12.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 2.34 |
| 4 | 23.2 |
| 63 | 21.3 |
| 200 | 53.2 |
| 2000 | 0 |


30616
2016-11577_30616_12.$av
Volume (%)
0
1
2
3
4
5
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30617_15.$av
2016-11577_30617_15.$av
File ID: 2016-11577
Sample ID: 30617
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30617_13.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30617_14.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30617_15.$ls

Volume Statistics (Arithmetic) 2016-11577_30617_15.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 112.1 µm | S.D.: | 164.5 µm |
| Median: | 64.78 µm | C.V.: | 147% |
| D(3,2): | 14.82 µm | Skewness: | 5.223 Right skewed |
| Mode: | 153.8 µm | Kurtosis: | 40.18 Leptokurtic |

$d_{10}$: 8.534 µm $d_{50}$: 64.78 µm $d_{90}$: 239.9 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 4.19 | Median: | 3.95 | Deviation: | 1.89 |
| Skewness: | 0.21 | Kurtosis: | 0.87 | | |

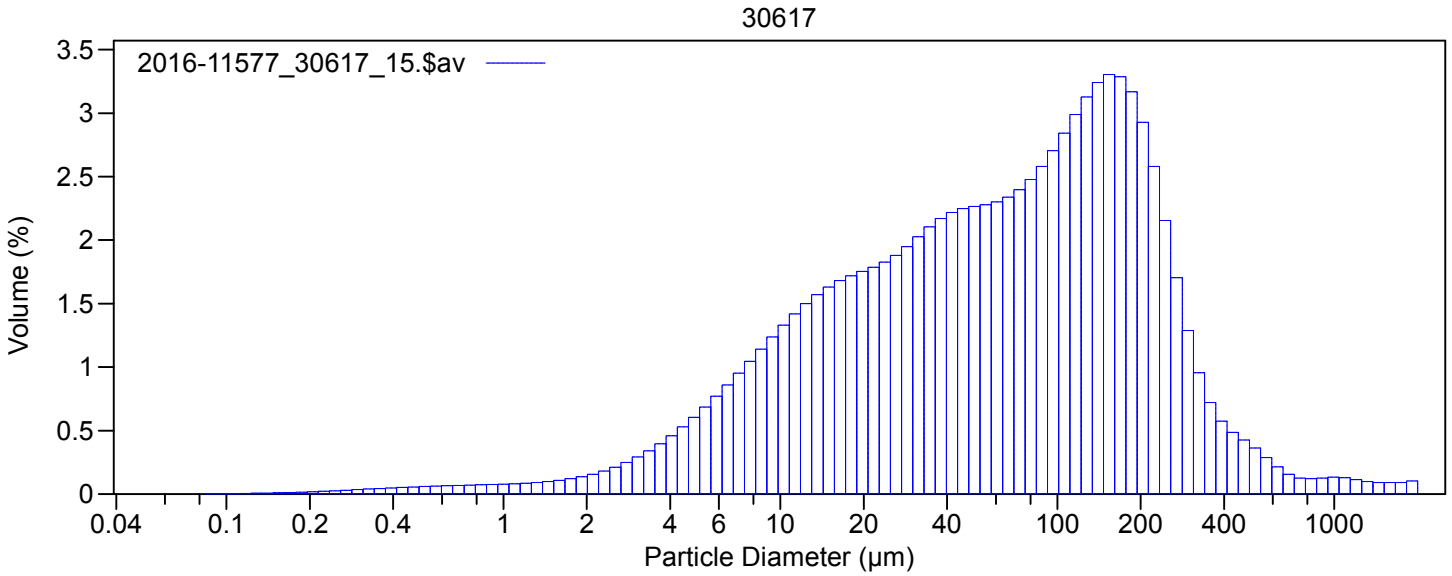
<80%
173.2 µm

2016-11577_30617_15.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 3.71 |
| 4 | 45.6 |
| 63 | 35.5 |
| 200 | 15.2 |
| 2000 | |

2016-11577_30617_15.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 3.71 |
| 4 | 45.6 |
| 63 | 35.5 |
| 200 | 15.2 |
| 2000 | 0 |


30617
2016-11577_30617_15.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30618_18.$av
2016-11577_30618_18.$av
File ID: 2016-11577
Sample ID: 30618
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 82 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30618_16.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30618_17.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30618_18.$ls

Volume Statistics (Arithmetic) 2016-11577_30618_18.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 100.5 µm | S.D.: | 105.6 µm |
| Median: | 72.27 µm | C.V.: | 105% |
| D(3,2): | 14.11 µm | Skewness: | 2.558 Right skewed |
| Mode: | 153.8 µm | Kurtosis: | 12.77 Leptokurtic |

Folk and Ward Statistics (Phi)

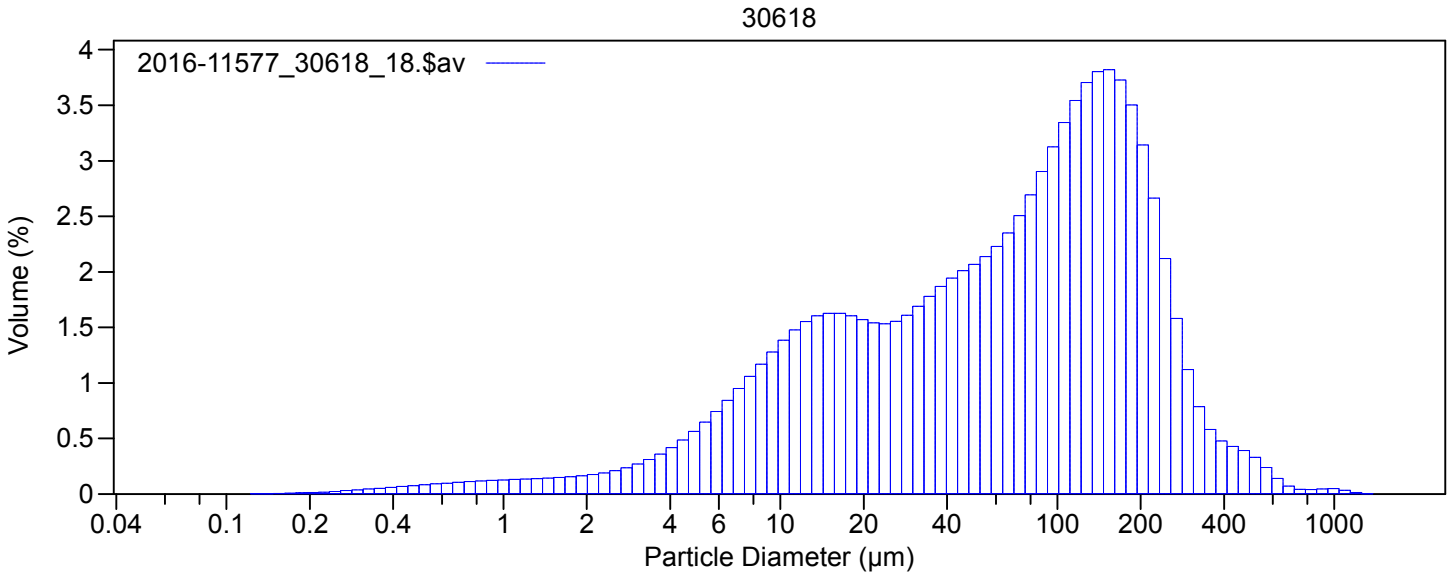
| | | | | | |
|---|---|---|---|---|---|
| Mean: | 4.18 | Median: | 3.79 | Deviation: | 1.87 |
| Skewness: | 0.32 | Kurtosis: | 0.86 | | |

2016-11577_30618_18.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 4.24 |
| 4 | 42.3 |
| 63 | 40.1 |
| 200 | 13.4 |
| 2000 | |

2016-11577_30618_18.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 4.24 |
| 4 | 42.3 |
| 63 | 40.1 |
| 200 | 13.4 |
| 2000 | 0 |


30618
2016-11577_30618_18.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30619_03.$av
2016-11577_30619_03.$av
File ID: 2016-11577
Sample ID: 30619
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30619_01.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30619_02.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30619_03.$ls

Volume Statistics (Arithmetic) 2016-11577_30619_03.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 137.6 µm | S.D.: | 199.6 µm |
| Median: | 83.25 µm | C.V.: | 145% |
| D(3,2): | 15.73 µm | Skewness: | 4.482 Right skewed |
| Mode: | 168.9 µm | Kurtosis: | 27.62 Leptokurtic |

$d_{10}$: 9.751 µm $d_{50}$: 83.25 µm $d_{90}$: 284.8 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 3.93 | Median: | 3.59 | Deviation: | 1.92 |
| Skewness: | 0.26 | Kurtosis: | 0.93 | | |

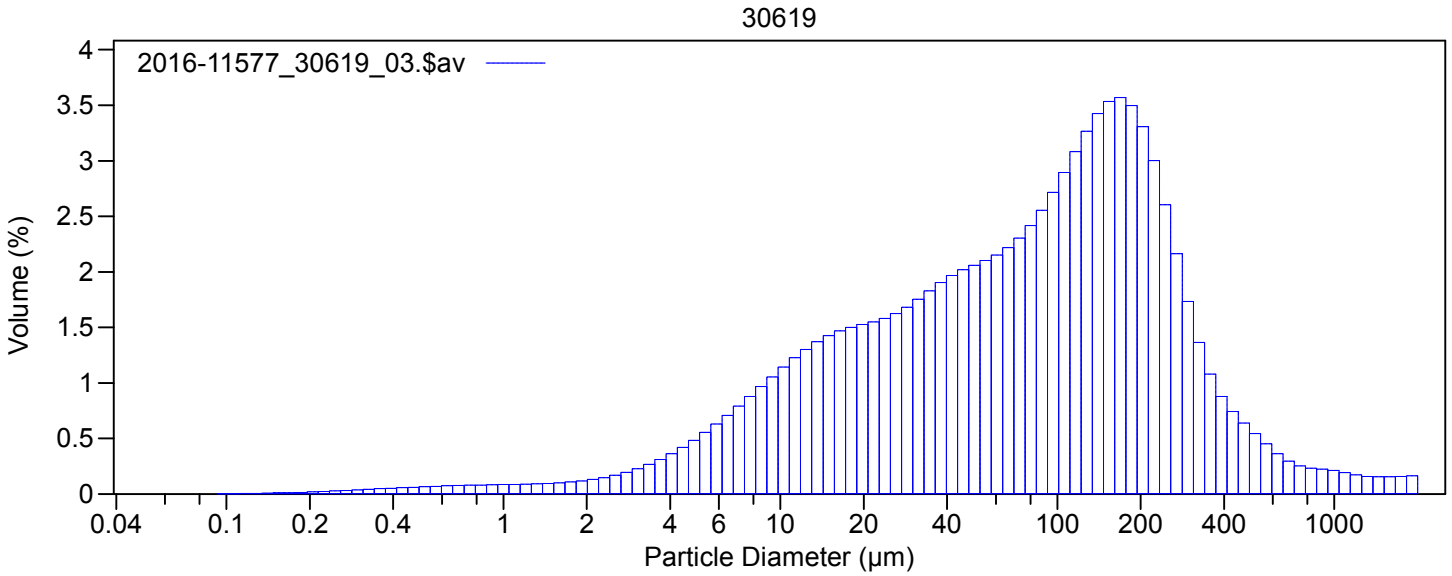
<80%
201.4 µm

2016-11577_30619_03.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 3.36 |
| 4 | 39.8 |
| 63 | 36.6 |
| 200 | 20.2 |
| 2000 | |

2016-11577_30619_03.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 3.36 |
| 4 | 39.8 |
| 63 | 36.6 |
| 200 | 20.2 |
| 2000 | 0 |


30619
2016-11577_30619_03.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30620a_06.$av
2016-11577_30620a_06.$av
File ID: 2016-11577
Sample ID: 30620a
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30620a_04.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30620a_05.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30620a_06.$ls

Volume Statistics (Arithmetic) 2016-11577_30620a_06.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 196.1 µm | S.D.: | 171.1 µm |
| Median: | 180.5 µm | C.V.: | 87.3% |
| D(3,2): | 19.98 µm | Skewness: | 3.135 Right skewed |
| Mode: | 245.2 µm | Kurtosis: | 21.01 Leptokurtic |

$d_{10}$: 19.00 µm $d_{50}$: 180.5 µm $d_{90}$: 368.4 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 2.96 | Median: | 2.47 | Deviation: | 1.64 |
| Skewness: | 0.51 | Kurtosis: | 1.20 | | |

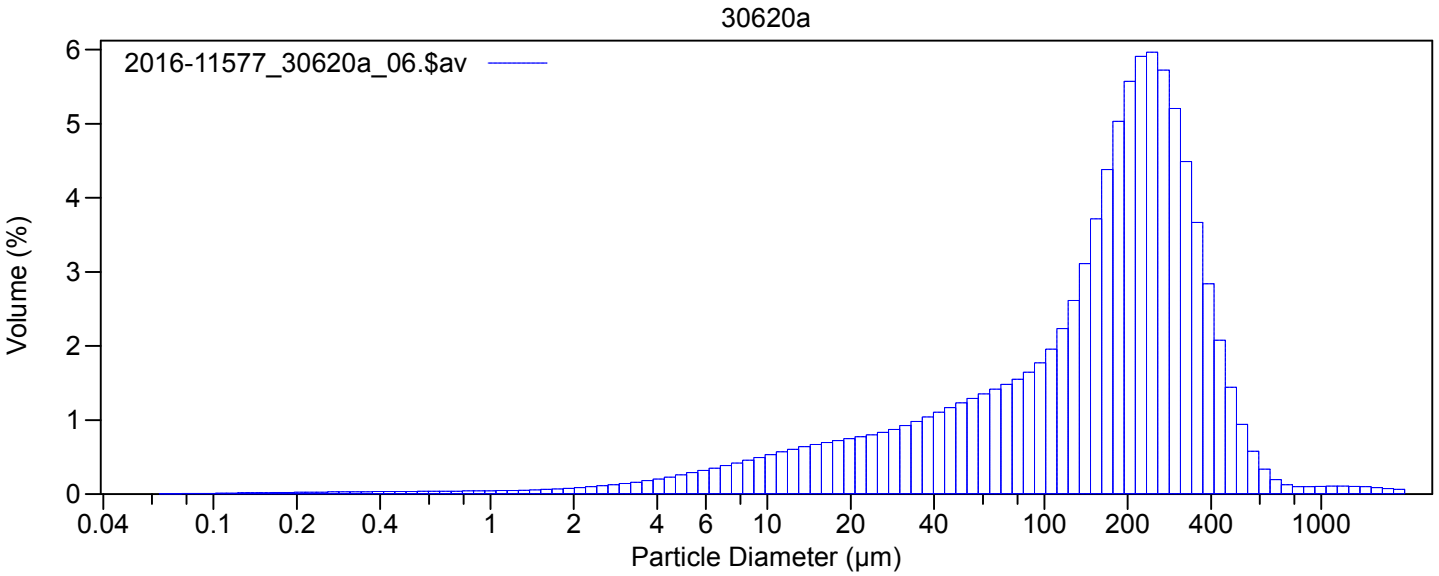
<80%
297.1 µm

2016-11577_30620a_06.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 2.18 |
| 4 | 20.8 |
| 63 | 32.7 |
| 200 | 44.3 |
| 2000 | |

2016-11577_30620a_06.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 2.18 |
| 4 | 20.8 |
| 63 | 32.7 |
| 200 | 44.3 |
| 2000 | 0 |


30620a
2016-11577_30620a_06.$av
Volume (%)
0
1
2
3
4
5
6
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30621_12.$av
2016-11577_30621_12.$av
File ID: 2016-11577
Sample ID: 30621
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30621_10.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30621_11.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30621_12.$ls

Volume Statistics (Arithmetic) 2016-11577_30621_12.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 216.1 µm | S.D.: | 288.5 µm |
| Median: | 136.7 µm | C.V.: | 134% |
| D(3,2): | 18.29 µm | Skewness: | 3.021 Right skewed |
| Mode: | 223.4 µm | Kurtosis: | 10.91 Leptokurtic |

$d_{10}$: 11.41 µm $d_{50}$: 136.7 µm $d_{90}$: 454.4 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 3.37 | Median: | 2.87 | Deviation: | 2.10 |
| Skewness: | 0.32 | Kurtosis: | 1.04 | | |

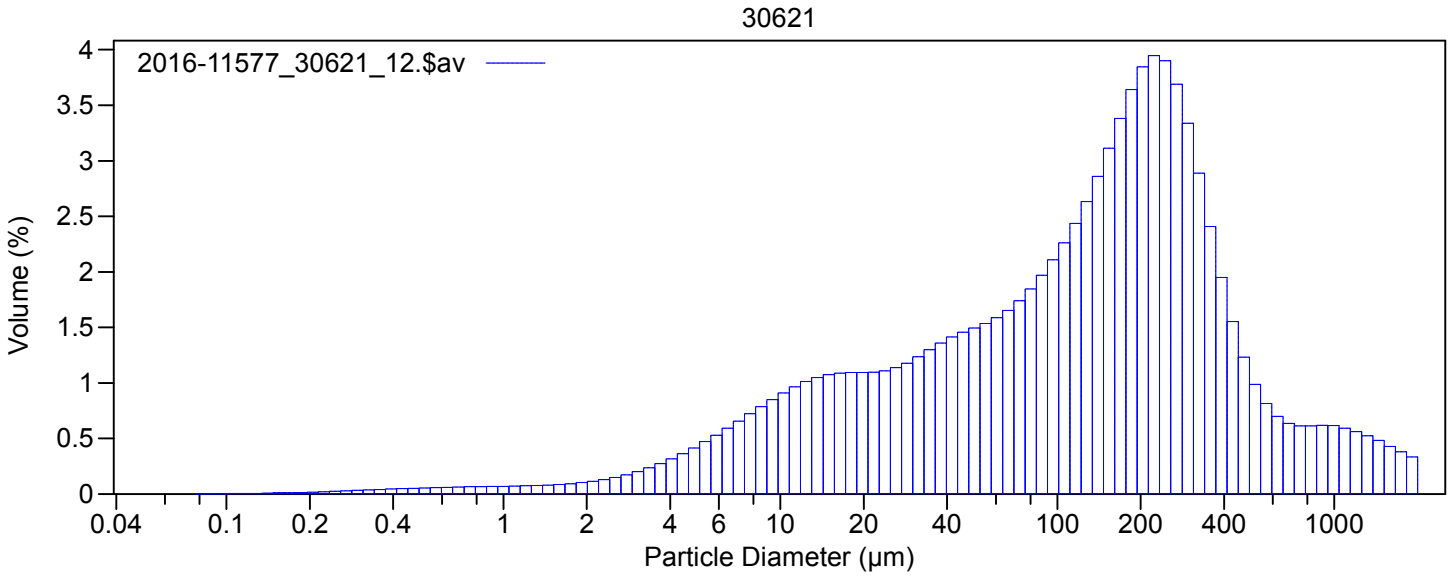
<80%
300.8 µm

2016-11577_30621_12.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 2.92 |
| 4 | 29.7 |
| 63 | 30.9 |
| 200 | 36.5 |
| 2000 | |

2016-11577_30621_12.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 2.92 |
| 4 | 29.7 |
| 63 | 30.9 |
| 200 | 36.5 |
| 2000 | 0 |


30621
2016-11577_30621_12.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30622_15.$av
2016-11577_30622_15.$av
File ID: 2016-11577
Sample ID: 30622
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30622_13.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30622_14.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30622_15.$ls

Volume Statistics (Arithmetic) 2016-11577_30622_15.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 43.56 µm | S.D.: | 71.65 µm |
| Median: | 18.61 µm | C.V.: | 164% |
| D(3,2): | 6.681 µm | Skewness: | 4.249 Right skewed |
| Mode: | 13.61 µm | Kurtosis: | 23.43 Leptokurtic |

$d_{10}$: 3.372 µm $d_{50}$: 18.61 µm $d_{90}$: 105.0 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.69 | Median: | 5.75 | Deviation: | 1.95 |
| Skewness: | 0.00 | Kurtosis: | 1.02 | | |

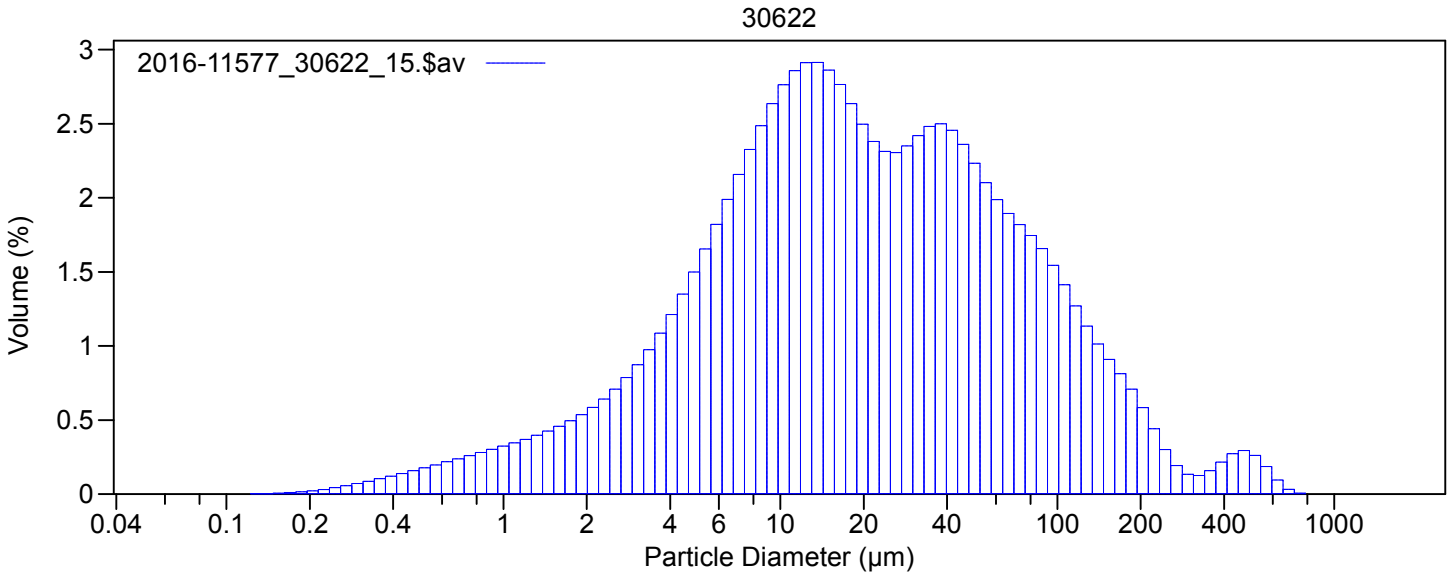
<80%
61.20 µm

2016-11577_30622_15.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 12.0 |
| 4 | 68.7 |
| 63 | 16.2 |
| 200 | 3.12 |
| 2000 | |

2016-11577_30622_15.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 12.0 |
| 4 | 68.7 |
| 63 | 16.2 |
| 200 | 3.12 |
| 2000 | 0 |


30622
2016-11577_30622_15.$av
Volume (%)
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30623_18.$av
2016-11577_30623_18.$av
File ID: 2016-11577
Sample ID: 30623
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30623_16.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30623_17.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30623_18.$ls

Volume Statistics (Arithmetic) 2016-11577_30623_18.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 33.29 µm | S.D.: | 37.28 µm |
| Median: | 19.65 µm | C.V.: | 112% |
| D(3,2): | 7.025 µm | Skewness: | 2.158 Right skewed |
| Mode: | 14.94 µm | Kurtosis: | 5.551 Leptokurtic |

$d_{10}$: 3.715 µm $d_{50}$: 19.65 µm $d_{90}$: 81.65 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.72 | Median: | 5.67 | Deviation: | 1.75 |
| Skewness: | 0.09 | Kurtosis: | 1.02 | | |

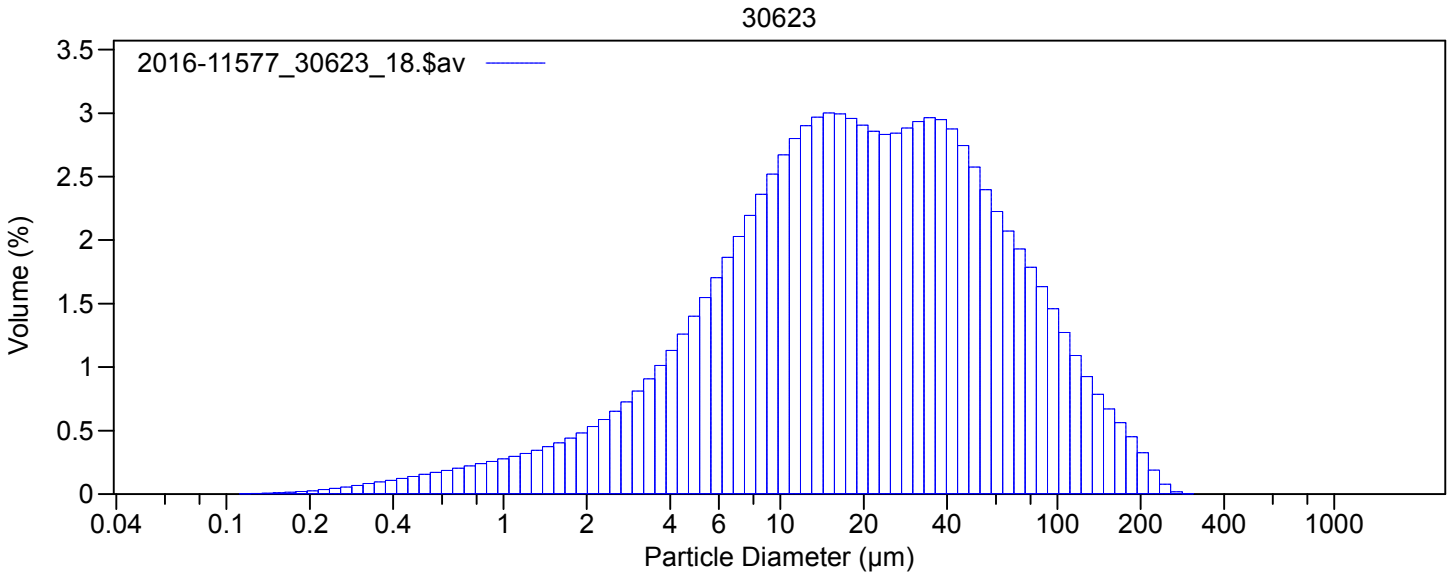
<80%
52.40 µm

2016-11577_30623_18.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 10.8 |
| 4 | 73.7 |
| 63 | 14.9 |
| 200 | 0.51 |
| 2000 | |

2016-11577_30623_18.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 10.8 |
| 4 | 73.7 |
| 63 | 14.9 |
| 200 | 0.51 |
| 2000 | 0 |


30623
2016-11577_30623_18.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30624_21.$av
2016-11577_30624_21.$av
File ID: 2016-11577
Sample ID: 30624
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 81 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30624_19.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30624_20.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30624_21.$ls

Volume Statistics (Arithmetic) 2016-11577_30624_21.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 33.76 µm | S.D.: | 37.93 µm |
| Median: | 19.90 µm | C.V.: | 112% |
| D(3,2): | 7.482 µm | Skewness: | 2.331 Right skewed |
| Mode: | 14.94 µm | Kurtosis: | 6.496 Leptokurtic |

$d_{10}$: 5.048 µm $d_{50}$: 19.90 µm $d_{90}$: 81.23 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.62 | Median: | 5.65 | Deviation: | 1.57 |
| Skewness: | 0.00 | Kurtosis: | 1.01 | | |

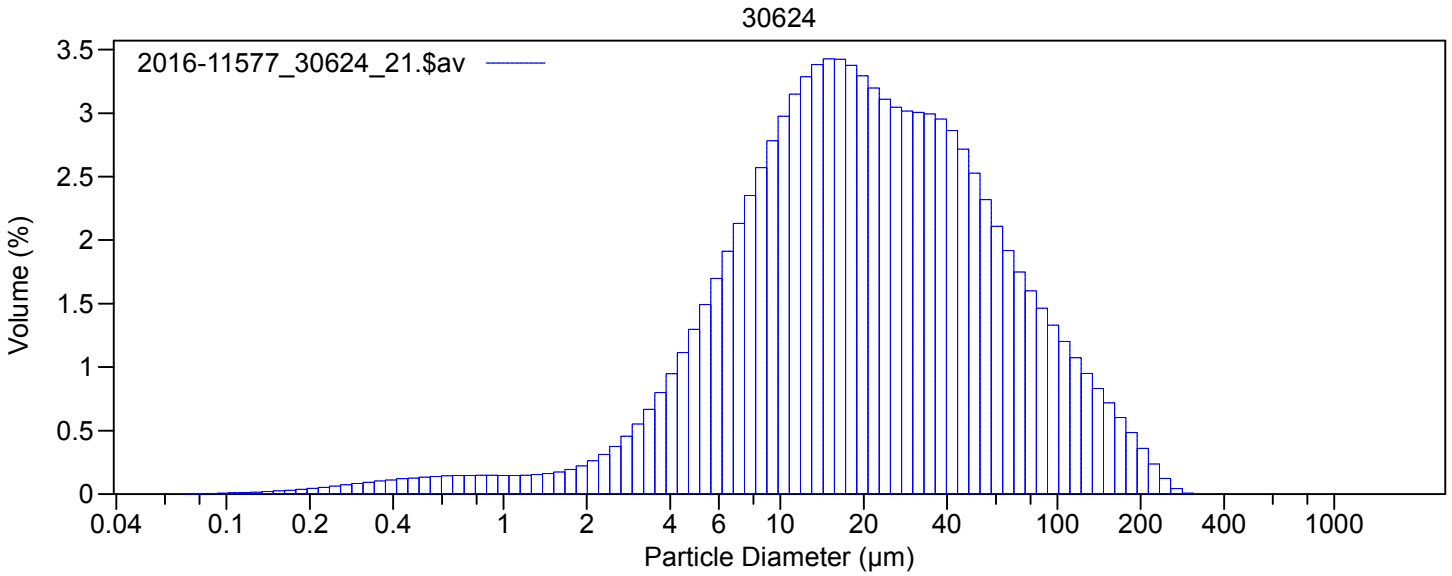
<80%
51.00 µm

2016-11577_30624_21.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 7.16 |
| 4 | 78.0 |
| 63 | 14.2 |
| 200 | 0.66 |
| 2000 | |

2016-11577_30624_21.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 7.16 |
| 4 | 78.0 |
| 63 | 14.2 |
| 200 | 0.66 |
| 2000 | 0 |


30624
2016-11577_30624_21.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30625_24.$av
2016-11577_30625_24.$av
File ID: 2016-11577
Sample ID: 30625
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 82 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30625_22.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30625_23.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30625_24.$ls

Volume Statistics (Arithmetic) 2016-11577_30625_24.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 35.01 µm | S.D.: | 56.93 µm |
| Median: | 14.51 µm | C.V.: | 163% |
| D(3,2): | 5.636 µm | Skewness: | 4.348 Right skewed |
| Mode: | 11.29 µm | Kurtosis: | 27.01 Leptokurtic |

$d_{10}$: 2.996 µm $d_{50}$: 14.51 µm $d_{90}$: 89.97 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.98 | Median: | 6.11 | Deviation: | 1.92 |
| Skewness: | -0.05 | Kurtosis: | 1.04 | | |

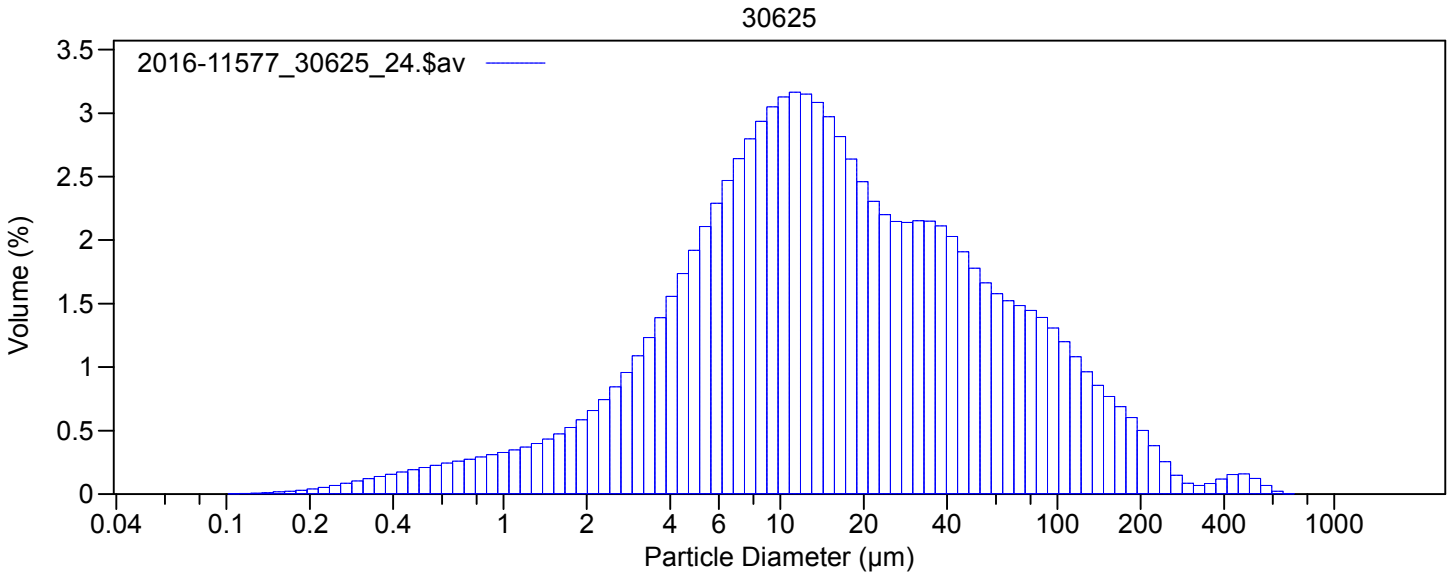
<80%
49.28 µm

2016-11577_30625_24.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 14.0 |
| 4 | 70.4 |
| 63 | 13.6 |
| 200 | 2.02 |
| 2000 | |

2016-11577_30625_24.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 14.0 |
| 4 | 70.4 |
| 63 | 13.6 |
| 200 | 2.02 |
| 2000 | 0 |


30625
2016-11577_30625_24.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30626_27.$av
2016-11577_30626_27.$av
File ID: 2016-11577
Sample ID: 30626
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30626_25.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30626_26.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30626_27.$ls

Volume Statistics (Arithmetic) 2016-11577_30626_27.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 27.05 µm | S.D.: | 37.01 µm |
| Median: | 13.45 µm | C.V.: | 137% |
| D(3,2): | 5.430 µm | Skewness: | 2.878 Right skewed |
| Mode: | 12.40 µm | Kurtosis: | 9.697 Leptokurtic |

$d_{10}$: 3.019 µm $d_{50}$: 13.45 µm $d_{90}$: 67.54 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 6.15 | Median: | 6.22 | Deviation: | 1.77 |
| Skewness: | -0.02 | Kurtosis: | 1.14 | | |

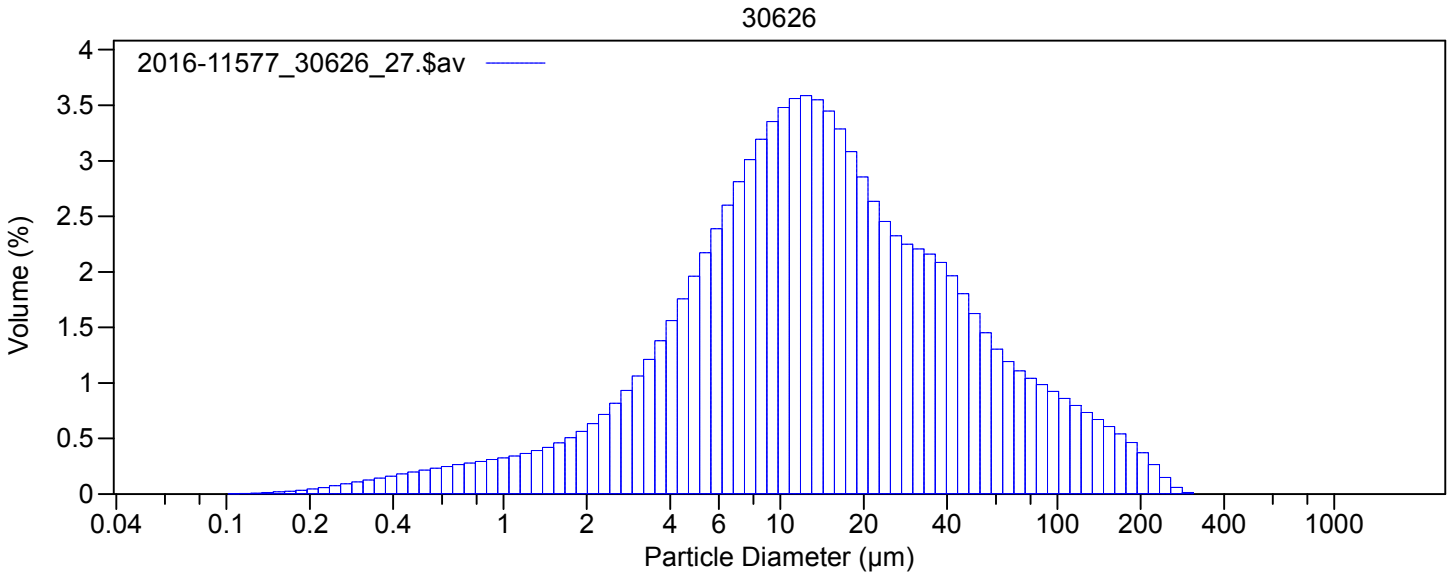
<80%
37.98 µm

2016-11577_30626_27.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 13.9 |
| 4 | 75.3 |
| 63 | 10.1 |
| 200 | 0.75 |
| 2000 | |

2016-11577_30626_27.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 13.9 |
| 4 | 75.3 |
| 63 | 10.1 |
| 200 | 0.75 |
| 2000 | 0 |


30626
2016-11577_30626_27.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30627_30.$av
2016-11577_30627_30.$av
File ID: 2016-11577
Sample ID: 30627
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30627_28.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30627_29.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30627_30.$ls

Volume Statistics (Arithmetic) 2016-11577_30627_30.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 25.92 µm | S.D.: | 32.25 µm |
| Median: | 14.45 µm | C.V.: | 124% |
| D(3,2): | 5.902 µm | Skewness: | 2.576 Right skewed |
| Mode: | 14.94 µm | Kurtosis: | 7.602 Leptokurtic |

$d_{10}$: 2.830 µm $d_{50}$: 14.45 µm $d_{90}$: 64.34 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 6.10 | Median: | 6.11 | Deviation: | 1.73 |
| Skewness: | 0.04 | Kurtosis: | 1.27 | | |

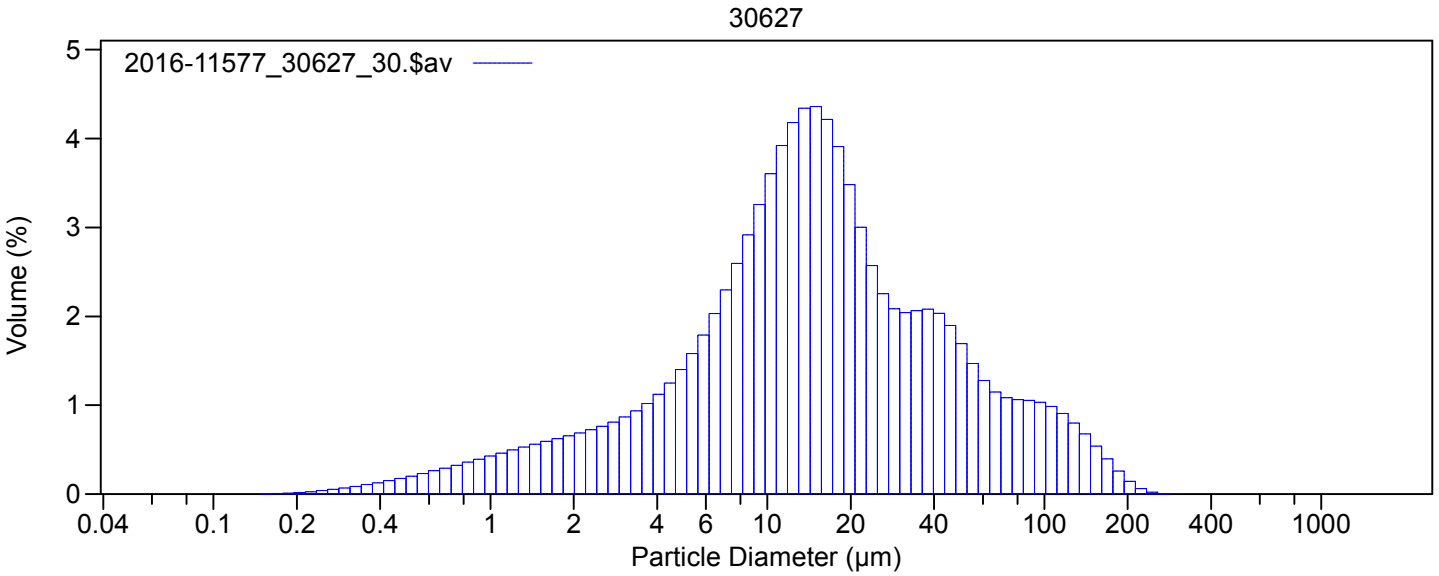
<80%
37.29 µm

2016-11577_30627_30.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 13.5 |
| 4 | 76.2 |
| 63 | 10.1 |
| 200 | 0.19 |
| 2000 | |

2016-11577_30627_30.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 13.5 |
| 4 | 76.2 |
| 63 | 10.1 |
| 200 | 0.19 |
| 2000 | 0 |


30627
2016-11577_30627_30.$av
Volume (%)
0
1
2
3
4
5
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30628_33.$av
2016-11577_30628_33.$av
File ID: 2016-11577
Sample ID: 30628
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30628_31.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30628_32.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30628_33.$ls

Volume Statistics (Arithmetic) 2016-11577_30628_33.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 154.8 µm | S.D.: | 136.5 µm |
| Median: | 130.2 µm | C.V.: | 88.2% |
| D(3,2): | 16.87 µm | Skewness: | 2.250 Right skewed |
| Mode: | 168.9 µm | Kurtosis: | 8.760 Leptokurtic |

$d_{10}$: 19.58 µm $d_{50}$: 130.2 µm $d_{90}$: 304.4 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 3.28 | Median: | 2.94 | Deviation: | 1.53 |
| Skewness: | 0.37 | Kurtosis: | 1.20 | | |

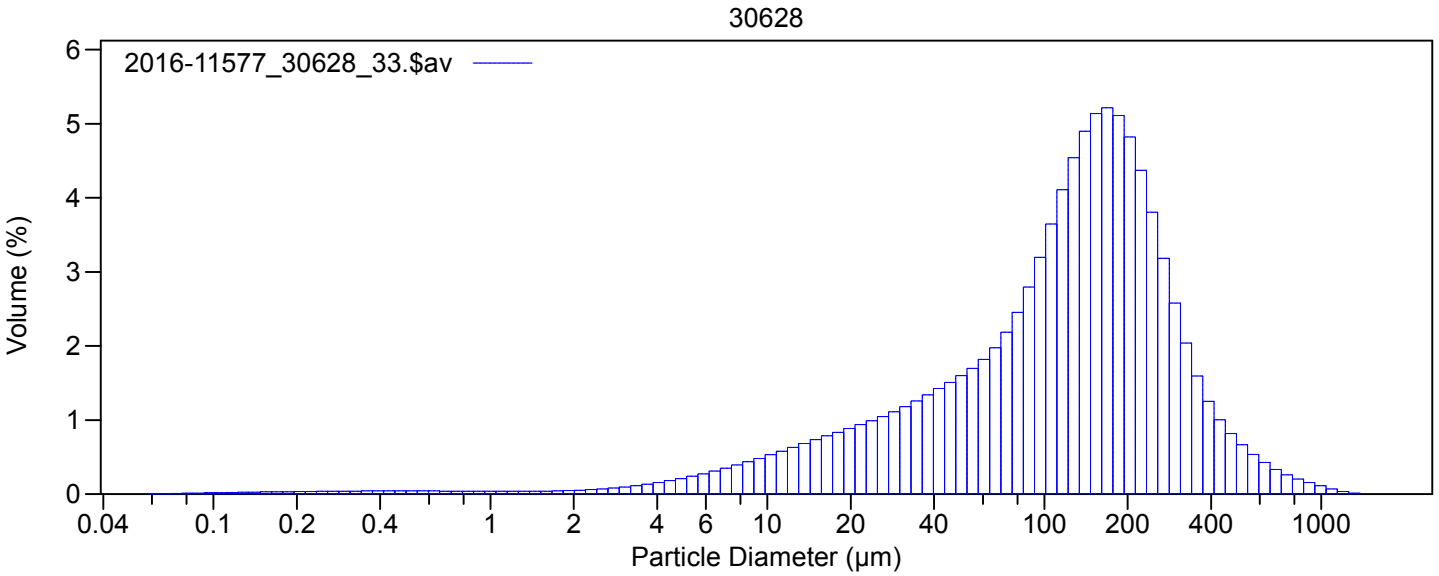
<80%
229.7 µm

2016-11577_30628_33.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 1.91 |
| 4 | 24.4 |
| 63 | 46.9 |
| 200 | 26.8 |
| 2000 | |

2016-11577_30628_33.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 1.91 |
| 4 | 24.4 |
| 63 | 46.9 |
| 200 | 26.8 |
| 2000 | 0 |


30628
2016-11577_30628_33.$av
Volume (%)
0
1
2
3
4
5
6
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30629_36.$av
2016-11577_30629_36.$av
File ID: 2016-11577
Sample ID: 30629
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30629_34.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30629_35.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30629_36.$ls

Volume Statistics (Arithmetic) 2016-11577_30629_36.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 138.6 µm | S.D.: | 114.3 µm |
| Median: | 119.8 µm | C.V.: | 82.4% |
| D(3,2): | 18.06 µm | Skewness: | 0.974 Right skewed |
| Mode: | 185.4 µm | Kurtosis: | 0.795 Leptokurtic |

$d_{10}$: 12.00 µm $d_{50}$: 119.8 µm $d_{90}$: 296.0 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 3.58 | Median: | 3.06 | Deviation: | 1.79 |
| Skewness: | 0.43 | Kurtosis: | 0.98 | | |

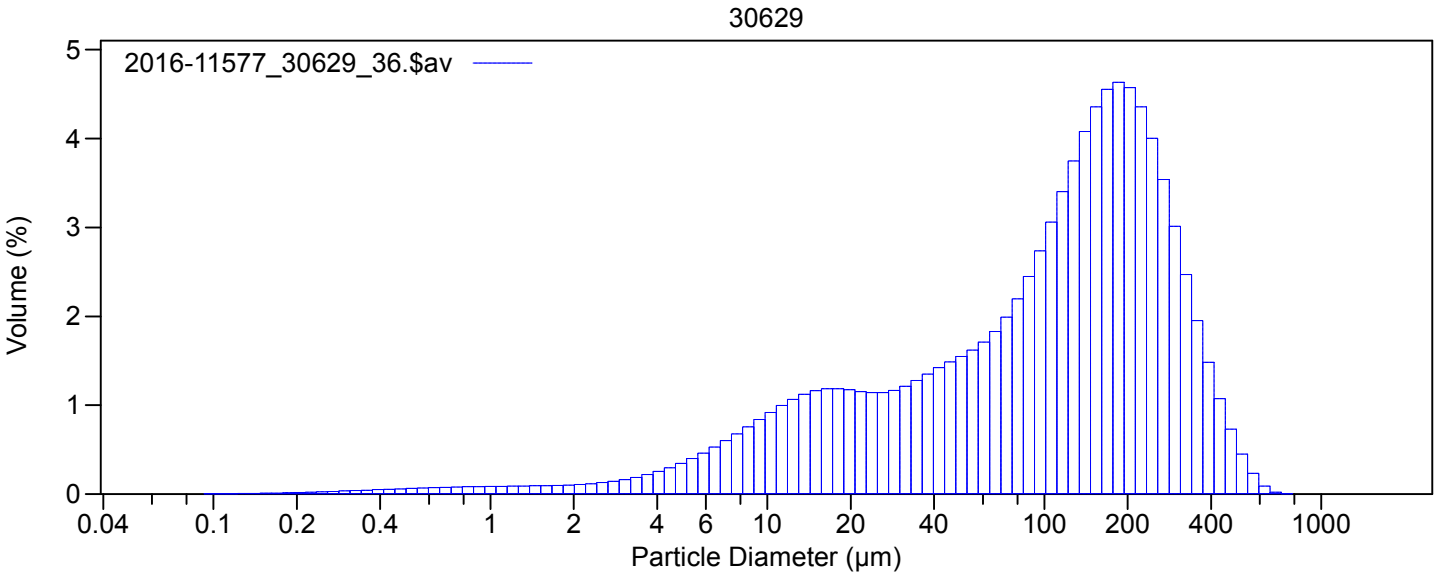
<80%
229.6 µm

2016-11577_30629_36.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 2.86 |
| 4 | 30.0 |
| 63 | 40.6 |
| 200 | 26.6 |
| 2000 | |

2016-11577_30629_36.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 2.86 |
| 4 | 30.0 |
| 63 | 40.6 |
| 200 | 26.6 |
| 2000 | 0 |


30629
2016-11577_30629_36.$av
Volume (%)
0
1
2
3
4
5
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30630a_39.$av
2016-11577_30630a_39.$av
File ID: 2016-11577
Sample ID: 30630a
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30630a_37.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30630a_38.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30630a_39.$ls

Volume Statistics (Arithmetic) 2016-11577_30630a_39.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 30.96 µm | S.D.: | 51.17 µm |
| Median: | 15.58 µm | C.V.: | 165% |
| D(3,2): | 6.280 µm | Skewness: | 5.493 Right skewed |
| Mode: | 13.61 µm | Kurtosis: | 42.68 Leptokurtic |

$d_{10}$: 3.746 µm $d_{50}$: 15.58 µm $d_{90}$: 67.34 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.96 | Median: | 6.00 | Deviation: | 1.67 |
| Skewness: | 0.00 | Kurtosis: | 1.20 | | |

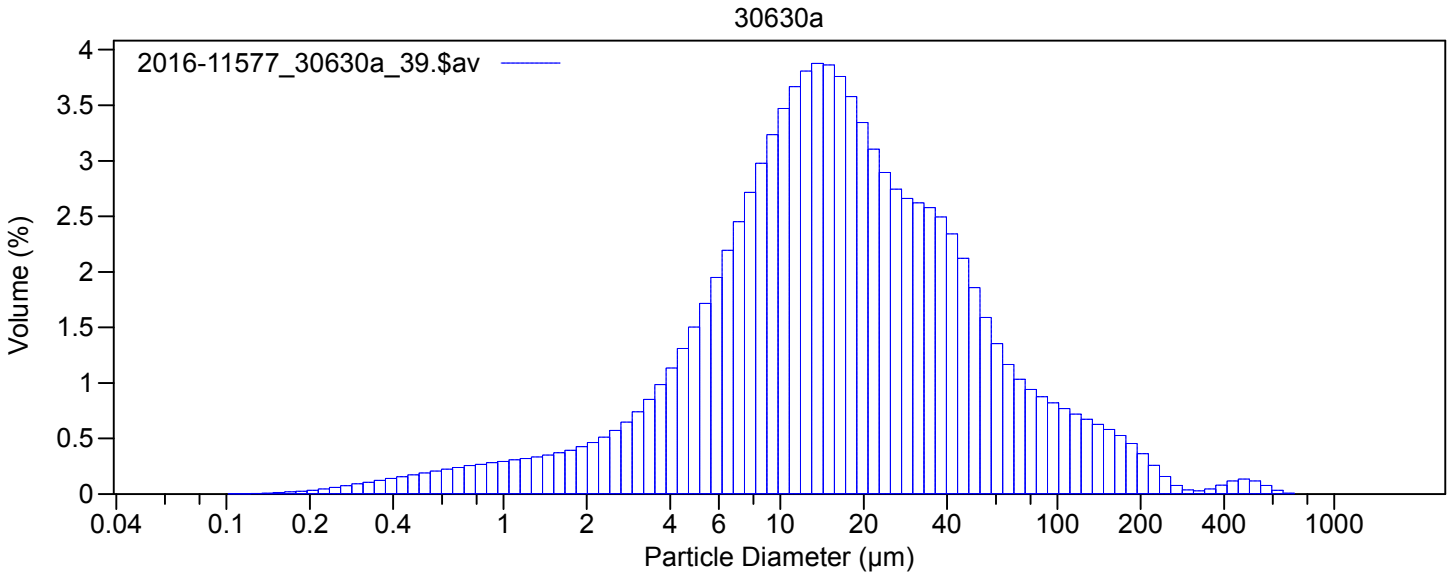
<80%
39.79 µm

2016-11577_30630a_39.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 10.7 |
| 4 | 78.4 |
| 63 | 9.40 |
| 200 | 1.43 |
| 2000 | |

2016-11577_30630a_39.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 10.7 |
| 4 | 78.4 |
| 63 | 9.40 |
| 200 | 1.43 |
| 2000 | 0 |


30630a
2016-11577_30630a_39.$av
Volume (%)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30631_45.$av
2016-11577_30631_45.$av
File ID: 2016-11577
Sample ID: 30631
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30631_43.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30631_44.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30631_45.$ls

Volume Statistics (Arithmetic) 2016-11577_30631_45.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 58.48 µm | S.D.: | 83.28 µm |
| Median: | 36.24 µm | C.V.: | 142% |
| D(3,2): | 9.412 µm | Skewness: | 4.935 Right skewed |
| Mode: | 72.94 µm | Kurtosis: | 36.86 Leptokurtic |

$d_{10}$: 4.418 µm $d_{50}$: 36.24 µm $d_{90}$: 123.3 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.09 | Median: | 4.79 | Deviation: | 1.88 |
| Skewness: | 0.26 | Kurtosis: | 0.92 | | |

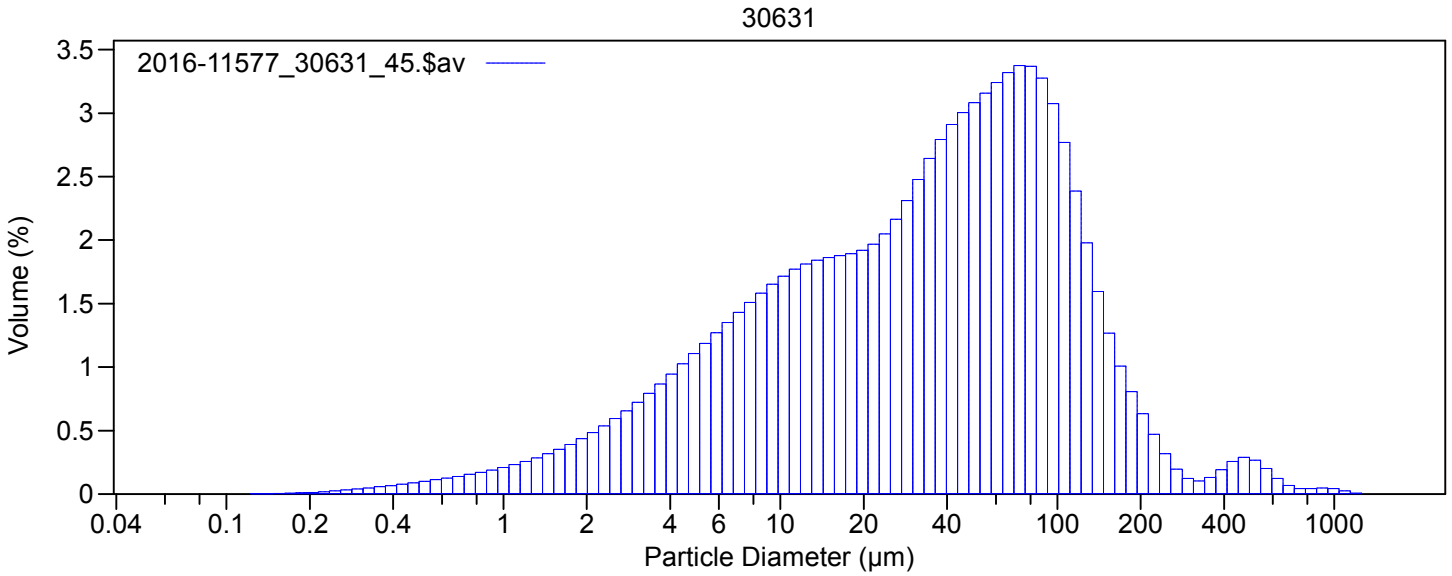
<80%
88.28 µm

2016-11577_30631_45.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 8.96 |
| 4 | 59.0 |
| 63 | 28.7 |
| 200 | 3.39 |
| 2000 | |

2016-11577_30631_45.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 8.96 |
| 4 | 59.0 |
| 63 | 28.7 |
| 200 | 3.39 |
| 2000 | 0 |


30631
2016-11577_30631_45.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30632_48.$av
2016-11577_30632_48.$av
File ID: 2016-11577
Sample ID: 30632
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30632_46.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30632_47.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30632_48.$ls

Volume Statistics (Arithmetic) 2016-11577_30632_48.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 267.8 µm | S.D.: | 152.7 µm |
| Median: | 272.1 µm | C.V.: | 57.0% |
| D(3,2): | 25.32 µm | Skewness: | 0.519 Right skewed |
| Mode: | 295.5 µm | Kurtosis: | 2.280 Leptokurtic |

$d_{10}$: 20.08 µm $d_{50}$: 272.1 µm $d_{90}$: 440.8 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 2.11 | Median: | 1.88 | Deviation: | 1.39 |
| Skewness: | 0.55 | Kurtosis: | 2.83 | | |

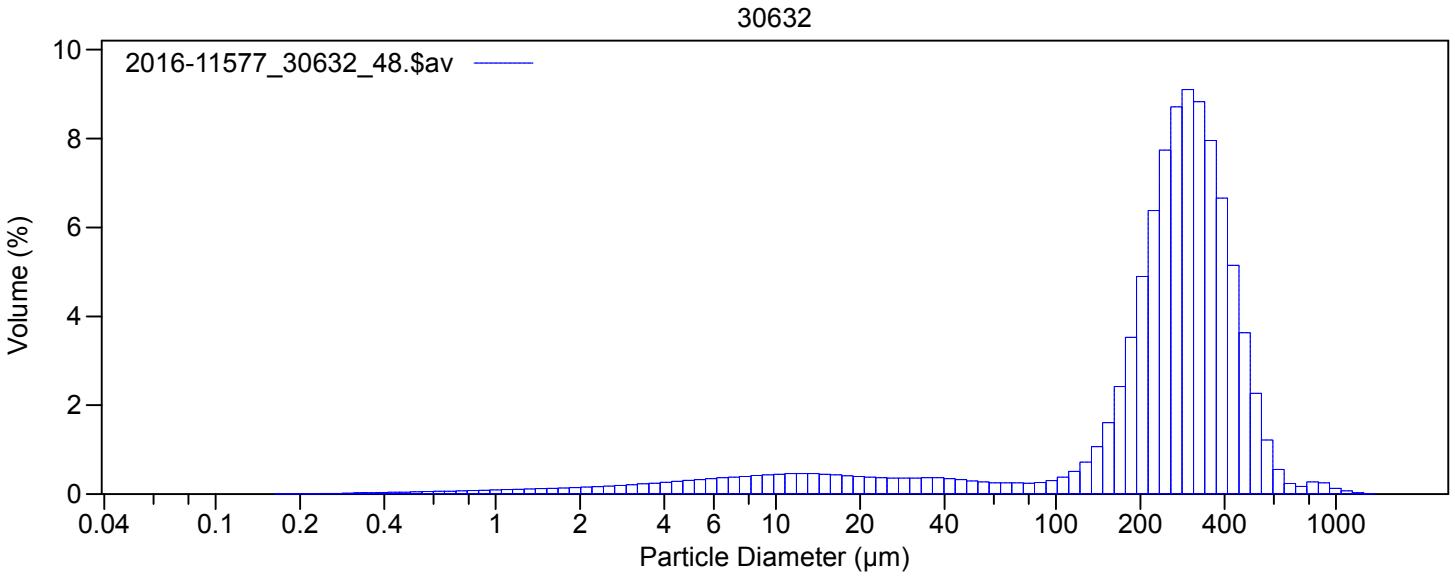
<80%
376.8 µm

2016-11577_30632_48.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 3.18 |
| 4 | 11.0 |
| 63 | 13.0 |
| 200 | 72.8 |
| 2000 | |

2016-11577_30632_48.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 3.18 |
| 4 | 11.0 |
| 63 | 13.0 |
| 200 | 72.8 |
| 2000 | 0 |


30632
2016-11577_30632_48.$av
Volume (%)
0
2
4
6
8
10
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30633_51.$av
2016-11577_30633_51.$av
File ID: 2016-11577
Sample ID: 30633
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30633_49.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30633_50.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30633_51.$ls

Volume Statistics (Arithmetic) 2016-11577_30633_51.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 417.2 µm | S.D.: | 223.2 µm |
| Median: | 418.0 µm | C.V.: | 53.5% |
| D(3,2): | 23.29 µm | Skewness: | 0.106 Right skewed |
| Mode: | 471.1 µm | Kurtosis: | 0.089 Leptokurtic |

$d_{10}$: 42.99 µm $d_{50}$: 418.0 µm $d_{90}$: 698.5 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 1.38 | Median: | 1.26 | Deviation: | 1.47 |
| Skewness: | 0.49 | Kurtosis: | 3.19 | | |

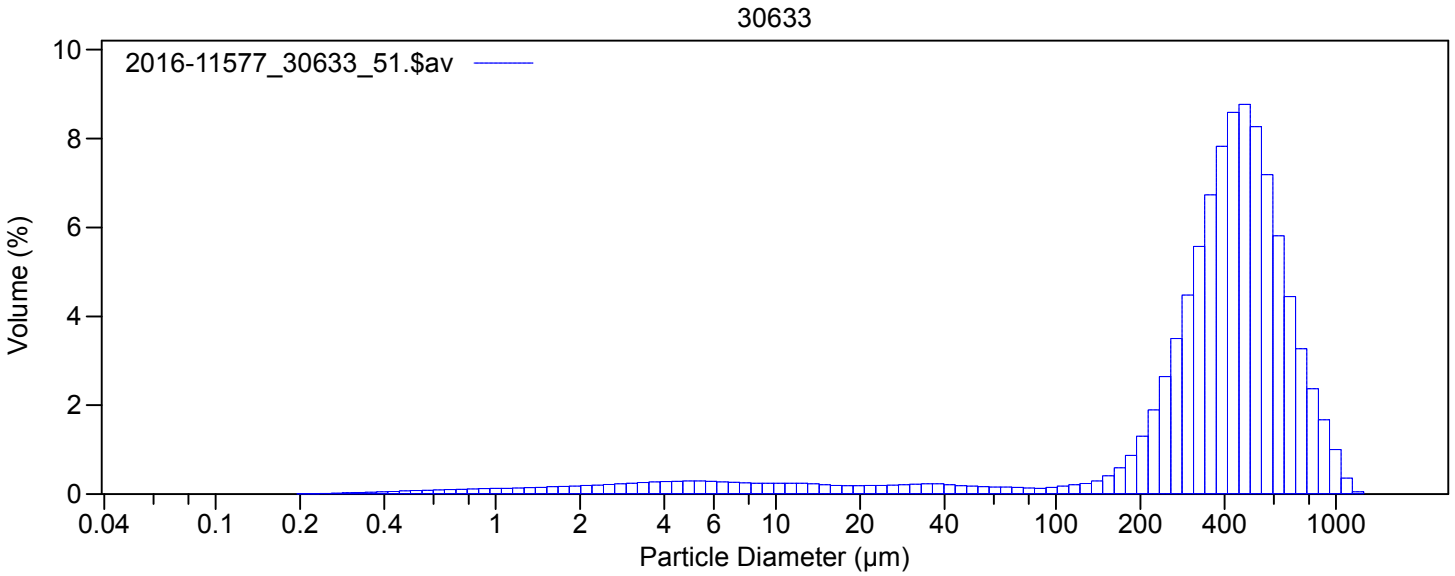
<80%
587.3 µm

2016-11577_30633_51.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 3.96 |
| 4 | 6.76 |
| 63 | 3.93 |
| 200 | 85.4 |
| 2000 | |

2016-11577_30633_51.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 3.96 |
| 4 | 6.76 |
| 63 | 3.93 |
| 200 | 85.4 |
| 2000 | 0 |


30633
2016-11577_30633_51.$av
Volume (%)
0
2
4
6
8
10
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30634_54.$av
2016-11577_30634_54.$av
File ID: 2016-11577
Sample ID: 30634
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Run length: 81 seconds
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30634_52.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30634_53.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30634_54.$ls

Volume Statistics (Arithmetic) 2016-11577_30634_54.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 340.3 µm | S.D.: | 213.2 µm |
| Median: | 326.9 µm | C.V.: | 62.6% |
| D(3,2): | 27.88 µm | Skewness: | 0.759 Right skewed |
| Mode: | 356.1 µm | Kurtosis: | 1.241 Leptokurtic |

$d_{10}$: 30.60 µm $d_{50}$: 326.9 µm $d_{90}$: 597.0 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 1.81 | Median: | 1.61 | Deviation: | 1.49 |
| Skewness: | 0.48 | Kurtosis: | 2.58 | | |

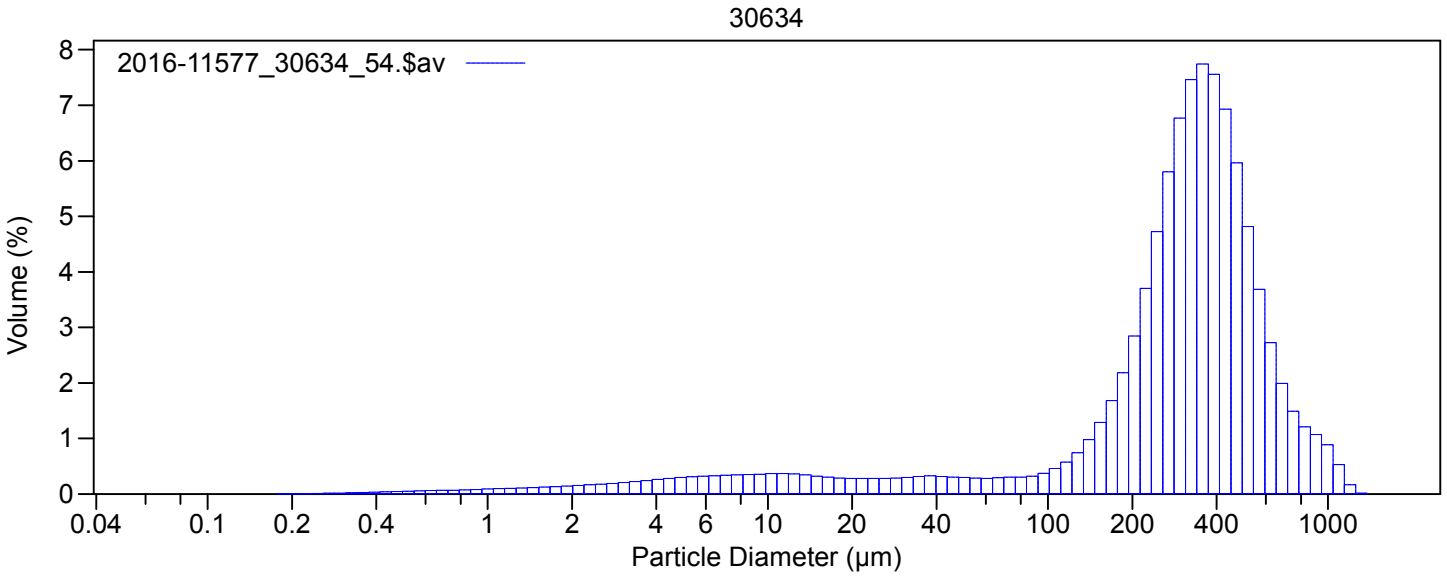
<80%
483.3 µm

2016-11577_30634_54.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 3.07 |
| 4 | 9.29 |
| 63 | 10.4 |
| 200 | 77.2 |
| 2000 | |

2016-11577_30634_54.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 3.07 |
| 4 | 9.29 |
| 63 | 10.4 |
| 200 | 77.2 |
| 2000 | 0 |


30634
2016-11577_30634_54.$av
Volume (%)
0
1
2
3
4
5
6
7
8
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30635_57.$av
2016-11577_30635_57.$av
File ID: 2016-11577
Sample ID: 30635
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30635_55.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30635_56.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30635_57.$ls

Volume Statistics (Arithmetic) 2016-11577_30635_57.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 28.58 µm | S.D.: | 32.42 µm |
| Median: | 17.76 µm | C.V.: | 113% |
| D(3,2): | 7.010 µm | Skewness: | 3.061 Right skewed |
| Mode: | 14.94 µm | Kurtosis: | 17.22 Leptokurtic |

$d_{10}$: 3.726 µm $d_{50}$: 17.76 µm $d_{90}$: 64.58 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.87 | Median: | 5.82 | Deviation: | 1.62 |
| Skewness: | 0.10 | Kurtosis: | 1.03 | | |

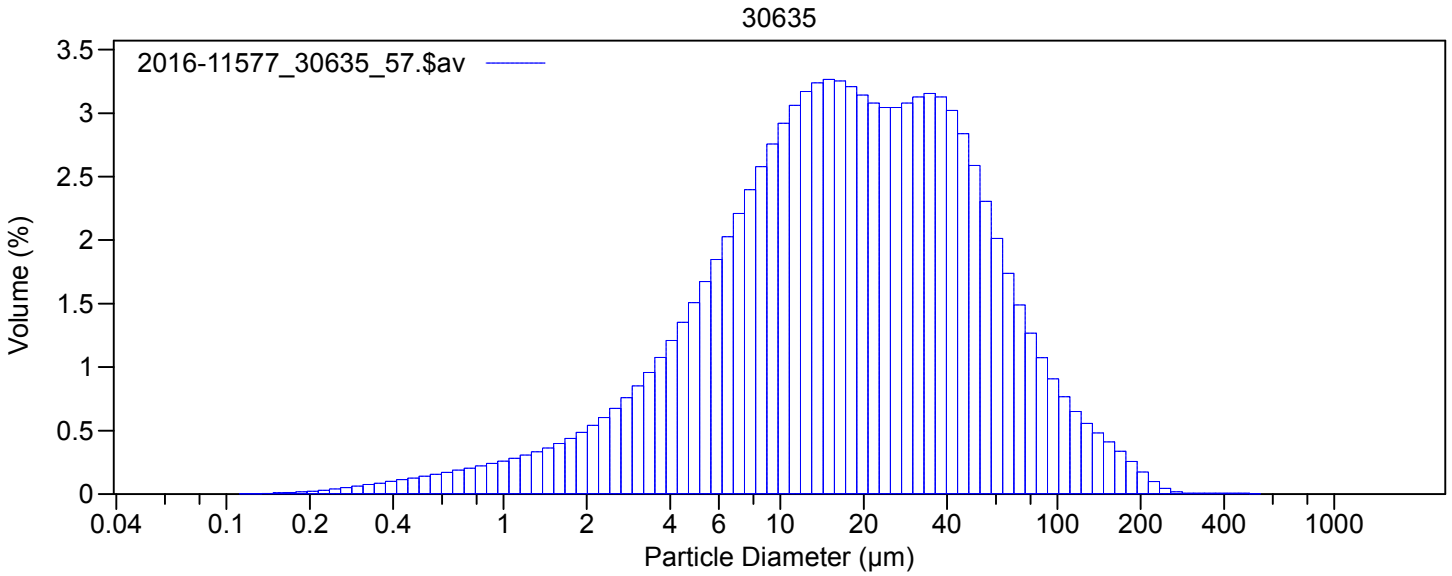
<80%
43.78 µm

2016-11577_30635_57.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 10.9 |
| 4 | 78.7 |
| 63 | 10.1 |
| 200 | 0.33 |
| 2000 | |

2016-11577_30635_57.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 10.9 |
| 4 | 78.7 |
| 63 | 10.1 |
| 200 | 0.33 |
| 2000 | 0 |


30635
2016-11577_30635_57.$av
Volume (%)
3.5
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

File name: G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30636a_60.$av
2016-11577_30636a_60.$av
File ID: 2016-11577
Sample ID: 30636a
Operator: MKM
Comment 1: sonicated
Optical model: Fraunhofer.rf780d PIDS included
LS 13 320 Aqueous Liquid Module
Pump speed: 60
Fluid: Water
Average of 3 files
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30636a_58.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30636a_59.$ls
G:\LabDocs\RADIO\Particle Size\LS13320\Data Files\2016-11577\2016-11577_30636a_60.$ls

Volume Statistics (Arithmetic) 2016-11577_30636a_60.$av

Calculations from 0.040 µm to 2000 µm

| | | | |
|---|---|---|---|
| Volume: | 100% | | |
| Mean: | 58.39 µm | S.D.: | 100.4 µm |
| Median: | 21.56 µm | C.V.: | 172% |
| D(3,2): | 7.406 µm | Skewness: | 4.554 Right skewed |
| Mode: | 13.61 µm | Kurtosis: | 30.56 Leptokurtic |

$d_{10}$: 3.837 µm $d_{50}$: 21.56 µm $d_{90}$: 145.3 µm

Folk and Ward Statistics (Phi)

| | | | | | |
|---|---|---|---|---|---|
| Mean: | 5.41 | Median: | 5.54 | Deviation: | 2.07 |
| Skewness: | -0.04 | Kurtosis: | 0.93 | | |

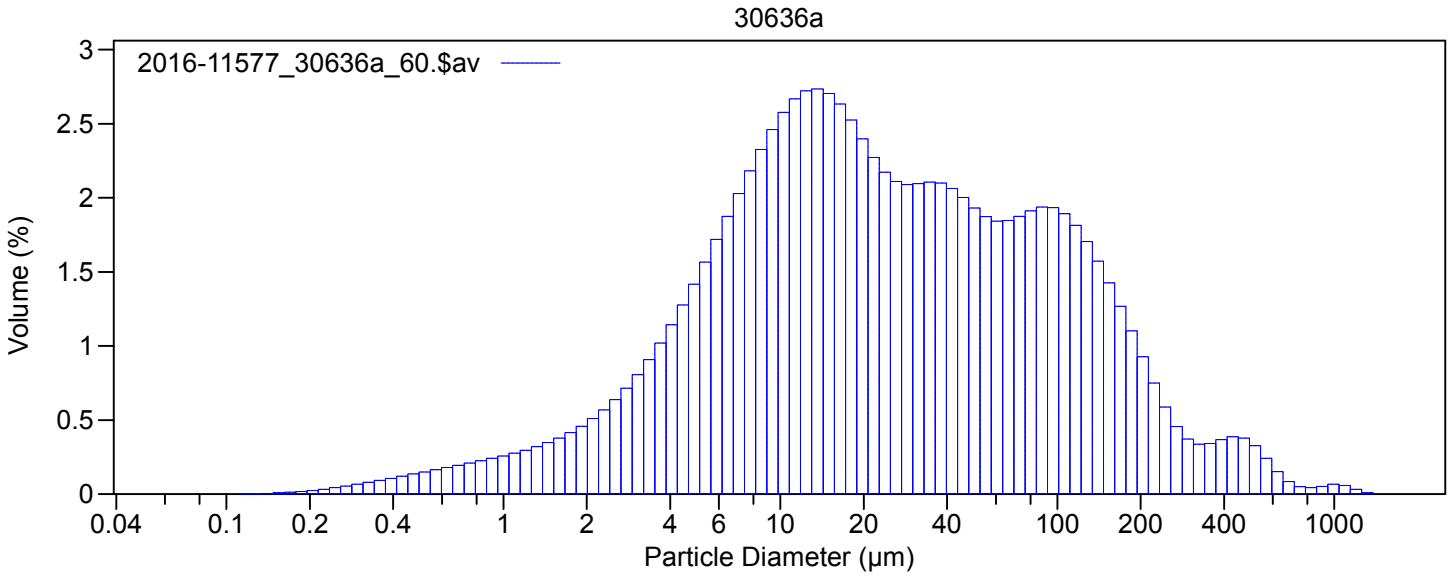
<80%
86.72 µm

2016-11577_30636a_60.$av

| Particle Diameter µm | Volume % |
|---|---|
| 0.04 | 10.5 |
| 4 | 63.1 |
| 63 | 20.7 |
| 200 | 5.74 |
| 2000 | |

2016-11577_30636a_60.$av

| Size µm | Diff. Volume % |
|---|---|
| 0 | 10.5 |
| 4 | 63.1 |
| 63 | 20.7 |
| 200 | 5.74 |
| 2000 | 0 |


30636a
2016-11577_30636a_60.$av
Volume (%)
3
2.5
2
1.5
1
0.5
0
0.04
0.1
0.2
0.4
1
2
4
6
10
20
40
100
200
400
1000
Particle Diameter (µm)

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

---

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman QP, Supervisor
Lab Section 2 results have been authorized by Melissa Tackaberry-Syed QP, Supervisor
Lab Section 3 results have been authorized by Pat Moser QP, Supervisor
Lab Sections 4 and 5 results have been authorized by Vicky Snook QP, Supervisor
Lab Section 6 results have been authorized by Marion McConnell QP, Supervisor

QP: Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

**30600 09/09/2016 LB-3-1 (0-2) *SEDIMENT***
**30601 09/09/2016 LA-5-1 (0-2) *SEDIMENT***
**30602 09/10/2016 LB-3-2 (0-2) *SEDIMENT***

| Analyte | Units | 30600 | 30601 | 30602 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 7800 | 5300 | 6300 |
| Antimony | ug/g | 0.4 | <0.2 | 0.3 |
| Arsenic | ug/g | 6.5 | 4.4 | 5.0 |
| Barium | ug/g | 57 | 49 | 46 |
| Beryllium | ug/g | 0.5 | 0.3 | 0.4 |
| Boron | ug/g | 9 | 6 | 6 |
| Cadmium | ug/g | 0.6 | 0.4 | 0.5 |
| Calcium | ug/g | 2000 | 1600 | 1900 |
| Chromium | ug/g | 17 | 11 | 12 |
| Cobalt | ug/g | 3.3 | 2.3 | 3.8 |
| Copper | ug/g | 8.4 | 2.0 | 6.4 |
| Iron | ug/g | 24800 | 23500 | 17400 |
| Lead | ug/g | 12 | 7.5 | 8.6 |
| Magnesium | ug/g | 870 | 780 | 720 |
| Manganese | ug/g | 160 | 320 | 140 |
| Molybdenum | ug/g | 1.2 | 0.7 | 1.2 |
| Nickel | ug/g | 13 | 6.3 | 12 |
| Phosphorus | ug/g | 1300 | 1600 | 1000 |
| Potassium | ug/g | 1100 | 1000 | 910 |
| Selenium | ug/g | 1.8 | 0.9 | 1.3 |
| Silver | ug/g | <0.1 | <0.1 | <0.1 |
| Sodium | ug/g | 340 | 210 | 190 |
| Strontium | ug/g | 32 | 26 | 29 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.3 | 0.2 | 0.2 |
| Titanium | ug/g | 270 | 200 | 230 |
| Uranium | ug/g | 1.0 | 0.7 | 0.9 |
| Vanadium | ug/g | 33 | 20 | 25 |
| Zinc | ug/g | 43 | 28 | 39 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.61 | 0.43 | 0.36 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30600 09/09/2016 LB-3-1 (0-2) *SEDIMENT***
**30601 09/09/2016 LA-5-1 (0-2) *SEDIMENT***
**30602 09/10/2016 LB-3-2 (0-2) *SEDIMENT***

| Analyte | Units | 30600 | 30601 | 30602 |
|---|---|---|---|---|
| **Lab Section 4 (Radiochemistry)** | | | | |
| Polonium-210 | Bq/g | 0.50 | 0.52 | 0.36 |
| Radium-226 | Bq/g | 0.02 | 0.03 | 0.01 |
| Thorium-228 | Bq/g | 0.02 | 0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 19.9 | 18.8 | 17.5 |
| Moisture | % | 93.77 | 96.10 | 91.95 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30603 09/10/2016 LB-3-3 (0-2) *SEDIMENT***
**30604 09/10/2016 LA-5-4 (0-2) *SEDIMENT***
**30605 09/10/2016 LA-5-5 (0-2) *SEDIMENT***

| Analyte | Units | 30603 | 30604 | 30605 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 2790 | 5800 | 2450 |
| Antimony | ug/g | <0.2 | <0.2 | <0.2 |
| Arsenic | ug/g | 1.5 | 3.1 | 1.2 |
| Barium | ug/g | 27 | 45 | 45 |
| Beryllium | ug/g | 0.1 | 0.3 | <0.1 |
| Boron | ug/g | <1 | 4 | <1 |
| Cadmium | ug/g | 0.3 | 0.3 | 0.4 |
| Calcium | ug/g | 680 | 2100 | 360 |
| Chromium | ug/g | 8.4 | 11 | 1.0 |
| Cobalt | ug/g | 1.2 | 1.8 | <0.2 |
| Copper | ug/g | <0.5 | 1.4 | <0.5 |
| Iron | ug/g | 5700 | 18500 | 1980 |
| Lead | ug/g | 2.4 | 7.0 | 1.6 |
| Magnesium | ug/g | 350 | 910 | 110 |
| Manganese | ug/g | 58 | 210 | 46 |
| Molybdenum | ug/g | 0.3 | 0.5 | <0.1 |
| Nickel | ug/g | 4.2 | 6.0 | 0.9 |
| Phosphorus | ug/g | 150 | 1400 | 70 |
| Potassium | ug/g | 720 | 1100 | 1400 |
| Selenium | ug/g | 0.3 | 0.7 | <0.1 |
| Silver | ug/g | 0.2 | <0.1 | 0.7 |
| Sodium | ug/g | 340 | 210 | 610 |
| Strontium | ug/g | 16 | 33 | 24 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.1 | 0.1 | <0.1 |
| Titanium | ug/g | 130 | 170 | 47 |
| Uranium | ug/g | 0.3 | 0.6 | 0.8 |
| Vanadium | ug/g | 7.9 | 17 | 1.3 |
| Zinc | ug/g | 12 | 24 | <0.5 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.04 | 0.40 | <0.04 |
| Polonium-210 | Bq/g | 0.05 | 0.40 | 0.02 |
| Radium-226 | Bq/g | 0.04 | 0.03 | 0.02 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30603 09/10/2016 LB-3-3 (0-2) *SEDIMENT***
**30604 09/10/2016 LA-5-4 (0-2) *SEDIMENT***
**30605 09/10/2016 LA-5-5 (0-2) *SEDIMENT***

| Analyte | Units | 30603 | 30604 | 30605 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 2.59 | 17.8 | 0.58 |
| Moisture | % | 68.39 | 96.81 | 34.29 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30606 09/11/2016 LA-5-2 (0-2) *SEDIMENT***
**30607 09/11/2016 LA-5-3 (0-2) *SEDIMENT***
**30608 09/10/2016 LA-5-2 PONAR *SEDIMENT***

| Analyte | Units | 30606 | 30607 | 30608 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1990 | 4860 | 1650 |
| Antimony | ug/g | <0.2 | <0.2 | <0.2 |
| Arsenic | ug/g | 0.6 | 3.9 | 0.5 |
| Barium | ug/g | 33 | 42 | 26 |
| Beryllium | ug/g | <0.1 | 0.3 | <0.1 |
| Boron | ug/g | <1 | 3 | <1 |
| Cadmium | ug/g | <0.1 | 0.3 | 0.1 |
| Calcium | ug/g | 270 | 1600 | 240 |
| Chromium | ug/g | 4.1 | 9.8 | 1.9 |
| Cobalt | ug/g | 0.2 | 2.1 | 0.3 |
| Copper | ug/g | <0.5 | 1.2 | <0.5 |
| Iron | ug/g | 2050 | 16400 | 1570 |
| Lead | ug/g | 1.3 | 7.1 | 1.0 |
| Magnesium | ug/g | 120 | 700 | 100 |
| Manganese | ug/g | 33 | 240 | 22 |
| Molybdenum | ug/g | 0.1 | 0.6 | <0.1 |
| Nickel | ug/g | 1.8 | 5.7 | 0.9 |
| Phosphorus | ug/g | 60 | 870 | 50 |
| Potassium | ug/g | 1000 | 840 | 740 |
| Selenium | ug/g | <0.1 | 0.7 | <0.1 |
| Silver | ug/g | 0.2 | <0.1 | 0.2 |
| Sodium | ug/g | 400 | 170 | 370 |
| Strontium | ug/g | 19 | 27 | 17 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | <0.1 | 0.1 | <0.1 |
| Titanium | ug/g | 45 | 180 | 44 |
| Uranium | ug/g | 0.2 | 0.6 | 0.2 |
| Vanadium | ug/g | 1.5 | 18 | 1.3 |
| Zinc | ug/g | 0.8 | 26 | <0.5 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.04 | 0.25 | <0.04 |
| Polonium-210 | Bq/g | 0.02 | 0.32 | 0.02 |
| Radium-226 | Bq/g | <0.01 | 0.03 | <0.01 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30606 09/11/2016 LA-5-2 (0-2) *SEDIMENT***
**30607 09/11/2016 LA-5-3 (0-2) *SEDIMENT***
**30608 09/10/2016 LA-5-2 PONAR *SEDIMENT***

| Analyte | Units | 30606 | 30607 | 30608 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 0.44 | 15.6 | 0.37 |
| Moisture | % | 28.92 | 94.24 | 29.58 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30609 09/10/2016 LA-5-5 PONAR *SEDIMENT***
**30610 09/12/2016 LA-6-1 (0-2) *SEDIMENT***
**30611 09/12/2016 LA-6-2 (0-2) *SEDIMENT***

| Analyte | Units | 30609 | 30610 | 30611 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1600 | 5200 | 4670 |
| Antimony | ug/g | <0.2 | <0.2 | <0.2 |
| Arsenic | ug/g | 0.4 | 3.3 | 3.1 |
| Barium | ug/g | 27 | 45 | 43 |
| Beryllium | ug/g | <0.1 | 0.3 | 0.3 |
| Boron | ug/g | <1 | 6 | 6 |
| Cadmium | ug/g | 0.2 | 0.4 | 0.4 |
| Calcium | ug/g | 250 | 1800 | 2500 |
| Chromium | ug/g | 2.9 | 10 | 8.3 |
| Cobalt | ug/g | <0.2 | 2.1 | 1.7 |
| Copper | ug/g | <0.5 | 2.1 | 3.0 |
| Iron | ug/g | 1410 | 15100 | 13200 |
| Lead | ug/g | 1.2 | 8.5 | 7.6 |
| Magnesium | ug/g | 90 | 750 | 880 |
| Manganese | ug/g | 22 | 140 | 190 |
| Molybdenum | ug/g | 0.3 | 0.7 | 0.4 |
| Nickel | ug/g | 1.5 | 6.4 | 4.7 |
| Phosphorus | ug/g | 60 | 1500 | 1400 |
| Potassium | ug/g | 750 | 940 | 960 |
| Selenium | ug/g | <0.1 | 0.9 | 0.9 |
| Silver | ug/g | 0.2 | <0.1 | <0.1 |
| Sodium | ug/g | 370 | 190 | 180 |
| Strontium | ug/g | 19 | 28 | 34 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | <0.1 | 0.2 | 0.2 |
| Titanium | ug/g | 36 | 180 | 230 |
| Uranium | ug/g | 0.2 | 0.7 | 0.7 |
| Vanadium | ug/g | 1.2 | 18 | 18 |
| Zinc | ug/g | <0.5 | 28 | 27 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.04 | 0.45 | 0.52 |
| Polonium-210 | Bq/g | <0.01 | 0.48 | 0.53 |
| Radium-226 | Bq/g | <0.01 | 0.04 | 0.03 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30609 09/10/2016 LA-5-5 PONAR *SEDIMENT***
**30610 09/12/2016 LA-6-1 (0-2) *SEDIMENT***
**30611 09/12/2016 LA-6-2 (0-2) *SEDIMENT***

| Analyte | Units | 30609 | 30610 | 30611 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 0.42 | 18.7 | 18.5 |
| Moisture | % | 24.59 | 96.72 | 95.56 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30612 09/14/2016 LA-1-1 (0-2) *SEDIMENT***
**30613 09/14/2016 LA-1-2 (0-2) *SEDIMENT***
**30614 09/13/2016 LA-7-1 (0-2) *SEDIMENT***

| Analyte | Units | 30612 | 30613 | 30614 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 4740 | 4440 | 3340 |
| Antimony | ug/g | 0.3 | 0.2 | 0.2 |
| Arsenic | ug/g | 5.7 | 5.0 | 3.6 |
| Barium | ug/g | 42 | 34 | 43 |
| Beryllium | ug/g | 0.3 | 0.3 | 0.2 |
| Boron | ug/g | 8 | 8 | 7 |
| Cadmium | ug/g | 0.5 | 0.4 | 0.3 |
| Calcium | ug/g | 1600 | 1600 | 2900 |
| Chromium | ug/g | 16 | 8.8 | 21 |
| Cobalt | ug/g | 2.3 | 2.2 | 1.9 |
| Copper | ug/g | 4.6 | 3.5 | 3.6 |
| Iron | ug/g | 9900 | 12100 | 8500 |
| Lead | ug/g | 10 | 8.6 | 7.2 |
| Magnesium | ug/g | 780 | 830 | 1000 |
| Manganese | ug/g | 170 | 150 | 130 |
| Molybdenum | ug/g | 2.0 | 0.9 | 2.8 |
| Nickel | ug/g | 12 | 8.8 | 12 |
| Phosphorus | ug/g | 1400 | 1300 | 2500 |
| Potassium | ug/g | 1000 | 980 | 1300 |
| Selenium | ug/g | 1.3 | 1.5 | 1.0 |
| Silver | ug/g | 0.2 | <0.1 | 0.1 |
| Sodium | ug/g | 210 | 170 | 210 |
| Strontium | ug/g | 25 | 24 | 31 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.2 | 0.2 | 0.2 |
| Titanium | ug/g | 200 | 250 | 170 |
| Uranium | ug/g | 0.8 | 0.8 | 0.7 |
| Vanadium | ug/g | 22 | 21 | 15 |
| Zinc | ug/g | 27 | 26 | 22 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.73 | 0.75 | 0.55 |
| Polonium-210 | Bq/g | 0.64 | 0.76 | 0.56 |
| Radium-226 | Bq/g | 0.04 | 0.02 | <0.01 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30612 09/14/2016 LA-1-1 (0-2) *SEDIMENT***
**30613 09/14/2016 LA-1-2 (0-2) *SEDIMENT***
**30614 09/13/2016 LA-7-1 (0-2) *SEDIMENT***

| Analyte | Units | 30612 | 30613 | 30614 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 17.4 | 17.2 | 25.5 |
| Moisture | % | 97.24 | 96.86 | 97.14 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30615 09/13/2016 LA-7-2 (0-2) *SEDIMENT***
**30616 09/13/2016 LA-7-3 (0-2) *SEDIMENT***
**30617 09/13/2016 LA-7A-1 (0-2) *SEDIMENT***

| Analyte | Units | 30615 | 30616 | 30617 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 3830 | 3860 | 4190 |
| Antimony | ug/g | 0.2 | 0.3 | 0.2 |
| Arsenic | ug/g | 3.5 | 3.6 | 3.3 |
| Barium | ug/g | 36 | 36 | 38 |
| Beryllium | ug/g | 0.2 | 0.2 | 0.2 |
| Boron | ug/g | 6 | 6 | 6 |
| Cadmium | ug/g | 0.4 | 0.4 | 0.4 |
| Calcium | ug/g | 3200 | 3100 | 3300 |
| Chromium | ug/g | 7.4 | 7.3 | 9.7 |
| Cobalt | ug/g | 1.4 | 1.4 | 1.2 |
| Copper | ug/g | 4.0 | 3.9 | 3.5 |
| Iron | ug/g | 6900 | 8000 | 7400 |
| Lead | ug/g | 7.8 | 8.3 | 10 |
| Magnesium | ug/g | 890 | 920 | 970 |
| Manganese | ug/g | 120 | 120 | 160 |
| Molybdenum | ug/g | 1.3 | 1.2 | 0.8 |
| Nickel | ug/g | 3.9 | 4.6 | 4.0 |
| Phosphorus | ug/g | 1200 | 1400 | 1200 |
| Potassium | ug/g | 870 | 1000 | 1000 |
| Selenium | ug/g | 1.2 | 1.2 | 1.0 |
| Silver | ug/g | <0.1 | <0.1 | <0.1 |
| Sodium | ug/g | 180 | 200 | 190 |
| Strontium | ug/g | 38 | 38 | 36 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.2 | 0.2 | 0.2 |
| Titanium | ug/g | 200 | 200 | 230 |
| Uranium | ug/g | 0.6 | 0.6 | 0.6 |
| Vanadium | ug/g | 16 | 16 | 17 |
| Zinc | ug/g | 29 | 29 | 23 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.29 | 0.29 | 0.41 |
| Polonium-210 | Bq/g | 0.30 | 0.35 | 0.51 |
| Radium-226 | Bq/g | 0.02 | 0.02 | <0.01 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30615 09/13/2016 LA-7-2 (0-2) *SEDIMENT***
**30616 09/13/2016 LA-7-3 (0-2) *SEDIMENT***
**30617 09/13/2016 LA-7A-1 (0-2) *SEDIMENT***

| Analyte | Units | 30615 | 30616 | 30617 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 25.9 | 25.5 | 23.6 |
| Moisture | % | 95.15 | 96.46 | 94.64 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30618 09/13/2016 LA-7A-2 (0-2) *SEDIMENT***
**30619 09/13/2016 LA-7A-3 (0-2) *SEDIMENT***
**30620 09/15/2016 LA-8-2 (0-2) *SEDIMENT***

| Analyte | Units | 30618 | 30619 | 30620 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 4530 | 3660 | 1950 |
| Antimony | ug/g | 0.3 | 0.2 | <0.2 |
| Arsenic | ug/g | 5.0 | 3.4 | 1.5 |
| Barium | ug/g | 33 | 33 | 20 |
| Beryllium | ug/g | 0.2 | 0.2 | 0.1 |
| Boron | ug/g | 6 | 5 | 3 |
| Cadmium | ug/g | 0.4 | 0.4 | 0.3 |
| Calcium | ug/g | 2100 | 2700 | 900 |
| Chromium | ug/g | 9.7 | 6.9 | 1.6 |
| Cobalt | ug/g | 2.2 | 1.4 | <0.2 |
| Copper | ug/g | 4.6 | 3.4 | <0.5 |
| Iron | ug/g | 10000 | 6800 | 9700 |
| Lead | ug/g | 8.7 | 7.8 | 3.7 |
| Magnesium | ug/g | 760 | 800 | 330 |
| Manganese | ug/g | 120 | 140 | 100 |
| Molybdenum | ug/g | 1.3 | 1.0 | 0.2 |
| Nickel | ug/g | 6.2 | 3.6 | 1.2 |
| Phosphorus | ug/g | 1300 | 1500 | 480 |
| Potassium | ug/g | 920 | 940 | 530 |
| Selenium | ug/g | 1.3 | 1.0 | 0.4 |
| Silver | ug/g | <0.1 | <0.1 | <0.1 |
| Sodium | ug/g | 170 | 160 | 80 |
| Strontium | ug/g | 30 | 32 | 20 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.2 | 0.2 | <0.1 |
| Titanium | ug/g | 220 | 190 | 80 |
| Uranium | ug/g | 0.8 | 0.6 | 0.3 |
| Vanadium | ug/g | 24 | 16 | 7.3 |
| Zinc | ug/g | 23 | 22 | 9.6 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.35 | 0.44 | 0.17 |
| Polonium-210 | Bq/g | 0.38 | 0.38 | 0.21 |
| Radium-226 | Bq/g | 0.03 | <0.01 | 0.01 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | 0.02 |
| Thorium-230 | Bq/g | 0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30618 09/13/2016 LA-7A-2 (0-2) *SEDIMENT***
**30619 09/13/2016 LA-7A-3 (0-2) *SEDIMENT***
**30620 09/15/2016 LA-8-2 (0-2) *SEDIMENT***

| Analyte | Units | 30618 | 30619 | 30620 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 19.0 | 22.7 | 7.83 |
| Moisture | % | 94.03 | 94.65 | 88.17 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30621 09/15/2016 LA-8-3 (0-2) *SEDIMENT***
**30622 09/19/2016 LAB-1-1 (0-2) *SEDIMENT***
**30623 09/15/2016 LAB-1-2 (0-2) *SEDIMENT***

| Analyte | Units | 30621 | 30622 | 30623 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 4310 | 4810 | 7400 |
| Antimony | ug/g | 0.2 | <0.2 | 0.2 |
| Arsenic | ug/g | 3.5 | 2.6 | 4.6 |
| Barium | ug/g | 30 | 45 | 60 |
| Beryllium | ug/g | 0.3 | 0.3 | 0.3 |
| Boron | ug/g | 4 | 7 | 11 |
| Cadmium | ug/g | 0.4 | 0.3 | 0.5 |
| Calcium | ug/g | 1800 | 2800 | 3000 |
| Chromium | ug/g | 7.2 | 8.0 | 12 |
| Cobalt | ug/g | 1.7 | 1.4 | 2.0 |
| Copper | ug/g | 3.2 | 1.7 | 2.8 |
| Iron | ug/g | 10200 | 11900 | 27000 |
| Lead | ug/g | 6.0 | 5.4 | 9.0 |
| Magnesium | ug/g | 620 | 960 | 1100 |
| Manganese | ug/g | 200 | 290 | 300 |
| Molybdenum | ug/g | 0.9 | 6.3 | 11 |
| Nickel | ug/g | 7.2 | 6.5 | 8.1 |
| Phosphorus | ug/g | 780 | 960 | 820 |
| Potassium | ug/g | 760 | 960 | 1100 |
| Selenium | ug/g | 1.2 | 1.0 | 1.2 |
| Silver | ug/g | <0.1 | <0.1 | 0.3 |
| Sodium | ug/g | 120 | 150 | 210 |
| Strontium | ug/g | 26 | 28 | 35 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.2 | 0.3 | 0.4 |
| Titanium | ug/g | 250 | 380 | 450 |
| Uranium | ug/g | 0.8 | 1.1 | 1.3 |
| Vanadium | ug/g | 20 | 16 | 22 |
| Zinc | ug/g | 26 | 18 | 30 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.22 | 0.63 | 0.56 |
| Polonium-210 | Bq/g | 0.26 | 0.55 | 0.55 |
| Radium-226 | Bq/g | 0.02 | 0.03 | 0.04 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | 0.02 |
| Thorium-230 | Bq/g | <0.02 | 0.03 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30621 09/15/2016 LA-8-3 (0-2) *SEDIMENT***
**30622 09/19/2016 LAB-1-1 (0-2) *SEDIMENT***
**30623 09/15/2016 LAB-1-2 (0-2) *SEDIMENT***

| Analyte | Units | 30621 | 30622 | 30623 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 15.6 | 13.0 | 12.9 |
| Moisture | % | 95.26 | 93.90 | 92.80 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30624 09/16/2016 LA-8-1 (0-2) *SEDIMENT***
**30625 09/16/2016 LA-6-3 (0-2) *SEDIMENT***
**30626 09/16/2016 LA-6-4 (0-2) *SEDIMENT***

| Analyte | Units | 30624 | 30625 | 30626 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 4470 | 5900 | 4620 |
| Antimony | ug/g | 0.3 | <0.2 | <0.2 |
| Arsenic | ug/g | 3.6 | 4.2 | 3.8 |
| Barium | ug/g | 39 | 42 | 37 |
| Beryllium | ug/g | 0.3 | 0.3 | 0.3 |
| Boron | ug/g | 8 | 7 | 6 |
| Cadmium | ug/g | 0.4 | 0.5 | 0.4 |
| Calcium | ug/g | 2500 | 1900 | 1700 |
| Chromium | ug/g | 8.0 | 10 | 7.5 |
| Cobalt | ug/g | 1.0 | 1.7 | 1.4 |
| Copper | ug/g | 4.1 | 1.6 | 1.7 |
| Iron | ug/g | 14500 | 14600 | 14000 |
| Lead | ug/g | 9.6 | 7.9 | 7.8 |
| Magnesium | ug/g | 890 | 800 | 650 |
| Manganese | ug/g | 230 | 230 | 180 |
| Molybdenum | ug/g | 1.2 | 0.6 | 0.4 |
| Nickel | ug/g | 6.7 | 5.5 | 4.2 |
| Phosphorus | ug/g | 1700 | 960 | 1000 |
| Potassium | ug/g | 1000 | 970 | 860 |
| Selenium | ug/g | 1.2 | 0.8 | 0.8 |
| Silver | ug/g | 0.2 | 0.2 | <0.1 |
| Sodium | ug/g | 120 | 190 | 140 |
| Strontium | ug/g | 29 | 28 | 26 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.2 | 0.2 | 0.2 |
| Titanium | ug/g | 250 | 310 | 250 |
| Uranium | ug/g | 0.7 | 0.7 | 0.6 |
| Vanadium | ug/g | 20 | 19 | 18 |
| Zinc | ug/g | 30 | 26 | 24 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.58 | 0.32 | 0.31 |
| Polonium-210 | Bq/g | 0.44 | 0.34 | 0.31 |
| Radium-226 | Bq/g | <0.01 | <0.01 | 0.03 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30624 09/16/2016 LA-8-1 (0-2) *SEDIMENT***
**30625 09/16/2016 LA-6-3 (0-2) *SEDIMENT***
**30626 09/16/2016 LA-6-4 (0-2) *SEDIMENT***

| Analyte | Units | 30624 | 30625 | 30626 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 24.1 | 16.6 | 15.9 |
| Moisture | % | 96.55 | 95.64 | 95.98 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30627 09/17/2016 LA-1-3 (0-2) *SEDIMENT***
**30628 09/18/2016 LA-9-1 (0-2) *SEDIMENT***
**30629 09/18/2016 LA-9-2 (0-2) *SEDIMENT***

| Analyte | Units | 30627 | 30628 | 30629 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 4010 | 1860 | 4410 |
| Antimony | ug/g | 0.2 | <0.2 | 0.3 |
| Arsenic | ug/g | 5.3 | 0.9 | 3.6 |
| Barium | ug/g | 30 | 20 | 36 |
| Beryllium | ug/g | 0.2 | <0.1 | 0.2 |
| Boron | ug/g | 5 | <1 | 6 |
| Cadmium | ug/g | 0.3 | 0.2 | 0.5 |
| Calcium | ug/g | 1400 | 600 | 2000 |
| Chromium | ug/g | 6.7 | 1.1 | 8.5 |
| Cobalt | ug/g | 1.6 | <0.2 | 1.4 |
| Copper | ug/g | 2.7 | <0.5 | 3.5 |
| Iron | ug/g | 7800 | 2670 | 4800 |
| Lead | ug/g | 8.2 | 1.5 | 10 |
| Magnesium | ug/g | 690 | 260 | 780 |
| Manganese | ug/g | 140 | 51 | 140 |
| Molybdenum | ug/g | 0.8 | <0.1 | 1.1 |
| Nickel | ug/g | 6.0 | <0.1 | 6.8 |
| Phosphorus | ug/g | 1000 | 120 | 1100 |
| Potassium | ug/g | 820 | 610 | 940 |
| Selenium | ug/g | 1.0 | 0.2 | 1.3 |
| Silver | ug/g | <0.1 | 0.2 | 0.4 |
| Sodium | ug/g | 160 | 240 | 200 |
| Strontium | ug/g | 21 | 16 | 26 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.2 | <0.1 | 0.2 |
| Titanium | ug/g | 280 | 230 | 290 |
| Uranium | ug/g | 0.7 | 0.3 | 0.7 |
| Vanadium | ug/g | 18 | 5.5 | 20 |
| Zinc | ug/g | 20 | 4.3 | 27 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.54 | <0.04 | 0.45 |
| Polonium-210 | Bq/g | 0.52 | 0.04 | 0.45 |
| Radium-226 | Bq/g | 0.02 | 0.05 | 0.03 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30627 09/17/2016 LA-1-3 (0-2) *SEDIMENT***
**30628 09/18/2016 LA-9-1 (0-2) *SEDIMENT***
**30629 09/18/2016 LA-9-2 (0-2) *SEDIMENT***

| Analyte | Units | 30627 | 30628 | 30629 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 13.3 | 2.61 | 16.7 |
| Moisture | % | 96.80 | 65.71 | 94.04 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30630 09/18/2016 LA-9-3 (0-2) *SEDIMENT***
**30631 09/21/2016 LAB-2-CONE (0-2) *SEDIMENT***
**30632 09/21/2016 LAB-2-1 PONAR *SEDIMENT***

| Analyte | Units | 30630 | 30631 | 30632 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 4250 | 9300 | 920 |
| Antimony | ug/g | 0.3 | <0.2 | <0.2 |
| Arsenic | ug/g | 3.8 | 7.2 | 0.6 |
| Barium | ug/g | 33 | 100 | 19 |
| Beryllium | ug/g | 0.3 | 0.5 | <0.1 |
| Boron | ug/g | 6 | 12 | <1 |
| Cadmium | ug/g | 0.4 | 0.6 | 0.1 |
| Calcium | ug/g | 1900 | 2800 | 190 |
| Chromium | ug/g | 8.5 | 13 | <0.5 |
| Cobalt | ug/g | 1.2 | 3.8 | <0.2 |
| Copper | ug/g | 3.0 | 3.9 | <0.5 |
| Iron | ug/g | 6100 | 91300 | 3170 |
| Lead | ug/g | 10 | 10 | 1.0 |
| Magnesium | ug/g | 710 | 1000 | 80 |
| Manganese | ug/g | 160 | 1270 | 230 |
| Molybdenum | ug/g | 1.0 | 12 | 1.1 |
| Nickel | ug/g | 6.1 | 9.9 | <0.1 |
| Phosphorus | ug/g | 1100 | 1400 | 80 |
| Potassium | ug/g | 850 | 1200 | 350 |
| Selenium | ug/g | 1.3 | 1.3 | <0.1 |
| Silver | ug/g | 0.1 | 0.1 | 0.2 |
| Sodium | ug/g | 170 | 150 | 100 |
| Strontium | ug/g | 27 | 40 | 16 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | 0.2 | 0.4 | <0.1 |
| Titanium | ug/g | 260 | 360 | 31 |
| Uranium | ug/g | 0.7 | 1.4 | 0.2 |
| Vanadium | ug/g | 23 | 30 | 1.7 |
| Zinc | ug/g | 28 | 62 | <0.5 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.58 | 0.45 | <0.04 |
| Polonium-210 | Bq/g | 0.54 | 0.42 | 0.03 |
| Radium-226 | Bq/g | 0.03 | 0.05 | <0.01 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | 0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30630 09/18/2016 LA-9-3 (0-2) *SEDIMENT***
**30631 09/21/2016 LAB-2-CONE (0-2) *SEDIMENT***
**30632 09/21/2016 LAB-2-1 PONAR *SEDIMENT***

| Analyte | Units | 30630 | 30631 | 30632 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 16.9 | 11.8 | 0.48 |
| Moisture | % | 95.04 | 93.08 | 34.51 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30633 09/21/2016 LAB-2-2 PONAR *SEDIMENT***
**30634 09/21/2016 LAB-2-3 PONAR *SEDIMENT***
**30635 09/15/2016 LAB-1-3 (0-2) *SEDIMENT***

| Analyte | Units | 30633 | 30634 | 30635 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1120 | 2820 | 9200 |
| Antimony | ug/g | <0.2 | <0.2 | 0.3 |
| Arsenic | ug/g | 1.0 | 0.7 | 5.6 |
| Barium | ug/g | 21 | 50 | 71 |
| Beryllium | ug/g | <0.1 | <0.1 | 0.4 |
| Boron | ug/g | <1 | <1 | 11 |
| Cadmium | ug/g | <0.1 | 0.7 | 0.5 |
| Calcium | ug/g | 190 | 370 | 3500 |
| Chromium | ug/g | <0.5 | <0.5 | 15 |
| Cobalt | ug/g | <0.2 | <0.2 | 2.7 |
| Copper | ug/g | <0.5 | <0.5 | 5.0 |
| Iron | ug/g | 9000 | 2360 | 33000 |
| Lead | ug/g | 1.0 | 1.5 | 13 |
| Magnesium | ug/g | 90 | 160 | 1200 |
| Manganese | ug/g | 200 | 90 | 360 |
| Molybdenum | ug/g | 1.2 | 0.6 | 13 |
| Nickel | ug/g | <0.1 | <0.1 | 12 |
| Phosphorus | ug/g | 170 | 50 | 1200 |
| Potassium | ug/g | 460 | 1400 | 1400 |
| Selenium | ug/g | <0.1 | <0.1 | 1.6 |
| Silver | ug/g | 0.2 | 2.0 | <0.1 |
| Sodium | ug/g | 140 | 730 | 180 |
| Strontium | ug/g | 17 | 28 | 42 |
| Thallium | ug/g | <0.2 | <0.2 | <0.2 |
| Tin | ug/g | <0.1 | <0.1 | 0.4 |
| Titanium | ug/g | 31 | 64 | 480 |
| Uranium | ug/g | 0.2 | 0.3 | 1.5 |
| Vanadium | ug/g | 2.1 | 1.8 | 27 |
| Zinc | ug/g | 1.4 | <0.5 | 44 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.04 | <0.04 | 0.55 |
| Polonium-210 | Bq/g | 0.02 | 0.02 | 0.68 |
| Radium-226 | Bq/g | <0.01 | 0.02 | 0.05 |
| Thorium-228 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.02 | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30633 09/21/2016 LAB-2-2 PONAR *SEDIMENT***
**30634 09/21/2016 LAB-2-3 PONAR *SEDIMENT***
**30635 09/15/2016 LAB-1-3 (0-2) *SEDIMENT***

| Analyte | Units | 30633 | 30634 | 30635 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Organic carbon | % | 0.30 | 0.37 | 14.9 |
| Moisture | % | 29.75 | 29.20 | 95.38 |
| Particle Size Custom Ranges | vol % | See Attached | See Attached | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30636 09/18/2016 LA-6-5 (0-2) *SEDIMENT***

| Analyte | Units | 30636 |
|---|---|---|
| **Lab Section 2 (ICP)** | | |
| Aluminum | ug/g | 3820 |
| Antimony | ug/g | <0.2 |
| Arsenic | ug/g | 3.4 |
| Barium | ug/g | 56 |
| Beryllium | ug/g | 0.3 |
| Boron | ug/g | 4 |
| Cadmium | ug/g | 0.4 |
| Calcium | ug/g | 1900 |
| Chromium | ug/g | 7.6 |
| Cobalt | ug/g | 1.5 |
| Copper | ug/g | 1.4 |
| Iron | ug/g | 22600 |
| Lead | ug/g | 7.0 |
| Magnesium | ug/g | 710 |
| Manganese | ug/g | 390 |
| Molybdenum | ug/g | 0.4 |
| Nickel | ug/g | 4.7 |
| Phosphorus | ug/g | 1300 |
| Potassium | ug/g | 800 |
| Selenium | ug/g | 0.8 |
| Silver | ug/g | <0.1 |
| Sodium | ug/g | 120 |
| Strontium | ug/g | 27 |
| Thallium | ug/g | <0.2 |
| Tin | ug/g | 0.2 |
| Titanium | ug/g | 300 |
| Uranium | ug/g | 0.6 |
| Vanadium | ug/g | 18 |
| Zinc | ug/g | 22 |
| **Lab Section 4 (Radiochemistry)** | | |
| Lead-210 | Bq/g | 0.59 |
| Polonium-210 | Bq/g | 0.57 |
| Radium-226 | Bq/g | 0.03 |
| Thorium-228 | Bq/g | <0.02 |
| Thorium-230 | Bq/g | <0.02 |
| Thorium-232 | Bq/g | <0.02 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11577

Nov 07, 2016

EcoMetrix Inc.

**30636 09/18/2016 LA-6-5 (0-2) *SEDIMENT***

| Analyte | Units | 30636 |
|---|---|---|
| **Lab Section 6 (Misc.)** | | |
| Organic carbon | % | 17.1 |
| Moisture | % | 95.78 |
| Particle Size Custom Ranges | vol % | See Attached |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Organic carbon was subcontracted to SRC Geoanalytical Laboratories

Results are reported on a dry basis.

ECOMETRIX INC
ATTN: JANEEN TANG/KAREN PETERSON
6800 CAMPOBELLO ROAD
MISSISSAUGA ON L5N 2L8

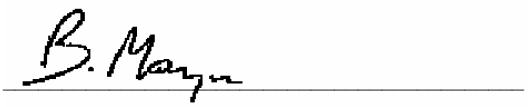
Date Received: 28-SEP-16
Report Date: 10-FEB-17 08:42 (MT)
Version: FINAL

Client Phone: 905-794-2325

# Certificate of Analysis

## Lab Work Order #: L1835656

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 14-427473
Legal Site Desc:



Brian Morgan, B.Sc. Hons.
Client Services Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1835656-1 | L1835656-2 | L1835656-3 | L1835656-4 | L1835656-5 |
|---|---|---|---|---|---|---|
| | Description | PLANKTON | PLANKTON | PLANKTON | PLANKTON | PLANKTON |
| | Sampled Date | 14-SEP-16 | 10-SEP-16 | 13-SEP-16 | 12-SEP-16 | 15-SEP-16 |
| | Sampled Time | 12:00 | 12:00 | 12:00 | 12:00 | 12:00 |
| | Client ID | LA-1 | LA-5 | LA-6 | LA-7 | LAB-1 |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Taxonomy** | Phytoplankton Biovolumes | See attached. | See attached. | See attached. | See attached. | See attached. |
| | Zooplankton Biovolumes | See attached. | See attached. | See attached. | See attached. | See attached. |
| **Plant Pigments** | Chlorophyll a (ug/L) | <0.60 | <0.60 | <0.60 | <0.60 | <0.60 |
| | ODb/ODa (ABS Ratio) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| | Pheophytin a (ug/L) | 10.9 | 8.94 | 6.68 | 7.24 | 6.40 |

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Sample ID** | L1835656-6 | | | | |
| | **Description** | PLANKTON | | | | |
| | **Sampled Date** | 21-SEP-16 | | | | |
| | **Sampled Time** | 12:00 | | | | |
| | **Client ID** | LAB-2 | | | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Taxonomy** | Phytoplankton Biovolumes | See attached. | | | | |
| | Zooplankton Biovolumes | See attached. | | | | |
| **Plant Pigments** | Chlorophyll a (ug/L) | <0.60 | | | | |
| | ODb/ODa (ABS Ratio) | 1.0 | | | | |
| | Pheophytin a (ug/L) | 13.9 | | | | |

# Reference Information

**Test Method References:**

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **CHL,PHEO-ACET-LOW-WP** | Water | Chlorophyll-a & Pheophytin-a | APHA 10200H |

Phytoplankton in aqueous matrices are concentrated by filtration. Chlorophyll is extracted from the cells collected on the filter using acetone. Chlorophyll a and its degradation product Pheophytin a, are determined spectrophotometrically using the acidification method.

| | | | |
|---|---|---|---|
| **PHYTO-BIO-WP** | Water | Phytoplankton Biovolumes | APHA 10200 C, F & I |

Samples are prepared by sedimentation/settling and examined using a compound phase contrast inverted microscope. Phytoplankters are identified to species where possible and enumerated. The average biovolume and total biovolume for every genus/species is also reported.

| | | | |
|---|---|---|---|
| **ZOOP-BIO-WP** | Water | Zooplankton Biovolumes | APHA 10200 C, G & I |

Samples are concentrated by sedimentation/settling and examined using a compound phase contrast inverted microscope or stereoscopic microscope (to aid in identification of larger crustaceans). Zooplankters are identified to species where possible and enumerated. The average biovolume and total biovolume for every genus/species is also reported.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

| Laboratory Definition Code | Laboratory Location |
|---|---|
| WP | ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA |

**Chain of Custody Numbers:**

14-427473

**GLOSSARY OF REPORT TERMS**

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*
*mg/kg - milligrams per kilogram based on dry weight of sample.*
*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*
*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*
*mg/L - milligrams per litre.*
*< - Less than.*
*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*
*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*
*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*
*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

# Quality Control Report

Workorder: L1835656 Report Date: 10-FEB-17 

Client: ECOMETRIX INC
6800 CAMPOBELLO ROAD
MISSISSAUGA ON L5N 2L8
Contact: JANEEN TANG/KAREN PETERSON

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|---|---|---|---|---|---|---|---|---|
| **CHL,PHEO-ACET-LOW-WP** | **Water** | | | | | | | |
| **Batch R3563211** | | | | | | | | |
| **WG2403007-1 LCS** | | | | | | | | |
| Chlorophyll a | | | 100.4 | | % | | 80-120 | 04-OCT-16 |
| **WG2402998-1 MB** | | | | | | | | |
| Chlorophyll a | | | <0.60 | | ug/L | | 0.6 | 04-OCT-16 |
| Pheophytin a | | | <0.60 | | ug/L | | 0.6 | 04-OCT-16 |
| **WG2402998-2 MB** | | | | | | | | |
| Chlorophyll a | | | <0.60 | | ug/L | | 0.6 | 04-OCT-16 |
| Pheophytin a | | | <0.60 | | ug/L | | 0.6 | 04-OCT-16 |

# Quality Control Report



**Legend:**

| | |
|---|---|
| Limit | ALS Control Limit (Data Quality Objectives) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

**Hold Time Exceedances:**

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

---

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental
1329 Niakwa Road E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Phytoplankton Sample Results*

**Lab Number:** L1835656-1 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 14, 2016 **Submitter:** CLIENT

**Sample ID:** LA-1

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Bacillariophyceae | *Asterionella* | *formosa* | Single Cell | 94000 | 810 | 76140000 |
| Bacillariophyceae | *Fragilaria* | *sp.* | Single Cell | 18000 | 640 | 11520000 |
| Bacillariophyceae | *Melosira* | *sp.* | Filament | 105000 | 115200 | 12096000000 |
| Bacillariophyceae | *Navicula* | *sp.* | Single Cell | 6000 | 4000 | 24000000 |
| Bacillariophyceae | *Stephanodiscus* | *sp.* | Single Cell | 5000 | 62500 | 312500000 |
| Bacillariophyceae | *Synedra* | *sp.* | Single Cell | 12000 | 810 | 9720000 |
| Bacillariophyceae | *Tabellaria* | *sp.* | Single Cell | 13000 | 1920 | 24960000 |
| Chlorophyceae | *Cosmarium* | *sp.* | Single Cell | 3000 | 11250 | 33750000 |
| Chlorophyceae | *Crucigenia* | *quadrata* | Single Cell | 56000 | 12 | 672000 |
| Chlorophyceae | *Crucigenia* | *sp.* | Single Cell | 25000 | 12 | 300000 |
| Chlorophyceae | *Crucigenia* | *tetrapedia* | Single Cell | 25000 | 36 | 900000 |
| Chlorophyceae | *Dictyosphaerium* | *sp.* | Colony | 2000 | 27000 | 54000000 |
| Chlorophyceae | *Elakatothrix* | *sp.* | Single Cell | 4000 | 180 | 720000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | Single Cell | 12000 | 120 | 1440000 |
| Chlorophyceae | *Oocystis* | *sp.* | Colony | 2000 | 4500 | 9000000 |
| Chlorophyceae | *Pediastrum* | *privum* | Colony | 12000 | 450 | 5400000 |
| Chlorophyceae | *Pediastrum* | *tetras* | Colony | 6000 | 200 | 1200000 |

**Date Printed:** February 09, 2017

**Lab Number:** L1835656-1 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 14, 2016 **Submitter:** CLIENT

**Sample ID:** LA-1

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Chlorophyceae | *Planktosphaeria* | *sp.* | Colony | 12000 | 27000 | 324000000 |
| Chlorophyceae | *Quadrigula* | *sp.* | Single Cell | 24000 | 180 | 4320000 |
| Chlorophyceae | *Scenedesmus* | *acuminatus* | Single Cell | 4000 | 160 | 640000 |
| Chlorophyceae | *Scenedesmus* | *quadricauda* | Single Cell | 25000 | 160 | 4000000 |
| Chlorophyceae | *Scenedesmus* | *sp.* | Single Cell | 37000 | 160 | 5920000 |
| Chlorophyceae | *Tetraedron* | *trigonum* | Single Cell | 1000 | 1200 | 1200000 |
| Chlorophyceae | *Unidentified* | | Filament | 1000 | 2500 | 2500000 |
| Chlorophyceae | *Unidentified* | | Single Cell | 297000 | 64 | 19008000 |
| Chrysophyceae | *Dinobryon* | *bavaricum* | Single Cell | 6000 | 540 | 3240000 |
| Chrysophyceae | *Dinobryon* | *sp.* | Single Cell | 6000 | 540 | 3240000 |
| Chrysophyceae | *small chrysophytes* | | Single Cell | 68000 | 64 | 4352000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | Single Cell | 19000 | 6750 | 128250000 |
| Cryptophyceae | *Unidentified* | | Single Cell | 74000 | 324 | 23976000 |
| Cyanophyceae | *Anabaena* | *sp.* | Filament | 16000 | 4320 | 69120000 |
| Cyanophyceae | *Aphanocapsa* | *sp.* | Colony | 6000 | 64000 | 384000000 |
| Cyanophyceae | *Aphanothece* | *sp.* | Colony | 1000 | 216000 | 216000000 |
| Cyanophyceae | *Gomphosphaeria* | *sp.* | Colony | 3000 | 27000 | 81000000 |
| Cyanophyceae | *Planktolyngbya* | *sp.* | Filament | 4000 | 720 | 2880000 |
| Dinophyceae | *Gymnodinium* | *sp.* | Single Cell | 3000 | 15625 | 46875000 |
| Euglenophyceae | *Trachelomonas* | *sp.* | Single Cell | 2000 | 4500 | 9000000 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# Zooplankton Sample Results

**Lab Number:** L1835656-1 **Work Order** L1835656

**Date Sampled:** September 14, 2016 **Submitter:** CLIENT
**Sample ID:** LA-1

*Volume Decanted (mL):* 500
*Volume Analyzed (mL):* 10

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | | | | *Unidentified* | | 800 | 9.72E+05 | 7.78E+08 |
| Crustacea | Branchiopoda | Cladocera | Bosminidae | *Bosmina* | *sp.* | 800 | 1.62E+07 | 1.30E+10 |
| Crustacea | Branchiopoda | Cladocera | Chydoridae | *Chydorus* | *sp.* | 50 | 1.08E+07 | 5.40E+08 |
| Crustacea | Branchiopoda | Cladocera | Daphniidae | *Daphnia* | *sp.* | 50 | 4.32E+06 | 2.16E+08 |
| Crustacea | Branchiopoda | Cladocera | Sididae | *Diaphanosoma* | *sp.* | 300 | 7.26E+07 | 2.18E+10 |
| Crustacea | Branchiopoda | Cladocera | Holopediidae | *Holopedium* | *sp.* | 4600 | 2.18E+08 | 1.00E+12 |
| Protozoa | Ciliata | Peritrichida | Epistylidae | *Epistylis* | *sp.* | 3800 | 9.60E+04 | 3.65E+08 |
| Protozoa | Ciliata | | | *Unidentified* | | 600 | 1.73E+06 | 1.04E+09 |
| Protozoa | Ciliata | Peritrichida | Vorticellidae | *Vorticella* | *sp.* | 10100 | 2.16E+05 | 2.18E+09 |
| Crustacea | Copepoda | Cyclopoida | Cyclopidae | *Acanthocyclops* | *sp.* | 850 | 4.86E+07 | 4.13E+10 |
| Crustacea | Copepoda | | | *Nauplii* | | 1800 | 9.72E+05 | 1.75E+09 |
| Crustacea | Copepoda | Cyclopoida | | *To young to ID* | | 2600 | 6.75E+06 | 1.76E+10 |
| Crustacea | Copepoda | Calanoida | | *To young to ID* | | 100 | 3.80E+07 | 3.80E+09 |
| Protozoa | Filosia | Aconchulinida | Euglyphidae | *Euglypha* | *sp.* | 200 | 2.25E+05 | 4.50E+07 |

**Date Printed:** February 09, 2017

**ALS Environmental**
**1329 Niakwa RD E - Unit 12**
**Winnipeg, Manitoba R2J 3T4**
**(204) 255-9720**

# *Zooplankton Sample Results*

**Lab Number:** **L1835656-1** **Work Order** **L1835656**

**Date Sampled:** September 14, 2016 **Submitter:** CLIENT *Volume Decanted (mL):* **500**

**Sample ID:** LA-1 *Volume Analyzed (mL):* **10**

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Protozoa | Lobosa | Arcellinida | Arcellidae | *Arcella* | *sp.* | 150 | 5.00E+05 | 7.50E+07 |
| Protozoa | Lobosa | Arcellinida | Difflugiidae | *Difflugia* | *sp.* | 100 | 8.10E+05 | 8.10E+07 |
| Rotifera | Monogononta | Flosculariaceae | Conochilidae | *Conochilus* | *sp.* | 1000 | 3.24E+05 | 3.24E+08 |
| Rotifera | Monogononta | Ploima | Gastropodidae | *Gastropus* | *sp.* | 200 | 4.86E+05 | 9.72E+07 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Kellicottia* | *longispina* | 50 | 5.40E+05 | 2.70E+07 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Keratella* | *sp.* | 2000 | 3.24E+05 | 6.48E+08 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa Road E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Phytoplankton Sample Results*

**Lab Number:** L1835656-2 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 10, 2016 **Submitter:** CLIENT

**Sample ID:** LA-5

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Bacillariophyceae | *Achnanthes* | *sp.* | Single Cell | 12000 | 180 | 2160000 |
| Bacillariophyceae | *Asterionella* | *formosa* | Single Cell | 7000 | 810 | 5670000 |
| Bacillariophyceae | *Cyclotella* | *sp.* | Single Cell | 6000 | 500 | 3000000 |
| Bacillariophyceae | *Fragilaria* | *sp.* | Single Cell | 170000 | 320 | 54400000 |
| Bacillariophyceae | *Melosira* | *sp.* | Filament | 17000 | 24000 | 408000000 |
| Bacillariophyceae | *Nitzschia* | *sp.* | Single Cell | 2000 | 640 | 1280000 |
| Bacillariophyceae | *Rhizosolenia* | *sp.* | Single Cell | 37000 | 540 | 19980000 |
| Bacillariophyceae | *Synedra* | *sp.* | Single Cell | 6000 | 810 | 4860000 |
| Bacillariophyceae | *Tabellaria* | *sp.* | Single Cell | 7000 | 1920 | 13440000 |
| Chlorophyceae | *Crucigenia* | *sp.* | Single Cell | 16000 | 12 | 192000 |
| Chlorophyceae | *Elakatothrix* | *sp.* | Single Cell | 12000 | 180 | 2160000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | Single Cell | 12000 | 120 | 1440000 |
| Chlorophyceae | *Pediastrum* | *Boryanum* | Colony | 1000 | 5000 | 5000000 |
| Chlorophyceae | *Pediastrum* | *privum* | Colony | 6000 | 450 | 2700000 |
| Chlorophyceae | *Quadrigula* | *sp.* | Single Cell | 8000 | 180 | 1440000 |
| Chlorophyceae | *Scenedesmus* | *sp.* | Single Cell | 14000 | 160 | 2240000 |
| Chlorophyceae | *Spondylosium* | *sp.* | Filament | 1000 | 1000 | 1000000 |

**Date Printed:** February 09, 2017

| | | | | | | |
|---|---|---|---|---|---|---|
| **Lab Number:** | **L1835656-2** | **Work Order** | **L1835656** | **Sample Type** | PLANKTON | |
| **Date Sampled:** | September 10, 2016 | **Submitter:** | CLIENT | | | |
| **Sample ID:** | LA-5 | | | | | |

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Chlorophyceae | *Staurastrum* | *sp.* | Single Cell | 2000 | 6750 | 13500000 |
| Chlorophyceae | *Tetraedron* | *minimum* | Single Cell | 1000 | 256 | 256000 |
| Chlorophyceae | *Unidentified* | | Single Cell | 99000 | 64 | 6336000 |
| Chrysophyceae | *Bitrichia* | *sp.* | Single Cell | 6000 | 432 | 2592000 |
| Chrysophyceae | *Dinobryon* | *bavaricum* | Single Cell | 43000 | 540 | 23220000 |
| Chrysophyceae | *Dinobryon* | *sp.* | Single Cell | 31000 | 540 | 16740000 |
| Chrysophyceae | *small chrysophytes* | | Single Cell | 248000 | 64 | 15872000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | Single Cell | 6000 | 6750 | 40500000 |
| Cryptophyceae | *Unidentified* | | Single Cell | 6000 | 324 | 1944000 |
| Cyanophyceae | *Anabaena* | *sp.* | Filament | 3000 | 4320 | 12960000 |
| Cyanophyceae | *Aphanizomenon* | *sp.* | Filament | 5000 | 2880 | 14400000 |
| Cyanophyceae | *Aphanothece* | *sp.* | Colony | 1000 | 216000 | 216000000 |
| Cyanophyceae | *Gomphosphaeria* | *sp.* | Colony | 2000 | 27000 | 54000000 |
| Cyanophyceae | *Planktolyngbya* | *sp.* | Filament | 3000 | 720 | 2160000 |
| Cyanophyceae | *Pseudanabaena* | *sp.* | Filament | 6000 | 720 | 4320000 |
| Dinophyceae | *Gymnodinium* | *sp.* | Single Cell | 6000 | 4500 | 27000000 |
| Dinophyceae | *Peridinium* | *sp.* | Single Cell | 6000 | 10000 | 60000000 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# Zooplankton Sample Results

**Lab Number:** L1835656-2 **Work Order** L1835656

**Date Sampled:** September 10, 2016 **Submitter:** CLIENT
**Sample ID:** LA-5

*Volume Decanted (mL):* 500
*Volume Analyzed (mL):* 20

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | | | | *Unidentified* | | 1900 | 9.72E+05 | 1.85E+09 |
| Crustacea | Branchiopoda | Cladocera | Bosminidae | *Bosmina* | *sp.* | 150 | 2.27E+07 | 3.40E+09 |
| Crustacea | Branchiopoda | Cladocera | Chydoridae | *Chydorus* | *sp.* | 25 | 8.06E+06 | 2.02E+08 |
| Protozoa | Ciliata | | | *Unidentified* | | 750 | 3.24E+05 | 2.43E+08 |
| Protozoa | Ciliata | Peritrichida | Vorticellidae | *Vorticella* | *sp.* | 100 | 2.16E+05 | 2.16E+07 |
| Crustacea | Copepoda | | | *Nauplii* | | 350 | 9.72E+05 | 3.40E+08 |
| Protozoa | Filosia | Aconchulinida | Euglyphidae | *Euglypha* | *sp.* | 25 | 2.25E+05 | 5.63E+06 |
| Protozoa | Heliozoa | Actinophryida | Actinosphaeridae | *Actinosphaerium* | *sp.* | 25 | 7.29E+05 | 1.82E+07 |
| Arthropoda | Insecta | Diptera | Chironomidae | *Unidentified* | | 50 | 2.59E+06 | 1.30E+08 |
| Protozoa | Lobosa | Arcellinida | Arcellidae | *Arcella* | *sp.* | 25 | 5.00E+05 | 1.25E+07 |
| Protozoa | Lobosa | Arcellinida | Difflugiidae | *Difflugia* | *sp.* | 100 | 8.10E+05 | 8.10E+07 |
| Rotifera | Monogononta | Collothecaceae | Collothecidae | *Collotheca* | *sp.* | 25 | 3.00E+05 | 7.50E+06 |
| Rotifera | Monogononta | Ploima | Euchlanidae | *Euchlanis* | *sp.* | 25 | 1.20E+07 | 3.00E+08 |
| Rotifera | Monogononta | Ploima | Gastropodidae | *Gastropus* | *sp.* | 275 | 4.86E+05 | 1.34E+08 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Zooplankton Sample Results*

**Lab Number:** L1835656-2 **Work Order** L1835656

**Date Sampled:** September 10, 2016 **Submitter:** CLIENT
**Sample ID:** LA-5

***Volume Decanted (mL):*** 500
***Volume Analyzed (mL):*** 20

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | Monogononta | Ploima | Brachionidae | *Kellicottia* | *longispina* | 25 | 5.40E+05 | 1.35E+07 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Keratella* | *sp.* | 2200 | 3.24E+05 | 7.13E+08 |
| Rotifera | Monogononta | Ploima | Synchaetidae | *Ploesoma* | *sp.* | 25 | 1.22E+06 | 3.04E+07 |
| Rotifera | Monogononta | Ploima | Synchaetidae | *Polyarthra* | *sp.* | 750 | 3.24E+05 | 2.43E+08 |
| Rotifera | Monogononta | Ploima | Trichocercidae | *Trichocerca* | *sp.* | 25 | 2.27E+06 | 5.67E+07 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa Road E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Phytoplankton Sample Results*

**Lab Number:** L1835656-3 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 13, 2016 **Submitter:** CLIENT

**Sample ID:** LA-6

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Bacillariophyceae | *Asterionella* | *formosa* | Single Cell | 8000 | 810 | 6480000 |
| Bacillariophyceae | *Cyclotella* | *sp.* | Single Cell | 14000 | 500 | 7000000 |
| Bacillariophyceae | *Fragilaria* | *sp.* | Single Cell | 90000 | 320 | 28800000 |
| Bacillariophyceae | *Melosira* | *sp.* | Filament | 25000 | 16960 | 424000000 |
| Bacillariophyceae | *Nitzschia* | *sp.* | Single Cell | 1000 | 640 | 640000 |
| Bacillariophyceae | *Rhizosolenia* | *sp.* | Single Cell | 19000 | 540 | 10260000 |
| Bacillariophyceae | *Synedra* | *sp.* | Single Cell | 7000 | 810 | 5670000 |
| Bacillariophyceae | *Tabellaria* | *sp.* | Single Cell | 2000 | 1920 | 3840000 |
| Chlorophyceae | *Elakatothrix* | *sp.* | Single Cell | 6000 | 180 | 1080000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | Single Cell | 6000 | 120 | 720000 |
| Chlorophyceae | *Oocystis* | *sp.* | Colony | 4000 | 2000 | 8000000 |
| Chlorophyceae | *Quadrigula* | *sp.* | Single Cell | 4000 | 180 | 720000 |
| Chlorophyceae | *Scenedesmus* | *quadricauda* | Single Cell | 25000 | 160 | 4000000 |
| Chlorophyceae | *Staurastrum* | *sp.* | Single Cell | 1000 | 6750 | 6750000 |
| Chlorophyceae | *Staurodesmus* | *sp.* | Single Cell | 6000 | 900 | 5400000 |
| Chlorophyceae | *Unidentified* | | Filament | 1000 | 3000 | 3000000 |
| Chlorophyceae | *Unidentified* | | Single Cell | 19000 | 64 | 1216000 |

**Date Printed:** February 09, 2017

**Lab Number:** L1835656-3 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 13, 2016 **Submitter:** CLIENT

**Sample ID:** LA-6

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Chrysophyceae | *Dinobryon* | *bavaricum* | Single Cell | 6000 | 540 | 3240000 |
| Chrysophyceae | *Dinobryon* | *sp.* | Single Cell | 19000 | 540 | 10260000 |
| Chrysophyceae | *small chrysophytes* | | Single Cell | 161000 | 64 | 10304000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | Single Cell | 2000 | 6750 | 13500000 |
| Cryptophyceae | *Unidentified* | | Single Cell | 12000 | 324 | 3888000 |
| Cyanophyceae | *Anabaena* | *sp.* | Filament | 10000 | 4320 | 43200000 |
| Cyanophyceae | *Aphanizomenon* | *sp.* | Filament | 6000 | 2880 | 17280000 |
| Cyanophyceae | *Planktolyngbya* | *sp.* | Filament | 12000 | 720 | 8640000 |
| Cyanophyceae | *Pseudanabaena* | *sp.* | Filament | 9000 | 720 | 6480000 |
| Dinophyceae | *Peridinium* | *sp.* | Single Cell | 6000 | 10000 | 60000000 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# Zooplankton Sample Results

**Lab Number:** L1835656-3 **Work Order** L1835656

**Date Sampled:** September 13, 2016 **Submitter:** CLIENT
**Sample ID:** LA-6

*Volume Decanted (mL):* 500
*Volume Analyzed (mL):* 30

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | | | | *Unidentified* | | 616.667 | 1.73E+06 | 1.07E+09 |
| Crustacea | Branchiopoda | Cladocera | Bosminidae | *Bosmina* | *sp.* | 100 | 9.72E+06 | 9.72E+08 |
| Crustacea | Branchiopoda | Cladocera | Sididae | *Diaphanosoma* | *sp.* | 50 | 1.73E+07 | 8.64E+08 |
| Crustacea | Branchiopoda | Cladocera | Holopediidae | *Holopedium* | *sp.* | 16.6667 | 5.53E+07 | 9.22E+08 |
| Protozoa | Ciliata | | | *Unidentified* | | 400 | 3.24E+05 | 1.30E+08 |
| Crustacea | Copepoda | | | *Nauplii* | | 83.3333 | 9.72E+05 | 8.10E+07 |
| Protozoa | Filosia | Aconchulinida | Cyphoderiidae | *Cyphoderia* | *sp.* | 33.3333 | 1.30E+06 | 4.32E+07 |
| Protozoa | Filosia | Aconchulinida | Euglyphidae | *Euglypha* | *sp.* | 33.3333 | 2.25E+05 | 7.50E+06 |
| Protozoa | Lobosa | Arcellinida | Arcellidae | *Arcella* | *sp.* | 33.3333 | 5.00E+05 | 1.67E+07 |
| Protozoa | Lobosa | Arcellinida | Difflugiidae | *Difflugia* | *sp.* | 150 | 8.10E+05 | 1.22E+08 |
| Rotifera | Monogononta | Collothecaceae | Collothecidae | *Collotheca* | *sp.* | 83.3333 | 3.00E+05 | 2.50E+07 |
| Rotifera | Monogononta | Flosculariaceae | Conochilidae | *Conochilus* | *sp.* | 33.3333 | 3.24E+05 | 1.08E+07 |
| Rotifera | Monogononta | Ploima | Gastropodidae | *Gastropus* | *sp.* | 516.667 | 4.86E+05 | 2.51E+08 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Keratella* | *sp.* | 1166.67 | 3.24E+05 | 3.78E+08 |

**Date Printed:** February 09, 2017

**ALS Environmental**
**1329 Niakwa RD E - Unit 12**
**Winnipeg, Manitoba R2J 3T4**
**(204) 255-9720**

# *Zooplankton Sample Results*

**Lab Number:** **L1835656-3** **Work Order** **L1835656**

**Date Sampled:** September 13, 2016 **Submitter:** CLIENT *Volume Decanted (mL):* **500**

**Sample ID:** LA-6 *Volume Analyzed (mL):* **30**

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | Monogononta | Ploima | Synchaetidae | *Polyarthra* | *sp.* | 300 | 3.24E+05 | 9.72E+07 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa Road E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Phytoplankton Sample Results*

**Lab Number:** L1835656-4 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 12, 2016 **Submitter:** CLIENT

**Sample ID:** LA-7

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Bacillariophyceae | *Cyclotella* | *sp.* | Single Cell | 81000 | 500 | 40500000 |
| Bacillariophyceae | *Fragilaria* | *sp.* | Single Cell | 90000 | 320 | 28800000 |
| Bacillariophyceae | *Melosira* | *sp.* | Filament | 22000 | 15680 | 344960000 |
| Bacillariophyceae | *Nitzschia* | *sigmoidea* | Single Cell | 2000 | 3420 | 6840000 |
| Bacillariophyceae | *Nitzschia* | *sp.* | Single Cell | 2000 | 640 | 1280000 |
| Bacillariophyceae | *Rhizosolenia* | *sp.* | Single Cell | 6000 | 540 | 3240000 |
| Bacillariophyceae | *Synedra* | *sp.* | Single Cell | 6000 | 810 | 4860000 |
| Bacillariophyceae | *Tabellaria* | *sp.* | Single Cell | 13000 | 1920 | 24960000 |
| Chlorophyceae | *Botryococcus* | *sp.* | Colony | 1000 | 64000 | 64000000 |
| Chlorophyceae | *Cosmarium* | *sp.* | Single Cell | 6000 | 500 | 3000000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | Single Cell | 19000 | 120 | 2280000 |
| Chlorophyceae | *Pediastrum* | *privum* | Colony | 2000 | 800 | 1600000 |
| Chlorophyceae | *Spondylosium* | *sp.* | Filament | 2000 | 1000 | 2000000 |
| Chlorophyceae | *Unidentified* | | Single Cell | 62000 | 64 | 3968000 |
| Chlorophyceae | *Unidentified* | | Filament | 2000 | 1500 | 3000000 |
| Chrysophyceae | *Dinobryon* | *bavaricum* | Single Cell | 19000 | 540 | 10260000 |
| Chrysophyceae | *Dinobryon* | *sp.* | Single Cell | 12000 | 540 | 6480000 |

**Date Printed:** February 09, 2017

**Lab Number:** L1835656-4 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 12, 2016 **Submitter:** CLIENT

**Sample ID:** LA-7

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Chrysophyceae | *small chrysophytes* | | Single Cell | 81000 | 64 | 5184000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | Single Cell | 37000 | 6750 | 249750000 |
| Cyanophyceae | *Anabaena* | *sp.* | Filament | 9000 | 4320 | 38880000 |
| Cyanophyceae | *Aphanizomenon* | *sp.* | Filament | 6000 | 2880 | 17280000 |
| Cyanophyceae | *Aphanothece* | *sp.* | Colony | 12000 | 8000 | 96000000 |
| Cyanophyceae | *Eucapsis* | *sp.* | Single Cell | 32000 | 8 | 256000 |
| Cyanophyceae | *Oscillatoria* | *sp.* | Filament | 1000 | 5250 | 5250000 |
| Cyanophyceae | *Planktolyngbya* | *sp.* | Filament | 19000 | 720 | 13680000 |
| Cyanophyceae | *Pseudanabaena* | *sp.* | Filament | 25000 | 480 | 12000000 |
| Dinophyceae | *Gymnodinium* | *sp.* | Single Cell | 12000 | 10000 | 120000000 |
| Dinophyceae | *Peridinium* | *sp.* | Single Cell | 1000 | 10000 | 10000000 |
| Euglenophyceae | *Trachelomonas* | *sp.* | Single Cell | 1000 | 4500 | 4500000 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# Zooplankton Sample Results

**Lab Number:** L1835656-4 **Work Order** L1835656

**Date Sampled:** September 12, 2016 **Submitter:** CLIENT
**Sample ID:** LA-7

*Volume Decanted (mL):* 500
*Volume Analyzed (mL):* 10

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | | | | *Unidentified* | | 900 | 3.24E+05 | 2.92E+08 |
| Crustacea | Branchiopoda | Cladocera | Chydoridae | *Chydorus* | *sp.* | 150 | 1.35E+07 | 2.03E+09 |
| Crustacea | Branchiopoda | Cladocera | Sididae | *Diaphanosoma* | *sp.* | 50 | 7.26E+07 | 3.63E+09 |
| Crustacea | Branchiopoda | Cladocera | Holopediidae | *Holopedium* | *sp.* | 800 | 2.36E+08 | 1.89E+11 |
| Protozoa | Ciliata | Peritrichida | Epistylidae | *Epistylis* | *sp.* | 700 | 9.60E+04 | 6.72E+07 |
| Protozoa | Ciliata | | | *Unidentified* | | 200 | 1.73E+06 | 3.46E+08 |
| Protozoa | Ciliata | Peritrichida | Vorticellidae | *Vorticella* | *sp.* | 700 | 2.16E+05 | 1.51E+08 |
| Crustacea | Copepoda | | | *Nauplii* | | 6300 | 9.72E+05 | 6.12E+09 |
| Crustacea | Copepoda | Calanoida | Diaptomidae | *Skistodiaptomus* | *sp.* | 650 | 7.56E+07 | 4.91E+10 |
| Crustacea | Copepoda | Calanoida | | *To young to ID* | | 1000 | 1.94E+07 | 1.94E+10 |
| Crustacea | Copepoda | Cyclopoida | | *To young to ID* | | 2600 | 6.75E+06 | 1.76E+10 |
| Euglenozoa | Euglenoidea | Euglenales | Euglenaceae | *Euglena* | *sp.* | 100 | 1.08E+05 | 1.08E+07 |
| Protozoa | Lobosa | Arcellinida | Arcellidae | *Arcella* | *sp.* | 50 | 5.00E+05 | 2.50E+07 |
| Protozoa | Lobosa | Arcellinida | Difflugiidae | *Difflugia* | *sp.* | 100 | 8.10E+05 | 8.10E+07 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Zooplankton Sample Results*

**Lab Number:** L1835656-4 **Work Order** L1835656

**Date Sampled:** September 12, 2016 **Submitter:** CLIENT
**Sample ID:** LA-7

***Volume Decanted (mL):*** 500
***Volume Analyzed (mL):*** 10

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | Monogononta | Flosculariaceae | Conochilidae | *Conochilus* | *sp.* | 38800 | 3.24E+05 | 1.26E+10 |
| Rotifera | Monogononta | Ploima | Gastropodidae | *Gastropus* | *sp.* | 800 | 4.86E+05 | 3.89E+08 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Kellicottia* | *longispina* | 3800 | 5.40E+05 | 2.05E+09 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Keratella* | *sp.* | 23900 | 3.24E+05 | 7.74E+09 |
| Rotifera | Monogononta | Ploima | Synchaetidae | *Polyarthra* | *sp.* | 3700 | 3.24E+05 | 1.20E+09 |
| Rotifera | Monogononta | Ploima | Trichocercidae | *Trichocerca* | *sp.* | 800 | 2.92E+06 | 2.33E+09 |
| Rotifera | Monogononta | Ploima | Trichotriidae | *Trichotria* | *sp.* | 100 | 1.22E+06 | 1.22E+08 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa Road E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Phytoplankton Sample Results*

**Lab Number:** L1835656-5 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 15, 2016 **Submitter:** CLIENT

**Sample ID:** LAB-1

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Bacillariophyceae | *Asterionella* | *formosa* | Single Cell | 36000 | 810 | 29160000 |
| Bacillariophyceae | *Cyclotella* | *sp.* | Single Cell | 4000 | 1800 | 7200000 |
| Bacillariophyceae | *Melosira* | *sp.* | Filament | 23000 | 24000 | 552000000 |
| Bacillariophyceae | *Nitzschia* | *sp.* | Single Cell | 6000 | 640 | 3840000 |
| Bacillariophyceae | *Rhizosolenia* | *sp.* | Single Cell | 25000 | 540 | 13500000 |
| Bacillariophyceae | *Synedra* | *sp.* | Single Cell | 19000 | 810 | 15390000 |
| Chlorophyceae | *Crucigenia* | *quadrata* | Single Cell | 32000 | 12 | 384000 |
| Chlorophyceae | *Crucigenia* | *sp.* | Single Cell | 16000 | 54 | 864000 |
| Chlorophyceae | *Elakatothrix* | *sp.* | Single Cell | 2000 | 180 | 360000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | Single Cell | 4000 | 120 | 480000 |
| Chlorophyceae | *Pediastrum* | *tetras* | Colony | 6000 | 450 | 2700000 |
| Chlorophyceae | *Quadrigula* | *sp.* | Single Cell | 4000 | 180 | 720000 |
| Chlorophyceae | *Staurastrum* | *sp.* | Single Cell | 2000 | 6750 | 13500000 |
| Chlorophyceae | *Tetraedron* | *sp.* | Single Cell | 6000 | 32 | 192000 |
| Chlorophyceae | *Unidentified* | | Single Cell | 74000 | 64 | 4736000 |
| Chrysophyceae | *Dinobryon* | *bavaricum* | Single Cell | 6000 | 540 | 3240000 |
| Chrysophyceae | *Dinobryon* | *sp.* | Single Cell | 42000 | 540 | 22680000 |

**Date Printed:** February 09, 2017

**Lab Number:** L1835656-5 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 15, 2016 **Submitter:** CLIENT

**Sample ID:** LAB-1

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Chrysophyceae | *small chrysophytes* | | Single Cell | 62000 | 64 | 3968000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | Single Cell | 56000 | 12000 | 672000000 |
| Cryptophyceae | *Unidentified* | | Single Cell | 50000 | 324 | 16200000 |
| Cyanophyceae | *Anabaena* | *sp.* | Filament | 8000 | 6480 | 51840000 |
| Cyanophyceae | *Aphanizomenon* | *sp.* | Filament | 2000 | 2880 | 5760000 |
| Cyanophyceae | *Aphanothece* | *sp.* | Colony | 2000 | 27000 | 54000000 |
| Cyanophyceae | *Gomphosphaeria* | *sp.* | Colony | 4000 | 27000 | 108000000 |
| Cyanophyceae | *Planktolyngbya* | *sp.* | Filament | 17000 | 960 | 16320000 |
| Cyanophyceae | *Pseudanabaena* | *sp.* | Filament | 2000 | 480 | 960000 |
| Dinophyceae | *Gymnodinium* | *sp.* | Single Cell | 19000 | 10000 | 190000000 |
| Dinophyceae | *Peridinium* | *sp.* | Single Cell | 6000 | 10000 | 60000000 |
| Euglenophyceae | *Trachelomonas* | *sp.* | Single Cell | 7000 | 4500 | 31500000 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# Zooplankton Sample Results

**Lab Number:** L1835656-5 **Work Order** L1835656

**Date Sampled:** September 15, 2016 **Submitter:** CLIENT
**Sample ID:** LAB-1

*Volume Decanted (mL):* 500
*Volume Analyzed (mL):* 10

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | | | | *Unidentified* | | 6300 | 9.72E+05 | 6.12E+09 |
| Crustacea | Branchiopoda | Cladocera | Bosminidae | *Bosmina* | *sp.* | 900 | 1.62E+07 | 1.46E+10 |
| Crustacea | Branchiopoda | Cladocera | Chydoridae | *Chydorus* | *sp.* | 1400 | 1.08E+07 | 1.51E+10 |
| Crustacea | Branchiopoda | Cladocera | Daphniidae | *Daphnia* | *sp.* | 200 | 9.60E+06 | 1.92E+09 |
| Crustacea | Branchiopoda | Cladocera | Holopediidae | *Holopedium* | *sp.* | 50 | 5.53E+07 | 2.76E+09 |
| Protozoa | Ciliata | Peritrichida | Epistylidae | *Epistylis* | *sp.* | 1600 | 9.60E+04 | 1.54E+08 |
| Protozoa | Ciliata | | | *Unidentified* | | 200 | 1.73E+06 | 3.46E+08 |
| Protozoa | Ciliata | Peritrichida | Vorticellidae | *Vorticella* | *sp.* | 4600 | 2.16E+05 | 9.94E+08 |
| Crustacea | Copepoda | | | *Nauplii* | | 4100 | 9.72E+05 | 3.99E+09 |
| Crustacea | Copepoda | Calanoida | | *To young to ID* | | 500 | 1.62E+07 | 8.10E+09 |
| Crustacea | Copepoda | Cyclopoida | | *To young to ID* | | 1700 | 6.75E+06 | 1.15E+10 |
| Arthropoda | Insecta | Diptera | Chironomidae | *Unidentified* | | 50 | 2.59E+06 | 1.30E+08 |
| Protozoa | Lobosa | Arcellinida | Difflugiidae | *Difflugia* | *sp.* | 50 | 8.10E+05 | 4.05E+07 |
| Rotifera | Monogononta | Ploima | Asplanchnidae | *Asplanchna* | *sp.* | 300 | 9.45E+06 | 2.84E+09 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Zooplankton Sample Results*

**Lab Number:** L1835656-5 **Work Order** L1835656

**Date Sampled:** September 15, 2016 **Submitter:** CLIENT
**Sample ID:** LAB-1

***Volume Decanted (mL):*** 500
***Volume Analyzed (mL):*** 10

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | Monogononta | Collothecaceae | Collothecidae | *Collotheca* | *sp.* | 100 | 3.00E+05 | 3.00E+07 |
| Rotifera | Monogononta | Flosculariaceae | Conochilidae | *Conochilus* | *sp.* | 1400 | 3.24E+05 | 4.54E+08 |
| Rotifera | Monogononta | Ploima | Gastropodidae | *Gastropus* | *sp.* | 2100 | 4.86E+05 | 1.02E+09 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Kellicottia* | *longispina* | 500 | 5.40E+05 | 2.70E+08 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Keratella* | *sp.* | 5500 | 3.24E+05 | 1.78E+09 |
| Rotifera | Monogononta | Ploima | Synchaetidae | *Polyarthra* | *sp.* | 1200 | 6.48E+05 | 7.78E+08 |
| Rotifera | Monogononta | Ploima | Trichocercidae | *Trichocerca* | *sp.* | 1100 | 9.60E+05 | 1.06E+09 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa Road E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Phytoplankton Sample Results*

**Lab Number:** L1835656-6 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 21, 2016 **Submitter:** CLIENT

**Sample ID:** LAB-2

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Bacillariophyceae | *Asterionella* | *formosa* | Single Cell | 4000 | 630 | 2520000 |
| Bacillariophyceae | *Cyclotella* | *sp.* | Single Cell | 12000 | 500 | 6000000 |
| Bacillariophyceae | *Melosira* | *sp.* | Filament | 16000 | 21120 | 337920000 |
| Bacillariophyceae | *Nitzschia* | *sp.* | Single Cell | 6000 | 640 | 3840000 |
| Bacillariophyceae | *Rhizosolenia* | *sp.* | Single Cell | 161000 | 450 | 72450000 |
| Bacillariophyceae | *Synedra* | *sp.* | Single Cell | 12000 | 540 | 6480000 |
| Chlorophyceae | *Elakatothrix* | *sp.* | Single Cell | 1000 | 180 | 180000 |
| Chlorophyceae | *Monoraphidium* | *sp.* | Single Cell | 6000 | 120 | 720000 |
| Chlorophyceae | *Pediastrum* | *privum* | Colony | 6000 | 450 | 2700000 |
| Chlorophyceae | *Unidentified* | | Single Cell | 31000 | 64 | 1984000 |
| Chrysophyceae | *Dinobryon* | *bavaricum* | Single Cell | 1000 | 540 | 540000 |
| Chrysophyceae | *small chrysophytes* | | Single Cell | 167000 | 64 | 10688000 |
| Cryptophyceae | *Cryptomonas* | *sp.* | Single Cell | 68000 | 12000 | 816000000 |
| Cryptophyceae | *Unidentified* | | Single Cell | 56000 | 324 | 18144000 |
| Cyanophyceae | *Anabaena* | *sp.* | Filament | 1000 | 1440 | 1440000 |
| Cyanophyceae | *Aphanizomenon* | *sp.* | Filament | 1000 | 3840 | 3840000 |
| Cyanophyceae | *Gomphosphaeria* | *sp.* | Colony | 2000 | 27000 | 54000000 |

**Date Printed:** February 09, 2017

**Lab Number:** L1835656-6 **Work Order** L1835656 **Sample Type** PLANKTON

**Date Sampled:** September 21, 2016 **Submitter:** CLIENT

**Sample ID:** LAB-2

| Class | Genus | Species | Unit: | Units/L | Biovolume Unit µm3 | Biovolume Total µm3 |
|---|---|---|---|---|---|---|
| Cyanophyceae | *Planktolyngbya* | *sp.* | Filament | 2000 | 960 | 1920000 |
| Dinophyceae | *Gymnodinium* | *sp.* | Single Cell | 5000 | 27000 | 135000000 |
| Dinophyceae | *Peridinium* | *sp.* | Single Cell | 2000 | 18750 | 37500000 |
| Euglenophyceae | *Trachelomonas* | *sp.* | Single Cell | 6000 | 4500 | 27000000 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# Zooplankton Sample Results

**Lab Number:** L1835656-6 **Work Order** L1835656

**Date Sampled:** September 21, 2016 **Submitter:** CLIENT
**Sample ID:** LAB-2

*Volume Decanted (mL):* 500
*Volume Analyzed (mL):* 10

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | | | | *Unidentified* | | 7300 | 9.72E+05 | 7.10E+09 |
| Crustacea | Branchiopoda | Cladocera | Bosminidae | *Bosmina* | *sp.* | 1000 | 1.62E+07 | 1.62E+10 |
| Crustacea | Branchiopoda | Cladocera | Chydoridae | *Chydorus* | *sp.* | 2400 | 1.08E+07 | 2.59E+10 |
| Crustacea | Branchiopoda | Cladocera | Daphniidae | *Daphnia* | *sp.* | 150 | 2.59E+07 | 3.89E+09 |
| Crustacea | Branchiopoda | Cladocera | Holopediidae | *Holopedium* | *sp.* | 50 | 6.91E+07 | 3.46E+09 |
| Protozoa | Ciliata | Peritrichida | Epistylidae | *Epistylis* | *sp.* | 300 | 9.60E+04 | 2.88E+07 |
| Protozoa | Ciliata | | | *Unidentified* | | 3800 | 1.73E+06 | 6.57E+09 |
| Protozoa | Ciliata | Peritrichida | Vorticellidae | *Vorticella* | *sp.* | 1900 | 2.16E+05 | 4.10E+08 |
| Crustacea | Copepoda | | | *Nauplii* | | 5000 | 9.72E+05 | 4.86E+09 |
| Crustacea | Copepoda | Cyclopoida | | *To young to ID* | | 3500 | 6.75E+06 | 2.36E+10 |
| Crustacea | Copepoda | Calanoida | | *To young to ID* | | 100 | 1.62E+07 | 1.62E+09 |
| Protozoa | Filosia | Aconchulinida | Cyphoderiidae | *Cyphoderia* | *sp.* | 200 | 4.32E+05 | 8.64E+07 |
| Protozoa | Heliozoa | Actinophryida | Actinosphaeridae | *Actinosphaerium* | *sp.* | 800 | 2.16E+05 | 1.73E+08 |
| Arthropoda | Insecta | Diptera | Chironomidae | *Unidentified* | | 50 | 8.55E+07 | 4.28E+09 |

**Date Printed:** February 09, 2017

ALS Environmental
1329 Niakwa RD E - Unit 12
Winnipeg, Manitoba R2J 3T4
(204) 255-9720

# *Zooplankton Sample Results*

**Lab Number:** L1835656-6 **Work Order** L1835656

**Date Sampled:** September 21, 2016 **Submitter:** CLIENT
**Sample ID:** LAB-2

***Volume Decanted (mL):*** 500
***Volume Analyzed (mL):*** 10

| Phylum | Class | Order | Family | *Genus* | *Species* | Total No. per Sample | Average µm3 Biovolume | Biovolume µm3 per Sample |
|---|---|---|---|---|---|---|---|---|
| Rotifera | Monogononta | Ploima | Asplanchnidae | *Asplanchna* | *sp.* | 800 | 6.53E+07 | 5.23E+10 |
| Rotifera | Monogononta | Collothecaceae | Collothecidae | *Collotheca* | *sp.* | 500 | 3.00E+05 | 1.50E+08 |
| Rotifera | Monogononta | Flosculariaceae | Conochilidae | *Conochilus* | *sp.* | 1800 | 3.24E+05 | 5.83E+08 |
| Rotifera | Monogononta | Ploima | Gastropodidae | *Gastropus* | *sp.* | 6400 | 4.86E+05 | 3.11E+09 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Kellicottia* | *longispina* | 1100 | 5.40E+05 | 5.94E+08 |
| Rotifera | Monogononta | Ploima | Brachionidae | *Keratella* | *sp.* | 9900 | 3.24E+05 | 3.21E+09 |
| Rotifera | Monogononta | Ploima | Synchaetidae | *Polyarthra* | *sp.* | 2700 | 3.24E+05 | 8.75E+08 |
| Rotifera | Monogononta | Ploima | Trichocercidae | *Trichocerca* | *sp.* | 900 | 9.60E+05 | 8.64E+08 |

**Date Printed:** February 09, 2017

ALS Environmental
www.alsglobal.com

# Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1835656-COFC

COC Number: 14 - 427473

Page 1 of 1

| Report To | | Report Format / Distribution | | Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) |
|---|---|---|---|---|
| Company: | | Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL) | | R ☒ Regular (Standard TAT if received by 3pm) |
| Contact: | | Quality Control (QC) Report with Report ☐ Yes ☐ No | | P ☐ Priority (2-4 business days if received by 3pm) |
| Address: | | ☐ Criteria on Report - provide details below if box checked | | E ☐ Emergency (1-2 business days if received by 3pm) |
| | | Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX | | E2 ☐ Same day or weekend emergency if received by 10am – contact ALS for surcharge. |
| Phone: | | Email 1 or Fax | | Specify Date Required for E2,E or P: |
| | | Email 2 | | |

**Analysis Request**

| Invoice To | | | Invoice Distribution | Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Same as Report To | ☒ Yes ☐ No | Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX | F | P | F | | | | | | | | | | | |
| | Copy of Invoice with Report | ☒ Yes ☐ No | | Chlorophyll | Zooplankton Community | Phytoplankton Community | | | | | | | | | | | Number of Containers |
| Company: | | | Email 1 or Fax | | | | | | | | | | | | | | |
| Contact: | | | Email 2 | | | | | | | | | | | | | | |

| Project Information | | Oil and Gas Required Fields (client use) | |
|---|---|---|---|
| ALS Quote #: | | Approver ID: | Cost Center: |
| Job #: | | GL Account: | Routing Code: |
| PO / AFE: | | Activity Code: | |
| LSD: | | Location: | |

| ALS Lab Work Order # (lab use only) | ALS Contact: | Sampler: |
|---|---|---|
| | | |

| ALS Sample # (lab use only) | Sample Identification and/or Coordinates (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | | | | Number of Containers |
|---|---|---|---|---|---|---|---|---|
| | LA-1 | 14Sept16 | | Plankton | X | X | X | 3 |
| | | 10Sept16 | | | | | | 3 |
| | | 13Sept16 | | | | | | 3 |
| | | 12Sept16 | | | | | | 3 |
| | | 15Sept16 | | | | | | 3 |
| | LAB-2 | 21Sept16 | | | | | | 3 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| Drinking Water (DW) Samples[1] (client use) | Special Instructions / Specify Criteria to add on report (client Use) |
|---|---|
| Are samples taken from a Regulated DW System? ☐ Yes ☐ No | |
| Are samples for human drinking water use? ☐ Yes ☐ No | |

**SAMPLE CONDITION AS RECEIVED (lab use only)**

| Frozen | ☐ | SIF Observations | Yes ☐ | No ☐ |
|---|---|---|---|---|
| Ice packs | ☐ Yes | ☐ No | ☐ Custody seal intact | ☐ Yes ☐ No |
| Cooling Initiated | ☐ | | | |

| INITIAL COOLER TEMPERATURES °C | | | | FINAL COOLER TEMPERATURES °C | | | |
|---|---|---|---|---|---|---|---|
| 4°C | | | | | | | |

| SHIPMENT RELEASE (client use) | | | INITIAL SHIPMENT RECEPTION (lab use only) | | FINAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|---|---|---|---|---|
| Released by: | Date: Sept 23/16 | Time: 15:30 | Received by: | Date: 23/9/16 | Time: 15:30 | Received by: | Date: Time: |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY



Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

| EcoMetrix - Denison Mine 2016 | | | | | | |
|---|---|---|---|---|---|---|
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | LA-1 | | |
| | | | | #1 | #2 | #3 |
| Nematoda | | | | | | |
| Microturbellaria | | | | | | |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | | | |
| Oligochaeta | Naididae | Tubificinae | | | | 3 |
| Oligochaeta | Naididae | Naidinae | | | | |
| Gastropoda | Lymnaeidae | | (i/d) | | | |
| Gastropoda | Planorbidae | | *Gyraulus* | | | |
| Gastropoda | Valvatidae | | *Valvata sincera* | | | |
| Pelecypoda | Pisidiidae | | (i/d) | | 2 | |
| Pelecypoda | Pisidiidae | | *Pisidium* | | | |
| Acari - Hydrachnidia | | | (i/d) | | | |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | | | |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | | | |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | | | |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | | | |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | | | |
| Acari - Hydrachnidia | Pionidae | | *Piona* | | | |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | | | |
| Ostracoda | | | | 2 | 2 | |
| Copepoda-Cyclopoida | | | | 1 | 4 | 5 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | 18 | 1 | 4 |
| Cladocera | Chydoridae | | - | | | |
| Cladocera | Chydoridae | | *Eurycercus* | 1 | | |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | | | |
| Cladocera | Macrothricidae | | | | | |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | 1 | | |
| Cladocera | Sididae | | *Latona setifera* | 1 | | |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | | | |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | | | |
| Ephemeroptera | Baetiscidae | | *Baetisca* | | | |
| Ephemeroptera | Caenidae | | *Caenis* | | | |
| Ephemeroptera | Ephemeridae | | *Ephemera* | | 1 | |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | | | |
| Trichoptera | Hydroptilidae | | *Oxyethira* | | 1 | |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | | | |
| Trichoptera | Leptoceridae | | *Mystacides* | | | |
| Trichoptera | Leptoceridae | | *Oecetis* | | | |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | | | |
| Trichoptera | Phryganeidae | | *Agrypnia* | | | |
| Megaloptera | Sialidae | | *Sialis* | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | | | |
| Diptera | Chaoboridae | | *Chaoborus* | 26 | 24 | 18 |
| Diptera | Chironomidae - pupa | | | | | |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 12 | 7 | 26 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | | | |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 1 | | |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | | | |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | | | |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | | | |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | | | |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | | | |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | | 7 | |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Tribelos* | | | |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | | | |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | | | |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | | | |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 6 | 20 | 5 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | | | |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | | | |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | | | |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | | | |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | | | |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | | | |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 2 | 4 | 1 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | | | |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | | | |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | | | |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | | | |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | | | |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | | | |
| Terrestrial | | | | | | |
| | | | ***Total*** | ***71*** | ***73*** | ***62*** |

| EcoMetrix - Denison Mine 2016 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | LA-5 | | | | |
| | | | | #1 | #2 | #3 | #4 | #5 |
| Nematoda | | | | 1 | | 5 | | |
| Microturbellaria | | | | 1 | | | | 1 |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | | | | | |
| Oligochaeta | Naididae | Tubificinae | | | 2 | | | 4 |
| Oligochaeta | Naididae | Naidinae | | 8 | | | | |
| Gastropoda | Lymnaeidae | | (i/d) | | | | | |
| Gastropoda | Planorbidae | | *Gyraulus* | | | | | 4 |
| Gastropoda | Valvatidae | | *Valvata sincera* | | | | | |
| Pelecypoda | Pisidiidae | | (i/d) | 8 | 28 | 6 | 3 | 72 |
| Pelecypoda | Pisidiidae | | *Pisidium* | 7 | 10 | | | 3 |
| Acari - Hydrachnidia | | | (i/d) | | | | | |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | 1 | | | | 1 |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | | 1 | | | 12 |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | | | | | 4 |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | | | | | |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | | | | | |
| Acari - Hydrachnidia | Pionidae | | *Piona* | | 5 | 1 | | |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | | 2 | 1 | 8 | |
| Ostracoda | | | | 18 | 16 | 20 | 40 | 4 |
| Copepoda-Cyclopoida | | | | 16 | 41 | 32 | 8 | 12 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | | | | | |
| Cladocera | Chydoridae | | - | | | | | |
| Cladocera | Chydoridae | | *Eurycercus* | 293 | 54 | 377 | 691 | 82 |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | 8 | | | 8 | |
| Cladocera | Macrothricidae | | | 225 | 40 | 164 | 152 | 76 |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | | | | | |
| Cladocera | Sididae | | *Latona setifera* | | | 4 | | 8 |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | | | | | |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | | | | | 1 |
| Ephemeroptera | Baetiscidae | | *Baetisca* | | | | | |
| Ephemeroptera | Caenidae | | *Caenis* | 39 | 48 | 10 | | 28 |
| Ephemeroptera | Ephemeridae | | *Ephemera* | | | | | 19 |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | | 19 | | | |
| Trichoptera | Hydroptilidae | | *Oxyethira* | | | | | |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | | | | | |
| Trichoptera | Leptoceridae | | *Mystacides* | | | | | 4 |
| Trichoptera | Leptoceridae | | *Oecetis* | | | | | |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | | | | | |
| Trichoptera | Phryganeidae | | *Agrypnia* | | | | | |
| Megaloptera | Sialidae | | *Sialis* | | | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | | 1 | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | 2 | 2 | 1 | | 3 |
| Diptera | Chaoboridae | | *Chaoborus* | | | | | |
| Diptera | Chironomidae - pupa | | | | | | | |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 3 | | 19 | 51 | |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | | | 2 | | 4 |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 8 | 3 | 10 | 21 | 20 |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | 1 | | | | |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | | 3 | | | 1 |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | 1 | | | | |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | 2 | 4 | | | 19 |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | | | | | |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | | 6 | | | |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | 1 | 2 | | | 4 |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | | | | | 4 |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 17 | | | 1 | |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | | | 1 | | |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | | 37 | 4 | | 141 |
| Diptera | Chironomidae | Chironomini | *Tribelos* | | | | | |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | | | | | 4 |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 29 | 8 | 15 | 3 | 8 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | 2 | 1 | 13 | | 1 |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 41 | 24 | 10 | | 27 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | | 3 | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | | 2 | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | | 1 | | | |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | | 4 | | | 6 |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | | 2 | | | |
| Terrestrial | | | | | | | | |
| | | | ***Total*** | ***732*** | ***369*** | ***695*** | ***986*** | ***577*** |

| EcoMetrix - Denison Mine 2016 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | LA-6 | | | | |
| | | | | #1 | #2 | #3 | #4 | #5 |
| Nematoda | | | | 3 | | 4 | 8 | |
| Microturbellaria | | | | | | | | |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | | | | | |
| Oligochaeta | Naididae | Tubificinae | | | | 1 | | |
| Oligochaeta | Naididae | Naidinae | | | | 12 | 24 | |
| Gastropoda | Lymnaeidae | | (i/d) | | | | | |
| Gastropoda | Planorbidae | | *Gyraulus* | | | | | |
| Gastropoda | Valvatidae | | *Valvata sincera* | | | | | |
| Pelecypoda | Pisidiidae | | (i/d) | 2 | 22 | 2 | 4 | 10 |
| Pelecypoda | Pisidiidae | | *Pisidium* | | 3 | 6 | 6 | 6 |
| Acari - Hydrachnidia | | | (i/d) | | | | | |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | | | | | |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | | 1 | 5 | | 2 |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | | | | | |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | | | | | |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | | | | | |
| Acari - Hydrachnidia | Pionidae | | *Piona* | | | | 6 | |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | | | | | |
| Ostracoda | | | | 4 | 8 | 33 | 176 | 26 |
| Copepoda-Cyclopoida | | | | 5 | | 8 | 24 | 24 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | | | | | |
| Cladocera | Chydoridae | | - | | 8 | 8 | | 32 |
| Cladocera | Chydoridae | | *Eurycercus* | 155 | 491 | 297 | 761 | 150 |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | 1 | | | 16 | 24 |
| Cladocera | Macrothricidae | | | 4 | 60 | 128 | 136 | 72 |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | | | | | |
| Cladocera | Sididae | | *Latona setifera* | 1 | | 8 | | |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | | | | 40 | |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | | | | | 1 |
| Ephemeroptera | Baetiscidae | | *Baetisca* | | | | | |
| Ephemeroptera | Caenidae | | *Caenis* | | 7 | 10 | 11 | 171 |
| Ephemeroptera | Ephemeridae | | *Ephemera* | | 1 | 3 | 1 | |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | | | | | |
| Trichoptera | Hydroptilidae | | *Oxyethira* | | | | | |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | | | | | |
| Trichoptera | Leptoceridae | | *Mystacides* | | | | | |
| Trichoptera | Leptoceridae | | *Oecetis* | | | | | 1 |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | | | | | |
| Trichoptera | Phryganeidae | | *Agrypnia* | | | | | |
| Megaloptera | Sialidae | | *Sialis* | | | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | | | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | | | | | |
| Diptera | Chaoboridae | | *Chaoborus* | | | | | |
| Diptera | Chironomidae - pupa | | | | | | | |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 18 | 121 | 4 | | 6 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | | | 5 | | 1 |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 2 | 9 | 7 | 10 | 14 |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | | | | | |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | | | | | |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | | | | | 9 |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | | | | | |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | | | | | |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | | | | | |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | | | | | |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | | | | | |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 1 | 16 | 1 | | 4 |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | | | | | |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | 1 | | | | |
| Diptera | Chironomidae | Chironomini | *Tribelos* | | | | | 2 |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | | 4 | | | |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 6 | 14 | 11 | 3 | 19 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | 5 | 4 | 33 | 65 | 25 |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 14 | 30 | 8 | 49 | 1 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | | | 2 | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | | | | | |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | | | | | |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | | | | | |
| Terrestrial | | | | | | | | |
| | | | ***Total*** | ***222*** | ***799*** | ***596*** | ***1340*** | ***600*** |

| EcoMetrix - Denison Mine 2016 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | LA-7 | | | LA-7A | | |
| | | | | #1 | #2 | #3 | #1 | #2 | #3 |
| Nematoda | | | | | | | | 1 | |
| Microturbellaria | | | | | | | | | |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | | | | | | |
| Oligochaeta | Naididae | Tubificinae | | | | | 1 | | |
| Oligochaeta | Naididae | Naidinae | | | | | | | |
| Gastropoda | Lymnaeidae | | (i/d) | | | | | | |
| Gastropoda | Planorbidae | | *Gyraulus* | | | | | | |
| Gastropoda | Valvatidae | | *Valvata sincera* | | | | | | |
| Pelecypoda | Pisidiidae | | (i/d) | 3 | 1 | 1 | | | |
| Pelecypoda | Pisidiidae | | *Pisidium* | | 1 | | | | |
| Acari - Hydrachnidia | | | (i/d) | | | | | | |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | | | | | | |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | | | | | | |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | | | | | | |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | | 1 | | | | |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | | | | | | |
| Acari - Hydrachnidia | Pionidae | | *Piona* | | | | | | |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | 1 | | 1 | | | |
| Ostracoda | | | | 7 | 17 | 3 | | 5 | |
| Copepoda-Cyclopoida | | | | 4 | 1 | 1 | | 14 | 2 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | | | | | | |
| Cladocera | Chydoridae | | - | | | | | | |
| Cladocera | Chydoridae | | *Eurycercus* | 1 | 3 | 6 | | | |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | | | | | | |
| Cladocera | Macrothricidae | | | | 2 | | | | |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | | | | | | |
| Cladocera | Sididae | | *Latona setifera* | 2 | | | | 4 | 1 |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | | | | | | |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | | | | | | |
| Ephemeroptera | Baetiscidae | | *Baetisca* | | | | | | |
| Ephemeroptera | Caenidae | | *Caenis* | | | 1 | | | |
| Ephemeroptera | Ephemeridae | | *Ephemera* | | | | | | |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | | | | | | |
| Trichoptera | Hydroptilidae | | *Oxyethira* | | | | | | |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | | | | | | |
| Trichoptera | Leptoceridae | | *Mystacides* | | | | | | |
| Trichoptera | Leptoceridae | | *Oecetis* | | | | | | |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | | | | | | |
| Trichoptera | Phryganeidae | | *Agrypnia* | | | | | | |
| Megaloptera | Sialidae | | *Sialis* | | | | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | | | | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | | | | | | |
| Diptera | Chaoboridae | | *Chaoborus* | | 1 | 2 | 1 | 1 | 1 |
| Diptera | Chironomidae - pupa | | | 1 | | | | | |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 17 | 106 | 79 | 8 | 48 | 5 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 2 | 2 | 1 | 2 | | 3 |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 9 | 25 | 49 | 8 | 2 | 20 |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | 1 | | | | | |
| Diptera | Chironomidae | Chironomini | *Tribelos* | | | | | | |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | | 17 | 10 | 18 | 7 | 15 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | 6 | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | | | 1 | | | |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | | | | | | 1 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | 2 | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | | | | | | |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | | | | | | |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | | | | | | |
| Terrestrial | | | | | | | | | |
| | | | ***Total*** | ***56*** | ***177*** | ***155*** | ***38*** | ***82*** | ***48*** |

| EcoMetrix - Denison Mine 2016 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | LA-8 | | | LA-9 | | |
| | | | | #1 | #2 | #3 | #1 | #2 | #3 |
| Nematoda | | | | | | | | | |
| Microturbellaria | | | | | | | | | |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | | | | | | |
| Oligochaeta | Naididae | Tubificinae | | | 1 | | 4 | | |
| Oligochaeta | Naididae | Naidinae | | | | | | | |
| Gastropoda | Lymnaeidae | | (i/d) | | | | | | |
| Gastropoda | Planorbidae | | *Gyraulus* | | | | | | |
| Gastropoda | Valvatidae | | *Valvata sincera* | | | | | | |
| Pelecypoda | Pisidiidae | | (i/d) | | 1 | | | | 1 |
| Pelecypoda | Pisidiidae | | *Pisidium* | | | 1 | 1 | | |
| Acari - Hydrachnidia | | | (i/d) | | | | | | |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | | | | 2 | | |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | | | | | | |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | | | | | | |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | | | 1 | | | |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | | | | 1 | | |
| Acari - Hydrachnidia | Pionidae | | *Piona* | | | | 4 | | |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | 1 | | | 1 | | |
| Ostracoda | | | | | | | 13 | | |
| Copepoda-Cyclopoida | | | | | | | 4 | 4 | 1 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | | | | | | |
| Cladocera | Chydoridae | | - | | | | | | |
| Cladocera | Chydoridae | | *Eurycercus* | | 1 | | | | |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | | | | | | |
| Cladocera | Macrothricidae | | | 1 | 1 | | | | |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | | | | | | |
| Cladocera | Sididae | | *Latona setifera* | | | | | | |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | | | | | | |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | | | | | | |
| Ephemeroptera | Baetiscidae | | *Baetisca* | | | | | | |
| Ephemeroptera | Caenidae | | *Caenis* | 1 | | | 3 | | |
| Ephemeroptera | Ephemeridae | | *Ephemera* | | | | | | |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | | | | 3 | | |
| Trichoptera | Hydroptilidae | | *Oxyethira* | | | | | | |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | | | | | | |
| Trichoptera | Leptoceridae | | *Mystacides* | | | | | | |
| Trichoptera | Leptoceridae | | *Oecetis* | | | | | | |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | | | | | | |
| Trichoptera | Phryganeidae | | *Agrypnia* | | | | | | |
| Megaloptera | Sialidae | | *Sialis* | | | | 1 | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | | | | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | | | | 2 | | |
| Diptera | Chaoboridae | | *Chaoborus* | 3 | 5 | 6 | 8 | 51 | 41 |
| Diptera | Chironomidae - pupa | | | 1 | | | | | |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 1 | 5 | 8 | 4 | 24 | 45 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | | 1 | | | 1 | |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 2 | 2 | 1 | 3 | | |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | | 1 | | | | |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 10 | 31 | 18 | 5 | | |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | | | | | 1 | |
| Diptera | Chironomidae | Chironomini | *Tribelos* | | | | 1 | | |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | 1 | 1 | | | | 3 |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 16 | 8 | 8 | 59 | 16 | 15 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | | 1 | | 4 | | |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 1 | | | 15 | | 1 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | 1 | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | | | | | | |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | | | | 1 | | |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | | | | | | |
| Terrestrial | | | | | | | | | 1 |
| | | | ***Total*** | ***39*** | ***59*** | ***43*** | ***139*** | ***97*** | ***108*** |

| EcoMetrix - Denison Mine 2016 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | LB-3 | | | LAB-1 | | |
| | | | | #1 | #2 | #3 | #1 | #2 | #3 |
| Nematoda | | | | | | | 9 | 3 | |
| Microturbellaria | | | | | | | | | 1 |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | | | | 1 | | |
| Oligochaeta | Naididae | Tubificinae | | 25 | 9 | 77 | 14 | 45 | 41 |
| Oligochaeta | Naididae | Naidinae | | 3 | | | 20 | 3 | |
| Gastropoda | Lymnaeidae | | (i/d) | | | | | | |
| Gastropoda | Planorbidae | | *Gyraulus* | | | | | | |
| Gastropoda | Valvatidae | | *Valvata sincera* | 1 | | | | | |
| Pelecypoda | Pisidiidae | | (i/d) | 6 | 51 | 12 | 34 | 21 | 14 |
| Pelecypoda | Pisidiidae | | *Pisidium* | 2 | 17 | 12 | 13 | 6 | 4 |
| Acari - Hydrachnidia | | | (i/d) | | 8 | | 1 | | |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | | | | | | |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | | | | | | |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | | | | | | |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | | | | | | |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | | | | | | |
| Acari - Hydrachnidia | Pionidae | | *Piona* | | 8 | | 1 | 1 | 1 |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | | | 1 | 1 | 2 | 1 |
| Ostracoda | | | | 1 | 8 | | 4 | 1 | 1 |
| Copepoda-Cyclopoida | | | | 8 | | 4 | 2 | 11 | 14 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | | | | | | |
| Cladocera | Chydoridae | | - | | | | | | |
| Cladocera | Chydoridae | | *Eurycercus* | | 8 | | | | |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | | | | | 1 | |
| Cladocera | Macrothricidae | | | | 8 | | 2 | | |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | | | | | | |
| Cladocera | Sididae | | *Latona setifera* | 2 | | | | 1 | |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | | | | | | |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | | | | | | |
| Ephemeroptera | Baetiscidae | | *Baetisca* | | | | | | |
| Ephemeroptera | Caenidae | | *Caenis* | | 1 | | | | |
| Ephemeroptera | Ephemeridae | | *Ephemera* | | | | | | |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | | | | | | |
| Trichoptera | Hydroptilidae | | *Oxyethira* | | | | | | |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | | | | | | |
| Trichoptera | Leptoceridae | | *Mystacides* | | | | | | |
| Trichoptera | Leptoceridae | | *Oecetis* | | | | | | |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | | | | 1 | | |
| Trichoptera | Phryganeidae | | *Agrypnia* | | | | | | |
| Megaloptera | Sialidae | | *Sialis* | | | 1 | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | | | | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | | | | | | |
| Diptera | Chaoboridae | | *Chaoborus* | 80 | 14 | 14 | | | 1 |
| Diptera | Chironomidae - pupa | | | | | | | | |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 16 | 17 | 46 | 3 | 35 | 54 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | 6 | 9 | | 32 | 3 | 9 |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | | 3 | 2 | 2 | 1 | 5 |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | | 30 | | 8 | | |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | | | | 7 | | |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | | | | 2 | | |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 15 | 18 | 3 | 34 | 3 | 14 |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | | | | | | |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | | | | | 1 | |
| Diptera | Chironomidae | Chironomini | *Tribelos* | | 1 | | 1 | | |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | | | | | | |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | 2 | | | | 1 | |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 43 | 114 | 44 | 12 | 21 | 12 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | | | 2 | | | |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | | 8 | | 58 | 1 | 3 |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | | 1286 | 3 | | | |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | | | | | | |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | | | | 1 | | |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 2 | 140 | 5 | 106 | 12 | 18 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | | | | | | |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | | | | 1 | | |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | | | | | | |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | | | | | | |
| Terrestrial | | | | | | | | | |
| | | | ***Total*** | ***212*** | ***1758*** | ***226*** | ***370*** | ***173*** | ***193*** |

| EcoMetrix - Denison Mine 2016 | | | | | | |
|---|---|---|---|---|---|---|
| Major Taxon | Family | Subfamily/Tribe | Genus/Species | LAB-2 | | |
| | | | | #1 | #2 | #3 |
| Nematoda | | | | 7 | 2 | 9 |
| Microturbellaria | | | | | | |
| Hirudinea | Erpobdellidae | | *Erpobdella punctata* | | | |
| Oligochaeta | Naididae | Tubificinae | | 5 | 5 | 1 |
| Oligochaeta | Naididae | Naidinae | | | | |
| Gastropoda | Lymnaeidae | | (i/d) | | | 1 |
| Gastropoda | Planorbidae | | *Gyraulus* | | | |
| Gastropoda | Valvatidae | | *Valvata sincera* | | | |
| Pelecypoda | Pisidiidae | | (i/d) | 13 | 32 | 40 |
| Pelecypoda | Pisidiidae | | *Pisidium* | 5 | 6 | 14 |
| Acari - Hydrachnidia | | | (i/d) | | | |
| Acari - Hydrachnidia | Arenuridae | | *Arrenurus* | | | |
| Acari - Hydrachnidia | Hygrobaetidae | | *Hygrobates* | 2 | 4 | |
| Acari - Hydrachnidia | Lebertiidae | | *Lebertia* | | | |
| Acari - Hydrachnidia | Limnesiidae | | *Limnesia* | | | |
| Acari - Hydrachnidia | Oxidae | | *Oxus* | | | |
| Acari - Hydrachnidia | Pionidae | | *Piona* | 1 | | 1 |
| Acari - Hydrachnidia | Unionicolidae | | *Unionicola* | | 1 | |
| Ostracoda | | | | 1 | | |
| Copepoda-Cyclopoida | | | | 3 | | 4 |
| Cladocera | Holopedidae | | *Holopedium gibberum* | | | |
| Cladocera | Chydoridae | | - | | | |
| Cladocera | Chydoridae | | *Eurycercus* | 3 | | |
| Cladocera | Ilyocryptidae | | *Ilyocryptus* | | | |
| Cladocera | Macrothricidae | | | 4 | | |
| Cladocera | Polyphemidae | | *Polyphemus pediculus* | | | |
| Cladocera | Sididae | | *Latona setifera* | 2 | | |
| Amphipoda | Gammaridae | | *Gammarus lacustris* | | | |
| Amphipoda | Hyalellidae | | *Hyalella azteca* | | | |
| Ephemeroptera | Baetiscidae | | *Baetisca* | | 1 | |
| Ephemeroptera | Caenidae | | *Caenis* | | | 1 |
| Ephemeroptera | Ephemeridae | | *Ephemera* | | 7 | 29 |
| Ephemeroptera | Ephemeridae | | *Hexagenia limbata* | | | 1 |
| Trichoptera | Hydroptilidae | | *Oxyethira* | | | |
| Trichoptera | Lepidosomatidae | | *Lepidostoma* | 1 | | |
| Trichoptera | Leptoceridae | | *Mystacides* | | | 5 |
| Trichoptera | Leptoceridae | | *Oecetis* | 2 | 2 | |
| Trichoptera | Molannidae | | *Molannodes / Molanna* | 2 | | |
| Trichoptera | Phryganeidae | | *Agrypnia* | 1 | | |
| Megaloptera | Sialidae | | *Sialis* | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Bezzia* | | | |
| Diptera | Ceratopogonidae | Ceratopogoninae | *Probezzia* | | | 2 |
| Diptera | Chaoboridae | | *Chaoborus* | | | |
| Diptera | Chironomidae - pupa | | | | | |
| Diptera | Chironomidae | Chironomini | *Chironomus* | 7 | 1 | 2 |
| Diptera | Chironomidae | Chironomini | *Cladopelma* | | | |
| Diptera | Chironomidae | Chironomini | *Cryptochironomus* | 6 | 5 | 7 |
| Diptera | Chironomidae | Chironomini | *Cryptotendipes* | | | |
| Diptera | Chironomidae | Chironomini | *Demicryptochironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Dicrotendipes* | 49 | 53 | 126 |
| Diptera | Chironomidae | Chironomini | *Endochironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Microtendipes* | | | |
| Diptera | Chironomidae | Chironomini | *Nilothauma* | | | 1 |
| Diptera | Chironomidae | Chironomini | *Parachironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Paracladopelma* | | | 1 |
| Diptera | Chironomidae | Chironomini | *Polypedilum* | 1 | | 1 |
| Diptera | Chironomidae | Chironomini | *Stenochironomus* | | | |
| Diptera | Chironomidae | Chironomini | *Stictochironomus* | 33 | 23 | 24 |
| Diptera | Chironomidae | Chironomini | *Tribelos* | | | |
| Diptera | Chironomidae | Pseudochironomini | *Pseudochironomus* | 1 | 5 | 11 |
| Diptera | Chironomidae | Tanypodinae | *Ablabesmyia* | 1 | | |
| Diptera | Chironomidae | Tanypodinae | *Guttipelopia guttipennis* | | | |
| Diptera | Chironomidae | Tanypodinae | *Procladius* | 10 | 3 | 44 |
| Diptera | Chironomidae | Tanypodinae | *Tanypus* | | | |
| Diptera | Chironomidae | Tanypodinae | *Thienemannimyia* gr. | | | |
| Diptera | Chironomidae | Tanytarsini | *Cladotanytarsus* | 4 | 1 | 49 |
| Diptera | Chironomidae | Tanytarsini | *Corynocera* | | | |
| Diptera | Chironomidae | Tanytarsini | *Neostempellina* | | 1 | 4 |
| Diptera | Chironomidae | Tanytarsini | *Paratanytarsus* | | | 16 |
| Diptera | Chironomidae | Tanytarsini | *Tanytarsus* | 23 | 21 | 336 |
| Diptera | Chironomidae | Orthocladiinae | *Cricotopus/Orthocladius* | | | 4 |
| Diptera | Chironomidae | Orthocladiinae | *Epoicocladius* | | | |
| Diptera | Chironomidae | Orthocladiinae | *Heterotanytarsus* | | | 4 |
| Diptera | Chironomidae | Orthocladiinae | *Heterotrissocladius* | 1 | 4 | |
| Diptera | Chironomidae | Orthocladiinae | *Paracladius* | | | |
| Diptera | Chironomidae | Orthocladiinae | *Psectrocladius* | 2 | 2 | |
| Diptera | Chironomidae | Diamesinae | *Potthastia longimana* group | 1 | 3 | 1 |
| Diptera | Chironomidae | Prodiamesinae | *Monodiamesa* | | | |
| Terrestrial | | | | | | 1 |
| | | | ***Total*** | ***191*** | ***182*** | ***740*** |

## QA/QC – SORTING EFFICIENCY

| Site | % sorting efficiency |
|---|---|
| LA-1 #1 | [1-(0/(71+0))]*100 = 100 |
| LA-5 #2 | [1-(3/(369+3))]*100 = 99.2 |
| LA-7 #3 | [1-(1/(155+1))]*100 = 99.4 |

**Average efficiency – 99.5%**

% sorting efficiency = [1-((# in QA/AC re-sort / (# sorted originally + # QA/QC resort))]* 100

# Benthic Invertebrate Sample Processing Methods

The field samples (usually three or five for each site) are processed separately. Each sample is divided into the coarse and the fine fractions. The coarse fractions are sorted completely and the fine fractions, if required, are subsampled independently using a modification of the subsampling method (Wrona et al. 1982).

1. Pour sample into sieves (2 mm, 1 mm, 500/250 μm) and wash through well with running water to remove preservative and silt); if there is only small amounts of larger organic material, the 2 mm sieve can be omitted.
2. Transfer the coarse fraction (contents of the 2-mm and 1 mm sieves) into individual container and add 70 % alcohol. Label container with site number and fraction size. Now this fraction is ready for sorting.
3. Transfer the fine fraction (contents of 500/250 μm sieve) into 2-L container for decanting. Add warm water to the 2 L container, swirl and decant water and organic material into the 0.250 mm sieve, repeating until all organic material is washed out of the sand; then scan container under magnifying glass for heavy-shelled or stone-cased animals and pick them out; then discard sand and gravel. Transfer this fine fraction into individual container and add 70 % alcohol. Label container with site number and fraction size. Now this fraction is ready for sorting.

**Coarse Fraction**

4. Sort out all organisms from the coarse fraction by the "grid method" and place them into properly labeled vials (if there are large numbers of Ephemeroptera, Plecoptera, Trichoptera or any other group place them in a separate vial). The grid method consists of a petri dish with a gridded bottom (1 x 1-cm). Add small amounts of organic material into the petri dish and pick out all benthic invertebrates with fine (#5) forceps under ~ 6 X magnification, proceeding row by row. Once done with a dish, re-mix material and quickly re-scan to catch any animals that were missed.
5. In some situations there is very little organic material in the fine fractions and usually very few organisms, in which case subsampling as described below, is not required for the fine fractions.

**Fine Fraction**

6. When there is a lot of organic material in the fine fractions and/or large numbers of organisms, a subsampling of the fine fractions is to be done.
7. Pour contents of 0.250-mm fraction container into the Imhoff cone and ensure that all material is transferred from the container. Fill the cone to the 1-L mark with diluted alcohol and allow bubbling for about 5 minutes to ensure thorough mixing. Remove ten 25-ml subsamples from the Imhoff cone with the 25-ml subsampler container and pour into gridded petri dishes (total volume of 250 ml removed). Examine each 25 ml subsample under the microscope (~12 X magnification) and go through each petri dish twice.

8. Generally, the recommended portion to subsample is a minimum of one-quarter (250-ml). However, if very large numbers of organisms are present the following guidelines are provided:
   - if each 25 ml subsample contains 35-50 organisms, then do all ten 25 ml subsamples (total volume of 250 ml),
   - if each 25 ml subsample contains 50-75 organisms, then do eight 25 ml subsamples (total volume of 200 ml),
   - if each 25 ml subsample contains 75-100 organisms, then do five 25 ml subsamples (total volume of 125 ml),
   - if each 25 ml subsample contains 100-150 organisms, then do four 25 ml subsamples (total volume of 100 ml),
   - for samples with very large number of organisms – if each 25 ml subsample contains >150 organisms, contact the project manager for confirmation, prior to doing two 25 ml subsamples (total volume of 50 ml),
   - for samples with very few organisms – if each 25 ml subsample contains less than 35 organisms, then do twenty 25 ml subsamples (total volume 500ml) or whole fine fraction'
9. Place the sorted and the unsorted material from the subsamples into a container for archiving and label them properly.
10. Return all sorted organisms, and archived sorted and unsorted samples to the Project Manager.

**Hints on subsampling**

Coarse fraction:

If there is a lot of material (takes more than 3-4 h to pick through), add the entire coarse fraction to a petri dish, distribute it evenly, and use an L-shaped piece of plastic to delineate a quarter of the dish and remove a quarter of the coarse fraction for sorting. The sorted and unsorted detritus should be dried and weighed to determine the exact amount sorted.
Other methods, such as evenly distributing the coarse fraction (after removing the water with a sieve) on a gridded surface (e.g. 4x4 grid) and randomly picking a sufficient number of cells on the grid to add up to ¼ of the sample (4 for this example) are also acceptable. At least 1/4 of the coarse fraction should be sorted.

Fine fraction:

If the amount of material is low, sort the entire fine fraction. If there is a lot of material, subsample it using cone with bubbler (Wrona et al. 1982), method described above. Aim for sorting a minimum of a quarter of the fine fraction, or for removing at least 100 individuals of the dominant animals (at the level of genus or Chironomidae subfamily/tribe). Staining of the fine fraction (with haematoxalin or rose bengal) will improve sorting quality.

## Identification

Once the field subsamples have been sorted, they are ready for the identification. All organisms should be identified to the lowest practical taxonomic level (genus or species wherever feasible) using current literature and nomenclature.

Level of taxonomic identification

| Group | Level |
|---|---|
| Nematoda | phylum |
| Oligochaeta | family |
| Gastropoda | genus/species |
| Turbellaria | family |
| Hirudinea | species |
| Mollusca | genus/species |
| Hydracarina | leave at this level |
| Cladocera | leave at this level |
| Copepoda | order |
| Ostracoda | leave at this level |
| Amphipoda | genus |
| Insecta | genus/species |
| Terrestrial | leave at this level |

The level of taxonomy should be consistent in each major group for all samples from a survey and from survey to survey. Organisms that cannot be identified to the desired level of taxonomic precision should be reported as a separate category (at the finest level of taxonomic resolution possible).
Organisms which require detailed microscopic examination for identification (e.g., Chironomidae) will be mounted onto microscope slides using an appropriate mounting medium (e.g. CMC 10, Canada balsam, Permount, Hohers's). The commonest species may be distinguishable on the basis of gross morphology and may require only a few mounts (5-10) as checks. All rare or less commonly occurring species are mounted for identification.
A reference collection (if required) is prepared of all taxa identified from the samples. These collections are retained for taxonomic verification, ensuring consistent taxonomy and for quality control checks.

## Weighing samples (wet biomass)

The coarse and fine fractions of each sample are analyzed separately, and are further subdivided into taxonomic groups (e.g. Ephemeroptera, Plecoptera, Trichoptera,

Chironomidae, other Diptera, and other Invertebrates). Excess preservative (70% alcohol) is removed with filter paper. Biomass is then measured on an electronic analytical balance (Mettler ER-182A) with a resolution of 0.01 mg.

**Deformities in Chironomidae**

Head capsules are removed with a sharpened probe from 125 randomly selected larvae. Heavily sclerotized individuals are cleared in warm 10% KOH, followed by rinsing in distilled water and then 70% ethanol. Head capsules are mounted individually in a mounting medium with the ventral side upwards on a slide. A small paintbrush is used to apply pressure without breaking the cover slip to fully flatten the head capsule. Mentum, mandible teeth and antennae of each individual are examined for abnormal appearance using compound microscope (magnification up to 400X).

---

**Commonly used literature for ID**

The taxa were identified using the following references, as appropriate:


Alder, P.H., D.C. Currie, and D. M. Wood. 2004. The Black Flies (Simulidae) of North America. Cornell University Press. 941pp.

Anderson, T., P. S. Cranston, and J. H. Epler (eds). 2013. Chironomidae of the Holarctic Region. Keys and diagnosis – Larvae. Insect Systematics and Evolution. Suppl. 66: 1-573.

Blahnik, R.J., and R. W. Holzenthal. 2006. Revision of the genus *Culoptila*. (Trichoptera: Glossosomatidae). Zootaxa 1233:1-52 (online edition).

Brinkhurst, R.O. 1986. Guide to the freshwater aquatic microdrile oligochaetes of North America. Can. Spec. Publ. Fish. Aquatic Sci. 98: 1-259.

Brooks, A.R., and L.A. Kelton. 1967. Aquatic and semiaquatic Heteroptera of Alberta, Saskatchewen, and Manitoba (Hemiptera). Memoirs of The Entomological Society of Canada, No. 51. 92 pp.

Clifford, H.F. 1991. Aquatic Invertebrates of Alberta. University of Alberta Press, Edmonton, Alberta. 538 pp.

Coffman, W.P., and L.C. Ferrington, Jr. 1996. pp. 635-754, In R.W. Merritt, and K.W.

Cummins (eds). An introduction to the aquatic insects of North America. (3rd ed.). Kendall/Hunt Publishing Company, Dubuque, Iowa. 862 pp.

Edmunds, G.F., Jr., S.L. Jensen, and L. Berner. 1976. The mayflies of North and Central America. University of Minnesota Press, Minneapolis. 330 pp.

Epler J. H. 2001. Identification manual for the larval Chironomidae (Diptera) of North and South Carolina. Special publication SJ2001-SP13. North Carolina Department of Environment and Natural Resources. 176 pp.

Kathman, R.D., and R.O. Brinkhurst. 1998. (Revised May 1999). Guide to the freshwater oligochaetes of North America. Aquatic Resources Center, Thompsons Station, Tennessee. 264pp.

Larson, D.J., Y. Alarie, and R.F. Roughley. 2000. Predaceous diving Beetles (Coleoptera: Dytiscidae) of the Nearctic Region with emphasis on the fauna of Canada and Alaska. NRC Res. Press, Ottawa, Ontario. 982pp.

Maschwitz, D.E., and E.F. Cook. 2000. Revision of the Nearctic species of the genus Polypedilum Kieffer (Diptera: Chironomidae) in the Subgenus P. (Polypedilum) Kieffer and P. (Urespedilum) Oyewo and Saether. Ohio Biological Survey Buletin (New Series) Vol. 12. N. 3. 135pp.

Maw, H.E.L., R.G. Foottit, K.G.A. Hamilton, and G.G.E. Scudder. 2000. Checklist of the Hemiptera of Canada and Alaska. NRC Research Press of Canada. 220 pp.

Merritt, R.W., K.W. Cummins, and M.B. Berg (eds). 2008. An introduction to the aquatic insects of North America. (4th ed.). Kendall/Hunt Publishing Company, Dubuque, Iowa. 1158 pp.

McAlpine, J.F., B.V. Peterson, G.E. Shewell, H.J. Teskey, J.R. Vockeroth, and D.M. Wood (cords). 1981. Manual of Nearctic Diptera, Vol. 1. Res. Branch, Agric. Can. Monogr. 28. 674 pp.

McCafferty, W.P., and R.P. Randolph. 1998. Canadian mayflies: A faunistic compendium. Proc. Ent. Soc. Ont. 129: 47-97.

Needham J. G., M.J. Westfall, Jr., and M.J. May. 2000. Dragonflies of North America, revised edition. Scientific Publ., Gainesville, Fl. 939pp.

Oliver, D.R., and M.E. Roussel. 1983. The genera of larval midges of Canada (Diptera: Chironomidae). Part 11. The insects and arachnids of Canada. Biosys. Res. Inst., Ottawa. 263 pp.

Pennak, R.W. 1989. Fresh-water invertebrates of the United States. (3rd ed.). John Wiley & Sons, New York. 628 pp.

Soponis, A.R. 1977. A revision of the Nearctic species of Orthocladius (Orthocladius) Van Der Wulp (Diptera: Chironomidae). Mem. Ent. Soc. Can. 102: 1-187.

Stewart, K.W., and M.W. Oswood. 2006. The Stoneflies (Plecoptera) of Alaska and Western Canada. The Caddis Press, Columbus, Ohia. 325pp.

Stewart, K.W., and B.P. Stark. 2002. Nymphs of North American stonefly genera (Plecoptera), 2nd ed.. The Caddis Press, Columbus, OH. 510 pp.
Tennessen, K. 2007. Odonata larvae of the Pacific Northwest. The Xerces Society for Invertebrate Conservation. 42pp.

Thorp J.H., and A.P. Covich (eds). 2001. Ecology and classification of Noth American freshwater invertaebrates, 2nd ed. Academic Press, San Diego, Ca. 1056 pp.
Wiederholm, T. (ed.). 1983. Chironomidae of the holarctic region. Keys and diagnoses. Part 1. Larvae. Ent. Scand. Suppl. 19: 1-457.

Wiggins, G.B. 1996. Larvae of the North American caddisfly genera (Trichoptera). (2nd ed.). University of Toronto Press, Toronto, Ontario. 457 pp.

Westfall, M.J., Jr., and M.L. May. 1996. Damselflies of North America. Scientific Publishers, Gainesville. 649 pp.

Wrona, F . J. , J. M. Culp, and R. W. Davies.1982. Macroinvertebrate subsampling: a simplified apparatus and approach. *Can. J. Fish. Aquat. Sci.* 39: 1051 - 1054.

Zloty, J. and G. Pritchard. 1997. Larvae and adults of *Ameletus* mayflies (Ephemeroptera: Ameletidae) from Alberta. Can. Ent. 129: 251-289.

Zloty, J., B.J. Sinclair, and G. Pritchard. 2005. Discovered in our backyard: a new genus and species of a new family from the Rocky Mountains of North America (Diptera, Tabanomorpha). Syst. Ent. 30: 248-266.

## Sample Sorting and Taxonomic Identification

Benthic invertebrate samples were processed according to standard protocols based on recommendations in Environment Canada (2002) and Gibbons et al. (1993). Benthic invertebrate samples were first washed through a 500-µm sieve to remove the preservative and fine sediments remaining after field sieving. Organic material was separated from inorganic material using elutriation, and the inorganic material was checked for any remaining shelled or cased invertebrates, which were removed and added to the organic material. The entire coarse fractions were sorted. Fine fractions of samples containing large amounts of detritus or large numbers of organisms were subsampled using the device described by Wrona et al. (1982). All remaining material was preserved for random checks of sorting efficiency.

Invertebrates were identified to the levels recommended by Alberta Environment (1990) and Environment Canada (2010, 2012), typically genus for most invertebrates. Damaged organisms and early instar insects were identified to the lowest level possible, generally to family. The most common taxa should be distinguishable based on gross morphology and should require only a few slide mounts (five to ten) for verification. Organisms that required detailed microscopic examination for identification (i.e., Chironomidae and Oligocheata) were mounted on microscope slides using appropriate medium. All rare or less commonly occurring taxa were mounted on microscope slides for identification. Identifications were made using recognized taxonomic keys.

Data were presented as the number of organisms per sample (organisms/sample) for individual taxa. The biomass (if required), in units of milligrams wet weight (mg, ww), for major taxonomic groups was also estimated for each sample and presented in the raw dataset.

As part of the QC program, the re-sorting of benthic sample residues was conducted on 10% of the samples to determine the level of sorting efficiency.

**References**

AENV (Alberta Environment). 1990. Selected Methods for the Monitoring of Benthic Invertebrates in Alberta Rivers. Environmental Quality Monitoring Branch, Environmental Assessment Division. Edmonton, AB.

Environment Canada. 2002. Revised Guidance for Sample Sorting and Subsampling Protocols for EEM Benthic Invertebrate Community Surveys. National EEM Office, Ottawa, ON, Canada.

Environment Canada. 2010. Pulp and Paper Environmental Effects Monitoring (EEM) Technical Guidance Document. National EEM Office, Ottawa, ON, Canada

Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. National EEM Office, Ottawa, ON, Canada.

Gibbons, W.N., M.D. Munn, M.D. Paine and EVS Environmental Consultants. 1993. Guidelines for Monitoring Benthos in Freshwater Environments. Environment Canada. North Vancouver, BC.

Wrona, F.J., J.M. Culp and R.W. Davies. 1982. Macroinvertebrate Subsampling: a Simplified Apparatus and Approach. Canadian Journal of Fisheries and Aquatic Science. 39:1051-1054

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11425

Nov 24, 2016

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

---

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman QP, Supervisor
Lab Section 2 results have been authorized by Melissa Tackaberry-Syed QP, Supervisor
Lab Section 3 results have been authorized by Pat Moser QP, Supervisor
Lab Sections 4 and 5 results have been authorized by Vicky Snook QP, Supervisor
Lab Section 6 results have been authorized by Marion McConnell QP, Supervisor

QP: Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11425

Nov 24, 2016

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

**30554 09/18/2016 LA-1 (CADDISFLY) *INSECTS***
**30555 09/18/2016 LA-6 (CADDISFLY) *INSECTS***
**30556 09/18/2016 LA-8 (DRAGONFLY) *INSECTS***

| Analyte | Units | 30554 | 30555 | 30556 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 93 | 140 | 39 |
| Antimony | ug/g | <0.1 | <0.1 | <0.1 |
| Arsenic | ug/g | 1.8 | 2.6 | 0.43 |
| Barium | ug/g | 142 | 167 | 4.7 |
| Beryllium | ug/g | 0.01 | 0.02 | <0.01 |
| Boron | ug/g | 4 | 3 | <1 |
| Cadmium | ug/g | 0.19 | 0.25 | 0.13 |
| Chromium | ug/g | <0.5 | <0.5 | <0.5 |
| Cobalt | ug/g | 0.99 | 0.68 | 0.12 |
| Copper | ug/g | 7.1 | 5.3 | 15 |
| Iron | ug/g | 1300 | 1800 | 390 |
| Lead | ug/g | 0.17 | 0.33 | 0.05 |
| Manganese | ug/g | 1900 | 1030 | 88 |
| Molybdenum | ug/g | 0.5 | 0.6 | 0.1 |
| Nickel | ug/g | 2.7 | 1.3 | 0.17 |
| Selenium | ug/g | 0.53 | 0.52 | 0.91 |
| Silver | ug/g | 0.02 | 0.03 | 0.12 |
| Strontium | ug/g | 10 | 10 | 3.6 |
| Thallium | ug/g | <0.05 | <0.05 | <0.05 |
| Tin | ug/g | <0.05 | <0.05 | <0.05 |
| Titanium | ug/g | 2.6 | 4.1 | 1.0 |
| Uranium | ug/g | 0.081 | 0.087 | 0.012 |
| Vanadium | ug/g | 0.4 | 0.4 | 0.1 |
| Zinc | ug/g | 150 | 110 | 91 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.05 | <0.02 | <0.02 |
| Polonium-210 | Bq/g | 0.06 | 0.061 | 0.06 |
| Radium-226 | Bq/g | 0.02 | 0.015 | <0.005 |
| Thorium-228 | Bq/g | <0.02 | <0.009 | <0.01 |
| Thorium-230 | Bq/g | <0.02 | <0.009 | <0.01 |
| Thorium-232 | Bq/g | <0.02 | <0.009 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11425

Nov 24, 2016

EcoMetrix Inc.

**30554 09/18/2016 LA-1 (CADDISFLY) *INSECTS***
**30555 09/18/2016 LA-6 (CADDISFLY) *INSECTS***
**30556 09/18/2016 LA-8 (DRAGONFLY) *INSECTS***

| Analyte | Units | 30554 | 30555 | 30556 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 91.29 | 86.90 | 84.28 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11425

Nov 24, 2016

EcoMetrix Inc.

**30557 09/18/2016 LA-9 (DRAGONFLY) *INSECTS***
**30558 09/19/2016 LA-5 (CADDISFLY) *INSECTS***
**30559 09/19/2016 LAB-1 (CADDISFLY) *INSECTS***

| Analyte | Units | 30557 | 30558 | 30559 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 62 | 120 | 250 |
| Antimony | ug/g | <0.1 | <0.1 | <0.1 |
| Arsenic | ug/g | 0.68 | 1.5 | 0.90 |
| Barium | ug/g | 4.8 | 85 | 111 |
| Beryllium | ug/g | <0.01 | <0.01 | 0.03 |
| Boron | ug/g | 1 | 1 | 6 |
| Cadmium | ug/g | 0.10 | 0.18 | 0.16 |
| Chromium | ug/g | <0.5 | 0.6 | <0.5 |
| Cobalt | ug/g | 0.18 | 0.48 | 2.0 |
| Copper | ug/g | 14 | 6.3 | 6.8 |
| Iron | ug/g | 500 | 1000 | 1800 |
| Lead | ug/g | 0.06 | 0.34 | 0.16 |
| Manganese | ug/g | 57 | 790 | 1850 |
| Molybdenum | ug/g | 0.2 | 0.4 | 1.2 |
| Nickel | ug/g | 0.20 | 0.75 | 2.3 |
| Selenium | ug/g | 1.0 | 0.50 | 0.37 |
| Silver | ug/g | 0.11 | 0.06 | 0.02 |
| Strontium | ug/g | 5.3 | 11 | 14 |
| Thallium | ug/g | <0.05 | <0.05 | <0.05 |
| Tin | ug/g | <0.05 | <0.05 | <0.05 |
| Titanium | ug/g | 1.4 | 3.0 | 5.6 |
| Uranium | ug/g | 0.014 | 0.062 | 0.099 |
| Vanadium | ug/g | 0.2 | 0.4 | 0.7 |
| Zinc | ug/g | 92 | 150 | 150 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.02 | <0.04 | 0.03 |
| Polonium-210 | Bq/g | 0.10 | 0.09 | 0.06 |
| Radium-226 | Bq/g | 0.008 | 0.01 | 0.02 |
| Thorium-228 | Bq/g | <0.01 | <0.02 | <0.02 |
| Thorium-230 | Bq/g | <0.01 | <0.02 | <0.02 |
| Thorium-232 | Bq/g | <0.01 | <0.02 | <0.02 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 81.94 | 86.65 | 89.18 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11425

Nov 24, 2016

EcoMetrix Inc.

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11425

Nov 24, 2016

EcoMetrix Inc.

**30560 09/20/2016 LA-7 (CADDISFLY) *INSECTS***
**30561 09/20/2016 LA-7A (CADDISFLY) *INSECTS***
**30562 09/21/2016 LAB-2 (CADDISFLY) *INSECTS***

| Analyte | Units | 30560 | 30561 | 30562 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 78 | 150 | 220 |
| Antimony | ug/g | <0.1 | <0.1 | <0.1 |
| Arsenic | ug/g | 0.74 | 1.2 | 0.81 |
| Barium | ug/g | 49 | 80 | 164 |
| Beryllium | ug/g | <0.01 | 0.01 | 0.01 |
| Boron | ug/g | 2 | 3 | 7 |
| Cadmium | ug/g | 0.13 | 0.22 | 0.20 |
| Chromium | ug/g | <0.5 | <0.5 | <0.5 |
| Cobalt | ug/g | 0.16 | 0.44 | 3.7 |
| Copper | ug/g | 6.9 | 8.5 | 6.6 |
| Iron | ug/g | 410 | 1200 | 1400 |
| Lead | ug/g | 0.08 | 0.20 | 0.13 |
| Manganese | ug/g | 146 | 385 | 1710 |
| Molybdenum | ug/g | 0.5 | 0.6 | 0.7 |
| Nickel | ug/g | 0.19 | 0.85 | 2.7 |
| Selenium | ug/g | 0.50 | 0.67 | 0.36 |
| Silver | ug/g | 0.05 | 0.05 | 0.03 |
| Strontium | ug/g | 7.5 | 11 | 20 |
| Thallium | ug/g | <0.05 | <0.05 | <0.05 |
| Tin | ug/g | <0.05 | <0.05 | <0.05 |
| Titanium | ug/g | 3.0 | 9.1 | 6.4 |
| Uranium | ug/g | 0.023 | 0.080 | 0.16 |
| Vanadium | ug/g | 0.2 | 0.5 | 0.7 |
| Zinc | ug/g | 150 | 160 | 190 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.04 | <0.06 | <0.04 |
| Polonium-210 | Bq/g | 0.08 | 0.12 | 0.03 |
| Radium-226 | Bq/g | <0.01 | <0.01 | 0.02 |
| Thorium-228 | Bq/g | <0.02 | <0.03 | <0.02 |
| Thorium-230 | Bq/g | <0.02 | <0.03 | <0.02 |
| Thorium-232 | Bq/g | <0.02 | <0.03 | <0.02 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 86.87 | 89.24 | 88.94 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11425

Nov 24, 2016

EcoMetrix Inc.

Results are reported on a dry basis.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

---

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman QP, Supervisor
Lab Section 2 results have been authorized by Melissa Tackaberry-Syed QP, Supervisor
Lab Section 3 results have been authorized by Pat Moser QP, Supervisor
Lab Sections 4 and 5 results have been authorized by Vicky Snook QP, Supervisor
Lab Section 6 results have been authorized by Marion McConnell QP, Supervisor

QP: Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-23-2016 Client P.O.: 16-2285

**30438 09/11/2016 WS2-LA-5-T *FISH FLESH***
**30439 09/11/2016 WS2-LA-5-B *FISH BONES***
**30440 09/11/2016 WS3-LA-5-T *FISH FLESH***

| Analyte | Units | 30438 | 30439 | 30440 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.8 | 1.7 | 0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.04 | 0.05 | 0.04 |
| Barium | ug/g | 0.17 | 6.4 | 0.14 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | 0.003 | 0.13 | 0.002 |
| Copper | ug/g | 0.27 | 1.6 | 0.40 |
| Iron | ug/g | 5.9 | 6.7 | 2.4 |
| Lead | ug/g | <0.002 | 0.09 | 0.002 |
| Manganese | ug/g | 0.16 | 24 | 0.12 |
| Mercury | ug/g | 0.076 | 0.03 | 0.049 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | 0.02 | 0.04 | 0.03 |
| Selenium | ug/g | 0.24 | 0.20 | 0.20 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.63 | 175 | 0.20 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.07 | 0.04 | 0.02 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 5.4 | 23 | 4.9 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0006 | 0.001 | 0.0010 |
| Radium-226 | Bq/g | <0.00009 | <0.001 | Not Reported |
| Thorium-230 | Bq/g | <0.0002 | <0.002 | Not Reported |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30438 09/11/2016 WS2-LA-5-T *FISH FLESH***
**30439 09/11/2016 WS2-LA-5-B *FISH BONES***
**30440 09/11/2016 WS3-LA-5-T *FISH FLESH***

| Analyte | Units | 30438 | 30439 | 30440 |
|---|---|---|---|---|
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 77.42 | 52.98 | 78.71 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30441 09/11/2016 WS3-LA-5-B *FISH BONES***
**30442 09/11/2016 WS4-LA-5-T *FISH FLESH***
**30443 09/11/2016 WS4-LA-5-B *FISH BONES***

| Analyte | Units | 30441 | 30442 | 30443 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | 0.9 | 0.7 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.05 | 0.03 | 0.04 |
| Barium | ug/g | 8.5 | 0.03 | 3.0 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.17 | <0.002 | 0.06 |
| Copper | ug/g | 1.4 | 0.28 | 1.2 |
| Iron | ug/g | 18 | 2.6 | 9.3 |
| Lead | ug/g | 0.07 | 0.002 | 0.06 |
| Manganese | ug/g | 38 | 0.16 | 18 |
| Mercury | ug/g | <0.01 | 0.045 | 0.03 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | 0.07 | <0.01 | <0.02 |
| Selenium | ug/g | 0.14 | 0.28 | 0.22 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 211 | 0.22 | 87 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.02 | <0.01 | 0.03 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 33 | 4.1 | 17 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.003 | 0.0016 | 0.003 |
| Radium-226 | Bq/g | <0.001 | <0.00006 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.0001 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 51.54 | 77.93 | 49.88 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30444 09/11/2016 WS5-LA-5-T *FISH FLESH***
**30445 09/11/2016 WS5-LA-5-B *FISH BONES***
**30446 09/16/2016 WS1-LA-6-T *FISH FLESH***

| Analyte | Units | 30444 | 30445 | 30446 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | 1.2 | 0.9 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.04 | 0.06 | 0.05 |
| Barium | ug/g | 0.04 | 6.9 | 0.02 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | 0.007 | 0.14 | <0.002 |
| Copper | ug/g | 0.42 | 1.1 | 0.28 |
| Iron | ug/g | 6.2 | 7.4 | 2.6 |
| Lead | ug/g | 0.002 | 0.05 | 0.002 |
| Manganese | ug/g | 0.15 | 35 | 0.13 |
| Mercury | ug/g | 0.028 | 0.02 | 0.035 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | 0.01 | 0.05 | <0.01 |
| Selenium | ug/g | 0.25 | 0.23 | 0.18 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.28 | 190 | 0.22 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | <0.01 | 0.04 | <0.01 |
| Uranium | ug/g | 0.006 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.9 | 27 | 3.2 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0010 | 0.002 | 0.0014 |
| Radium-226 | Bq/g | <0.00008 | <0.001 | <0.00006 |
| Thorium-230 | Bq/g | <0.0002 | <0.002 | <0.0001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 76.87 | 54.23 | 78.72 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30447 09/16/2016 WS1-LA-6-B *FISH BONES***
**30448 09/16/2016 WS2-LA-6-T *FISH FLESH***
**30449 09/16/2016 WS2-LA-6-B *FISH BONES***

| Analyte | Units | 30447 | 30448 | 30449 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1.0 | 0.6 | 0.8 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.06 | 0.02 | 0.04 |
| Barium | ug/g | 5.5 | 0.05 | 3.8 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.12 | 0.056 | 0.08 |
| Copper | ug/g | 0.93 | 0.20 | 0.79 |
| Iron | ug/g | 8.1 | 2.8 | 4.0 |
| Lead | ug/g | 0.04 | 0.002 | 0.03 |
| Manganese | ug/g | 33 | 0.09 | 17 |
| Mercury | ug/g | 0.02 | 0.044 | 0.03 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | 0.04 | 0.08 | 0.03 |
| Selenium | ug/g | 0.17 | 0.22 | 0.18 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 145 | 0.20 | 92 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.03 | 0.01 | 0.04 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 21 | 4.3 | 16 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.003 | 0.0018 | 0.002 |
| Radium-226 | Bq/g | <0.001 | <0.00006 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.0001 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 52.83 | 78.09 | 52.82 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30450 09/16/2016 WS3-LA-6-T *FISH FLESH***
**30451 09/16/2016 WS3-LA-6-B *FISH BONES***
**30452 09/16/2016 WS4-LA-6-T *FISH FLESH***

| Analyte | Units | 30450 | 30451 | 30452 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.6 | 0.9 | 0.7 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.06 | 0.07 | 0.04 |
| Barium | ug/g | 0.05 | 4.8 | 0.04 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | 0.027 | 0.06 | 0.006 |
| Copper | ug/g | 0.24 | 0.84 | 0.38 |
| Iron | ug/g | 1.7 | 16 | 3.1 |
| Lead | ug/g | <0.002 | 0.02 | <0.002 |
| Manganese | ug/g | 0.28 | 18 | 0.11 |
| Mercury | ug/g | 0.024 | 0.02 | 0.070 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | 0.04 | <0.02 | <0.01 |
| Selenium | ug/g | 0.24 | 0.22 | 0.21 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.68 | 132 | 0.12 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | <0.01 | 0.03 | 0.01 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.0 | 21 | 3.9 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0008 | 0.002 | 0.0011 |
| Radium-226 | Bq/g | Not Reported | <0.001 | <0.0001 |
| Thorium-230 | Bq/g | Not Reported | <0.002 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 77.90 | 51.77 | 77.48 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30453 09/16/2016 WS4-LA-6-B *FISH BONES***
**30454 09/16/2016 WS5-LA-6-T *FISH FLESH***
**30455 09/16/2016 WS5-LA-6-B *FISH BONES***

| Analyte | Units | 30453 | 30454 | 30455 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.9 | 0.6 | 0.8 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.05 | 0.06 | 0.05 |
| Barium | ug/g | 3.8 | 0.05 | 3.6 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.10 | 0.021 | 0.10 |
| Copper | ug/g | 0.73 | 0.42 | 0.77 |
| Iron | ug/g | 4.9 | 2.6 | 9.7 |
| Lead | ug/g | 0.02 | 0.003 | 0.03 |
| Manganese | ug/g | 26 | 0.22 | 27 |
| Mercury | ug/g | 0.02 | 0.025 | 0.03 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | 0.03 | 0.03 | 0.02 |
| Selenium | ug/g | 0.15 | 0.20 | 0.18 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 100 | 0.40 | 126 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.04 | <0.01 | 0.05 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 16 | 3.9 | 16 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.004 | 0.0015 | 0.004 |
| Radium-226 | Bq/g | <0.001 | <0.00008 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.0002 | 0.003 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 52.58 | 76.16 | 51.17 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30456 09/16/2016 NP1-LA-6T *FISH FLESH***
**30457 09/16/2016 NP1-LA-6B *FISH BONES***
**30458 09/16/2016 NP2-LA-6T *FISH FLESH***

| Analyte | Units | 30456 | 30457 | 30458 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | 1.5 | 1.0 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | <0.01 | <0.02 | <0.01 |
| Barium | ug/g | 0.07 | 6.8 | 0.04 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.13 | <0.002 |
| Copper | ug/g | 0.23 | 0.63 | 0.16 |
| Iron | ug/g | 2.4 | 6.8 | 1.6 |
| Lead | ug/g | 0.004 | 0.03 | 0.002 |
| Manganese | ug/g | 0.23 | 13 | 0.10 |
| Mercury | ug/g | 0.074 | 0.03 | 0.18 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | 0.09 | <0.01 |
| Selenium | ug/g | 0.20 | 0.16 | 0.21 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.75 | 125 | 0.13 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.02 | 0.04 | 0.01 |
| Uranium | ug/g | 0.002 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 4.1 | 56 | 4.0 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0026 | 0.002 | 0.0006 |
| Radium-226 | Bq/g | Not Reported | <0.001 | <0.00009 |
| Thorium-230 | Bq/g | Not Reported | <0.002 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 78.84 | 60.92 | 76.52 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 30456
This sample was reanalyzed for Polonium 210. Reanalysis confirmed original results within the expected measurement uncertainty.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30459 09/16/2016 NP2-LA-6B *FISH BONES***
**30460 09/16/2016 NP3-LA-6T *FISH FLESH***
**30461 09/16/2016 NP3-LA-6B *FISH BONES***

| Analyte | Units | 30459 | 30460 | 30461 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.8 | 0.7 | 0.9 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.02 | <0.01 | 0.02 |
| Barium | ug/g | 5.8 | 0.02 | 2.9 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.08 | <0.002 | 0.04 |
| Copper | ug/g | 0.57 | 0.15 | 0.55 |
| Iron | ug/g | 3.6 | 1.5 | 3.9 |
| Lead | ug/g | 0.02 | <0.002 | 0.02 |
| Manganese | ug/g | 9.2 | 0.08 | 6.0 |
| Mercury | ug/g | 0.03 | 0.30 | 0.08 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.13 | 0.23 | 0.16 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 111 | 0.09 | 50 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.04 | 0.01 | 0.06 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 38 | 3.1 | 36 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.0006 | 0.0006 | 0.002 |
| Radium-226 | Bq/g | <0.001 | <0.00007 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.0001 | <0.003 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 51.27 | 77.83 | 50.86 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30462 09/16/2016 NP4-LA-6T *FISH FLESH***
**30463 09/16/2016 NP4-LA-6B *FISH BONES***
**30464 09/16/2016 NP5-LA-6T *FISH FLESH***

| Analyte | Units | 30462 | 30463 | 30464 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.9 | 0.9 | 1.1 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | <0.01 | 0.03 | <0.01 |
| Barium | ug/g | 0.07 | 5.2 | 0.01 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.09 | <0.002 |
| Copper | ug/g | 0.18 | 0.55 | 0.15 |
| Iron | ug/g | 1.4 | 3.3 | 1.5 |
| Lead | ug/g | 0.002 | 0.02 | 0.002 |
| Manganese | ug/g | 0.10 | 11 | 0.11 |
| Mercury | ug/g | 0.14 | 0.03 | 0.30 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.20 | 0.12 | 0.22 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.15 | 109 | 0.14 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.02 | 0.02 | 0.02 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.9 | 34 | 4.3 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0009 | 0.0005 | 0.0008 |
| Radium-226 | Bq/g | <0.00007 | <0.001 | <0.00006 |
| Thorium-230 | Bq/g | <0.0001 | <0.002 | 0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 76.35 | 54.26 | 75.48 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30465 09/16/2016 NP5-LA-6B *FISH BONES***
**30466 09/17/2016 NP1-LA-1T *FISH FLESH***
**30467 09/17/2016 NP1-LA-1B *FISH BONES***

| Analyte | Units | 30465 | 30466 | 30467 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1.2 | 1.0 | 1.0 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.02 | <0.01 | 0.03 |
| Barium | ug/g | 6.2 | 0.02 | 4.4 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.11 | <0.002 | 0.09 |
| Copper | ug/g | 0.54 | 0.16 | 0.64 |
| Iron | ug/g | 4.2 | 1.9 | 7.7 |
| Lead | ug/g | 0.02 | 0.003 | 0.02 |
| Manganese | ug/g | 11 | 0.10 | 20 |
| Mercury | ug/g | 0.04 | 0.11 | 0.03 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | 0.05 |
| Selenium | ug/g | 0.11 | 0.23 | 0.16 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 128 | 0.10 | 118 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.05 | 0.02 | 0.03 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 44 | 3.5 | 47 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | <0.0005 | 0.0008 | <0.0005 |
| Radium-226 | Bq/g | <0.001 | Not Reported | <0.001 |
| Thorium-230 | Bq/g | <0.002 | Not Reported | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 49.64 | 77.84 | 57.41 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30468 09/17/2016 NP2-LA-1T *FISH FLESH***
**30469 09/17/2016 NP2-LA-1B *FISH BONES***
**30470 09/17/2016 NP3-LA-1T *FISH FLESH***

| Analyte | Units | 30468 | 30469 | 30470 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | 1.3 | 0.8 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | <0.01 | 0.03 | <0.01 |
| Barium | ug/g | 0.10 | 5.0 | 0.04 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.07 | 0.002 |
| Copper | ug/g | 0.14 | 0.82 | 0.17 |
| Iron | ug/g | 2.0 | 4.8 | 3.0 |
| Lead | ug/g | <0.002 | 0.02 | <0.002 |
| Manganese | ug/g | 0.11 | 15 | 0.12 |
| Mercury | ug/g | 0.082 | 0.02 | 0.25 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.20 | 0.16 | 0.25 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.15 | 118 | 0.28 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.03 | 0.06 | 0.04 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.9 | 49 | 9.0 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0015 | 0.001 | 0.0008 |
| Radium-226 | Bq/g | Not Reported | <0.0009 | <0.00007 |
| Thorium-230 | Bq/g | Not Reported | <0.002 | <0.0001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 79.35 | 64.52 | 76.17 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30471 09/17/2016 NP3-LA-1B *FISH BONES***
**30472 09/17/2016 NP4-LA-1T *FISH FLESH***
**30473 09/17/2016 NP4-LA-1B *FISH BONES***

| Analyte | Units | 30471 | 30472 | 30473 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.6 | <0.5 | 0.5 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | <0.02 | <0.01 | <0.02 |
| Barium | ug/g | 4.4 | 0.03 | 9.8 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.10 | <0.002 | 0.11 |
| Copper | ug/g | 0.66 | 0.23 | 0.50 |
| Iron | ug/g | 6.0 | 6.4 | 4.9 |
| Lead | ug/g | 0.03 | <0.002 | 0.04 |
| Manganese | ug/g | 12 | 0.08 | 19 |
| Mercury | ug/g | 0.06 | 0.43 | 0.13 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.16 | 0.20 | 0.14 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 133 | 0.11 | 173 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.04 | 0.01 | 0.02 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 43 | 4.1 | 60 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | <0.0005 | 0.0009 | 0.001 |
| Radium-226 | Bq/g | <0.001 | Not Reported | <0.001 |
| Thorium-230 | Bq/g | <0.003 | Not Reported | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 49.44 | 79.60 | 56.04 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30474 09/17/2016 NP5-LA-1T *FISH FLESH***
**30475 09/17/2016 NP5-LA-1B *FISH BONES***
**30476 09/19/2016 LA7-NP1-T *FISH FLESH***

| Analyte | Units | 30474 | 30475 | 30476 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | 0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | <0.01 | <0.02 | <0.01 |
| Barium | ug/g | <0.01 | 4.5 | 0.03 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.07 | <0.002 |
| Copper | ug/g | 0.18 | 0.48 | 0.29 |
| Iron | ug/g | 2.7 | 6.8 | 3.5 |
| Lead | ug/g | <0.002 | 0.02 | 0.004 |
| Manganese | ug/g | 0.11 | 20 | 0.13 |
| Mercury | ug/g | 0.10 | 0.03 | 0.18 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.24 | 0.18 | 0.23 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.07 | 97 | 0.36 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.01 | 0.03 | 0.02 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 6.2 | 62 | 5.3 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0010 | 0.0008 | 0.0012 |
| Radium-226 | Bq/g | Not Reported | <0.001 | Not Reported |
| Thorium-230 | Bq/g | Not Reported | <0.002 | Not Reported |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 77.71 | 57.64 | 77.63 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30477 09/19/2016 LA7-NP1-B *FISH BONES***
**30478 09/19/2016 LA7-NP2-T *FISH FLESH***
**30479 09/19/2016 LA7-NP2-B *FISH BONES***

| Analyte | Units | 30477 | 30478 | 30479 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | <0.5 | 0.8 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | <0.02 | <0.01 | <0.02 |
| Barium | ug/g | 4.4 | 0.02 | 6.5 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | 0.4 |
| Cobalt | ug/g | 0.07 | <0.002 | 0.11 |
| Copper | ug/g | 0.43 | 0.18 | 0.32 |
| Iron | ug/g | 13 | 2.4 | 6.9 |
| Lead | ug/g | 0.02 | <0.002 | 0.01 |
| Manganese | ug/g | 7.8 | 0.09 | 9.2 |
| Mercury | ug/g | 0.04 | 0.31 | 0.07 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.13 | 0.23 | 0.15 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 97 | 0.07 | 149 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.10 | 0.02 | 0.04 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 51 | 5.4 | 67 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.0008 | 0.0008 | 0.0008 |
| Radium-226 | Bq/g | <0.001 | Not Reported | <0.001 |
| Thorium-230 | Bq/g | <0.002 | Not Reported | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 53.29 | 77.14 | 54.40 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30480 09/19/2016 LA7-NP3-T *FISH FLESH***
**30481 09/19/2016 LA7-NP3-B *FISH BONES***
**30482 09/19/2016 LA7-NP4-T *FISH FLESH***

| Analyte | Units | 30480 | 30481 | 30482 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1.0 | 0.7 | 0.7 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | <0.01 | <0.02 | <0.01 |
| Barium | ug/g | 0.10 | 4.6 | 0.07 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.08 | <0.002 |
| Copper | ug/g | 0.31 | 0.31 | 0.20 |
| Iron | ug/g | 4.2 | 4.5 | 2.2 |
| Lead | ug/g | 0.011 | 0.01 | 0.010 |
| Manganese | ug/g | 0.12 | 8.6 | 0.12 |
| Mercury | ug/g | 0.14 | 0.05 | 0.11 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.20 | 0.13 | 0.21 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.20 | 132 | 0.12 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.03 | 0.03 | 0.04 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 4.2 | 70 | 4.7 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0011 | 0.001 | 0.0012 |
| Radium-226 | Bq/g | <0.00007 | <0.001 | Not Reported |
| Thorium-230 | Bq/g | <0.0001 | <0.002 | Not Reported |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 78.03 | 58.34 | 76.89 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30483 09/19/2016 LA7-NP4-B *FISH BONES***
**30484 09/19/2016 LA7-NP5-T *FISH FLESH***
**30485 09/19/2016 LA7-NP5-B *FISH BONES***

| Analyte | Units | 30483 | 30484 | 30485 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.9 | 0.6 | <0.5 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | <0.02 | <0.01 | <0.02 |
| Barium | ug/g | 3.4 | 0.06 | 4.2 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.07 | <0.002 | 0.10 |
| Copper | ug/g | 0.30 | 0.21 | 0.26 |
| Iron | ug/g | 3.5 | 2.5 | 5.1 |
| Lead | ug/g | 0.01 | 0.004 | <0.01 |
| Manganese | ug/g | 5.4 | 0.11 | 11 |
| Mercury | ug/g | 0.03 | 0.16 | 0.02 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.12 | 0.21 | 0.12 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 114 | 0.26 | 145 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.08 | 0.02 | 0.05 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 31 | 5.2 | 85 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.0006 | 0.0015 | 0.0006 |
| Radium-226 | Bq/g | 0.001 | <0.00007 | 0.003 |
| Thorium-230 | Bq/g | <0.002 | <0.0001 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 55.79 | 76.61 | 56.39 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30486 09/19/2016 LA7-WS1-T *FISH FLESH***
**30487 09/19/2016 LA7-WS1-B *FISH BONES***
**30488 09/19/2016 LA7-WS2-T *FISH FLESH***

| Analyte | Units | 30486 | 30487 | 30488 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.5 | 0.8 | 0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.04 | 0.02 | 0.05 |
| Barium | ug/g | 0.15 | 3.4 | 0.12 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.05 | <0.002 |
| Copper | ug/g | 0.20 | 0.40 | 0.50 |
| Iron | ug/g | 3.2 | 6.4 | 3.6 |
| Lead | ug/g | <0.002 | 0.01 | 0.004 |
| Manganese | ug/g | 0.15 | 11 | 0.33 |
| Mercury | ug/g | 0.018 | 0.01 | 0.020 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.23 | 0.20 | 0.22 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.35 | 122 | 0.61 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.01 | 0.04 | 0.01 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.3 | 18 | 4.9 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | 0.002 |
| Polonium-210 | Bq/g | 0.0014 | 0.004 | 0.0017 |
| Radium-226 | Bq/g | Not Reported | <0.001 | <0.00008 |
| Thorium-230 | Bq/g | Not Reported | <0.002 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 79.55 | 56.68 | 78.34 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30489 09/19/2016 LA7-WS2-B *FISH BONES***
**30490 09/19/2016 LA7-WS3-T *FISH FLESH***
**30491 09/19/2016 LA7-WS3-B *FISH BONES***

| Analyte | Units | 30489 | 30490 | 30491 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.8 | <0.5 | <0.5 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.04 | 0.05 | <0.02 |
| Barium | ug/g | 4.3 | 0.24 | 5.1 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.07 | <0.002 | 0.07 |
| Copper | ug/g | 0.36 | 0.25 | 0.28 |
| Iron | ug/g | 7.4 | 3.0 | 7.1 |
| Lead | ug/g | 0.02 | 0.005 | <0.01 |
| Manganese | ug/g | 13 | 0.23 | 12 |
| Mercury | ug/g | 0.01 | 0.019 | <0.01 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.19 | 0.20 | 0.15 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 164 | 0.14 | 150 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.04 | <0.01 | 0.03 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 22 | 4.5 | 21 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.007 | 0.0025 | 0.006 |
| Radium-226 | Bq/g | <0.0009 | Not Reported | <0.001 |
| Thorium-230 | Bq/g | <0.002 | Not Reported | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 52.25 | 78.97 | 56.00 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 30490
This sample was reanalyzed for Polonium 210. Reanalysis confirmed original results within the expected measurement uncertainty.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30492 09/20/2016 LA7-WS4-T *FISH FLESH***
**30493 09/20/2016 LA7-WS4-B *FISH BONES***
**30494 09/20/2016 LA7-WS5-T *FISH FLESH***

| Analyte | Units | 30492 | 30493 | 30494 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | 1.1 | <0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.05 | <0.02 | 0.04 |
| Barium | ug/g | 0.14 | 3.7 | 0.05 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | 0.002 | 0.07 | <0.002 |
| Copper | ug/g | 0.19 | 0.20 | 0.21 |
| Iron | ug/g | 2.3 | 8.0 | 3.6 |
| Lead | ug/g | 0.003 | <0.01 | <0.002 |
| Manganese | ug/g | 0.14 | 13 | 0.14 |
| Mercury | ug/g | 0.012 | <0.01 | 0.021 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.15 | 0.18 | 0.22 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.16 | 120 | 0.27 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.02 | 0.09 | 0.01 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.2 | 18 | 3.5 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0018 | 0.005 | 0.0019 |
| Radium-226 | Bq/g | <0.00008 | 0.001 | <0.00008 |
| Thorium-230 | Bq/g | <0.0002 | <0.002 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 79.95 | 58.34 | 78.51 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30495 09/20/2016 LA7-WS5-B *FISH BONES***
**30496 09/20/2016 LAB-NP1-T *FISH FLESH***
**30497 09/20/2016 LAB-NP1-B *FISH BONES***

| Analyte | Units | 30495 | 30496 | 30497 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.6 | <0.5 | 1.2 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.02 | <0.01 | <0.02 |
| Barium | ug/g | 2.6 | 0.18 | 2.7 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.05 | <0.002 | 0.14 |
| Copper | ug/g | 0.40 | 0.13 | 0.06 |
| Iron | ug/g | 15 | 1.3 | 3.3 |
| Lead | ug/g | <0.01 | 0.002 | <0.01 |
| Manganese | ug/g | 12 | 0.08 | 20 |
| Mercury | ug/g | 0.02 | 0.24 | 0.02 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.20 | 0.38 | 0.21 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 100 | 0.04 | 67 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | <0.02 | 0.02 | 0.04 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 16 | 3.9 | 46 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | 0.005 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.004 | 0.0020 | 0.0005 |
| Radium-226 | Bq/g | <0.001 | <0.001 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.0002 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 55.71 | 77.11 | 53.41 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30498 09/21/2016 LAB-NP2-T *FISH FLESH***
**30499 09/21/2016 LAB-NP2-B *FISH BONES***
**30500 09/21/2016 LAB-NP3-T *FISH FLESH***

| Analyte | Units | 30498 | 30499 | 30500 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | 1.2 | <0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.01 | <0.02 | 0.01 |
| Barium | ug/g | <0.01 | 3.7 | 0.08 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.12 | <0.002 |
| Copper | ug/g | 0.14 | 0.23 | 0.17 |
| Iron | ug/g | 4.7 | 6.1 | 1.4 |
| Lead | ug/g | <0.002 | 0.01 | 0.002 |
| Manganese | ug/g | 0.10 | 24 | 0.18 |
| Mercury | ug/g | 0.48 | 0.14 | 0.37 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.25 | 0.22 | 0.53 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.07 | 60 | 0.20 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | <0.01 | 0.21 | <0.01 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 6.5 | 62 | 3.7 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0017 | 0.001 | 0.0030 |
| Radium-226 | Bq/g | Not Reported | <0.001 | <0.00007 |
| Thorium-230 | Bq/g | Not Reported | <0.002 | <0.0001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 81.50 | 58.28 | 77.33 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 30500
This sample was reanalyzed for Polonium 210. Reanalysis confirmed original results within the expected measurement uncertainty.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30501 09/21/2016 LAB-NP3-B *FISH BONES***
**30502 09/21/2016 LAB-NP4-T *FISH FLESH***
**30503 09/21/2016 LAB-NP4-B *FISH BONES***

| Analyte | Units | 30501 | 30502 | 30503 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1.0 | <0.5 | 0.9 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.02 | 0.02 | 0.02 |
| Barium | ug/g | 2.5 | <0.01 | 2.6 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.18 | <0.002 | 0.14 |
| Copper | ug/g | 0.21 | 0.09 | 0.29 |
| Iron | ug/g | 6.6 | 0.8 | 5.1 |
| Lead | ug/g | 0.01 | <0.002 | 0.03 |
| Manganese | ug/g | 33 | 0.11 | 19 |
| Mercury | ug/g | 0.03 | 0.20 | 0.02 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | 0.03 | <0.01 | <0.02 |
| Selenium | ug/g | 0.27 | 0.30 | 0.20 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 77 | 0.04 | 90 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.06 | <0.01 | 0.02 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 75 | 4.0 | 46 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.0009 | 0.0010 | 0.0009 |
| Radium-226 | Bq/g | <0.001 | 0.00007 | <0.001 |
| Thorium-230 | Bq/g | <0.003 | <0.0001 | <0.003 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 47.92 | 77.24 | 49.19 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30504 09/21/2016 LAB-NP5-T *FISH FLESH***
**30505 09/21/2016 LAB-NP5-B *FISH BONES***
**30506 09/21/2016 LAB-WS1-T *FISH FLESH***

| Analyte | Units | 30504 | 30505 | 30506 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | 1.3 | <0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.02 | <0.02 | <0.01 |
| Barium | ug/g | 0.06 | 3.3 | 0.03 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.16 | 0.018 |
| Copper | ug/g | 0.08 | 0.31 | 0.16 |
| Iron | ug/g | 1.2 | 4.4 | 1.3 |
| Lead | ug/g | <0.002 | <0.01 | <0.002 |
| Manganese | ug/g | 0.12 | 41 | 0.16 |
| Mercury | ug/g | 0.21 | 0.02 | 0.043 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.36 | 0.24 | 0.48 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.10 | 100 | 0.07 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | <0.01 | 0.10 | 0.01 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 8.6 | 63 | 3.0 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0010 | 0.0006 | 0.0008 |
| Radium-226 | Bq/g | <0.00003 | <0.001 | <0.00007 |
| Thorium-230 | Bq/g | <0.00006 | <0.002 | <0.0001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 77.66 | 55.71 | 81.11 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30507 09/21/2016 LAB-WS1-B *FISH BONES***
**30508 09/21/2016 LAB-WS2-T *FISH FLESH***
**30509 09/21/2016 LAB-WS2-B *FISH BONES***

| Analyte | Units | 30507 | 30508 | 30509 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | <0.5 | 0.5 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | <0.02 | 0.04 | 0.03 |
| Barium | ug/g | 2.1 | 0.02 | 1.3 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.13 | <0.002 | 0.05 |
| Copper | ug/g | 0.50 | 0.32 | 0.38 |
| Iron | ug/g | 12 | 2.3 | 6.8 |
| Lead | ug/g | 0.02 | <0.002 | <0.01 |
| Manganese | ug/g | 41 | 0.42 | 45 |
| Mercury | ug/g | 0.02 | 0.025 | <0.01 |
| Molybdenum | ug/g | 0.15 | <0.02 | 0.23 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.45 | 0.33 | 0.46 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 75 | 0.33 | 40 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.09 | <0.01 | 0.03 |
| Uranium | ug/g | 0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 26 | 3.9 | 16 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.005 | 0.0012 | 0.003 |
| Radium-226 | Bq/g | <0.001 | <0.00008 | <0.0008 |
| Thorium-230 | Bq/g | <0.002 | <0.0002 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 60.49 | 80.49 | 64.36 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30510 09/21/2016 LAB-WS3-T *FISH FLESH***
**30511 09/21/2016 LAB-WS3-B *FISH BONES***
**30512 09/21/2016 LAB-WS4-T *FISH FLESH***

| Analyte | Units | 30510 | 30511 | 30512 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.02 | <0.02 | 0.02 |
| Barium | ug/g | 0.02 | 2.1 | 0.04 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | 0.010 | 0.10 | <0.002 |
| Copper | ug/g | 0.18 | 0.45 | 0.21 |
| Iron | ug/g | 1.8 | 8.2 | 1.8 |
| Lead | ug/g | <0.002 | 0.01 | <0.002 |
| Manganese | ug/g | 0.28 | 67 | 0.17 |
| Mercury | ug/g | 0.022 | <0.01 | 0.021 |
| Molybdenum | ug/g | <0.02 | 0.20 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.56 | 0.59 | 0.46 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.14 | 72 | 0.05 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | <0.01 | 0.04 | 0.02 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.2 | 24 | 3.3 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0019 | <0.0005 | 0.0021 |
| Radium-226 | Bq/g | <0.00007 | <0.0008 | 0.0004 |
| Thorium-230 | Bq/g | <0.0001 | <0.002 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 78.93 | 61.00 | 78.29 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30513 09/21/2016 LAB-WS4-B *FISH BONES***
**30514 09/21/2016 LAB-WS5-T *FISH FLESH***
**30515 09/21/2016 LAB-WS5-B *FISH BONES***

| Analyte | Units | 30513 | 30514 | 30515 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | <0.5 | 1.4 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | <0.02 | 0.05 | 0.03 |
| Barium | ug/g | 2.4 | 0.03 | 2.4 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.07 | <0.002 | 0.09 |
| Copper | ug/g | 0.66 | 0.26 | 0.55 |
| Iron | ug/g | 8.7 | 2.1 | 11 |
| Lead | ug/g | 0.10 | <0.002 | 0.01 |
| Manganese | ug/g | 68 | 0.18 | 49 |
| Mercury | ug/g | <0.01 | 0.022 | <0.01 |
| Molybdenum | ug/g | 0.13 | <0.02 | 0.17 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.39 | 0.38 | 0.32 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 69 | 0.12 | 61 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.04 | <0.01 | 0.11 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 24 | 3.8 | 21 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.003 | 0.0013 | 0.004 |
| Radium-226 | Bq/g | <0.0008 | Not Reported | <0.0009 |
| Thorium-230 | Bq/g | <0.002 | Not Reported | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 62.61 | 77.98 | 60.69 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30516 09/17/2016 LA1-WS1-T *FISH FLESH***
**30517 09/17/2016 LA1-WS1-B *FISH BONES***
**30518 09/20/2016 LA1-WS2-T *FISH FLESH***

| Analyte | Units | 30516 | 30517 | 30518 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.8 | 0.6 | 0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.03 | <0.02 | 0.01 |
| Barium | ug/g | 0.15 | 5.5 | 0.12 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | <0.002 | 0.10 | <0.002 |
| Copper | ug/g | 0.17 | 0.42 | 0.17 |
| Iron | ug/g | 3.1 | 5.2 | 2.2 |
| Lead | ug/g | 0.002 | 0.01 | 0.003 |
| Manganese | ug/g | 1.1 | 35 | 0.18 |
| Mercury | ug/g | 0.023 | 0.01 | 0.040 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | <0.01 | <0.02 | <0.01 |
| Selenium | ug/g | 0.30 | 0.18 | 0.30 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 2.5 | 175 | 0.28 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.03 | 0.06 | 0.02 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 4.2 | 19 | 3.6 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | 0.007 | 0.001 |
| Polonium-210 | Bq/g | 0.0010 | 0.002 | 0.0012 |
| Radium-226 | Bq/g | <0.00008 | <0.001 | <0.00008 |
| Thorium-230 | Bq/g | <0.0002 | <0.002 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 78.71 | 57.59 | 79.42 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30519 09/20/2016 LA1-WS2-B *FISH BONES***
**30520 09/20/2016 LA1-WS3-T *FISH FLESH***
**30521 09/20/2016 LA1-WS3-B *FISH BONES***

| Analyte | Units | 30519 | 30520 | 30521 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1.2 | 0.5 | 1.4 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | <0.02 | 0.02 | 0.03 |
| Barium | ug/g | 3.2 | 0.25 | 3.6 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.06 | <0.002 | 0.06 |
| Copper | ug/g | 0.46 | 0.25 | 0.40 |
| Iron | ug/g | 8.9 | 3.1 | 8.6 |
| Lead | ug/g | 0.03 | 0.004 | 0.01 |
| Manganese | ug/g | 30 | 0.41 | 20 |
| Mercury | ug/g | 0.02 | 0.028 | 0.01 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.26 | 0.29 | 0.18 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 111 | 1.0 | 120 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.04 | 0.02 | 0.09 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 16 | 3.8 | 18 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.004 | 0.0006 | 0.002 |
| Radium-226 | Bq/g | <0.001 | Not Reported | <0.001 |
| Thorium-230 | Bq/g | <0.002 | Not Reported | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 55.90 | 80.39 | 60.31 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-11422

Dec 15, 2016

EcoMetrix Inc.

**30522 09/20/2016 LA1-WS4-T *FISH FLESH***
**30523 09/20/2016 LA1-WS4-B *FISH BONES***

| Analyte | Units | 30522 | 30523 |
|---|---|---|---|
| **Lab Section 2 (ICP)** | | | |
| Aluminum | ug/g | <0.5 | 0.8 |
| Antimony | ug/g | <0.02 | <0.05 |
| Arsenic | ug/g | 0.05 | <0.02 |
| Barium | ug/g | 0.20 | 3.6 |
| Beryllium | ug/g | <0.002 | <0.01 |
| Boron | ug/g | <0.2 | <0.5 |
| Cadmium | ug/g | <0.002 | <0.01 |
| Chromium | ug/g | <0.1 | <0.2 |
| Cobalt | ug/g | <0.002 | 0.06 |
| Copper | ug/g | 0.25 | 0.45 |
| Iron | ug/g | 2.9 | 7.9 |
| Lead | ug/g | 0.009 | 0.01 |
| Manganese | ug/g | 0.17 | 18 |
| Mercury | ug/g | 0.022 | 0.02 |
| Molybdenum | ug/g | <0.02 | <0.05 |
| Nickel | ug/g | <0.01 | 0.12 |
| Selenium | ug/g | 0.23 | 0.20 |
| Silver | ug/g | <0.002 | <0.01 |
| Strontium | ug/g | 0.84 | 117 |
| Thallium | ug/g | <0.01 | <0.02 |
| Tin | ug/g | <0.01 | <0.02 |
| Titanium | ug/g | 0.01 | 0.05 |
| Uranium | ug/g | <0.001 | <0.01 |
| Vanadium | ug/g | <0.02 | <0.05 |
| Zinc | ug/g | 4.6 | 20 |
| **Lab Section 4 (Radiochemistry)** | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.0015 | 0.004 |
| Radium-226 | Bq/g | <0.00009 | <0.001 |
| Thorium-230 | Bq/g | <0.0002 | <0.002 |
| **Lab Section 6 (Misc.)** | | | |
| Moisture | % | 79.93 | 58.41 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
N/R- Results not reported due to equipment failure.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-19-2016 Client P.O.: 16-2285

---

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Sections 1 and 2 have been authorized by Keith Gipman, Supervisor
Results from Lab Section 3 have been authorized by Pat Moser, Supervisor
Results from Lab Sections 4 and 5 have been authorized by Vicky Snook, Supervisor
Results from Lab Section 6 have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

This is a final report.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Karen Petersen

Date Samples Received: Sep-19-2016 Client P.O.: 16-2285

**29905 09/10/2016 NP1-LA-5-T *FISH FLESH***
**29906 09/10/2016 NP1-LA-5-B *FISH BONES***
**29907 09/10/2016 NP2-LA-5-T *FISH FLESH***

| Analyte | Units | 29905 | 29906 | 29907 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1.3 | 1.3 | 0.7 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | 0.01 | 0.03 | <0.01 |
| Barium | ug/g | 0.06 | 7.2 | <0.01 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | 0.009 | 0.06 | <0.002 |
| Copper | ug/g | 0.14 | 0.16 | 0.11 |
| Iron | ug/g | 2.3 | 11 | 1.1 |
| Lead | ug/g | 0.004 | 0.01 | <0.002 |
| Manganese | ug/g | 0.11 | 17 | 0.11 |
| Mercury | ug/g | 0.047 | 0.02 | 0.16 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | 0.01 | 0.03 | <0.01 |
| Selenium | ug/g | 0.17 | 0.17 | 0.15 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.14 | 121 | 0.37 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | 0.04 | 0.06 | <0.01 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 4.4 | 54 | 3.1 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0021 | 0.003 | 0.0004 |
| Radium-226 | Bq/g | 0.0002 | <0.001 | <0.00007 |
| Thorium-228 | Bq/g | <0.0002 | <0.002 | <0.0001 |
| Thorium-230 | Bq/g | <0.0002 | <0.002 | <0.0001 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

**29905 09/10/2016 NP1-LA-5-T *FISH FLESH***
**29906 09/10/2016 NP1-LA-5-B *FISH BONES***
**29907 09/10/2016 NP2-LA-5-T *FISH FLESH***

| Analyte | Units | 29905 | 29906 | 29907 |
|---|---|---|---|---|
| **Lab Section 4 (Radiochemistry)** | | | | |
| Thorium-232 | Bq/g | <0.0002 | <0.002 | <0.0001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 78.10 | 59.00 | 78.87 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on an "as received" basis.

Note the addition of results for moisture as per client request. VE
Aug17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

**29908 09/10/2016 NP2-LA-5-B *FISH BONES***
**29909 09/10/2016 NP3-LA-5-T *FISH FLESH***
**29910 09/10/2016 NP3-LA-5-B *FISH BONES***

| Analyte | Units | 29908 | 29909 | 29910 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.8 | 0.6 | <0.5 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.03 | <0.01 | 0.02 |
| Barium | ug/g | 6.7 | <0.01 | 6.4 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.10 | <0.002 | 0.10 |
| Copper | ug/g | 0.09 | 0.11 | 0.08 |
| Iron | ug/g | 4.2 | 0.8 | 1.4 |
| Lead | ug/g | <0.01 | <0.002 | <0.01 |
| Manganese | ug/g | 14 | 0.08 | 12 |
| Mercury | ug/g | 0.03 | 0.23 | 0.04 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | <0.01 | <0.02 |
| Selenium | ug/g | 0.10 | 0.19 | 0.09 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 155 | 0.16 | 162 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.03 | <0.01 | 0.05 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 36 | 3.8 | 32 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | <0.0005 | 0.0005 | 0.0008 |
| Radium-226 | Bq/g | <0.0008 | <0.00009 | <0.0009 |
| Thorium-228 | Bq/g | <0.002 | <0.0002 | <0.002 |
| Thorium-230 | Bq/g | <0.002 | <0.0002 | <0.002 |
| Thorium-232 | Bq/g | <0.002 | <0.0002 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 60.70 | 78.39 | 58.53 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

Results are reported on an "as received" basis.

Note the addition of results for moisture as per client request. VE Aug17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

**29911 09/10/2016 NP4-LA-5-T *FISH FLESH***
**29912 09/10/2016 NP4-LA-5-B *FISH BONES***
**29913 09/10/2016 NP5-LA-5-T *FISH FLESH***

| Analyte | Units | 29911 | 29912 | 29913 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.6 | <0.5 | <0.5 |
| Antimony | ug/g | <0.02 | <0.05 | <0.02 |
| Arsenic | ug/g | <0.01 | 0.02 | <0.01 |
| Barium | ug/g | <0.01 | 7.2 | 0.01 |
| Beryllium | ug/g | <0.002 | <0.01 | <0.002 |
| Boron | ug/g | <0.2 | <0.5 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.01 | <0.002 |
| Chromium | ug/g | <0.1 | <0.2 | <0.1 |
| Cobalt | ug/g | 0.014 | 0.09 | 0.009 |
| Copper | ug/g | 0.09 | 0.09 | 0.09 |
| Iron | ug/g | 1.0 | 3.7 | 0.9 |
| Lead | ug/g | <0.002 | 0.01 | <0.002 |
| Manganese | ug/g | 0.11 | 13 | 0.12 |
| Mercury | ug/g | 0.15 | 0.04 | 0.23 |
| Molybdenum | ug/g | <0.02 | <0.05 | <0.02 |
| Nickel | ug/g | 0.02 | <0.02 | <0.01 |
| Selenium | ug/g | 0.17 | 0.10 | 0.17 |
| Silver | ug/g | <0.002 | <0.01 | <0.002 |
| Strontium | ug/g | 0.10 | 156 | 0.29 |
| Thallium | ug/g | <0.01 | <0.02 | <0.01 |
| Tin | ug/g | <0.01 | <0.02 | <0.01 |
| Titanium | ug/g | <0.01 | 0.04 | <0.01 |
| Uranium | ug/g | <0.001 | <0.01 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.05 | <0.02 |
| Zinc | ug/g | 3.5 | 41 | 3.3 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.002 | <0.001 |
| Polonium-210 | Bq/g | 0.0002 | 0.001 | 0.0005 |
| Radium-226 | Bq/g | <0.00006 | <0.0009 | <0.00006 |
| Thorium-228 | Bq/g | <0.0001 | <0.002 | <0.0001 |
| Thorium-230 | Bq/g | <0.0001 | <0.002 | <0.0001 |
| Thorium-232 | Bq/g | <0.0001 | <0.002 | <0.0001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 77.82 | 57.99 | 81.06 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

Results are reported on an "as received" basis.

Note the addition of results for moisture as per client request. VE Aug17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

**29914 09/10/2016 NP5-LA-5-B *FISH BONES***
**29915 09/10/2016 WS1-LA-5-T *FISH FLESH***
**29916 09/10/2016 WS1-LA-5-B *FISH BONES***

| Analyte | Units | 29914 | 29915 | 29916 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | 0.7 | 1.2 |
| Antimony | ug/g | <0.05 | <0.02 | <0.05 |
| Arsenic | ug/g | 0.02 | 0.04 | 0.05 |
| Barium | ug/g | 7.2 | 0.01 | 4.4 |
| Beryllium | ug/g | <0.01 | <0.002 | <0.01 |
| Boron | ug/g | <0.5 | <0.2 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.002 | <0.01 |
| Chromium | ug/g | <0.2 | <0.1 | <0.2 |
| Cobalt | ug/g | 0.10 | <0.002 | 0.05 |
| Copper | ug/g | 0.08 | 0.16 | 0.26 |
| Iron | ug/g | 3.6 | 2.3 | 9.8 |
| Lead | ug/g | 0.01 | 0.004 | 0.01 |
| Manganese | ug/g | 12 | 0.14 | 21 |
| Mercury | ug/g | 0.06 | 0.014 | 0.02 |
| Molybdenum | ug/g | <0.05 | <0.02 | <0.05 |
| Nickel | ug/g | <0.02 | 0.01 | <0.02 |
| Selenium | ug/g | 0.11 | 0.17 | 0.16 |
| Silver | ug/g | <0.01 | <0.002 | <0.01 |
| Strontium | ug/g | 156 | 0.11 | 125 |
| Thallium | ug/g | <0.02 | <0.01 | <0.02 |
| Tin | ug/g | <0.02 | <0.01 | <0.02 |
| Titanium | ug/g | 0.06 | 0.02 | 0.05 |
| Uranium | ug/g | <0.01 | <0.001 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.02 | <0.05 |
| Zinc | ug/g | 30 | 2.8 | 15 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.001 | <0.002 |
| Polonium-210 | Bq/g | 0.0007 | 0.0006 | 0.002 |
| Radium-226 | Bq/g | 0.002 | <0.00009 | 0.001 |
| Thorium-228 | Bq/g | <0.002 | <0.0002 | <0.002 |
| Thorium-230 | Bq/g | <0.002 | <0.0002 | <0.002 |
| Thorium-232 | Bq/g | <0.002 | <0.0002 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 60.29 | 79.64 | 57.78 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

Results are reported on an "as received" basis.

Note the addition of results for moisture as per client request. VE Aug17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

**29917 09/11/2016 WS2-LA-5-T *FISH FLESH***

| Analyte | Units | 29917 |
|---|---|---|
| **Lab Section 2 (ICP)** | | |
| Aluminum | ug/g | 0.6 |
| Antimony | ug/g | <0.02 |
| Arsenic | ug/g | 0.03 |
| Barium | ug/g | 0.07 |
| Beryllium | ug/g | <0.002 |
| Boron | ug/g | <0.2 |
| Cadmium | ug/g | <0.002 |
| Chromium | ug/g | <0.1 |
| Cobalt | ug/g | 0.005 |
| Copper | ug/g | 0.27 |
| Iron | ug/g | 2.8 |
| Lead | ug/g | 0.006 |
| Manganese | ug/g | 0.21 |
| Mercury | ug/g | 0.055 |
| Molybdenum | ug/g | <0.02 |
| Nickel | ug/g | 0.02 |
| Selenium | ug/g | 0.19 |
| Silver | ug/g | <0.002 |
| Strontium | ug/g | 0.06 |
| Thallium | ug/g | <0.01 |
| Tin | ug/g | <0.01 |
| Titanium | ug/g | 0.01 |
| Uranium | ug/g | <0.001 |
| Vanadium | ug/g | <0.02 |
| Zinc | ug/g | 3.9 |
| **Lab Section 4 (Radiochemistry)** | | |
| Lead-210 | Bq/g | <0.001 |
| Polonium-210 | Bq/g | 0.0008 |
| Radium-226 | Bq/g | <0.00007 |
| Thorium-228 | Bq/g | <0.0001 |
| Thorium-230 | Bq/g | <0.0001 |
| Thorium-232 | Bq/g | <0.0001 |
| **Lab Section 6 (Misc.)** | | |
| Moisture | % | 79.76 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2016-11104

Aug 17, 2017

EcoMetrix Inc.

Results are reported on an "as received" basis.

Note the addition of results for moisture as per client request. VE Aug17/17

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: J Tang

Date Samples Received: Jun-02-2017 Client P.O.: 16-2285

---

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Sections 1 and 2 have been authorized by Keith Gipman, Supervisor
Results from Lab Section 3 have been authorized by Pat Moser, Supervisor
Results from Lab Sections 4 and 5 have been authorized by Vicky Snook, Supervisor
Results from Lab Section 6 have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

This is a final report.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: J Tang

Date Samples Received: Jun-02-2017 Client P.O.: 16-2285

**22747 LA1-NP1 *FISH FLESH***
**22748 LA1-NP2 *FISH FLESH***
**22749 LA1-NP3 *FISH FLESH***

| Analyte | Units | 22747 | 22748 | 22749 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.02 | <0.02 | <0.02 |
| Arsenic | ug/g | <0.01 | <0.01 | <0.01 |
| Barium | ug/g | 0.02 | 0.02 | 0.02 |
| Beryllium | ug/g | <0.002 | <0.002 | <0.002 |
| Boron | ug/g | <0.2 | <0.2 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.002 | <0.002 |
| Chromium | ug/g | 0.2 | <0.1 | <0.1 |
| Cobalt | ug/g | 0.005 | <0.002 | <0.002 |
| Copper | ug/g | 0.30 | 0.28 | 0.55 |
| Iron | ug/g | 3.5 | 3.5 | 5.0 |
| Lead | ug/g | <0.002 | <0.002 | <0.002 |
| Manganese | ug/g | 0.09 | 0.09 | 0.13 |
| Mercury | ug/g | 0.15 | 0.23 | 0.081 |
| Molybdenum | ug/g | <0.02 | <0.02 | <0.02 |
| Nickel | ug/g | 0.02 | <0.01 | 0.03 |
| Selenium | ug/g | 0.19 | 0.20 | 0.20 |
| Silver | ug/g | <0.002 | <0.002 | 0.002 |
| Strontium | ug/g | 0.25 | 0.11 | 0.39 |
| Thallium | ug/g | <0.01 | <0.01 | <0.01 |
| Tin | ug/g | <0.01 | <0.01 | <0.01 |
| Titanium | ug/g | 0.02 | 0.02 | 0.02 |
| Uranium | ug/g | <0.001 | <0.001 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.02 | <0.02 |
| Zinc | ug/g | 5.3 | 9.7 | 8.6 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | 0.001 | <0.001 |
| Polonium-210 | Bq/g | <0.0002 | 0.0002 | 0.0007 |
| Radium-226 | Bq/g | <0.00007 | <0.00006 | <0.0002 |
| Thorium-228 | Bq/g | <0.0001 | <0.0001 | <0.0004 |
| Thorium-230 | Bq/g | <0.0001 | <0.0001 | <0.0004 |

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22747 LA1-NP1 *FISH FLESH***
**22748 LA1-NP2 *FISH FLESH***
**22749 LA1-NP3 *FISH FLESH***

| Analyte | Units | 22747 | 22748 | 22749 |
|---|---|---|---|---|
| **Lab Section 4 (Radiochemistry)** | | | | |
| Thorium-232 | Bq/g | <0.0001 | <0.0001 | <0.0004 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 77.74 | 80.09 | 77.81 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22750 LA1-NP4 *FISH FLESH***
**22751 LA1-WS1 *FISH FLESH***
**22752 LA1-WS2 *FISH FLESH***

| Analyte | Units | 22750 | 22751 | 22752 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.02 | <0.02 | <0.02 |
| Arsenic | ug/g | <0.01 | 0.03 | <0.01 |
| Barium | ug/g | 0.03 | 0.07 | 0.06 |
| Beryllium | ug/g | <0.002 | <0.002 | <0.002 |
| Boron | ug/g | <0.2 | <0.2 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.002 | <0.002 |
| Chromium | ug/g | <0.1 | 0.2 | <0.1 |
| Cobalt | ug/g | 0.004 | 0.005 | 0.014 |
| Copper | ug/g | 0.48 | 0.62 | 0.24 |
| Iron | ug/g | 3.2 | 4.6 | 3.0 |
| Lead | ug/g | 0.002 | 0.003 | <0.002 |
| Manganese | ug/g | 0.10 | 0.12 | 0.15 |
| Mercury | ug/g | 0.075 | 0.068 | 0.046 |
| Molybdenum | ug/g | <0.02 | <0.02 | <0.02 |
| Nickel | ug/g | <0.01 | 0.11 | 0.02 |
| Selenium | ug/g | 0.24 | 0.21 | 0.30 |
| Silver | ug/g | <0.002 | <0.002 | 0.018 |
| Strontium | ug/g | 0.58 | 0.24 | 0.22 |
| Thallium | ug/g | <0.01 | <0.01 | <0.01 |
| Tin | ug/g | <0.01 | <0.01 | <0.01 |
| Titanium | ug/g | 0.02 | 0.03 | 0.01 |
| Uranium | ug/g | <0.001 | <0.001 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.02 | <0.02 |
| Zinc | ug/g | 8.0 | 4.9 | 3.9 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.001 | <0.001 |
| Polonium-210 | Bq/g | 0.0008 | 0.0008 | 0.0008 |
| Radium-226 | Bq/g | <0.0002 | <0.0002 | <0.00008 |
| Thorium-228 | Bq/g | <0.0004 | <0.0003 | <0.0002 |
| Thorium-230 | Bq/g | <0.0004 | <0.0003 | <0.0002 |
| Thorium-232 | Bq/g | <0.0004 | <0.0003 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 79.36 | 76.07 | 77.75 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Note for Sample # 22751
This sample was reanalyzed for Nickel. Reanalysis confirms original results are within the expected measurement uncertainty.

Note for Sample # 22752
This sample was reanalyzed for Silver. Reanalysis confirms original results are within the expected measurement uncertainty.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22753 LA5-WS1 *FISH FLESH***
**22754 LA6-NP1 *FISH FLESH***
**22755 LA6-WS1 *FISH FLESH***

| Analyte | Units | 22753 | 22754 | 22755 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.02 | <0.02 | <0.02 |
| Arsenic | ug/g | 0.02 | 0.02 | 0.02 |
| Barium | ug/g | <0.01 | 0.09 | 0.04 |
| Beryllium | ug/g | <0.002 | <0.002 | <0.002 |
| Boron | ug/g | <0.2 | <0.2 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.002 | <0.002 |
| Chromium | ug/g | <0.1 | <0.1 | <0.1 |
| Cobalt | ug/g | 0.009 | 0.010 | 0.007 |
| Copper | ug/g | 0.42 | 0.16 | 0.28 |
| Iron | ug/g | 5.6 | 1.4 | 3.5 |
| Lead | ug/g | 0.002 | <0.002 | <0.002 |
| Manganese | ug/g | 0.70 | 0.18 | 0.10 |
| Mercury | ug/g | 0.051 | 0.17 | 0.044 |
| Molybdenum | ug/g | <0.02 | <0.02 | <0.02 |
| Nickel | ug/g | 0.02 | 0.02 | <0.01 |
| Selenium | ug/g | 0.23 | 0.19 | 0.24 |
| Silver | ug/g | <0.002 | <0.002 | <0.002 |
| Strontium | ug/g | 2.5 | 1.1 | 0.16 |
| Thallium | ug/g | <0.01 | <0.01 | <0.01 |
| Tin | ug/g | <0.01 | <0.01 | <0.01 |
| Titanium | ug/g | 0.03 | 0.02 | 0.02 |
| Uranium | ug/g | <0.001 | <0.001 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.02 | <0.02 |
| Zinc | ug/g | 6.5 | 4.6 | 3.2 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.001 | <0.001 |
| Polonium-210 | Bq/g | 0.0011 | 0.0010 | 0.0012 |
| Radium-226 | Bq/g | <0.00007 | <0.00008 | <0.0001 |
| Thorium-228 | Bq/g | <0.0001 | <0.0002 | <0.0002 |
| Thorium-230 | Bq/g | <0.0001 | <0.0002 | <0.0002 |
| Thorium-232 | Bq/g | <0.0001 | <0.0002 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 79.17 | 78.79 | 78.59 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Note for Sample # 22753
This sample was reanalyzed for Strontium and Manganese. Reanalysis confirms original results are within the expected measurement uncertainty.

Note for Sample # 22754
This sample was reanalyzed for Polonium 210. Reanalysis confirms original results are within the expected measurement uncertainty.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22756 LA7-NP1 *FISH FLESH***
**22757 LA7-NP2 *FISH FLESH***
**22758 LA7-NP3 *FISH FLESH***

| Analyte | Units | 22756 | 22757 | 22758 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.02 | <0.02 | <0.02 |
| Arsenic | ug/g | <0.01 | <0.01 | <0.01 |
| Barium | ug/g | 0.01 | 0.02 | 0.06 |
| Beryllium | ug/g | <0.002 | <0.002 | <0.002 |
| Boron | ug/g | <0.2 | <0.2 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.002 | <0.002 |
| Chromium | ug/g | <0.1 | <0.1 | <0.1 |
| Cobalt | ug/g | 0.004 | 0.005 | 0.034 |
| Copper | ug/g | 0.21 | 0.50 | 0.23 |
| Iron | ug/g | 1.0 | 3.4 | 2.2 |
| Lead | ug/g | <0.002 | <0.002 | <0.002 |
| Manganese | ug/g | 0.07 | 0.07 | 0.15 |
| Mercury | ug/g | 0.067 | 0.11 | 0.085 |
| Molybdenum | ug/g | <0.02 | <0.02 | <0.02 |
| Nickel | ug/g | <0.01 | 0.02 | 0.07 |
| Selenium | ug/g | 0.17 | 0.18 | 0.17 |
| Silver | ug/g | <0.002 | <0.002 | <0.002 |
| Strontium | ug/g | 0.26 | 0.31 | 1.1 |
| Thallium | ug/g | <0.01 | <0.01 | <0.01 |
| Tin | ug/g | 0.02 | <0.01 | <0.01 |
| Titanium | ug/g | 0.01 | 0.02 | 0.02 |
| Uranium | ug/g | <0.001 | <0.001 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.02 | <0.02 |
| Zinc | ug/g | 5.0 | 7.4 | 6.5 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.001 | <0.001 |
| Polonium-210 | Bq/g | 0.0011 | 0.0006 | 0.0009 |
| Radium-226 | Bq/g | <0.00007 | <0.0002 | <0.00009 |
| Thorium-228 | Bq/g | <0.0001 | <0.0003 | <0.0002 |
| Thorium-230 | Bq/g | <0.0001 | <0.0003 | <0.0002 |
| Thorium-232 | Bq/g | <0.0001 | <0.0003 | <0.0002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 77.24 | 78.54 | 78.75 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Note for Sample # 22758
This sample was reanalyzed for Cobalt. Reanalysis confirms original results are within the expected measurement uncertainty.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22759 LA7-WS1 *FISH FLESH***
**22760 LA7-WS2 *FISH FLESH***
**22761 LAB-NP1 *FISH FLESH***

| Analyte | Units | 22759 | 22760 | 22761 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.02 | <0.02 | <0.02 |
| Arsenic | ug/g | 0.03 | 0.02 | 0.02 |
| Barium | ug/g | 0.05 | 0.03 | 0.04 |
| Beryllium | ug/g | <0.002 | <0.002 | <0.002 |
| Boron | ug/g | <0.2 | <0.2 | <0.2 |
| Cadmium | ug/g | <0.002 | <0.002 | <0.002 |
| Chromium | ug/g | <0.1 | <0.1 | <0.1 |
| Cobalt | ug/g | 0.004 | <0.002 | 0.008 |
| Copper | ug/g | 0.66 | 0.17 | 0.46 |
| Iron | ug/g | 5.3 | 2.2 | 4.4 |
| Lead | ug/g | <0.002 | <0.002 | <0.002 |
| Manganese | ug/g | 0.09 | 0.12 | 0.20 |
| Mercury | ug/g | 0.027 | 0.014 | 0.14 |
| Molybdenum | ug/g | <0.02 | <0.02 | <0.02 |
| Nickel | ug/g | 0.01 | <0.01 | <0.01 |
| Selenium | ug/g | 0.18 | 0.18 | 0.30 |
| Silver | ug/g | <0.002 | <0.002 | <0.002 |
| Strontium | ug/g | 0.15 | 0.32 | 0.43 |
| Thallium | ug/g | <0.01 | <0.01 | <0.01 |
| Tin | ug/g | <0.01 | <0.01 | <0.01 |
| Titanium | ug/g | <0.01 | 0.02 | 0.02 |
| Uranium | ug/g | <0.001 | <0.001 | <0.001 |
| Vanadium | ug/g | <0.02 | <0.02 | <0.02 |
| Zinc | ug/g | 5.8 | 2.7 | 9.8 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.001 | <0.001 | <0.001 |
| Polonium-210 | Bq/g | 0.0008 | 0.0011 | 0.0012 |
| Radium-226 | Bq/g | <0.00007 | <0.00007 | <0.00007 |
| Thorium-228 | Bq/g | <0.0001 | <0.0001 | <0.0001 |
| Thorium-230 | Bq/g | <0.0001 | <0.0001 | <0.0001 |
| Thorium-232 | Bq/g | <0.0001 | <0.0001 | <0.0001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 80.16 | 81.85 | 79.19 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Note for Sample # 22761
This sample was reanalyzed for Polonium 210. Reanalysis confirms original results are within the expected measurement uncertainty.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22762 LA1-NP1 *FISH BONES***
**22763 LA1-NP2 *FISH BONES***
**22764 LA1-NP3 *FISH BONES***

| Analyte | Units | 22762 | 22763 | 22764 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.05 | <0.05 | <0.05 |
| Arsenic | ug/g | <0.02 | <0.02 | <0.02 |
| Barium | ug/g | 5.5 | 2.2 | 5.4 |
| Beryllium | ug/g | <0.01 | <0.01 | <0.01 |
| Boron | ug/g | <0.5 | <0.5 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.01 | <0.01 |
| Chromium | ug/g | <0.2 | <0.2 | <0.2 |
| Cobalt | ug/g | 0.16 | 0.05 | 0.12 |
| Copper | ug/g | 0.16 | 0.32 | 0.28 |
| Iron | ug/g | 2.7 | 5.6 | 4.4 |
| Lead | ug/g | 0.04 | <0.01 | <0.01 |
| Manganese | ug/g | 14 | 5.7 | 16 |
| Mercury | ug/g | 0.03 | 0.20 | 0.02 |
| Molybdenum | ug/g | <0.05 | <0.05 | <0.05 |
| Nickel | ug/g | 0.06 | 0.07 | 0.09 |
| Selenium | ug/g | 0.12 | 0.20 | 0.16 |
| Silver | ug/g | <0.01 | <0.01 | <0.01 |
| Strontium | ug/g | 146 | 41 | 117 |
| Thallium | ug/g | <0.02 | <0.02 | <0.02 |
| Tin | ug/g | <0.02 | <0.02 | <0.02 |
| Titanium | ug/g | 0.21 | 0.31 | 0.24 |
| Uranium | ug/g | <0.01 | <0.01 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.05 | <0.05 |
| Zinc | ug/g | 45 | 32 | 64 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.002 | <0.002 |
| Polonium-210 | Bq/g | 0.0005 | 0.0005 | 0.0007 |
| Radium-226 | Bq/g | <0.001 | <0.0009 | <0.0007 |
| Thorium-228 | Bq/g | <0.002 | <0.002 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.002 | <0.001 |
| Thorium-232 | Bq/g | <0.002 | <0.002 | <0.001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 59.61 | 61.35 | 63.36 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22765 LA1-NP4 *FISH BONES***
**22766 LA1-WS1 *FISH BONES***
**22767 LA1-WS2 *FISH BONES***

| Analyte | Units | 22765 | 22766 | 22767 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | <0.5 | <0.5 |
| Antimony | ug/g | <0.05 | <0.05 | <0.05 |
| Arsenic | ug/g | <0.02 | <0.02 | <0.02 |
| Barium | ug/g | 3.3 | 7.3 | 5.4 |
| Beryllium | ug/g | <0.01 | <0.01 | <0.01 |
| Boron | ug/g | <0.5 | <0.5 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.01 | <0.01 |
| Chromium | ug/g | <0.2 | <0.2 | <0.2 |
| Cobalt | ug/g | 0.07 | 0.14 | 0.11 |
| Copper | ug/g | 0.27 | 0.27 | 0.38 |
| Iron | ug/g | 3.2 | 4.1 | 9.8 |
| Lead | ug/g | <0.01 | <0.01 | <0.01 |
| Manganese | ug/g | 9.4 | 10 | 27 |
| Mercury | ug/g | 0.04 | <0.01 | 0.02 |
| Molybdenum | ug/g | <0.05 | <0.05 | <0.05 |
| Nickel | ug/g | 0.04 | 0.03 | 0.05 |
| Selenium | ug/g | 0.20 | 0.13 | 0.21 |
| Silver | ug/g | <0.01 | <0.01 | 0.02 |
| Strontium | ug/g | 67 | 188 | 119 |
| Thallium | ug/g | <0.02 | <0.02 | <0.02 |
| Tin | ug/g | <0.02 | <0.02 | <0.02 |
| Titanium | ug/g | 0.33 | 0.40 | 0.52 |
| Uranium | ug/g | <0.01 | <0.01 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.05 | <0.05 |
| Zinc | ug/g | 34 | 18 | 21 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.002 | <0.002 |
| Polonium-210 | Bq/g | 0.0008 | 0.001 | 0.002 |
| Radium-226 | Bq/g | <0.0009 | <0.0009 | <0.001 |
| Thorium-228 | Bq/g | <0.002 | <0.002 | <0.002 |
| Thorium-230 | Bq/g | <0.002 | <0.002 | <0.002 |
| Thorium-232 | Bq/g | <0.002 | <0.002 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 62.20 | 52.68 | 53.40 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22768 LA5-WS1 *FISH BONES***
**22769 LA6-NP1 *FISH BONES***
**22770 LA6-WS1 *FISH BONES***

| Analyte | Units | 22768 | 22769 | 22770 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 1.0 | 1.4 | <0.5 |
| Antimony | ug/g | <0.05 | <0.05 | <0.05 |
| Arsenic | ug/g | 0.02 | <0.02 | <0.02 |
| Barium | ug/g | 4.4 | 8.0 | 5.6 |
| Beryllium | ug/g | <0.01 | <0.01 | <0.01 |
| Boron | ug/g | <0.5 | <0.5 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.01 | <0.01 |
| Chromium | ug/g | <0.2 | <0.2 | <0.2 |
| Cobalt | ug/g | 0.10 | 0.12 | 0.13 |
| Copper | ug/g | 0.37 | 0.26 | 0.42 |
| Iron | ug/g | 9.4 | 8.6 | 13 |
| Lead | ug/g | 0.01 | <0.01 | <0.01 |
| Manganese | ug/g | 22 | 15 | 36 |
| Mercury | ug/g | 0.01 | 0.06 | 0.02 |
| Molybdenum | ug/g | <0.05 | <0.05 | <0.05 |
| Nickel | ug/g | 0.07 | 0.07 | 0.08 |
| Selenium | ug/g | 0.18 | 0.15 | 0.20 |
| Silver | ug/g | <0.01 | <0.01 | <0.01 |
| Strontium | ug/g | 107 | 113 | 165 |
| Thallium | ug/g | <0.02 | <0.02 | <0.02 |
| Tin | ug/g | <0.02 | <0.02 | <0.02 |
| Titanium | ug/g | 0.25 | 0.24 | 0.23 |
| Uranium | ug/g | <0.01 | <0.01 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.05 | <0.05 |
| Zinc | ug/g | 20 | 46 | 22 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.002 | <0.002 |
| Polonium-210 | Bq/g | 0.001 | 0.0008 | 0.002 |
| Radium-226 | Bq/g | <0.0008 | <0.0009 | <0.0008 |
| Thorium-228 | Bq/g | <0.002 | <0.002 | <0.002 |
| Thorium-230 | Bq/g | <0.002 | <0.002 | <0.002 |
| Thorium-232 | Bq/g | <0.002 | <0.002 | <0.002 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 57.26 | 61.99 | 61.72 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22771 LA7-NP1 *FISH BONES***
**22772 LA7-NP2 *FISH BONES***
**22773 LA7-NP3 *FISH BONES***

| Analyte | Units | 22771 | 22772 | 22773 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | 0.7 | <0.5 | 0.5 |
| Antimony | ug/g | <0.05 | <0.05 | <0.05 |
| Arsenic | ug/g | <0.02 | 0.02 | <0.02 |
| Barium | ug/g | 4.9 | 4.1 | 4.5 |
| Beryllium | ug/g | <0.01 | <0.01 | <0.01 |
| Boron | ug/g | <0.5 | <0.5 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.01 | <0.01 |
| Chromium | ug/g | <0.2 | <0.2 | <0.2 |
| Cobalt | ug/g | 0.14 | 0.13 | 0.11 |
| Copper | ug/g | 0.30 | 0.25 | 0.21 |
| Iron | ug/g | 7.5 | 7.6 | 6.1 |
| Lead | ug/g | <0.01 | <0.01 | <0.01 |
| Manganese | ug/g | 6.8 | 6.0 | 7.8 |
| Mercury | ug/g | 0.01 | 0.04 | 0.03 |
| Molybdenum | ug/g | <0.05 | <0.05 | <0.05 |
| Nickel | ug/g | 0.13 | 0.05 | 0.03 |
| Selenium | ug/g | 0.12 | 0.13 | 0.14 |
| Silver | ug/g | <0.01 | <0.01 | <0.01 |
| Strontium | ug/g | 132 | 105 | 127 |
| Thallium | ug/g | <0.02 | <0.02 | <0.02 |
| Tin | ug/g | 0.05 | <0.02 | <0.02 |
| Titanium | ug/g | 0.14 | 0.15 | 0.33 |
| Uranium | ug/g | <0.01 | <0.01 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.05 | <0.05 |
| Zinc | ug/g | 43 | 44 | 39 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | 0.002 | <0.002 |
| Polonium-210 | Bq/g | <0.0005 | 0.0008 | 0.002 |
| Radium-226 | Bq/g | <0.001 | <0.001 | <0.0006 |
| Thorium-228 | Bq/g | <0.002 | <0.003 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.003 | <0.001 |
| Thorium-232 | Bq/g | <0.002 | <0.003 | <0.001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 55.72 | 51.09 | 66.94 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
T: 306-933-6932 F: 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca
www.src.sk.ca/analytical

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

**22774 LA7-WS1 *FISH BONES***
**22775 LA7-WS2 *FISH BONES***
**22776 LAB-NP1 *FISH BONES***

| Analyte | Units | 22774 | 22775 | 22776 |
|---|---|---|---|---|
| **Lab Section 2 (ICP)** | | | | |
| Aluminum | ug/g | <0.5 | 1.6 | 0.8 |
| Antimony | ug/g | <0.05 | <0.05 | <0.05 |
| Arsenic | ug/g | 0.03 | 0.02 | 0.05 |
| Barium | ug/g | 5.2 | 4.7 | 1.9 |
| Beryllium | ug/g | <0.01 | <0.01 | <0.01 |
| Boron | ug/g | <0.5 | <0.5 | <0.5 |
| Cadmium | ug/g | <0.01 | <0.01 | <0.01 |
| Chromium | ug/g | <0.2 | <0.2 | <0.2 |
| Cobalt | ug/g | 0.15 | 0.06 | 0.12 |
| Copper | ug/g | 0.33 | 0.50 | 0.44 |
| Iron | ug/g | 150 | 120 | 150 |
| Lead | ug/g | <0.01 | <0.01 | <0.01 |
| Manganese | ug/g | 16 | 6.4 | 17 |
| Mercury | ug/g | <0.01 | <0.01 | 0.05 |
| Molybdenum | ug/g | <0.05 | <0.05 | <0.05 |
| Nickel | ug/g | 0.13 | 0.05 | 0.06 |
| Selenium | ug/g | 0.16 | 0.16 | 0.24 |
| Silver | ug/g | <0.01 | <0.01 | <0.01 |
| Strontium | ug/g | 172 | 67 | 39 |
| Thallium | ug/g | <0.02 | <0.02 | <0.02 |
| Tin | ug/g | <0.02 | 0.02 | <0.02 |
| Titanium | ug/g | 0.48 | 1.7 | 0.46 |
| Uranium | ug/g | <0.01 | <0.01 | <0.01 |
| Vanadium | ug/g | <0.05 | <0.05 | <0.05 |
| Zinc | ug/g | 21 | 11 | 31 |
| **Lab Section 4 (Radiochemistry)** | | | | |
| Lead-210 | Bq/g | <0.002 | <0.002 | <0.002 |
| Polonium-210 | Bq/g | 0.002 | 0.001 | 0.001 |
| Radium-226 | Bq/g | <0.001 | <0.0009 | <0.0007 |
| Thorium-228 | Bq/g | <0.002 | <0.002 | <0.001 |
| Thorium-230 | Bq/g | <0.002 | <0.002 | <0.001 |
| Thorium-232 | Bq/g | <0.002 | <0.002 | <0.001 |
| **Lab Section 6 (Misc.)** | | | | |
| Moisture | % | 60.03 | 65.32 | 64.97 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

***Revised***

SRC Group # 2017-6189

Aug 17, 2017

EcoMetrix Inc.

Results are reported on a "raw weight" basis.
Revised to include Mercury analysis as requested by client 08/10/2017 SB
Note the addition of results for moisture as per client request. VE Aug 17/17

**CANADIAN CENTRE FOR DNA BARCODING**
**DNA Testing Laboratory Report**

Date of issue: August 31, 2018 

**FORENSIC CASE INFORMATION**

File Number: CCDB-PRE-02763

Accession Number: CCDB-PRE-02763

Client Name:
Fei Luo
EcoMetrix, Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Canada
Email: fluo@ecometrix.ca

**ITEMS**

Description: Environmental samples (22 tubes with NC filters preserved in ethanol)

Dates Received: July 18, 2018

Received From: Fei Luo

Dates of Analysis: July 26, 2018 to August 14, 2018

Collector/Collection Site: Natalia Ivanova / Canadian Centre for DNA Barcoding, Biodiversity of Ontario, University of Guelph, 50 Stone Road East, Guelph

Processed by: Natalia Ivanova

## METHODS

### DNA extraction:

Upon receiving, each sample tube was accessioned with Process and kept at -20°C before processing. Prior to DNA extraction, all lab surfaces and pipettors were sterilized using 10% bleach, followed by 70% ethanol, as described in [1]. Pipettors were repeatedly cleaned with 10% bleach, followed by 70% ethanol during extraction and gloves were frequently changed. Centrifuge rotors, adapters, and tube racks were washed with diluted ELIMINase (Decon Labs) (1:10) and rinsed with deionized water. Prior to Extraction each filter was carefully unfolded using sterilized forceps (forceps were sterilized with 20% bleach, followed by 100% ethanol and triple flame sterilization between samples) and placed in DNEasy PowerWater Bead Tube. DNA was extracted using QIAGEN DNEasy PowerWater kit following manufacturer's instructions for alternative lysis procedure (heating samples at 65°C prior to grinding) and eluted in 100 µl of EB buffer. DNA was transferred into a 96-well plate in 3 replicates per sample.

### The Next Generation Sequencing (NGS) workflows:

**S5 workflow:**
The target genetic marker – COI was amplified using the Polymerase Chain Reaction (PCR) for 40 cycles with M13-tailed primers (Table 1), using standard CCDB protocol for Platinum Taq to produce M13-tailed amplicon libraries. Resulted PCR products were diluted 2x and used for second round PCR with fusion primers for 20 cycles to create IonXpress MID-tag labeled libraries. AquaF2 library was pooled without normalization and purified using magnetic beads with 0.9 to 1 bead to product ratio, and diluted to 26 pM for S5 run using Ion 520/530 chef kit.

**PGM workflow:**
The target genetic marker – COI was amplified using the Polymerase Chain Reaction (PCR) for 40 cycles with regular primers (Table 1), using standard CCDB protocol for Platinum Taq to produce. Resulted PCR products were diluted 2x and used for second round PCR with fusion primers for 20 cycles to create IonXpress MID-tag labeled libraries.
Each library (AquaF2 and AquaF3) was pooled separately without normalization and purified using magnetic beads with 0.9 to 1 bead to product ratio, then each amplicon library was diluted to 13 pM. For the PGM run two libraries were combined in equal ratios and resulting normalized library was used for templating reaction. or Ion PGM Template Hi-Q View 400 kit, 316 chip and Hi-Q View Ion PGM Sequencing 400 Kit for Ion Torrent PGM were used for sequencing, according to manufacturer's instructions.

**Note:** For the S5 workflow, each DNA replicate was processed under a separate IonXpress MID-tag, while for the PGM workflow three DNA replicates for each sample were processed under the same IonXpress MID-tag.

The following procedure was used to process the raw NGS reads: Cutadapt (v1.8.1) was used to trim primer sequences; Sickle (v1.33) was used for size filtering (sequences from 100-205 bp were retained), while Uclust (v1.2.22q) was employed to recognize OTUs based on the >98% identity and a minimum read depth of 2 thresholds. The Local Blast 2.2.29+ algorithm was then used to compare each OTU to the reference sequences in five datasets: public fish data from BOLD filtered to genus and species ID level (130,357 sequences), and public BOLD data for Amphibia, Aves, Mammalia, and Reptilia represented by the following datasets: DS-EBACAMPH (11,018 sequences), DS-EBACAVES (28,914 sequences), DS-EBACMAMM (39,890 sequences), DS-EBACREPT (5,424 sequences). Raw Blast output results were parsed using a custom-built python scripts, processed results in tab-delimited format were imported to MS Excel, filtered by min score of 250, and 97-100% percent identity range. Blast search results were parsed and concatenated using custom Python scripts; exported to Excel and visualized using Tableau software.

**Table 1. Primers used for eDNA amplification**

| Region/Primer name | Direction | Primer sequence | Reference |
|---|---|---|---|
| **COX1** | | | |
| AquaF2 | F | [M13F]ATCACRACCATCATYAAYATRAARCC | [2] |
| AquaF3 | F | [M13F]CCAGCCATTTCNCARTACCARACRCC | [1] |
| **C_FishR1** | | **Cocktail primers (FR1d: FishR2; 1:1)** | [3] |
| FR1d | R | [M13R]ACCTCAGGGTGTCCGAARAAYCARAA | |
| FishR2 | R | [M13R]ACTTCAGGGTGACCGAAGAATCAGAA | |
| **M13-tails - S5 workflow** | | | |
| M13F | F | TGTAAAACGACGGCCAGT | [4] |
| M13R | R | CAGGAAACAGCTATGAC | [4] |
| **NGS-fusion** | | | |
| IonA | F | CCATCTCATCCCTGCGTGTCTCC[GACT][IonExpress-MID][specific sequence] | Ion Torrent, Thermo Fisher Scientific |
| trP1 | R | CCTCTCTATGGGCAGTCGGTGAT [specific sequence] | Ion Torrent, Thermo Fisher Scientific |

## DNA SEQUENCING RESULTS AND INTERPRETATION FOR NGS

NGS run reports are provided in Appendixes 1 and 2. Only high quality reads assigned to correct Ion Express MID tags were used in NGS data analysis. Only human reads were detected both in Samples and Negative controls. No vertebrate DNA was detected in environmental samples.

## SUMMARY

**Table 2. Summary of identification results filtered by min score 250. Green shading – samples processed on S5 and PGM instruments, no shading – S5 only.**

| | | | | Instrument | |
|---|---|---|---|---|---|
| Process ID | Sample ID | Top Hit Identification | Replicate | PGM | S5 |
| CCDB-ST02290 | LA1DNA1 | Homo sapiens | Rep1-3 | 8 | |
| | | | Rep2 | | 2 |
| | | NoTopHit | Rep1-3 | 2001 | |
| | | | Rep2 | | 2 |
| | | | Rep3 | | 2 |
| CCDB-ST02291 | LA1DNA2 | Homo sapiens | Rep1-3 | 111328 | |
| | | NoTopHit | Rep1 | | 8 |
| | | | Rep1-3 | 10 | |
| | | | Rep2 | | 2 |
| CCDB-ST02292 | LA1DNA3 | Homo sapiens | Rep1-3 | 10 | |
| | | | Rep2 | | 1056 |
| | | NoTopHit | Rep1 | | 2 |
| | | | Rep1-3 | 110 | |
| | | | Rep3 | | 2 |
| CCDB-ST02293 | LA1DNA4 | Homo sapiens | Rep1-3 | 209221 | |
| | | NoTopHit | Rep1 | | 5 |

| | | | | | |
|---|---|---|---|---|---|
| | | | Rep1-3 | 135678 | |
| | | | Rep2 | | 8 |
| CCDB-ST02294 | LA1DNA5 | Homo sapiens | Rep2 | | 26 |
| | | NoTopHit | Rep1-3 | 11 | |
| | | | Rep2 | | 2 |
| CCDB-ST02295 | LA1DNA5 | NoTopHit | Rep1 | | 18640 |
| | | | Rep1-3 | 203761 | |
| | | | Rep3 | | 277 |
| CCDB-ST02296 | LA1DNA6 | Homo sapiens | Rep1-3 | 196873 | |
| | | NoTopHit | Rep1-3 | 14537 | |
| CCDB-ST02297 | LA1DNA7 | Homo sapiens | Rep1-3 | 4 | |
| | | NoTopHit | Rep1-3 | 101 | |
| CCDB-ST02298 | LA1DNA8 | Homo sapiens | Rep1-3 | 779 | |
| | | NoTopHit | Rep1-3 | 1946 | |
| | | | Rep2 | | 2 |
| | | | Rep3 | | 75 |
| CCDB-ST02299 | LA1DNA9 | Homo sapiens | Rep1-3 | 5 | |
| | | NoTopHit | Rep1 | | 5556 |
| | | | Rep1-3 | 17687 | |
| CCDB-ST02300 | LA1DNA10 | Homo sapiens | Rep1-3 | 4 | |
| | | NoTopHit | Rep1-3 | 2 | |
| | | | Rep3 | | 2 |
| CCDB-ST02301 | LA6DNA1 | NoTopHit | Rep1 | | 6122 |
| | | | Rep1-3 | 5395 | |
| | | | Rep2 | | 457 |
| | | | Rep3 | | 3060 |
| CCDB-ST02302 | LA6DNA2 | Homo sapiens | Rep1 | | 42 |
| | | | Rep1-3 | 15144 | |
| | | NoTopHit | Rep1 | | 77939 |
| | | | Rep1-3 | 45360 | |
| | | | Rep2 | | 146654 |
| CCDB-ST02303 | LA6DNA3 | NoTopHit | Rep1 | | 8 |
| | | | Rep2 | | 6 |
| | | | Rep3 | | 1400522 |
| CCDB-ST02304 | LA6DNA4 | NoTopHit | Rep1 | | 2360719 |
| | | | Rep2 | | 2 |
| | | | Rep3 | | 497780 |
| CCDB-ST02305 | LA6DNA5 | NoTopHit | Rep1 | | 3 |
| | | | Rep2 | | 2 |
| | | | Rep3 | | 709654 |
| CCDB-ST02306 | LA6DNA6 | NoTopHit | Rep1 | | 3 |
| CCDB-ST02307 | LA6DNA7 | NoTopHit | Rep2 | | 13 |
| CCDB-ST02308 | LA6DNA8 | NoTopHit | Rep1 | | 8 |
| | | | Rep3 | | 2 |

| | | | | | |
|---|---|---|---|---|---|
| CCDB-ST02311 | FieldBlk | Homo sapiens | Rep1-3 | 6 | |
| | | NoTopHit | Rep1 | | 7 |
| | | | Rep1-3 | 5 | |
| CCDB-ST02312 | CCDB-EXT-NEG | Homo sapiens | Rep1-3 | 4 | |
| | | | Rep3 | | 1038775 |
| | | NoTopHit | Rep1 | | 3 |
| | | | Rep2 | | 4 |
| CCDB-ST02313 | CCDB-PCR-NEG | Homo sapiens | Rep1-3 | 2 | |
| | | | Rep2 | | 3 |
| | | NoTopHit | Rep1-3 | 8 | |
| | | | Rep2 | | 2 |
| | | | Rep3 | | 2 |

**TROUBLESHOOTING**

DNA was quantified using Qubit HS kit. Majority of samples (except for LA1DNA5B, LA6DNA1 and LA6DNA2, which barely passed sensitivity threshold) were below sensitivity threshold.

**RECOMMENDATIONS**

1) Optimize sampling and DNA extraction protocols using alternative kits or CCDB DNA extraction protocols, as there were reported issues with Qiagen version of DNEasy PowerWater kit: https://www.researchgate.net/post/Is_the_new_DNeasy_Power_Water_kit_from_Qiagen_working_properly_for_DNA_extraction
2) We suggest running mock experiment using water from aquarium and from Irvine creek in Elora on frozen and Ethanol-preserved filters using in-house DNA extraction method and DNeasy kit as a control. We need to develop proper filter handling technique which will allow to process samples in efficient manner. DNA extracted from the mock experiment (or PCR product generated from this DNA) can serve as a positive control for future NGS runs for this project.

**EXAMPLE OF SUCCESSFUL eDNA SEQUENCING RUN**

Example of successful eDNA sequencing run from our recent paper on eDNA detection [1] is provided in Appendix 3.

**References**

1. Valdez-Moreno M, Ivanova N V., Elias-Gutierrez M, Pedersen SL, Bessonov K, Hebert PDN. Using eDNA to biomonitor the fish community in a tropical oligotrophic lake. bioRxiv. 2018; 375089. doi:10.1101/375089
2. Ivanova N V, Clare EL, Borisenko A V. DNA barcoding in mammals. In: Kress J, Erickson D, editors. Analytical protocols In: DNA barcodes, methods in molecular biology. Humana Press; 2012. pp. 153–182. doi:10.1007/978-1-61779-591-6
3. Ivanova NV, Zemlak TS, Hanner RH, Hebert PDN. Universal primer cocktails for fish DNA barcoding. Mol Ecol Notes. 2007;7: 544–548.
4. Messing J. New M13 vectors for cloning. Methods Enzymol. 1983;101: 20–78.

**RESULTS REPORTED BY:**



Natalia Ivanova, Lead DNA Scientist

**RESULTS REVIEWED BY:**



Dr. Evgeny V. Zakharov, Director, CCDB

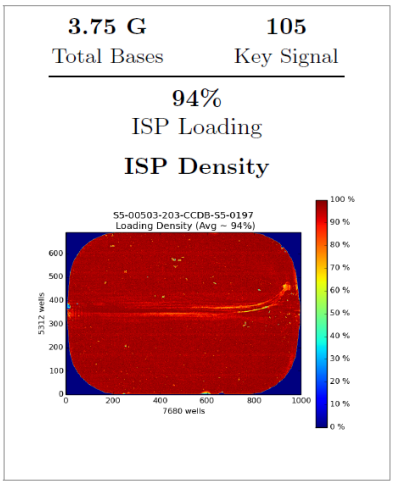
All inquiries pertaining to this report should be directed to Natalia Ivanova (nivanova@uoguelph.ca) and Evgeny V. Zakharov (zakharov@uoguelph.ca).
This report should not be reproduced, except in full, without written approval of the CCDB.

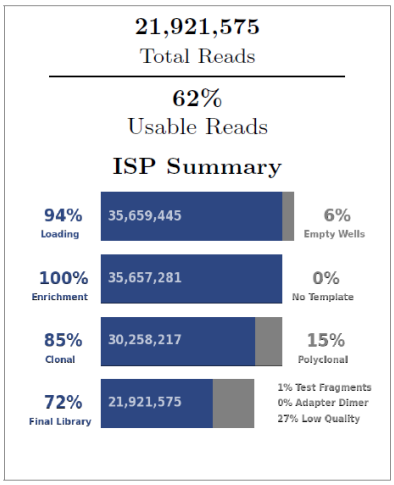
Disclaimer: "THIS REPORT AND ALL ATTACHMENTS HERETO ARE CONFIDENTIAL AND SUBJECT TO SOLICITOR-CLIENT PRIVILEGE. DO NOT FORWARD, CIRCULATE, DISTRIBUTE, COPY OR DUPLICATE THIS REPORT OR ANY ATTACHMENT HERETO WITHOUT AUTHORIZATION"

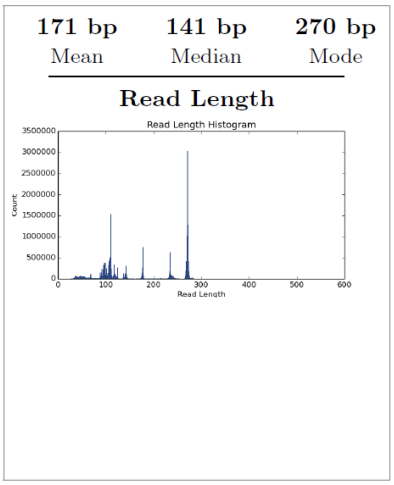
**Appendix 1. Ion Torrent S5 Report**

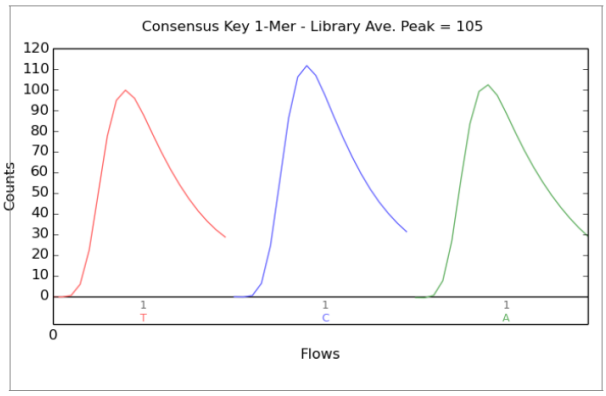
Run Report for Auto_user_S5-00503-203-CCDB-S5-0197_335

# Run Summary




| **Addressable Wells** | **37,849,615** | |
|---|---|---|
| With ISPs | 35,659,445 | 94.2% |
| Live | 35,657,281 | 100.0% |
| Test Fragment | 314,933 | 00.9% |
| Library | 35,342,348 | 99.1% |

| **Library ISPs** | **35,342,348** | |
|---|---|---|
| Filtered: Polyclonal | 5,399,064 | 15.3% |
| Filtered: Low Quality | 7,741,851 | 21.9% |
| Filtered: Adapter Dimer | 1,067 | 00.0% |
| **Final Library ISPs** | **21,921,575** | **62.0%** |

Notes: CCDB-PRE-02763. Fei Luo eDNA. DNeasy PowerWater Kit. AquaF2_t1-C_FishR1_t1. Platinum 40x20 cycles. 0.9 cleanup. 26 pM.

| Barcode Name | Sample | Bases | $\geq Q20$ | Reads | Mean Read Length | Read Length Histogram |
|---|---|---|---|---|---|---|
| No barcode | none | 94,233,563 | 72,871,096 | 691,350 | 136 bp |  |
| IonXpress_001 | CCDB-ST02290_LA1DNA1_AquaF2t1-CFishR1t1_Rep1 | 455,321 | 409,439 | 4,738 | 96 bp |  |
| IonXpress_002 | CCDB-ST02290_LA1DNA1_AquaF2t1-CFishR1t1_Rep2 | 324,606 | 299,212 | 3,390 | 95 bp |  |
| IonXpress_003 | CCDB-ST02290_LA1DNA1_AquaF2t1-CFishR1t1_Rep3 | 57,431,110 | 51,416,164 | 522,459 | 109 bp |  |



CCDB, BIO, UofG, 50 Stone Rd E, Building 138, Guelph, ON. Canada N1G 2W1 Tel: 1-519-824-4120 Fax: 1-519-824-5703

| | | | | | | |
|---|---|---|---|---|---|---|
| IonXpress_004 | CCDB-ST02291_LA1DNA2_AquaF2t1-CFishR1t1_Rep1 | 52,768,389 | 45,706,094 | 554,957 | 95 bp |  |
| IonXpress_005 | CCDB-ST02291_LA1DNA2_AquaF2t1-CFishR1t1_Rep2 | 3,054 | 2,735 | 25 | 122 bp |  |
| IonXpress_006 | CCDB-ST02291_LA1DNA2_AquaF2t1-CFishR1t1_Rep3 | 15,177 | 13,929 | 157 | 96 bp |  |
| IonXpress_007 | CCDB-ST02292_LA1DNA3_AquaF2t1-CFishR1t1_Rep1 | 19,359,782 | 17,529,030 | 209,689 | 92 bp |  |
| IonXpress_008 | CCDB-ST02292_LA1DNA3_AquaF2t1-CFishR1t1_Rep2 | 378,242 | 339,528 | 1,513 | 249 bp |  |
| IonXpress_009 | CCDB-ST02292_LA1DNA3_AquaF2t1-CFishR1t1_Rep3 | 44,336 | 38,908 | 463 | 95 bp |  |
| IonXpress_010 | CCDB-ST02293_LA1DNA4_AquaF2t1-CFishR1t1_Rep1 | 2,759 | 2,613 | 23 | 119 bp |  |
| IonXpress_011 | CCDB-ST02293_LA1DNA4_AquaF2t1-CFishR1t1_Rep2 | 10,491 | 9,620 | 99 | 105 bp |  |
| IonXpress_012 | CCDB-ST02293_LA1DNA4_AquaF2t1-CFishR1t1_Rep3 | 1,633 | 1,383 | 20 | 81 bp |  |
| IonXpress_013 | CCDB-ST02294_LA1DNA5_AquaF2t1-CFishR1t1_Rep1 | 157,707 | 144,411 | 1,593 | 99 bp |  |
| IonXpress_014 | CCDB-ST02294_LA1DNA5_AquaF2t1-CFishR1t1_Rep2 | 14,075 | 12,553 | 76 | 185 bp |  |
| IonXpress_015 | CCDB-ST02294_LA1DNA5_AquaF2t1-CFishR1t1_Rep3 | 2,551 | 2,309 | 33 | 77 bp |  |
| IonXpress_016 | CCDB-ST02295_LA1DNA5_AquaF2t1-CFishR1t1_Rep1 | 63,894,088 | 57,495,463 | 516,193 | 123 bp |  |
| IonXpress_017 | CCDB-ST02295_LA1DNA5_AquaF2t1-CFishR1t1_Rep2 | 40,864,306 | 36,044,300 | 450,799 | 90 bp |  |
| IonXpress_018 | CCDB-ST02295_LA1DNA5_AquaF2t1-CFishR1t1_Rep3 | 5,155,818 | 4,413,581 | 48,517 | 106 bp |  |



iontorrent by Thermo Fisher Scientific

| | | | | | | |
|---|---|---|---|---|---|---|
| IonXpress_019 | CCDB-ST02296_LA1DNA6_AquaF2t1-CFishR1t1_Rep1 | 1,086 | 994 | 13 | 83 bp |  |
| IonXpress_020 | CCDB-ST02296_LA1DNA6_AquaF2t1-CFishR1t1_Rep2 | 2,094 | 1,876 | 16 | 130 bp |  |
| IonXpress_021 | CCDB-ST02296_LA1DNA6_AquaF2t1-CFishR1t1_Rep3 | 2,082 | 1,933 | 20 | 104 bp |  |
| IonXpress_022 | CCDB-ST02297_LA1DNA7_AquaF2t1-CFishR1t1_Rep1 | 1,307 | 1,151 | 15 | 87 bp |  |
| IonXpress_023 | CCDB-ST02297_LA1DNA7_AquaF2t1-CFishR1t1_Rep2 | 13,404 | 11,427 | 142 | 94 bp |  |
| IonXpress_024 | CCDB-ST02297_LA1DNA7_AquaF2t1-CFishR1t1_Rep3 | 2,302 | 2,050 | 19 | 121 bp |  |
| IonXpress_025 | CCDB-ST02298_LA1DNA8_AquaF2t1-CFishR1t1_Rep1 | 87,876 | 77,119 | 913 | 96 bp |  |
| IonXpress_026 | CCDB-ST02298_LA1DNA8_AquaF2t1-CFishR1t1_Rep2 | 9,782,037 | 8,812,172 | 92,015 | 106 bp |  |
| IonXpress_027 | CCDB-ST02298_LA1DNA8_AquaF2t1-CFishR1t1_Rep3 | 23,054 | 21,752 | 92 | 250 bp |  |
| IonXpress_028 | CCDB-ST02299_LA1DNA9_AquaF2t1-CFishR1t1_Rep1 | 287,403,674 | 256,896,423 | 1,731,359 | 165 bp |  |
| IonXpress_029 | CCDB-ST02299_LA1DNA9_AquaF2t1-CFishR1t1_Rep2 | 82,473,110 | 70,290,262 | 829,477 | 99 bp |  |
| IonXpress_030 | CCDB-ST02299_LA1DNA9_AquaF2t1-CFishR1t1_Rep3 | 17,288,090 | 14,434,306 | 193,587 | 89 bp |  |
| IonXpress_031 | CCDB-ST02300_LA1DNA10_AquaF2t1-CFishR1t1_Rep1 | 56,460 | 52,150 | 628 | 89 bp |  |
| IonXpress_032 | CCDB-ST02300_LA1DNA10_AquaF2t1-CFishR1t1_Rep2 | 1,902 | 1,561 | 28 | 67 bp |  |
| IonXpress_033 | CCDB-ST02300_LA1DNA10_AquaF2t1-CFishR1t1_Rep3 | 1,453 | 1,323 | 14 | 103 bp |  |



iontorrent
by Thermo Fisher Scientific

Run Report for Auto_user_S5-00503-203-CCDB-S5-0197_335

| | | | | | | |
|---|---|---|---|---|---|---|
| IonXpress_034 | CCDB-ST02301_LA6DNA1_AquaF2t1-CFishR1t1_Rep1 | 40,715,490 | 35,124,314 | 450,159 | 90 bp |  |
| IonXpress_035 | CCDB-ST02301_LA6DNA1_AquaF2t1-CFishR1t1_Rep2 | 87,592,056 | 71,915,031 | 665,906 | 131 bp |  |
| IonXpress_036 | CCDB-ST02301_LA6DNA1_AquaF2t1-CFishR1t1_Rep3 | 30,406,570 | 28,237,067 | 306,120 | 99 bp |  |
| IonXpress_037 | CCDB-ST02302_LA6DNA2_AquaF2t1-CFishR1t1_Rep1 | 70,172,337 | 62,428,955 | 554,681 | 126 bp |  |
| IonXpress_038 | CCDB-ST02302_LA6DNA2_AquaF2t1-CFishR1t1_Rep2 | 155,508,084 | 132,675,436 | 1,129,858 | 137 bp |  |
| IonXpress_039 | CCDB-ST02302_LA6DNA2_AquaF2t1-CFishR1t1_Rep3 | 274,095,886 | 246,621,070 | 1,367,746 | 200 bp |  |
| IonXpress_040 | CCDB-ST02303_LA6DNA3_AquaF2t1-CFishR1t1_Rep1 | 11,425,122 | 9,743,682 | 129,926 | 87 bp |  |
| IonXpress_041 | CCDB-ST02303_LA6DNA3_AquaF2t1-CFishR1t1_Rep2 | 6,028 | 5,543 | 41 | 147 bp |  |
| IonXpress_042 | CCDB-ST02303_LA6DNA3_AquaF2t1-CFishR1t1_Rep3 | 492,884,625 | 442,615,230 | 1,987,850 | 247 bp |  |
| IonXpress_043 | CCDB-ST02304_LA6DNA4_AquaF2t1-CFishR1t1_Rep1 | 745,629,062 | 684,888,676 | 3,045,707 | 244 bp |  |
| IonXpress_044 | CCDB-ST02304_LA6DNA4_AquaF2t1-CFishR1t1_Rep2 | 784,070 | 715,716 | 5,089 | 154 bp |  |
| IonXpress_045 | CCDB-ST02304_LA6DNA4_AquaF2t1-CFishR1t1_Rep3 | 185,239,626 | 154,481,096 | 763,321 | 242 bp |  |
| IonXpress_046 | CCDB-ST02305_LA6DNA5_AquaF2t1-CFishR1t1_Rep1 | 2,884 | 2,586 | 23 | 125 bp |  |
| IonXpress_047 | CCDB-ST02305_LA6DNA5_AquaF2t1-CFishR1t1_Rep2 | 8,416,651 | 7,711,184 | 89,817 | 93 bp |  |
| IonXpress_048 | CCDB-ST02305_LA6DNA5_AquaF2t1-CFishR1t1_Rep3 | 235,407,678 | 213,739,174 | 1,061,301 | 221 bp |  |

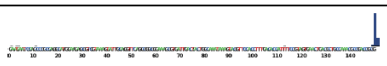
| | | | | | | |
|---|---|---|---|---|---|---|
| IonXpress_049 | CCDB-ST02306_LA6DNA6_AquaF2t1-CFishR1t1_Rep1 | 3,685 | 3,140 | 37 | 99 bp |  |
| IonXpress_050 | CCDB-ST02306_LA6DNA6_AquaF2t1-CFishR1t1_Rep2 | 51,467,706 | 44,983,313 | 507,237 | 101 bp |  |
| IonXpress_051 | CCDB-ST02306_LA6DNA6_AquaF2t1-CFishR1t1_Rep3 | 4,070 | 3,527 | 43 | 94 bp |  |
| IonXpress_052 | CCDB-ST02307_LA6DNA7_AquaF2t1-CFishR1t1_Rep1 | 15,996 | 14,742 | 163 | 98 bp |  |
| IonXpress_053 | CCDB-ST02307_LA6DNA7_AquaF2t1-CFishR1t1_Rep2 | 9,036 | 7,898 | 51 | 177 bp |  |
| IonXpress_054 | CCDB-ST02307_LA6DNA7_AquaF2t1-CFishR1t1_Rep3 | 578 | 563 | 9 | 64 bp |  |
| IonXpress_055 | CCDB-ST02308_LA6DNA8_AquaF2t1-CFishR1t1_Rep1 | 6,151 | 5,567 | 46 | 133 bp |  |
| IonXpress_056 | CCDB-ST02308_LA6DNA8_AquaF2t1-CFishR1t1_Rep2 | 5,765 | 4,731 | 58 | 99 bp |  |
| IonXpress_057 | CCDB-ST02308_LA6DNA8_AquaF2t1-CFishR1t1_Rep3 | 1,224 | 1,130 | 8 | 153 bp |  |
| IonXpress_058 | CCDB-ST02309_LA6DUP_AquaF2t1-CFishR1t1_Rep1 | 1,274 | 1,212 | 19 | 67 bp |  |
| IonXpress_059 | CCDB-ST02309_LA6DUP_AquaF2t1-CFishR1t1_Rep2 | 1,917 | 1,811 | 27 | 71 bp |  |
| IonXpress_060 | CCDB-ST02309_LA6DUP_AquaF2t1-CFishR1t1_Rep3 | 862,378 | 790,749 | 9,463 | 91 bp |  |
| IonXpress_073 | CCDB-ST02310_LA6DNA9_AquaF2t1-CFishR1t1_Rep1 | 1,598 | 1,439 | 18 | 88 bp |  |
| IonXpress_074 | CCDB-ST02310_LA6DNA9_AquaF2t1-CFishR1t1_Rep2 | 56,423,854 | 49,647,442 | 537,078 | 105 bp |  |
| IonXpress_075 | CCDB-ST02310_LA6DNA9_AquaF2t1-CFishR1t1_Rep3 | 15,796,008 | 14,273,435 | 187,125 | 84 bp |  |



iontorrent by Thermo Fisher Scientific

Run Report for Auto_user_S5-00503-203-CCDB-S5-0197_335

| | | | | | | |
|---|---|---|---|---|---|---|
| IonXpress_079 | CCDB-ST02311_FieldBlk_AquaF2t1-CFishR1t1_Rep1 | 32,415,983 | 27,936,762 | 379,159 | 85 bp |  |
| IonXpress_080 | CCDB-ST02311_FieldBlk_AquaF2t1-CFishR1t1_Rep2 | 18,862,974 | 16,714,253 | 199,720 | 94 bp |  |
| IonXpress_081 | CCDB-ST02311_FieldBlk_AquaF2t1-CFishR1t1_Rep3 | 1,327 | 1,095 | 15 | 88 bp |  |
| IonXpress_082 | CCDB-ST02312_CCDB-EXT-NEG_AquaF2t1-CFishR1t1_Rep1 | 40,060 | 35,325 | 395 | 101 bp |  |
| IonXpress_083 | CCDB-ST02312_CCDB-EXT-NEG_AquaF2t1-CFishR1t1_Rep2 | 456,240 | 422,503 | 4,675 | 97 bp |  |
| IonXpress_084 | CCDB-ST02312_CCDB-EXT-NEG_AquaF2t1-CFishR1t1_Rep3 | 420,663,168 | 361,590,478 | 1,783,046 | 235 bp |  |
| IonXpress_094 | CCDB-ST02313_CCDB-PCR-NEG_AquaF2t1-CFishR1t1_Rep1 | 5,549,316 | 4,959,511 | 57,699 | 96 bp |  |
| IonXpress_095 | CCDB-ST02313_CCDB-PCR-NEG_AquaF2t1-CFishR1t1_Rep2 | 56,761,856 | 48,976,045 | 597,014 | 95 bp |  |
| IonXpress_096 | CCDB-ST02313_CCDB-PCR-NEG_AquaF2t1-CFishR1t1_Rep3 | 23,407,776 | 20,479,450 | 246,471 | 94 bp |  |

| Test Fragment | Reads | Percent 50AQ17 | Read Length Histogram |
|---|---|---|---|
| **TF_1** | **107,810** | **95** |  |

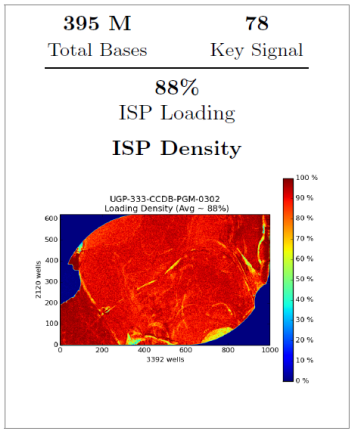


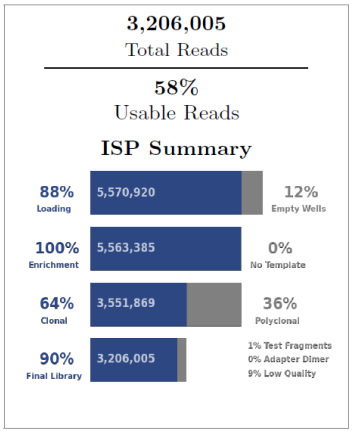
iontorrent by Thermo Fisher Scientific

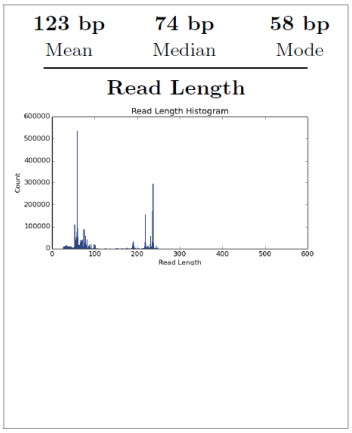
**Appendix 2. Ion Torrent PGM Report**

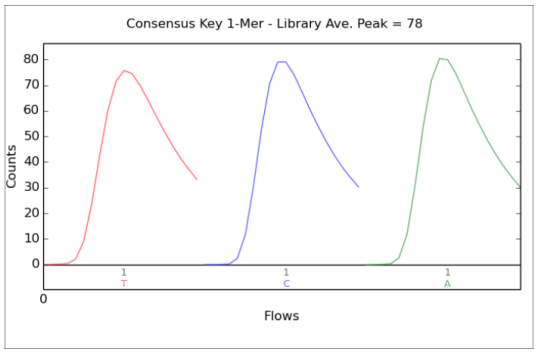
Run Report for Auto_user_UGP-333-CCDB-PGM-0302_213

## Run Summary




| | | |
|---|---|---|
| **Addressable Wells** | **6,337,389** | |
| With ISPs | 5,570,920 | 87.9% |
| Live | 5,563,385 | 99.9% |
| Test Fragment | 36,425 | 00.7% |
| Library | 5,526,960 | 99.3% |
| **Library ISPs** | **5,526,960** | |
| Filtered: Polyclonal | 2,011,516 | 36.4% |
| Filtered: Low Quality | 265,488 | 04.8% |
| Filtered: Adapter Dimer | 83 | 00.0% |
| **Final Library ISPs** | **3,206,005** | **58.0%** |

Notes: CCDB-PRE-02763. Fei Luo eDNA. DNeasy PowerWater Kit. AquaF2-F3C_FishR1. Platinum 40x20 cycles. 0.9 manual cleanup. 13 pM

| Barcode Name | Sample | Bases | $\geq Q20$ | Reads | Mean Read Length | Read Length Histogram |
|---|---|---|---|---|---|---|
| No barcode | none | 14,684,175 | 11,381,644 | 177,138 | 82 bp | |
| IonXpress_040 | CCDB-ST02290_LA1DNA1_AquaF2-F3-CFishR1 | 9,233,550 | 8,658,461 | 139,619 | 66 bp | |
| IonXpress_041 | CCDB-ST02291_LA1DNA2_AquaF2-F3-CFishR1 | 32,522,576 | 30,871,924 | 202,335 | 160 bp | |
| IonXpress_042 | CCDB-ST02292_LA1DNA3_AquaF2-F3-CFishR1 | 31,264,120 | 29,608,464 | 228,840 | 136 bp | |



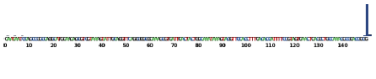
ion torrent by Thermo Fisher Scientific

Run Report for Auto_user_UGP-333-CCDB-PGM-0302_213

| | | | | | | |
|---|---|---|---|---|---|---|
| IonXpress_043 | CCDB-ST02293_LA1DNA4_AquaF2-F3-CFishR1 | 87,673,629 | 82,555,250 | 481,244 | 182 bp |  |
| IonXpress_044 | CCDB-ST02294_LA1DNA5_AquaF2-F3-CFishR1 | 2,765,183 | 2,606,517 | 49,496 | 55 bp |  |
| IonXpress_045 | CCDB-ST02295_LA1DNA5_AquaF2-F3-CFishR1 | 69,840,746 | 65,184,366 | 510,229 | 136 bp |  |
| IonXpress_046 | CCDB-ST02296_LA1DNA6_AquaF2-F3-CFishR1 | 58,303,327 | 55,332,442 | 331,953 | 175 bp |  |
| IonXpress_047 | CCDB-ST02297_LA1DNA7_AquaF2-F3-CFishR1 | 5,089,413 | 4,739,639 | 81,388 | 62 bp |  |
| IonXpress_048 | CCDB-ST02298_LA1DNA8_AquaF2-F3-CFishR1 | 5,163,433 | 4,888,657 | 82,634 | 62 bp |  |
| IonXpress_049 | CCDB-ST02299_LA1DNA9_AquaF2-F3-CFishR1 | 12,192,872 | 11,459,906 | 144,618 | 84 bp |  |
| IonXpress_050 | CCDB-ST02300_LA1DNA10_AquaF2-F3-CFishR1 | 3,376,554 | 3,166,743 | 58,996 | 57 bp |  |
| IonXpress_051 | CCDB-ST02301_LA6DNA1_AquaF2-F3-CFishR1 | 19,477,805 | 17,705,260 | 215,792 | 90 bp |  |
| IonXpress_052 | CCDB-ST02302_LA6DNA2_AquaF2-F3-CFishR1 | 31,607,735 | 30,029,186 | 302,909 | 104 bp |  |
| IonXpress_053 | CCDB-ST02311_FieldBlk_AquaF2-F3-CFishR1 | 4,268,180 | 3,967,145 | 74,203 | 57 bp |  |
| IonXpress_054 | CCDB-ST02312_CCDB-EXT-NEG_AquaF2-F3-CFishR1 | 3,131,615 | 2,950,690 | 54,668 | 57 bp |  |
| IonXpress_055 | CCDB-ST02313_CCDB-PCR-NEG_AquaF2-F3-CFishR1 | 3,998,678 | 3,747,359 | 69,903 | 57 bp |  |

**Test Fragments Report**

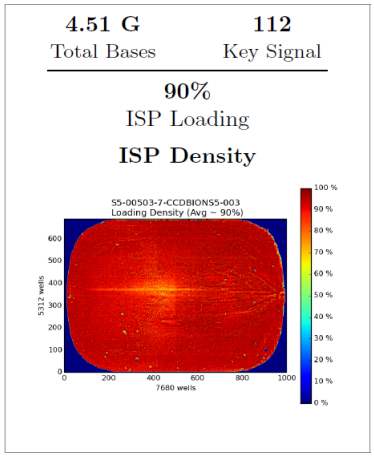
Run Report for Auto_user_UGP-333-CCDB-PGM-0302_213

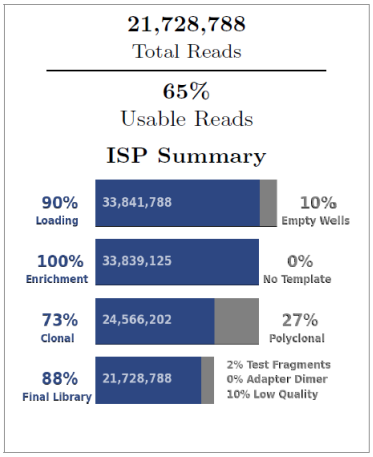
| | | | |
|---|---|---|---|
| **TF_C** | **22,591** | **98** |  |
| **TF_1** | **12,107** | **92** |  |

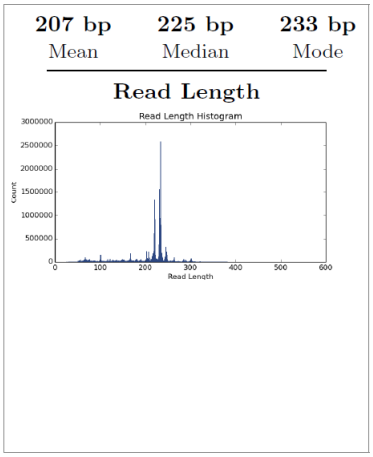
**Appendix 3. Example of productive S5 sequencing run on eDNA.**

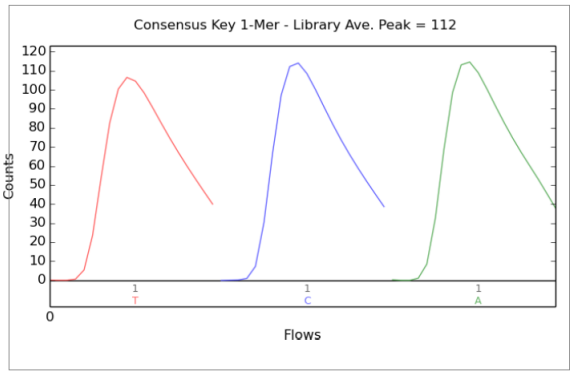
Run Report for Auto_user_S5-00503-7-CCDBIONS5-003_63

## Run Summary




| **Addressable Wells** | **37,559,830** | |
|---|---|---|
| With ISPs | 33,841,788 | 90.1% |
| Live | 33,839,125 | 100.0% |
| Test Fragment | 464,815 | 01.4% |
| Library | 33,374,310 | 98.6% |
| **Library ISPs** | **33,374,310** | |
| Filtered: Polyclonal | 9,272,923 | 27.8% |
| Filtered: Low Quality | 2,393,044 | 07.2% |
| Filtered: Adapter Dimer | 335 | 00.0% |
| **Final Library ISPs** | **21,728,788** | **65.1%** |

Notes: CCDBION187 eDNA re-purified. Mexico eDNA same library dilution. 1_2 of PGM dilution aiming for 26 pmol.

| Barcode Name | Sample | Bases | $\geq Q20$ | Reads | Mean Read Length |
|---|---|---|---|---|---|
| No barcode | none | 2,265,502,459 | 2,086,838,687 | 11,318,236 | 200 bp |
| IonXpress_040 | PW1-AquaF2-AquaF3-ion40-C_FishR1_trP1 | 178,498,912 | 168,563,853 | 815,252 | 219 bp |
| IonXpress_041 | PW2-AquaF2-AquaF3-ion41-C_FishR1_trP1 | 157,020,826 | 147,834,242 | 737,133 | 213 bp |
| IonXpress_042 | PW3-AquaF2-AquaF3-ion42-C_FishR1_trP1 | 166,857,470 | 157,797,927 | 759,707 | 220 bp |
| IonXpress_043 | PW4-AquaF2-AquaF3-ion43-C_FishR1_trP1 | 174,092,897 | 163,434,131 | 812,073 | 214 bp |
| IonXpress_044 | PW5-AquaF2-AquaF3-ion44-C_FishR1_trP1 | 112,142,766 | 105,286,997 | 516,418 | 217 bp |



iontorrent
by Thermo Fisher Scientific

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-9335

Jul 22, 2019

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Robert Eakins

Date Samples Received: Jul-08-2019 Client P.O.:

---

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

This is a final report.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-9335

Jul 22, 2019

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Robert Eakins

Date Samples Received: Jul-08-2019 Client P.O.:

**37104 07/05/2019 SA1 *WATER***
**37105 07/05/2019 SA1B *WATER***
**37106 07/05/2019 SA2 *WATER***

| Analyte | Units | 37104 | 37105 | 37106 |
|---|---|---|---|---|
| **Lab Section 1** | | | | |
| Bicarbonate | mg/L | 8 | 7 | 5 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.5 | 0.4 | 0.4 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 7.02 | 7.04 | 7.04 |
| Specific conductivity | uS/cm | 13 | 11 | 9 |
| Sum of ions | mg/L | 13 | 11 | 9 |
| Total alkalinity | mg/L | 7 | 6 | 4 |
| Total hardness | mg/L | 5 | 5 | 4 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 | <0.01 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.48 | 0.55 | 0.58 |
| Mercury | ng/L | 2 | 2 | 2 |
| Organic carbon | mg/L | 2.2 | 2.1 | 2.3 |
| Organic carbon, dissolved | mg/L | 2.4 | 2.5 | 2.7 |
| Fluoride | mg/L | 0.02 | 0.02 | 0.02 |
| Total dissolved solids | mg/L | 33 | 34 | 12 |
| Total suspended solids | mg/L | 1 | 1 | <1 |
| **Lab Section 2** | | | | |
| Calcium | mg/L | 1.2 | 1.2 | 1.1 |
| Magnesium | mg/L | 0.4 | 0.4 | 0.3 |
| Potassium | mg/L | 0.4 | 0.4 | 0.3 |
| Sodium | mg/L | 1.4 | 1.4 | 1.4 |
| Sulfate | mg/L | 0.7 | 0.6 | 0.6 |
| Aluminum | mg/L | 0.0054 | 0.0068 | 0.0071 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | <0.1 | <0.1 |
| Barium | mg/L | 0.0022 | 0.0023 | 0.0020 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-9335

Jul 22, 2019

EcoMetrix Inc.

**37104 07/05/2019 SA1 *WATER***
**37105 07/05/2019 SA1B *WATER***
**37106 07/05/2019 SA2 *WATER***

| Analyte | Units | 37104 | 37105 | 37106 |
|---|---|---|---|---|
| **Lab Section 2** | | | | |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.12 | 0.11 | 0.066 |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.012 | 0.013 | 0.0098 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.011 | 0.012 | 0.010 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.0017 | 0.0016 | 0.0020 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | 0.005 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-9335

Jul 22, 2019

EcoMetrix Inc.

**37107 07/05/2019 SA3 *WATER***
**37108 07/04/2019 SA4 *WATER***
**37109 07/04/2019 SA5 *WATER***

| Analyte | Units | 37107 | 37108 | 37109 |
|---|---|---|---|---|
| **Lab Section 1** | | | | |
| Bicarbonate | mg/L | 5 | 11 | 7 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.6 | 0.5 | 0.3 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 6.96 | 7.04 | 6.99 |
| Specific conductivity | uS/cm | 14 | 11 | 8 |
| Sum of ions | mg/L | 10 | 16 | 11 |
| Total alkalinity | mg/L | 4 | 9 | 6 |
| Total hardness | mg/L | 5 | 5 | 4 |
| Ammonia as nitrogen | mg/L | 0.02 | <0.01 | <0.01 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.24 | 0.27 | 0.21 |
| Mercury | ng/L | 2 | 2 | 2 |
| Organic carbon | mg/L | 2.3 | 2.6 | 2.2 |
| Organic carbon, dissolved | mg/L | 2.7 | 3.1 | 2.8 |
| Fluoride | mg/L | 0.02 | 0.02 | 0.02 |
| Total dissolved solids | mg/L | 17 | 40 | 36 |
| Total suspended solids | mg/L | <1 | 1 | <1 |
| **Lab Section 2** | | | | |
| Calcium | mg/L | 1.4 | 1.3 | 1.1 |
| Magnesium | mg/L | 0.4 | 0.4 | 0.3 |
| Potassium | mg/L | 0.4 | 0.4 | 0.3 |
| Sodium | mg/L | 1.5 | 1.6 | 1.3 |
| Sulfate | mg/L | 0.8 | 0.6 | 0.6 |
| Aluminum | mg/L | 0.0033 | 0.0084 | 0.0078 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | <0.1 | <0.1 |
| Barium | mg/L | 0.0025 | 0.0022 | 0.0022 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.065 | 0.075 | 0.074 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-9335

Jul 22, 2019

EcoMetrix Inc.

**37107 07/05/2019 SA3 *WATER***
**37108 07/04/2019 SA4 *WATER***
**37109 07/04/2019 SA5 *WATER***

| Analyte | Units | 37107 | 37108 | 37109 |
|---|---|---|---|---|
| **Lab Section 2** | | | | |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.0076 | 0.012 | 0.0094 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.013 | 0.012 | 0.0097 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.0021 | 0.0015 | 0.0024 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 | 0.006 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2
**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca
**www.src.sk.ca/analytical**

SRC Group # 2019-9335

Jul 22, 2019

EcoMetrix Inc.

**37110 07/04/2019 SA6 *WATER***
**37111 07/06/2019 RC1 *WATER***
**37112 07/05/2019 FIELD BLANK *WATER***

| Analyte | Units | 37110 | 37111 | 37112 |
|---|---|---|---|---|
| **Lab Section 1** | | | | |
| Bicarbonate | mg/L | 6 | 16 | 2 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.4 | 0.6 | <0.1 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 7.03 | 7.18 | 5.61 |
| Specific conductivity | uS/cm | 9 | 12 | <1 |
| Sum of ions | mg/L | 10 | 21 | 2 |
| Total alkalinity | mg/L | 5 | 13 | 2 |
| Total hardness | mg/L | 4 | 5 | <1 |
| Ammonia as nitrogen | mg/L | <0.01 | <0.01 | <0.01 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.25 | 0.26 | <0.05 |
| Mercury | ng/L | 2 | 2 | 1 |
| Organic carbon | mg/L | 2.3 | 2.2 | <0.2 |
| Organic carbon, dissolved | mg/L | 2.8 | 2.6 | 0.3 |
| Fluoride | mg/L | 0.02 | 0.02 | <0.01 |
| Total dissolved solids | mg/L | 35 | 38 | <5 |
| Total suspended solids | mg/L | <1 | 2 | <1 |
| **Lab Section 2** | | | | |
| Calcium | mg/L | 1.2 | 1.4 | <0.1 |
| Magnesium | mg/L | 0.3 | 0.4 | <0.1 |
| Potassium | mg/L | 0.4 | 0.4 | <0.1 |
| Sodium | mg/L | 1.4 | 1.6 | 0.1 |
| Sulfate | mg/L | 0.6 | 0.5 | <0.2 |
| Aluminum | mg/L | 0.0079 | 0.0046 | 0.0013 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | <0.1 | <0.1 |
| Barium | mg/L | 0.0021 | 0.0020 | <0.0005 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.078 | 0.048 | <0.0005 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-9335

Jul 22, 2019

EcoMetrix Inc.

**37110 07/04/2019 SA6 *WATER***
**37111 07/06/2019 RC1 *WATER***
**37112 07/05/2019 FIELD BLANK *WATER***

| Analyte | Units | 37110 | 37111 | 37112 |
|---|---|---|---|---|
| **Lab Section 2** | | | | |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.010 | 0.0073 | <0.0005 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.010 | 0.013 | <0.0005 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.0016 | 0.0029 | 0.0019 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | 0.007 | <0.005 | <0.005 |
| Radium-226 | Bq/L | 0.006 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Note for Sample # 37112
This sample was reanalyzed for Zinc and Organic carbon, dissolved.
Reanalysis confirms original results are within the expected measurement uncertainty.

The temperature of the cooler was 16.2 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-12514

Sep 25, 2019

EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Fei Luo

Date Samples Received: Sep-03-2019 Client P.O.:

---

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Section 1, Lab Section 2 authorized by Keith Gipman, Supervisor
Results from Lab Section 4 authorized by Vicky Snook, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

* Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

This is a final report.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-12514

Sep 25, 2019

EcoMetrix Inc.

6800 Campobello Road
Mississauga, ON L5N 2L8
Attn: Fei Luo

Date Samples Received: Sep-03-2019 Client P.O.:

**49955 08/30/2019 SA1 *WATER***
**49956 08/30/2019 SA2 *WATER***
**49957 08/30/2019 SA3 *WATER***

| Analyte | Units | 49955 | 49956 | 49957 |
|---|---|---|---|---|
| **Lab Section 1** | | | | |
| Bicarbonate | mg/L | 5 | <1 | <1 |
| Carbonate | mg/L | <1 | 1 | <1 |
| Chloride | mg/L | 0.4 | 0.3 | 0.7 |
| Hydroxide | mg/L | <1 | 2 | 2 |
| P. alkalinity | mg/L | <1 | 7 | 7 |
| pH | pH units | 7.06 | 6.92 | 6.98 |
| Specific conductivity | uS/cm | 13 | 11 | 14 |
| Sum of ions | mg/L | 9 | 7 | 7 |
| Total alkalinity | mg/L | 4 | 8 | 7 |
| Total hardness | mg/L | 5 | 4 | 5 |
| Ammonia as nitrogen | mg/L | 0.02 | 0.02 | 0.01 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.25 | 0.26 | 0.26 |
| Mercury | ng/L | 4 | 4 | 6 |
| Organic carbon | mg/L | 2.1 | 2.2 | 2.2 |
| Organic carbon, dissolved | mg/L | 2.4 | 2.5 | 2.4 |
| Fluoride | mg/L | 0.01 | 0.01 | 0.01 |
| Total dissolved solids | mg/L | 22 | 26 | 24 |
| Total suspended solids | mg/L | 4 | 6 | 3 |
| **Lab Section 2** | | | | |
| Calcium | mg/L | 1.2 | 1.1 | 1.4 |
| Magnesium | mg/L | 0.4 | 0.4 | 0.4 |
| Potassium | mg/L | 0.4 | 0.4 | 0.4 |
| Sodium | mg/L | 1.4 | 1.4 | 1.5 |
| Sulfate | mg/L | 0.6 | 0.6 | 0.7 |
| Aluminum | mg/L | 0.0034 | 0.0087 | 0.016 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | 0.1 | 0.1 | <0.1 |
| Barium | mg/L | 0.0024 | 0.0023 | 0.0026 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-12514

Sep 25, 2019

EcoMetrix Inc.

**49955 08/30/2019 SA1 *WATER***
**49956 08/30/2019 SA2 *WATER***
**49957 08/30/2019 SA3 *WATER***

| Analyte | Units | 49955 | 49956 | 49957 |
|---|---|---|---|---|
| **Lab Section 2** | | | | |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.12 | 0.11 | 0.072 |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.015 | 0.014 | 0.0063 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | 0.0002 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.012 | 0.011 | 0.014 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | 0.0009 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.0005 | 0.0009 | 0.0008 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 10.9 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-12514

Sep 25, 2019

EcoMetrix Inc.

**49958 08/29/2019 SA4 *WATER***
**49959 08/29/2019 SA5 *WATER***
**49960 08/29/2019 SA6 *WATER***

| Analyte | Units | 49958 | 49959 | 49960 |
|---|---|---|---|---|
| **Lab Section 1** | | | | |
| Bicarbonate | mg/L | 8 | 11 | 12 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.5 | 0.2 | 0.3 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 6.97 | 6.89 | 6.93 |
| Specific conductivity | uS/cm | 16 | 10 | 11 |
| Sum of ions | mg/L | 13 | 15 | 16 |
| Total alkalinity | mg/L | 7 | 9 | 10 |
| Total hardness | mg/L | 5 | 4 | 5 |
| Ammonia as nitrogen | mg/L | 0.02 | 0.01 | 0.02 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.28 | 0.22 | 0.29 |
| Mercury | ng/L | 4 | 5 | 5 |
| Organic carbon | mg/L | 2.3 | 2.1 | 2.3 |
| Organic carbon, dissolved | mg/L | 2.4 | 2.1 | 2.6 |
| Fluoride | mg/L | 0.02 | 0.01 | 0.01 |
| Total dissolved solids | mg/L | 26 | 16 | 18 |
| Total suspended solids | mg/L | 5 | 4 | 5 |
| **Lab Section 2** | | | | |
| Calcium | mg/L | 1.4 | 1.1 | 1.2 |
| Magnesium | mg/L | 0.4 | 0.3 | 0.4 |
| Potassium | mg/L | 0.4 | 0.3 | 0.3 |
| Sodium | mg/L | 1.6 | 1.3 | 1.4 |
| Sulfate | mg/L | 0.5 | 0.5 | 0.6 |
| Aluminum | mg/L | 0.0060 | 0.0063 | 0.0072 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | <0.1 | 0.1 |
| Barium | mg/L | 0.0023 | 0.0022 | 0.0022 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.095 | 0.085 | 0.10 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-12514

Sep 25, 2019

EcoMetrix Inc.

**49958 08/29/2019 SA4 *WATER***
**49959 08/29/2019 SA5 *WATER***
**49960 08/29/2019 SA6 *WATER***

| Analyte | Units | 49958 | 49959 | 49960 |
|---|---|---|---|---|
| **Lab Section 2** | | | | |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.015 | 0.0097 | 0.013 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.013 | 0.010 | 0.011 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.0005 | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | 0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 | 0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 10.9 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-12514

Sep 25, 2019

EcoMetrix Inc.

**49961 09/01/2019 RC1 *WATER***
**49962 09/01/2019 RC1D *WATER***
**49963 08/31/2019 FIELD BLANK *WATER***

| Analyte | Units | 49961 | 49962 | 49963 |
|---|---|---|---|---|
| **Lab Section 1** | | | | |
| Bicarbonate | mg/L | 18 | 2 | 2 |
| Carbonate | mg/L | <1 | <1 | <1 |
| Chloride | mg/L | 0.5 | 0.5 | <0.1 |
| Hydroxide | mg/L | <1 | <1 | <1 |
| P. alkalinity | mg/L | <1 | <1 | <1 |
| pH | pH units | 7.03 | 7.01 | 5.57 |
| Specific conductivity | uS/cm | 13 | 13 | <1 |
| Sum of ions | mg/L | 23 | 7 | 2 |
| Total alkalinity | mg/L | 15 | 2 | 2 |
| Total hardness | mg/L | 5 | 5 | <1 |
| Ammonia as nitrogen | mg/L | 0.04 | 0.02 | 0.01 |
| Nitrate | mg/L | <0.04 | <0.04 | <0.04 |
| Total Kjeldahl nitrogen | mg/L | 0.29 | 0.28 | <0.05 |
| Mercury | ng/L | 5 | 5 | 4 |
| Organic carbon | mg/L | 2.2 | 2.2 | <0.2 |
| Organic carbon, dissolved | mg/L | 2.6 | 2.6 | <0.2 |
| Fluoride | mg/L | 0.01 | 0.01 | <0.01 |
| Total dissolved solids | mg/L | 26 | 26 | <5 |
| Total suspended solids | mg/L | 5 | 3 | <1 |
| **Lab Section 2** | | | | |
| Calcium | mg/L | 1.4 | 1.4 | <0.1 |
| Magnesium | mg/L | 0.4 | 0.4 | <0.1 |
| Potassium | mg/L | 0.4 | 0.4 | <0.1 |
| Sodium | mg/L | 1.6 | 1.6 | 0.1 |
| Sulfate | mg/L | 0.4 | 0.4 | <0.2 |
| Aluminum | mg/L | 0.0041 | 0.0038 | 0.0008 |
| Antimony | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | ug/L | <0.1 | 0.1 | <0.1 |
| Barium | mg/L | 0.0023 | 0.0023 | <0.0005 |
| Beryllium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | <0.01 | <0.01 | 0.01 |
| Cadmium | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.081 | 0.069 | <0.0005 |

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

**T:** 306-933-6932 **F:** 306-933-7922
**Toll-free:** 1-800-240-8808
**E:** analytical@src.sk.ca

**www.src.sk.ca/analytical**

SRC Group # 2019-12514

Sep 25, 2019

EcoMetrix Inc.

**49961 09/01/2019 RC1 *WATER***
**49962 09/01/2019 RC1D *WATER***
**49963 08/31/2019 FIELD BLANK *WATER***

| Analyte | Units | 49961 | 49962 | 49963 |
|---|---|---|---|---|
| **Lab Section 2** | | | | |
| Lead | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Manganese | mg/L | 0.013 | 0.012 | <0.0005 |
| Molybdenum | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | 0.014 | 0.013 | <0.0005 |
| Thallium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | <0.0002 | <0.0002 | <0.0002 |
| Uranium | ug/L | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Phosphorus | mg/L | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | <0.01 | <0.01 | <0.01 |
| **Lab Section 4** | | | | |
| Lead-210 | Bq/L | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | <0.005 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | <0.01 | <0.01 | <0.01 |

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 10.9 °C upon receipt.

# Appendix C Stream Station Photographs



Photo 1: Stream station SA-1 looking downstream (17 September 2016). This Icelander River (drainage area A) station is situated approximately2 km downstream of lake LA-1 and 3 km upstream of Russell Lake.



Photo 2: Stream station SA-1 looking upstream (17 September 2016). Northern Pike exhibiting spawning behaviour were observed within this upstream reach during the May 2017 spawning survey.



Photo 3: Stream station SA-2 looking upstream (16 September 2016). This drainage area A station is situated on the northwest tributary of lake LA-1, immediately upstream of the lake, approximately 800 m downstream of lake LA-6.



Photo 4: Stream station SA-2 looking downstream (16 September 2016). Use of the reach by White Sucker and Walleye for spawning was observed during the May 2017 spawning survey.



Photo 5: Stream station SA-3 looking upstream (16 September 2016). This drainage area A station is situated on a shallow, wide, low-flowing, sandy-bottom stream with vertical banks, upstream of lake LA-1 and downstream of lake LA-2.



Photo 6: Stream station SA-3 looking downstream (16 September 2016). Water level elevation and streamflow (discharge) at SA-3 were 494.43 masl and 0.44 cms, respectively.



Photo 7: Stream station SA-4 looking upstream (10 September 2016). This drainage area A station is situated about 800 m upstream of lake LA-6 and approximately 2 km downstream of the outlet from of Kratchkowsky Lake (LA-7).



Photo 8: Stream station SA-4 looking upstream (26 May 2017). Use of the reach by White Sucker and Lake Chub for spawning was observed during the May 2017 spawning survey.



Photo 9: Stream station SA-5 looking downstream (10 September 2016). This drainage area A station is situated immediately upstream of lake LA-6 on the northeastern tributary that provides drainage from lakes LA-8 and LA-9.



Photo 10: Stream station SA-5 looking upstream (9 September 2016). A large school of White Suckers was observed in this ponded area situated immediately upstream of the road, during the May 2017 spawning survey.



Photo 11: Stream station SA-6 looking downstream (12 September 2016). This drainage area A station is situated on the connecting channel between lakes LA-6 (upstream) and LA-5 (downstream).



Photo 12: Stream station SA-6 looking downstream (12 September 2016). Suitable spawning habitat for Northern Pike occurred near the inlet to lake LA-5, and adult pike were observed in the vicinity during the May 2017 spawning survey.



Photo 13: Stream station SA-7 looking downstream (15 September 2016). This drainage area A station is situated on the southwestern inlet tributary to Kratchkowsky Lake (LA-7A), approximately 60 m upstream of the lake.



Photo 14: Stream station SA-7 looking upstream (15 September 2016). At this location, the watercourse is a narrow, marshy stream with vertical banks. The measured streamflow was 0.04 cms.



Photo 15: Stream station SA-8 looking downstream (15 September 2016). This drainage area A station is situated on the northwestern inlet tributary to Kratchkowsky Lake (LA-7A), approximately 15 m upstream of the lake.



Photo 16: Stream station SA-8 looking upstream (15 September 2016). At this location, the watercourse is a meandering narrow, sandy-bottom stream with steep banks. Some areas of the bank were undercut.



Photo 17: Stream station SA-9 looking downstream (18 September 2016). This drainage area A station is situated the southeastern outlet tributary of lake LA-8, approximately 50 m downstream of the lake.



Photo 18: Stream station SA-9 looking upstream (18 September 2016). At this location, the watercourse is shallow and the stream bottom is comprised mainly of sand, gravel, cobbles.



Photo 19: Stream station SA-10 looking downstream (18 September 2016). This drainage area A station is situated on the northern inlet tributary to lake LA-9, approximately 150 m upstream of the lake.



Photo 20: Stream station SA-10 looking upstream (18 September 2016). At this location, the watercourse is a wide, sandy-bottom stream with vertical banks. The water is deep and slow flowing.



Photo 21: Stream station SA-11 looking upstream (19 September 2016). This drainage area A station is situated on the northeastern inlet tributary to Kratchkowsky Lake (LA-7A) approximately 25 m upstream of the lake.



Photo 22: Stream station SA-11 looking upstream (19 September 2016). At this location, the stream bottom is comprised primarily of gravel and cobbles and the stream channel is braided.



Photo 23: Stream station RC-1 looking downstream (14 September 2016). This drainage area A station is situated immediately downstream of Kratchkowsky Lake (LA-7), approximately 2 km upstream of station SA-4



Photo 24: Stream station RC-1 looking downstream (29 May 2017). A spring spawning survey was undertaken at this location and use of the reach for spawning was not observed for any species during the May 2017 spawning survey.



Photo 25: Stream station SB-1 looking downstream (17 September 2016). This drainage area B station is situated at the McArthur River Mine Road crossing, approximately 650 m upstream of Russell Lake.



Photo 26: Stream station SB-1 looking upstream (17 September 2016). At this location, the stream banks were stable, the channel was ponded, and the gradient was low.



Photo 27: Stream station SB-2 looking upstream (17 September 2016). This station is situated on a tributary that drains from the west, and joins the primary drainage B watercourse immediately upstream of the McArthur River Mine Road crossing at SB-1.



Photo 28: Stream station SB-2 looking upstream (17 September 2016). At this location, the streambed was marshy with a thick organic base and no surface water connection with the primary drainage area B watercourse was observed.



Photo 29: Stream station SB-3 looking downstream (11 September 2016). This drainage area B station is situated approximately 100 m downstream of lake LB-2.



Photo 30: Stream station SB-3 looking upstream (11 September 2016). At this location, the stream bottom is comprised of organics, sand, cobbles and boulders, and the stream banks are nearly vertical.



Photo 31: Stream station SB-4 looking downstream (11 September 2016). This drainage area B station is situated on the southwestern inlet tributary to Williams Lake (LB-3), approximately 160 m upstream of the lake.



Photo 32: Stream station SB-4 looking upstream (11 September 2016). At this location, the stream banks are shallow and poorly defined. And the stream bottom is primarily boulders and large cobbles.



Photo 33: Stream station SB-5 looking upstream (14 September 2016). This drainage area B station is situated on the outlet tributary from Williams Lake (LB-3) at the Fox Lake Tote Road crossing, approximately 350 m downstream of the lake.



Photo 34: Stream station SB-5 looking downstream (14 September 2016). At this location, the stream bottom was composed of sand, gravel and cobbles.

# Appendix D Fish species Photographs



Photo 1: Lake Chub (adult). Although this minnow species occurs in both lakes and streams within the study area, it was only captured in streams during the baseline studies.



Photo 2: Spottail Shiner (adult). This minnow species also occurs in both lakes and streams within the study area. During baseline studies it was frequently captured in lakes.



Photo 3: Longnose Sucker (adult). During baseline studies, this species was captured throughout drainage area A, in low abundance, primarily in stream habitats.



Photo 4: White Sucker (adult). This species was widely distributed throughout the study area during baseline studies, and occurred in high abundance in both lakes and streams.




Photo 5: Lake Whitefish (adult). This species was widely distributed throughout the study area during baseline studies, and occurred in high abundance, primarily in lakes.



Photo 6: Lake Trout (adult). During baseline studies, this species was only collected in very low abundance in lake LA-1 and Russell Lake.



Photo 6: Arctic Grayling (adult). During baseline studies, this species was captured low abundance in stream habitats.



Photo 7: Northern Pike (juvenile). This species was widely distributed throughout the study area during baseline studies, and was captured in high abundance in both lakes and streams.



Photo 9: Burbot (juvenile). Although this species occurs in both lakes and streams within the study area, it was captured in abundance only in the streams during baseline studies.

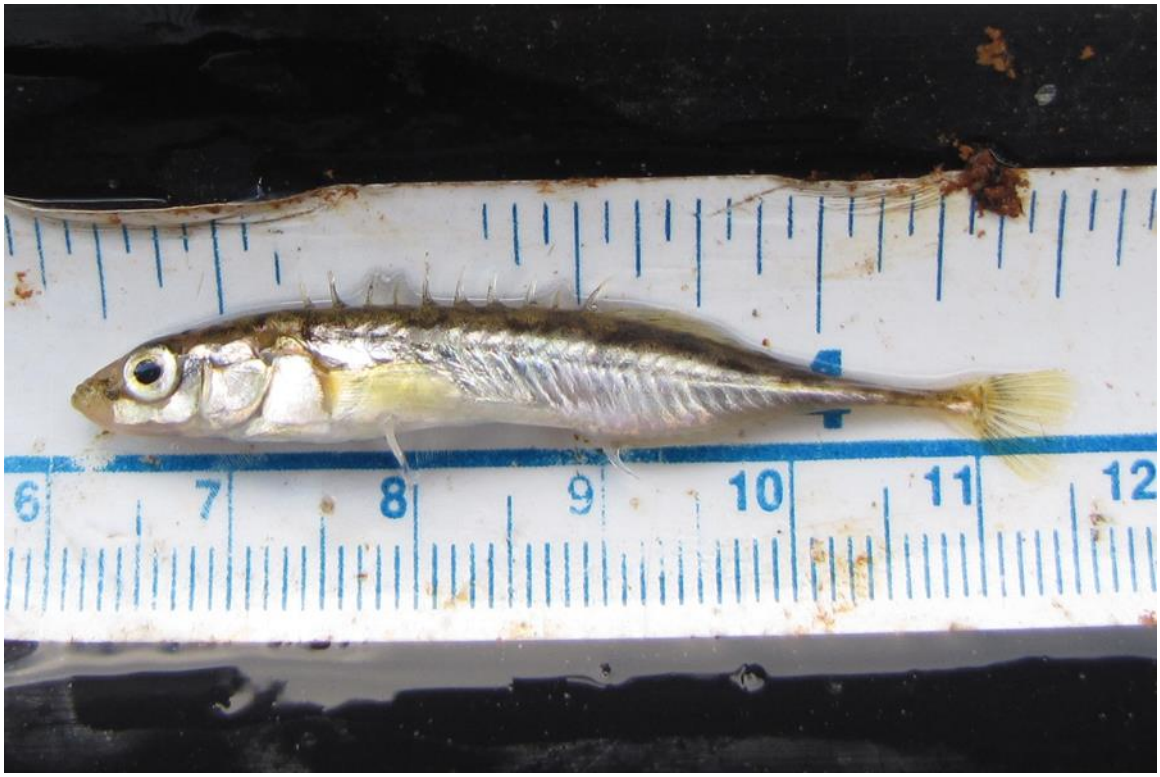



Photo 10: Ninespine Stickleback (adult). This small forage species was captured in lakes and streams throughout the study area, during baseline studies.



Photo 11: Slimy Sculpin (adult). This small species was captured only in streams, often in high abundance, during baseline studies.




Photo 12: Yellow Perch (juvenile). This species was collected in low abundance throughout the study area, in both lakes and streams, during baseline studies.



Photo 13: Walleye (adult). This species was widely distributed throughout the study area, occurring in both lakes and streams, and was captured in high abundance in lakes during baseline studies.

# Appendix E Special Collection Permits

Ministry of Environment

Saskatchewan

# SPECIAL COLLECTION PERMIT

SCP-16-SC052

Under authority of *The Fisheries Act* (*Saskatchewan*), *1994*, permission is hereby granted to Brian Fraser and the individuals listed in Table 1 of the Appendix, of EcoMetrix Inc., on behalf of Denison Mines Corporation, to collect and keep fishes and aquatic invertebrates for fish community assessment work and chemical and radiological analysis sampling, from the lakes, ponds and streams outlined in Figure 1, located in the Denison's Wheeler River Project area at the approximate coordinates: 57°30'07"N, 105°21'34W.

This does not serve as a permit for research related to species at risk pursuant to the *Species at Risk Act* or *Fisheries Act*. Permit holders should contact the Department of Fisheries and Oceans regarding prohibitions and conditions, which may be in effect for their study area or species.

This Permit is valid from **August 16, 2016,** to **September 30, 2016,** inclusive.

Please note that the following conditions apply:

- All collection gear left unattended shall be visibly labeled with a sign marked with the name of the agency and the phrase "Scientific Collection".
- No biological sampling gear shall be left unattended in excess of 24 hours.
- No shortjaw cisco (*Coregonus zenithicus*) may be retained.
- All fish released must be returned to their originating water in suitable habitat close to the area of capture. All dead or non-releasable fish not being used for mercury sampling must be disposed of in an appropriate manor.
- Conservation Officers at the Ministry of Environment field office in Pinehouse must be contacted and advised of collection activities in advance at 306.884.2060.
- Any unidentifiable fish species or yellow highlighted species in the *Fish to Collect, Preserve, Drop Off, and Info* document should be preserved and sent to the fisheries officer as per outlined instructions.
- A *Fish Data Collection Return Form* is included with this permit. Upon conclusion of collection activities, the spreadsheet must be completed without alteration with the numbers and species taken and waters from which said species were taken and submitted to the issuing Fisheries Officer. A copy of any other prepared reports containing effort and sampling information may also be submitted.

Issued in Regina, Saskatchewan, on **August 16, 2016**.

Signature of Permittee

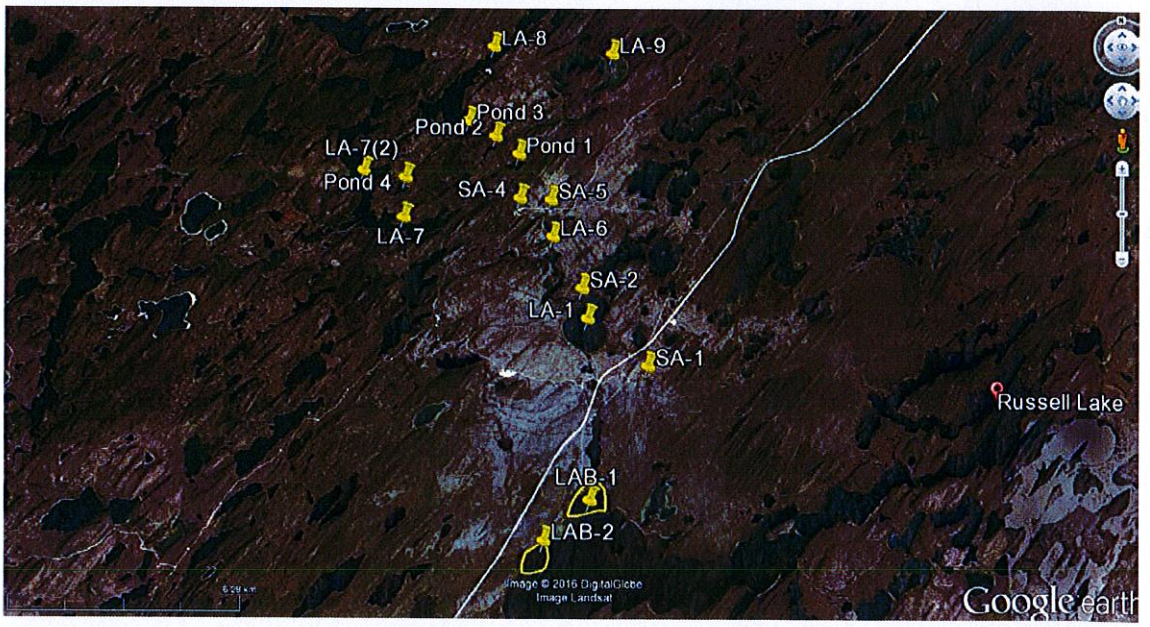
Curtis Kuntz
Fisheries Officer
Fish and Wildlife Branch

# APPENDIX
# SCP-16-SC052

**Table 1**: Additional EcoMetrix Inc. Special Collection Permit Holders:

Robert Eakins;
Joseph Tetreault;
Karen Petersen;
Carolyn Brown;
Nichole Wiemann; and
Janeen Tang.

**Image 1:** Lake and stream survey locations in the Denison's Wheeler River Project area.



Government of Saskatchewan

**Ministry of Environment**

# SPECIAL COLLECTION PERMIT

## SCP17-INV04

Under authority of *The Fisheries Act* (*Saskatchewan*), *1994*, permission is hereby granted to:

Robert Eakins and his authorized individuals listed in Table 1, of EcoMetrix Inc., on behalf of Denison Mines Corporation, to collect, keep and transport fishes and aquatic invertebrates for fish community assessment work and for the chemical and radiological analysis requirements outlined in Table 2, as part of ongoing baseline environmental studies, from waters located within the Denison's Wheeler River Project Site (Figure 1) located at the approximate geographical coordinates:

- 57°30'07"N, 105°21'34W.

*This does not serve as a permit for research related to species at risk pursuant to the Species at Risk Act or Fisheries Act. Permit holders should contact the Department of Fisheries and Oceans regarding prohibitions and conditions, which may be in effect for their study area or species.*

This Permit is valid from **April 15, 2017,** to **June 30, 2017,** inclusive.

The following conditions also apply:

- All collection gear left unattended shall be visibly labeled with a sign marked with the name of the agency and the phrase "Scientific Collection".
- No biological sampling gear shall be left unattended in excess of 24 hours.
- A sub-sample of any unidentifiable fish species or a species listed in the *Fish Submission and Preservation Requirements* document should be preserved and sent to the fisheries officer as per the instructions outlined.
- Any dead or non-releasable fish must be disposed in an environmentally acceptable manor.
- Conservation Officers at the Ministry of Environment field office in Pinehouse must be contacted and advised of collection activities in advance at (306) 884-2060.
- A *Fish Data Collection Return Form* is included with this permit. Upon conclusion of collection activities, the spreadsheet must be completed (without any alteration) with name and number of each species taken species taken and submitted to the issuing Fisheries Officer. A copy of any other prepared reports containing effort and sampling information should also be submitted.

Issued in Regina, Saskatchewan, on **April 12, 2017.**

Signature of Permittee

Curtis Kuntz
Fisheries Officer
Fish, Wildlife and Lands Branch

Government of Saskatchewan

# SPC17-INV04
# APPENDIX

**Table 1:** Additional EcoMetrix Inc. Special Collection Permit Holders:

Kristine Campbell

Nichole Wiemann

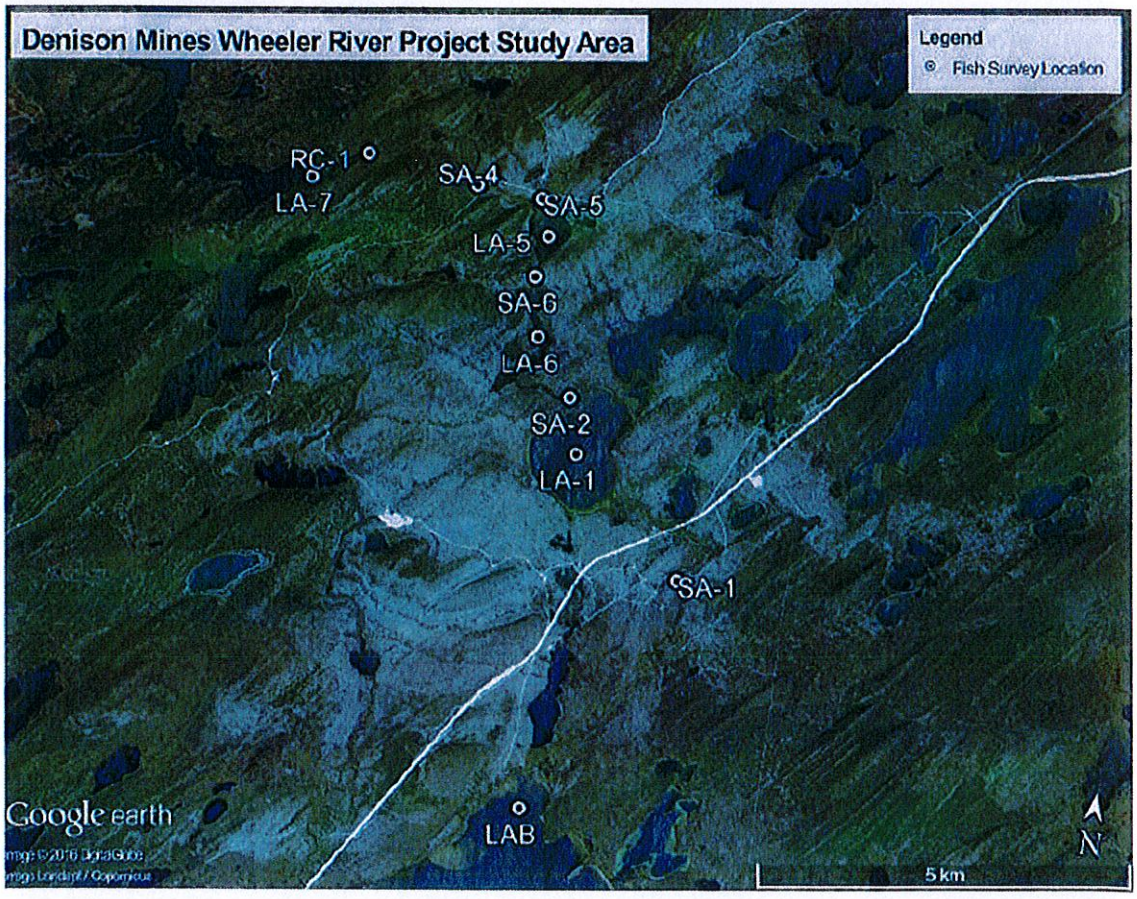
Janeen Tang.

**Table 2:** Sampling Requirements for Chemical and Radiological Analysis.

A total of 16 fish required per lake, from 5 lakes within the study area comprised of:

- 9 Northern Pike
- 7 Common White Sucker

**Figure 1:** Lake and stream survey locations in the Denison's Wheeler River Project area.



# Appendix F Golder Associates Ltd. 2014. 2012-2014 Aquatic Baseline Summary Report

May 2014

# DENISON MINES - WHEELER RIVER PROJECT

# 2012 - 2014 Aquatic Baseline Summary Report

**Submitted to:**
Mr. Lawson Forand
Exploration Manager
Denison Mines Corporation
Suite 200 - 320 - 22nd Street East
Saskatoon, SK S7K 0E9

REPORT

**Report Number:** 12-1362-0050/4000/4400

**Distribution:**

2 Copies - Denison Mines Corporation
Saskatoon, Saskatchewan
2 Copies - Golder Associates Ltd.,
Saskatoon, Saskatchewan

Golder Associates

# Table of Contents


**1.0 STUDY OBJECTIVES ..... 1**

**2.0 SAMPLING ..... 1**

**3.0 METHODS ..... 6**

3.1 Water Quality Sampling ..... 6

3.1.1 Sample Processing ..... 6

3.1.2 Sample Storage ..... 6

3.1.3 Chain-of-Custody and Sample Shipment ..... 6

3.1.4 Quality Assurance/Quality Control ..... 6

3.2 Water Chemistry Analysis ..... 7

3.2.1 Samples Submitted ..... 7

3.2.2 Comparison to Water Quality Guidelines/Objectives ..... 8

3.3 Limnology ..... 8

3.4 Bathymetric Surveys ..... 8

3.5 Fish Habitat Assessments ..... 9

3.6 Quality Assurance/Quality Control ..... 9

**4.0 RESULTS ..... 9**

4.1 Water Quality ..... 9

4.1.1 2012 Sampling Program ..... 9

4.1.2 2013 Sampling Program ..... 10

4.1.3 2014 Sampling Program ..... 11

4.2 Limnology ..... 11

4.3 Bathymetric Surveys ..... 15

4.4 Fish Habitat Assessments ..... 15

**5.0 CLOSURE ..... 18**

**6.0 REFERENCES ..... 19**

# Table of Contents (continued)

**TABLES**

Table 1: Sampling in Lakes during the 2012 Summer Sampling Program ..... 2

Table 2: Sampling in Lakes during the 2014 Winter Sampling Program ..... 2

Table 3: Sampling in Streams during the 2012 and 2013 Spring, Summer, and Fall Sampling Programs ..... 4

Table 4: Sampling in Streams during the 2014 Winter Sampling Programs ..... 4

Table 5: Quantity of Water Quality Samples Collected per Season during 2012 to 2014 Field Program ..... 8

Table 6: Aquatic Habitat Summary for Lakes in the Wheeler River Project Area, Summer 2012 ..... 16

**FIGURES**

Figure 1: Aquatic Baseline Lake Sampling, 2012 and 2014 ..... 3

Figure 2: Aquatic Baseline Stream Sampling, 2012 to 2014 ..... 5

Figure 3: Temperature and Dissolved Oxygen Profiles and Secchi Depth for Lakes in the Wheeler River Project Area, Summer 2012 ..... 12

Figure 4a: Temperature and Dissolved Oxygen Profiles and Secchi Depth for Lakes in the Wheeler River Project Area, Winter 2014 ..... 13

Figure 4b: Temperature and Dissolved Oxygen Profiles and Secchi Depth for Lakes in the Wheeler River Project Area, Winter 2014 ..... 14

**APPENDICES**

**APPENDIX A**
Water Chemistry

**APPENDIX B**
Limnology

**APPENDIX C**
Bathymetry Maps

**APPENDIX D**
Fish Habitat Maps

# 1.0 STUDY OBJECTIVES

Golder Associates Ltd. (Golder) was retained by Denison Mines Corporation (Denison) to carry out spring, summer, fall, and winter aquatics baseline investigations in two drainage areas north of Russell Lake from 2012 to 2014, and in the north bay of Russell Lake, Saskatchewan in 2012 and 2014 (the Project). The objectives of the 2012 - 2014 field sampling programs were as follows:

- to collect surface water quality samples and limnology profiles in selected streams (spring, summer, and fall of 2012 and 2013 and winter 2014) and lakes (summer 2012 and winter 2014) from the study area;
- to carry out bathymetric surveys of selected lakes in the Project study area (summer 2012); and
- to complete fish habitat assessments in the same selected lakes (summer 2012).

The data collected provides information on surface water quality of streams and lakes of the Project area, and on lake morphometry and fish habitat for selected lakes of the Project area. This information will help support future project planning, environmental assessment, and regulatory permitting activities. This field summary report describes the 2012 spring, summer, and fall field programs, carried out between May 8, 2012 and October 25, 2012; the 2013 spring, summer and fall field programs carried out between May 22, 2013 and October 19, 2013; as well as the 2014 winter field program carried out between March 22, 2014 and April 1, 2014.

# 2.0 SAMPLING

The 2012 field program included water quality sampling, bathymetric surveys, fish habitat assessments, and limnology measurements taken at stream and lake water quality sampling locations. The 2013 field program included water quality sampling and limnology measurements taken at stream water quality sampling locations. The winter 2014 field program included water quality sampling and limnology measurements taken at stream and lake water quality sampling locations. A total of four lakes (i.e., LA-1, LA-5, LA-6, and Williams Lake [LB-3]) and two portions of lakes (i.e., south-east bay of Kratchkowsky Lake and the Icelander River outlet bay of Russell Lake) were sampled for all components of the summer 2012 sampling program (Table 1, Figure 1). The same four lakes and two portions of lakes, as well as an additional four lakes (i.e., LA-2, LA-3, LA-4, and LB-2) were sampled for all components of the winter 2014 sampling program (Table 2, Figure 1). A total of 11 streams were sampled for water quality and limnology during each of the spring, summer, and fall sampling programs for 2012 and 2013 (Table 3, Figure 2) but only nine streams were sampled during the 2014 winter sampling program (Table 4, Figure 2) as bed fast ice was encountered in two streams (i.e., SB-2 and SB-5).

**Table 1: Sampling in Lakes during the 2012 Summer Sampling Program**

| Drainage | Waterbody | Water Quality | Limnology | Bathymetry | Fish Habitat | UTM Coordinates[a] | |
|---|---|---|---|---|---|---|---|
| | | | | | | Easting | Northing |
| A (Icelander River) | Lake LA-1 | √ | √ | √ | √ | 478873 | 6371901 |
| | Lake LA-5 | √ | √ | √ | √ | 477939 | 6374466 |
| | Lake LA-6 | √ | √ | √ | √ | 478043 | 6375324 |
| | Kratchkowsky Lake (LA-7) (south-east bay) | √ | √ | √ | √ | 473208 | 6375597 |
| B (Unnamed) | Williams Lake[b] (LB-3) | √ | √ | √ | √ | 473915 | 6373612 |
| Russell Lake | Russell Lake (RL-A) (Icelander River outlet bay) | √ | √ | √ | √ | 478549 | 6367476 |

[a] All location coordinates are in North American Datum 1983 (NAD 83), Zone 13.

[b] Local lake name.

UTM = Universal Transverse Mercator.

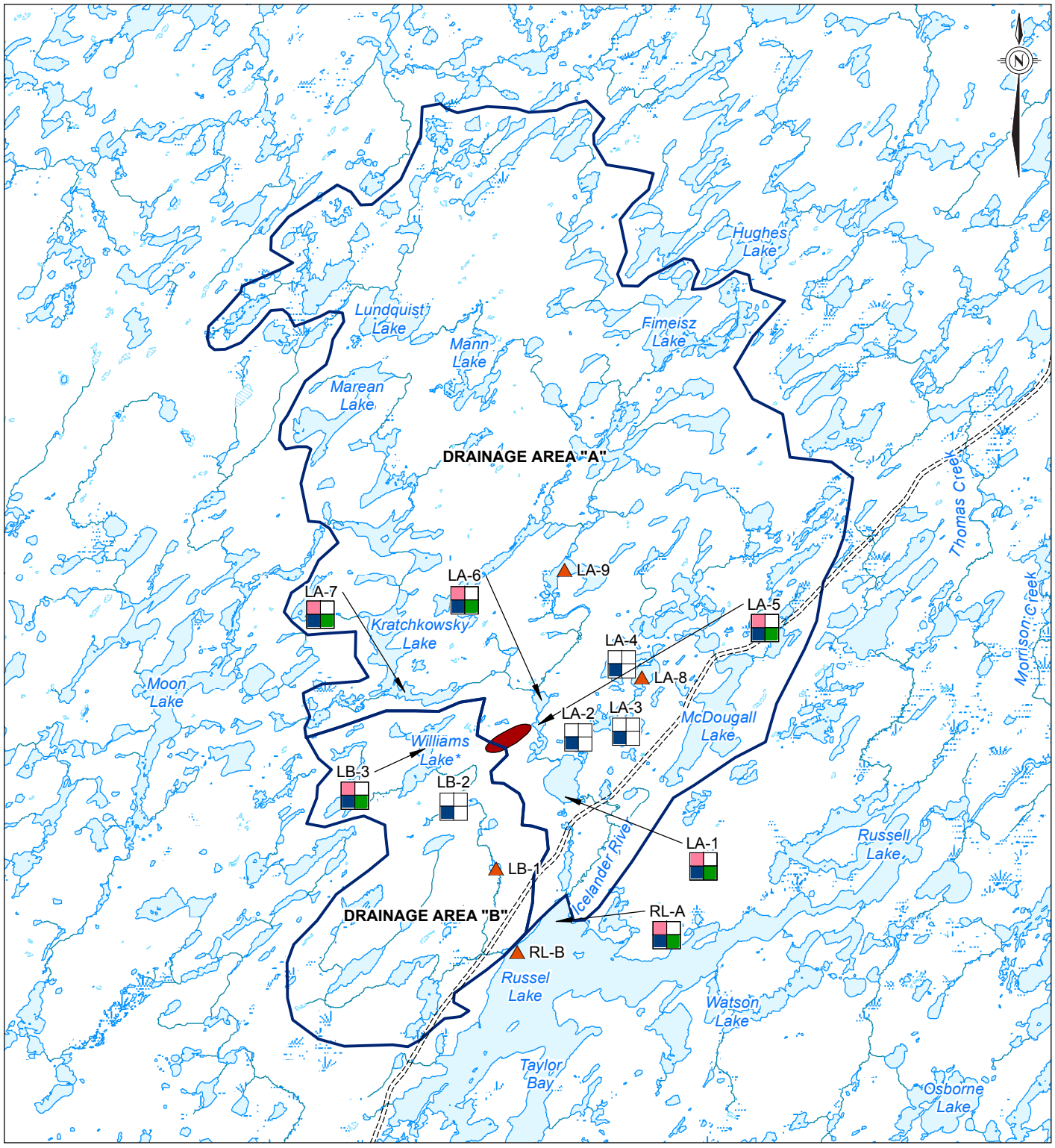
**Table 2: Sampling in Lakes during the 2014 Winter Sampling Program**

| Drainage | Waterbody | Water Quality | Limnology | UTM Coordinates[a] | |
|---|---|---|---|---|---|
| | | | | Easting | Northing |
| A (Icelander River) | Lake LA-1 | √ | √ | 478856 | 6371913 |
| | Lake LA-2 | √ | √ | 479354 | 6374020 |
| | Lake LA-3 | √ | √ | 481035 | 6374208 |
| | Lake LA-4 | √ | √ | 480889 | 6376599 |
| | Lake LA-5 | √ | √ | 477973 | 6374483 |
| | Lake LA-6 | √ | √ | 478037 | 6375331 |
| | Kratchkowsky Lake (LA-7) (south-east bay) | √ | √ | 473200 | 6375598 |
| B (Unnamed) | LB-2 | √ | √ | 474926 | 6371555 |
| | Williams Lake[b] (LB-3) | √ | √ | 473928 | 6373589 |
| Russell Lake | Russell Lake (RL-A) (Icelander River outlet bay) | √ | √ | 478559 | 6367460 |

[a] All location coordinates are in North American Datum 1983 (NAD 83), Zone 13.

[b] Local lake name.

UTM = Universal Transverse Mercator.




## LEGEND

- LAKE NOT SAMPLED
- MCARTHUR RIVER MINE ACCESS ROAD
- ORE BODY
- DRAINAGE AREA BOUNDARY
- FISH HABITAT MAPPING
- BATHYMETRIC MAPPING
- WATER QUALITY SAMPLING

4 0 4

SCALE 1:200,000 KILOMETRES

## NOTES

* LOCAL LAKE NAME

## REFERENCE

NTS MAPSHEETS 74H02,03,04,05,06,07,10,11,12
NAD83 UTM ZONE 13

PROJECT

DENISON MINES CORP.
WHEELER RIVER PROPERTY

TITLE

# AQUATIC BASELINE LAKE SAMPLING, 2012 AND 2014

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| GIS | SM/LR | 02/05/14 | FIGURE: 1 | |
| CHECK | BLC | 29/05/14 | | |
| REVIEW | BT | 29/05/14 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\Task 2500\Figure 1 - 12-1362-0050-2000-2500 - Aquatic Baseline Lake Sampling 2012 and 2014.mxd Date: 5/29/2014 2:27:07 PM

**Table 3: Sampling in Streams during the 2012 and 2013 Spring, Summer, and Fall Sampling Programs**

| Drainage | Watercourse | Water Quality and Limnology | | | UTM Coordinates[a] | |
|---|---|---|---|---|---|---|
| | | Spring | Summer | Fall | Easting | Northing |
| A (Icelander River) | SA-1 | √ | √ | √ | 480368 | 6371123 |
| | SA-2 | √ | √ | √ | 478524 | 6373216 |
| | SA-3 | √ | √ | √ | 479415 | 6373234 |
| | SA-4 | √ | √ | √ | 476929 | 6375866 |
| | SA-5 | √ | √ | √ | 477804 | 6375716 |
| | SA-6 | √ | √ | √ | 477861 | 6374749 |
| B (Unnamed) | SB-1 | √ | √ | √ | 476041 | 6366362 |
| | SB-2 | √ | √ | √ | 475972 | 6366308 |
| | SB-3 | √ | √ | √ | 475866 | 6371655 |
| | SB-4 | √ | √ | √ | 472952 | 6372222 |
| | SB-5 | √ | √ | √ | 474615 | 6372695 |

[a] All location coordinates are in North American Datum 1983 (NAD 83), Zone 13.

UTM = Universal Transverse Mercator.

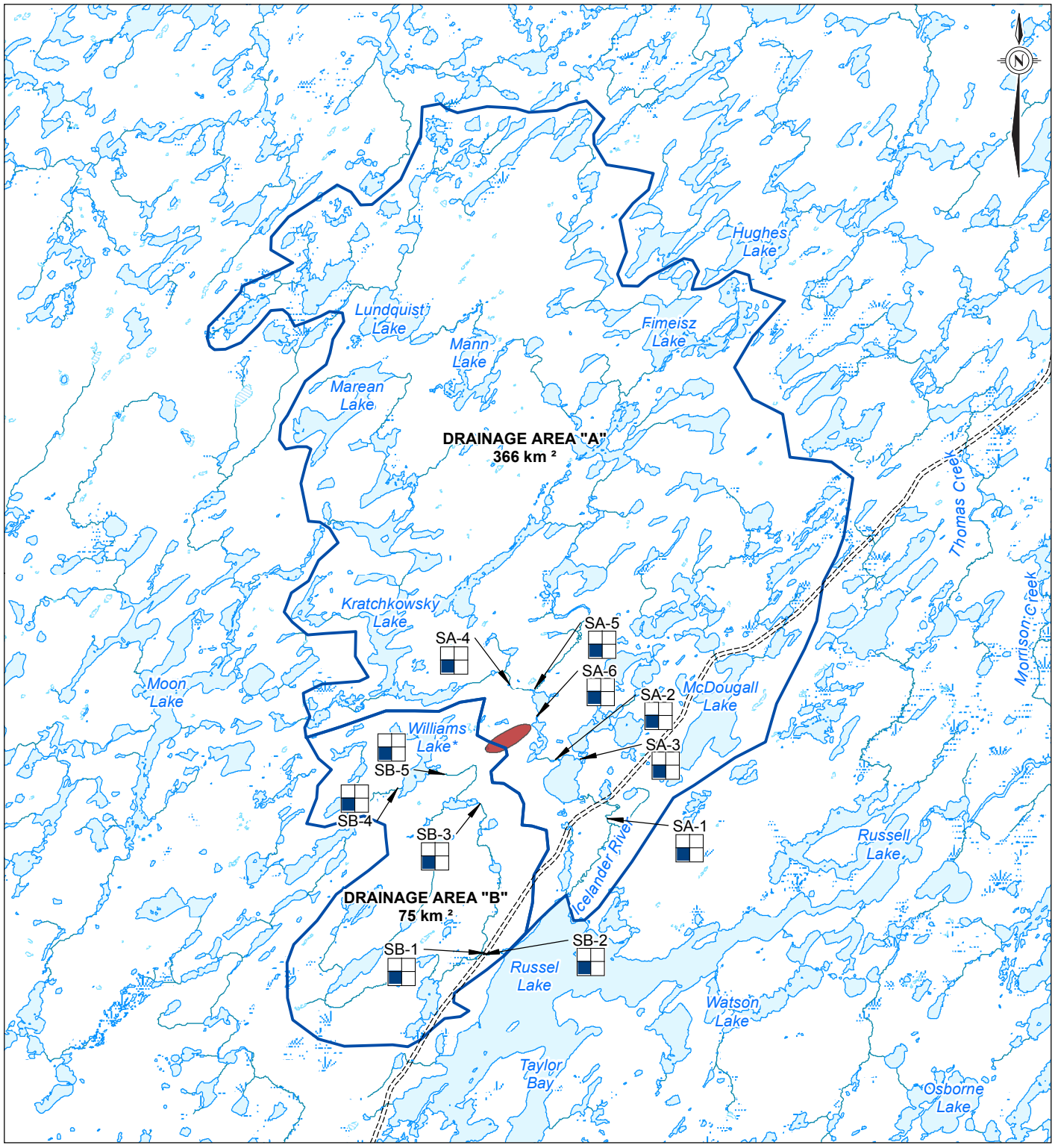
**Table 4: Sampling in Streams during the 2014 Winter Sampling Program**

| Drainage | Watercourse | Water Quality and Limnology | UTM Coordinates[a] | |
|---|---|---|---|---|
| | | | Easting | Northing |
| A (Icelander River) | SA-1 | √ | 480368 | 6371123 |
| | SA-2 | √ | 478524 | 6373216 |
| | SA-3 | √ | 479415 | 6373234 |
| | SA-4 | √ | 476929 | 6375866 |
| | SA-5 | √ | 477804 | 6375716 |
| | SA-6 | √ | 477861 | 6374749 |
| B (Unnamed) | SB-1 | √ | 476041 | 6366362 |
| | SB-2 | [b] | 475972 | 6366308 |
| | SB-3 | √ | 475866 | 6371655 |
| | SB-4 | √ | 472952 | 6372222 |
| | SB-5 | [b] | 474615 | 6372695 |

[a] All location coordinates are in North American Datum 1983 (NAD 83), Zone 13.

[b] Bed fast ice encountered.

UTM = Universal Transverse Mercator.




**LEGEND**

- WATER QUALITY SAMPLING
- MCARTHUR RIVER MINE ACCESS ROAD
- ORE ZONE
- DRAINAGE AREA BOUNDARY

4 0 4

SCALE 1:200,000 KILOMETRES

**NOTES**

* LOCAL LAKE NAME

**REFERENCE**

NTS MAPSHEETS 74H02,03,04,05,06,07,10,11,12
DATUM: NAD83 PROJECTION: UTM ZONE 13

PROJECT

DENISON MINES CORP.
WHEELER RIVER PROPERTY

TITLE

# AQUATIC BASELINE STREAM SAMPLING, 2012 TO 2014

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| GIS | SM/LR | 02/05/14 | FIGURE: 2 | |
| CHECK | BLC | 29/05/14 | | |
| REVIEW | BT | 29/05/14 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\Task 2500\Figure 2 - 12-1362-0050-2000-2500 - Aquatic Baseline Stream Sampling 2012 to 2014.mxd Date: 5/29/2014 2:33:17 PM

# 3.0 METHODS

The 2012 field program included water quality sampling, limnology measurements, bathymetric surveys and fish habitat assessments. The 2013 and 2014 field programs included water quality sampling and limnology measurements. The methods used to complete the program are detailed below.

## 3.1 Water Quality Sampling

Water quality samples were collected from lakes and streams of the Project area. Lake water samples consisted of a composite of three water samples collected from three depth intervals (top, middle, and bottom) using a Kemmerer water sampler. The water collected was mixed in a carboy triple rinsed with surface water. Stream water samples consisted of grab samples collected at mid-depth with a triple rinsed carboy. Water quality samples were collected in accordance with Golder's Technical Procedure 8.3-1 Surface Water Sampling Methods (unpublished).

Sample bottles were each labelled with a sample identification code and location, date, time, and project number. The sample code (e.g., D-LA-1-WQ001) followed a convention where D = Denison [client], LA-1 = site [Lake 1 in Drainage A], and WQ001 = water sample number. Information for each water quality station (i.e., date and time, location coordinates, weather information, limnology information, and sample depth) was recorded on the appropriate field data collection form.

### 3.1.1 Sample Processing

Water samples were collected and transported to the Denison mining camp for processing each evening. Processing included filtering water where necessary, filling individual triple rinsed Saskatchewan Research Council (SRC) Analytical Laboratory sample bottles unless otherwise instructed (i.e., if preservative was added to the bottles by the lab), and adding preservatives if required. Staff avoided contaminating the sample bottles by filling bottles in a sheltered area, not touching the inside of the lid or bottle, and by wearing gloves and other appropriate personal protective equipment when adding preservatives to the samples.

### 3.1.2 Sample Storage

Samples were stored in coolers with ice packs to keep samples cool (between 1 degree Celsius [°C] and 7°C). If samples were to be held for several days before shipping, ice packs were changed twice daily to keep temperatures between 1°C and 7°C. If samples were to be shipped immediately, the ice packs were changed before taping the coolers closed for shipment.

### 3.1.3 Chain-of-Custody and Sample Shipment

All water samples were brought directly back to the office by the Golder field crew. SRC Analytical Laboratory chain-of-custody forms were completed for each cooler of water samples. Quality Assurance/Quality Control (QA/QC) samples were split amongst the various coolers. All coolers of water samples were dropped off at the SRC laboratory, as well as any leftover sample preservative solutions.

### 3.1.4 Quality Assurance/Quality Control

The following water samples were collected for QA/QC purposes:

- eight random, single blind duplicate samples;
- six field blanks; and

- six trip blanks.

Duplicate Samples: eight duplicate samples were randomly collected, with one collected per sampling session (i.e., spring, summer, fall) per year (i.e., 2012 and 2013) and two collected during the 2014 winter sampling session. The sampling location of the duplicate sample was recorded in the field notebook or on the limnology datasheet, however the location was not recorded on the bottle as the sample was a single blind duplicate used to check the precision of analytical results.

Field Blank: six field blanks were filled while in the field, with two bottles in 2012 (none during the summer sampling session), three bottles in 2013, and one bottle in 2014. The field blank bottles were filled with de-ionized (DI) water provided by SRC, in the field at the same time as water samples were collected. Field blank samples were treated the same as actual samples (i.e., filtered when required, preservatives added when required).

Trip Blank: six trip blanks were carried around during the field sessions, with two bottles in 2012 (none during summer sampling session), three bottles in 2013, and one bottle in 2014. The trip blanks were filled with DI water at the SRC laboratory and remained sealed for the duration of the trip. They were stored in coolers with the other water samples.

## 3.2 Water Chemistry Analysis

Water quality samples were submitted to SRC Analytical Laboratories for chemistry analysis of the following parameters:

- conventional parameters (pH, total alkalinity, total hardness, specific conductivity, total dissolved solids, total suspended solids);
- major ions (bicarbonate, calcium, carbonate, chloride, fluoride, hydroxide, magnesium, P. alkalinity, potassium, sodium, sulphate, sum of ions);
- nutrients (total Kjeldahl nitrogen, total and unionized ammonia, nitrite+nitrate nitrogen, nitrite, total and dissolved phosphorus, orthophosphate, total and dissolved organic carbon);
- chlorophyll *a*;
- soluble silicon;
- total and dissolved metals, metalloids, and non-metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, zinc); and
- radionuclides (lead-210, polonium-210, radium-226, thorium-228, thorium-230, thorium-232).

### 3.2.1 Samples Submitted

A total of 46 sets of water samples were submitted for chemical analyses (Table 5) in 2012, 42 sets in 2013, and 23 sets in 2014. The three 2012 duplicates submitted were for water samples from SB-1 in spring 2012, Russell Lake in summer 2012, and SB-5 in fall 2012. In 2013, the three duplicates submitted were for the water sample collected at SB-1 in spring 2013, SA-1 in summer 2013, and SA-1 in fall 2013. In winter 2014, the two duplicates submitted were for the water samples collected at SA-6 and LB-2.



**Table 5: Quantity of Water Quality Samples Collected per Season during 2012 to 2014 Field Program**

| Year | Season | Streams | Lakes | Field Duplicate | Trip Blank | Field Blank | Total Sample Set |
|---|---|---|---|---|---|---|---|
| 2012 | Spring | 11 | 0 | 1 | 1 | 1 | 14 |
| | Summer | 11 | 6 | 1 | 0 | 0 | 18 |
| | Fall | 11 | 0 | 1 | 1 | 1 | 14 |
| 2013 | Spring | 11 | 0 | 1 | 1 | 1 | 14 |
| | Summer | 11 | 0 | 1 | 1 | 1 | 14 |
| | Fall | 11 | 0 | 1 | 1 | 1 | 14 |
| 2014 | Winter | 9 | 10 | 2 | 1 | 1 | 23 |
| **Total** | | **75** | **16** | **8** | **6** | **6** | **111** |

### 3.2.2 Comparison to Water Quality Guidelines/Objectives

Water chemistry values were compared to applicable provincial and federal water quality guidelines that are intended to protect aquatic species; namely, the Saskatchewan Surface Water Quality Objectives (SSWQO; Water Security Agency 2006) and the Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME CWQG; CCME 1999, with updates).

## 3.3 Limnology

Limnology profiles (i.e., dissolved oxygen, pH, specific conductivity, and water temperature) were collected at each lake sampling station in 2012 and in 2014 using a calibrated multi-meter (YSI 600 QS-O-M). Measurements in streams (2012, 2013, and 2014) were recorded at mid-depth. Measurements in lakes were recorded at the following regular depth intervals (e.g., 0.5 or 1.0 metre [m] intervals depending on lake depth):

- if the lake depth was less than 5 m, vertical profiles were collected at 0.5 m intervals from below the surface to 0.5 m above the lake bottom; or
- if the lake depth was greater than 5 m, vertical profiles were collected at 1.0 m intervals from below the surface to 1.0 m above the lake bottom.

Limnology data were collected in accordance with Golder's Technical Procedure TP-8.23-0 Basic Limnology and Bathymetry Procedures (unpublished).

## 3.4 Bathymetric Surveys

Bathymetric surveys were completed in 2012 on three lakes (i.e., LA-1, LA-5, LA-6) and one lake basin (i.e., LA-7) in Drainage A, one lake (i.e., LB-3) in Drainage B, as well as a portion (i.e., RL-A) of Russell Lake adjacent to the stream outflow from Drainage A (Icelander River; Table 1). A Garmin GPSMap 178C depth sounder was used to collect geo-referenced bathymetric data. The Global Positioning System component provided the position of the boat using satellite triangulation, while the sounding transducer provided the water depth at each location. The sounder was configured to record geo-referenced depths at five second intervals. Water depth at staff gauges in surveyed lakes was recorded at the time of the bathymetry survey to provide a geodetic water level for each lake surveyed. Figures showing depth contour lines were prepared for each lake, or portion of lake surveyed. Bathymetry data were collected in accordance with Golder's Technical Procedure TP-8.23-0 *Basic Limnology and Bathymetry Procedures*.

## 3.5 Fish Habitat Assessments

Fish habitat surveys were undertaken in 2012 for the same lakes, or portion of lakes, as identified in Section 3.4 Bathymetric Surveys. Habitat assessment included qualitative surveys of aquatic and shore vegetation and identification of major habitat types. The information was summarized on geo-referenced maps with appropriate photos to illustrate particular habitats. Fish habitat data were collected in accordance with Golder's Technical Procedures TP-8.19.0 *Lake Habitat Mapping*.

## 3.6 Quality Assurance/Quality Control

QA/QC programs consist of sampling and analytical procedures that are followed to limit the introduction of error into analytical data. Quality assurance procedures include appropriate training of sampling personnel, use of standard operating procedures when collecting the samples, appropriate sample handling and storage, submission of samples to accredited analytical laboratories, and use of data management systems. Quality control procedures are designed to assess data quality, including potential laboratory and field contamination, through the use of blanks, replicates, and spiked or reference materials.

Detailed specific work instructions were provided to Golder field personnel prior to commencing the field program in order to improve overall program and sampling success. As part of routine field operations for QA/QC, sampling equipment was calibrated frequently. Samples were collected by experienced personnel and were prepared, labelled, and transported according to Golder's Technical Procedures, and the SRC Laboratory protocols. Duplicate samples, trip blanks, and field blanks were used for QA/QC purposes.

Detailed field notes and environmental data were recorded on waterproof forms and field notebooks. Data collected during the field program underwent a variety of thorough QA/QC checks. Field data sheets were verified at the end of each day for completeness and accuracy by a crew member who did not record the data. Field data were transferred to an Excel spreadsheet upon returning to the office or were entered into the emLine™ database. Transcriptional quality assurance was completed on all information entered into Excel and emLine™ to reduce the potential for transcriptional errors. Prior to processing the data into tables, content quality assurance was completed to identify any inconsistencies in the data and other possible errors. Chain-of-custody forms were used to track sample shipment from the field to SRC Laboratories. Saskatchewan Research Council (SRC) Laboratories request forms were submitted with the water chemistry samples. A QA/QC check was completed comparing the hard copy report and the electronic data received from SRC Laboratories to verify there were no transcription errors in the water quality data.

# 4.0 RESULTS

In 2012, water quality samples and limnology measurements were collected during spring (May 8 and 9), summer (August 7 to 13) and fall (October 24 and 25). In 2013, water quality samples and limnology measurements were collected during spring (May 22), summer (August 15), and fall (October 18 and 19). In 2014, water quality samples and limnology measurements were collected during winter (March 28 to April 1). Bathymetry and fish habitat mapping information was collected during summer (August 9 to 13) of 2012.

## 4.1 Water Quality

### 4.1.1 2012 Sampling Program

In 2012, water sampling was conducted on four lakes or portions of lakes, and six streams from Drainage A (Icelander River drainage); on one lake and five streams from Drainage B; and on Russell Lake. Seven

additional water samples were taken for QA/QC purposes: three field duplicates, two trip blanks, and two field blanks. Water chemistry results for samples collected in 2012 are presented in Table A1 (Appendix A).

Water quality of the lakes and streams sampled was comparable to other oligotrophic lakes in the region, being generally characterised by neutral or slightly acidic pH values, low concentrations of nutrients and ions, and metal concentrations that were near or below analytical detection limits (Appendix A, Table A1). Radionuclide concentrations were generally low and often below analytical detection limits. Radium-226[1] concentrations were below the SSWQO of 0.11 Becquerels per litre (Bq/L) for all samples collected in 2012 (Appendix A, Table A1).

Water chemistry values were generally below water quality guidelines/objectives for the protection of aquatic life (Appendix A, Table A1). The following parameters exceeded the guidelines/objectives in at least one sample: dissolved oxygen (measured just below surface), pH, aluminum, cadmium, iron, and lead. Dissolved oxygen measured at the surface of stream SB-2 during the spring session, of all lakes during the summer (n=6), and of all streams (with the exception of SB-1) during the summer was below the guideline/objective of 9.5 milligrams per litre (mg/L) for the protection of the early life stages of aquatic life located in cold water ecosystems. Field surface pH values were equal to or below the CCME CWQG in at least one sample from lake LA-1 and all streams sampled. Aluminum concentrations exceeded the pH-dependent guideline/objective in several streams, usually in samples where the pH value was below the guideline. Cadmium concentrations [2]exceeded the guideline/objective in at least one sample from every lake and stream sampled with the exception of streams SA-5 in Drainage Area A and all the streams in Drainage Area B (i.e., SB-1, SB-2, SB-3, SB-4, SB-5). Iron and lead concentrations exceeded the guideline/objective in stream SB-2 and lake LA-6, respectively.

### 4.1.2 2013 Sampling Program

In 2013, water sampling was conducted on six streams from Drainage A (Icelander River drainage); and on five streams from Drainage B. Nine additional water samples were taken for QA/QC purposes: three field duplicates, three trip blanks, and three field blanks. Water chemistry results for samples collected in 2013 are presented in Table A2 (Appendix A).

Water quality of the streams sampled was comparable to results from the 2012 sampling program, being generally characterised by neutral or slightly acidic pH values, low concentrations of nutrients and ions, and metal concentrations that were near or below analytical detection limits (Appendix A, Table A2). Radionuclide concentrations were generally low and often below analytical detection limits. Radium-226 concentrations were below the SSWQO of 0.11 Bq/L for all samples collected in 2013 (Appendix A, Table A2).

Water chemistry values were generally below water quality guidelines/objectives for the protection of aquatic life (Appendix A, Table A2). The following parameters exceeded the guidelines/objectives in at least one sample: dissolved oxygen (measured just below surface), pH, aluminum, cadmium, and iron. Dissolved oxygen measured at the surface of streams SB-2 and SB-4 during the spring session and of all streams (n=11) during the summer session was below the guideline/objective of 9.5 mg/L for the protection of the early life stages of aquatic life located in cold water ecosystems. Field surface pH values were equal to or below the CCME CWQG in at least one sample from all streams sampled with the exception of streams SA-1 and SB-3. Aluminum

[1] The Saskatchewan Surface Water Quality Objectives (SSWQO) for radium-226 was missed in the 2006 SSWQO (Water Security Agency [WSA] 2006) revisions; an objective of 0.11 Bq/L was presented in 1997 SSWQO (WSA) and is expected to be added to the next SSWQO revision (T. Moulding pers. comm.).

[2] In January 2014, the Canadian Council of Ministers of the Environment (CCME) updated the Canadian water quality guideline (CWQG) for cadmium. The new guideline was included in the 2012 and 2013 water quality tables and the result section.

concentrations exceeded the pH-dependent guideline/objective in several streams, usually in samples where the field pH value was below the guideline. Cadmium concentrations exceeded the guideline/objective in at least one sample from all streams sampled with the exception of streams SA-1, SA-3, and SA-4; a field blank sample was above detection limit and exceeded the objective in May 2013. Iron concentrations exceeded the guideline/objective in at least one sample from streams SA-1, SB-1, and SB-2.

### 4.1.3 2014 Sampling Program

In 2014, water sampling was conducted on six streams from Drainage A (Icelander River drainage); and only three streams from Drainage B as two streams (i.e., SB-2 and SB-5) had bed fast ice. Four additional water samples were taken for QA/QC purposes: two field duplicates, one trip blank, and one field blank. Water chemistry results for samples collected in 2014 are presented in Table A3 (Appendix A).

Water quality of the streams sampled was comparable to results from the 2012 and 2013 sampling programs, being generally characterised by neutral or slightly acidic pH values, low concentrations of nutrients and ions, and metal concentrations that were near or below analytical detection limits (Appendix A, Table A3). Radionuclide concentrations were generally low and often below analytical detection limits. Radium-226 concentrations were below the SSWQO of 0.11 Bq/L for all samples collected in 2014 (Appendix A, Table A3).

Water chemistry values were generally below water quality guidelines/objectives for the protection of aquatic life (Appendix A, Table A3). The following parameters exceeded the guidelines/objectives in at least one sample: dissolved oxygen (measured just below surface), pH, aluminum, and iron.

Dissolved oxygen measured at the surface of lakes LA5 and LB-2 and streams SA-7, SB-1, SB-2 and SB-5 during the winter session was below the guideline/objective of 9.5 mg/L for the protection of the early life stages of aquatic life located in cold water ecosystems. Field surface pH values were equal to or below the CCME CWQG in streams SA-2, SA-6, and SB-3. Aluminum concentrations exceeded the pH-dependent guideline/objective in lake LA-6, where the laboratory pH value was below the guideline. Iron concentrations exceeded the guideline/objective in stream SB-1.

## 4.2 Limnology

Limnology measurements were obtained for four lakes and six streams from Drainage A, for one lake and five streams from Drainage B, and for one station in Russell Lake during the 2012 water sampling program. Limnology results for 2012 are presented in Table B1 (Appendix B). Limnology profiles for all lakes measured in 2012 are presented in Figure 3.

Limnology measurements were obtained for six streams from Drainage A and for five streams from Drainage B during the 2013 water sampling program. Limnology results for 2013 are presented in Table B2 (Appendix B). Limnology measurements were obtained for seven lakes and six streams from Drainage A, for two lakes and three streams from Drainage B, and for one station in Russell Lake during the 2014 winter water sampling program. Limnology results for 2014 are presented in Table B3 (Appendix B). Limnology profiles for all lakes measured in 2014 are presented in Figure 4a and 4b.

*Figure 3: Temperature and Dissolved Oxygen Profiles and Secchi Depth for Lakes in the Wheeler River Project Area, Summer 2012*

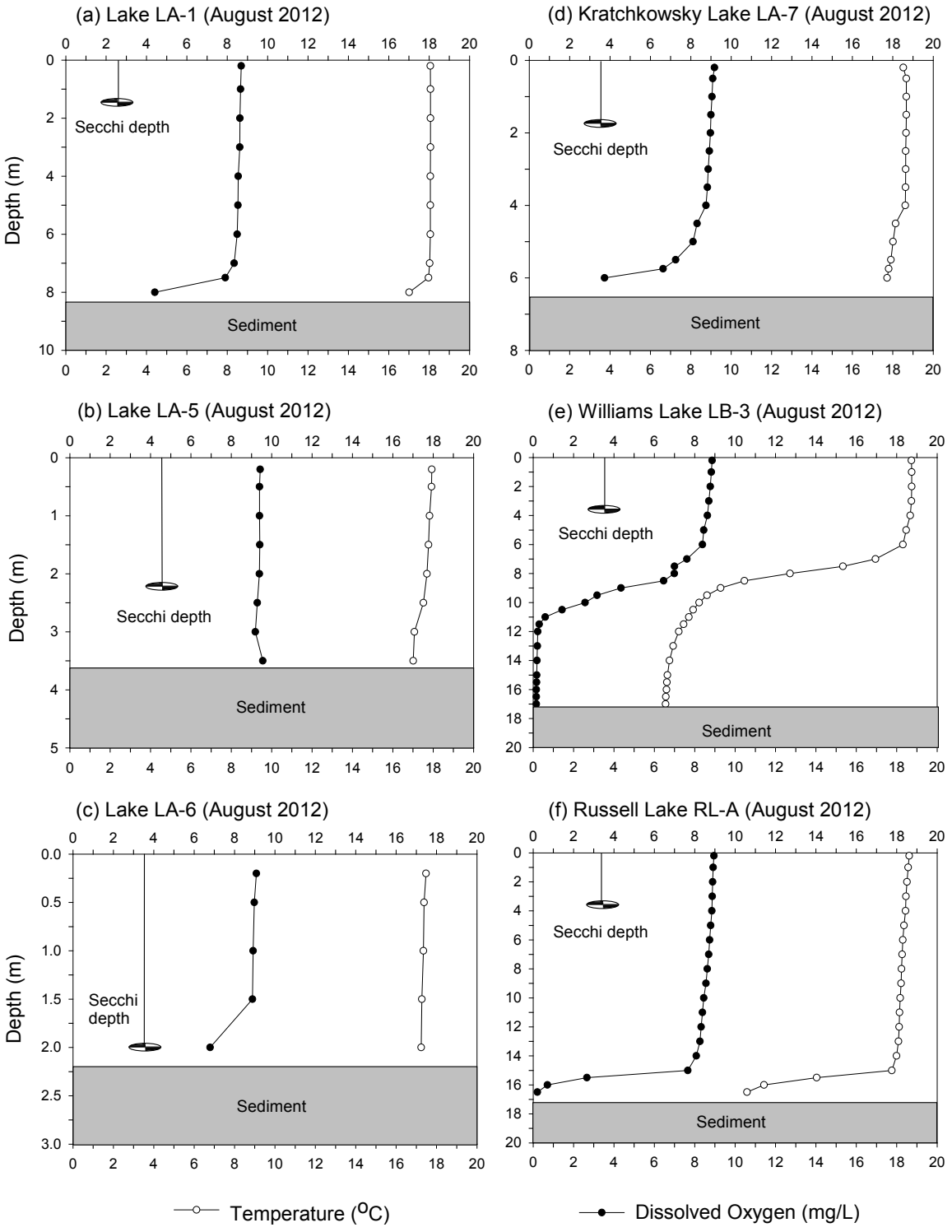


*Figure 4a: Temperature and Dissolved Oxygen Profiles and Secchi Depth for Lakes in the Wheeler River Project Area, Winter 2014.*

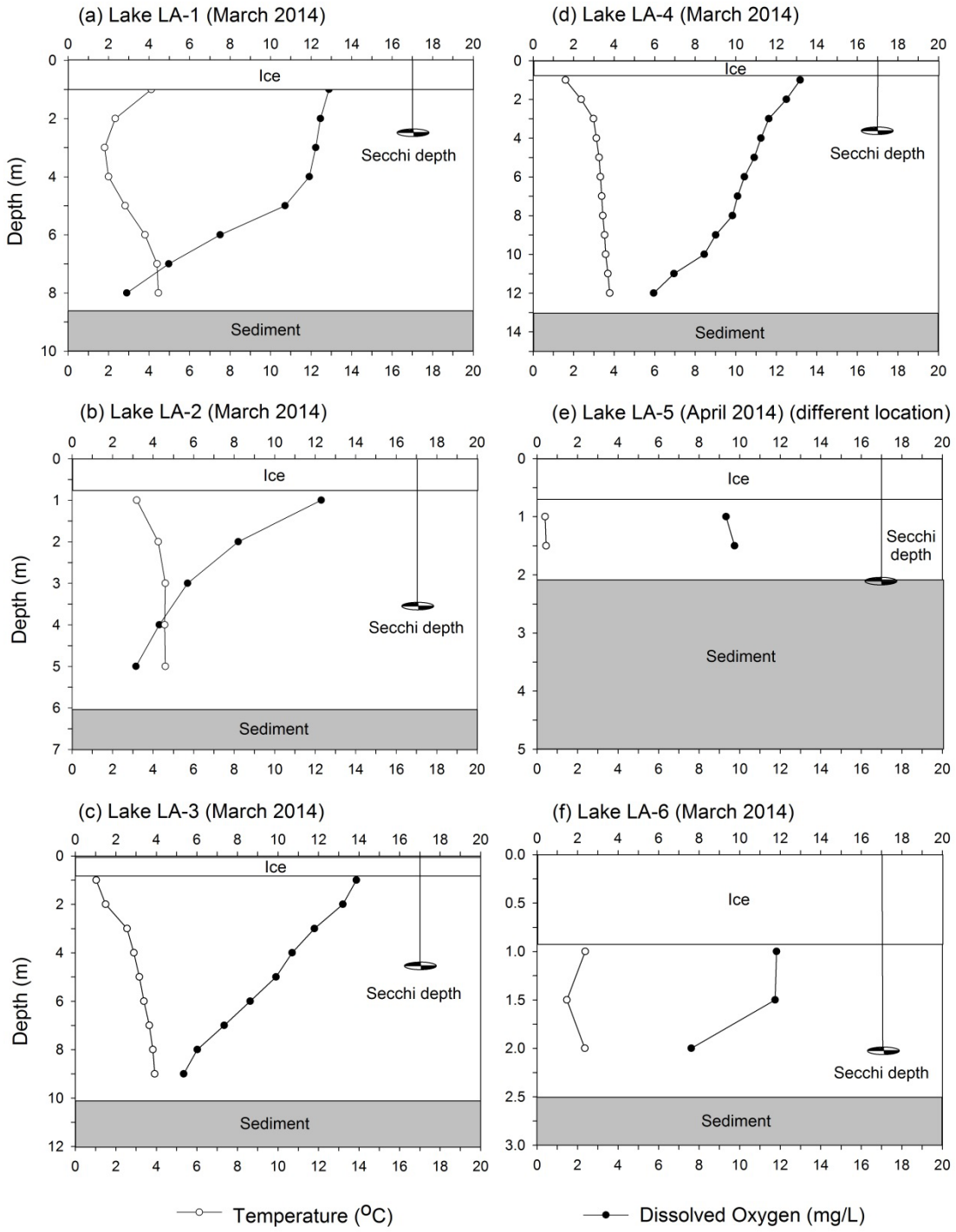
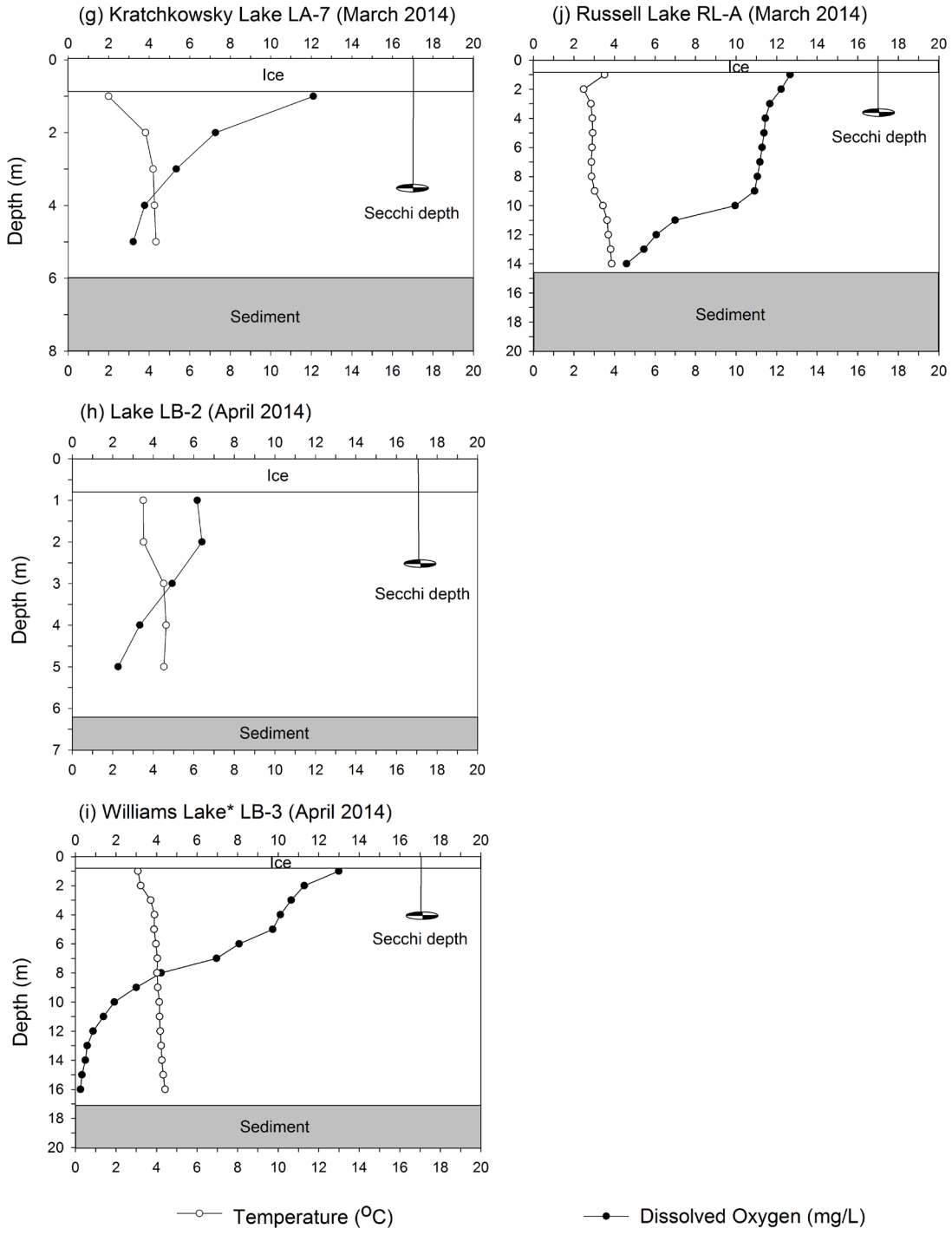


*Figure 4b: Temperature and Dissolved Oxygen Profiles and Secchi Depth for Lakes in the Wheeler River Project Area, Winter 2014.*



## 4.3 Bathymetric Surveys

In 2012, bathymetric surveys were completed on three lakes (i.e., LA-1, LA-5, LA-6) and one lake basin (i.e., south-east bay of Kratchkowsky Lake [LA-7]) in Drainage A; one lake (i.e., Williams Lake [LB-3]) in Drainage B; as well as a portion (i.e., RL-A) of Russell Lake adjacent to the stream outflow from Drainage A (Icelander River).

A summary of the lake morphometric information is presented in Table 6. All bathymetry maps are presented in Figures C1 to C6 (Appendix C).

## 4.4 Fish Habitat Assessments

In 2012, fish habitat assessments were completed on three lakes (i.e., LA-1, LA-5, LA-6) and one lake basin (i.e., south-east bay of Kratchkowsky Lake [LA-7]) in Drainage A, one lake (i.e., Williams Lake [LB-3]) in Drainage B, as well as a portion (i.e., RL-A) of Russell Lake adjacent to the stream outflow from Drainage A (Icelander River).

A summary of the fish habitat information is presented in Table 6. All habitat maps are presented in Figures D1 to D6 (Appendix D).

**Table 6: Aquatic Habitat Summary for Lakes in the Wheeler River Project Area, Summer 2012**

| Drainage | Waterbody | Code | Date of Survey (dd-mmm-yy) | Lake Elevation (masl) | Maximum Length (km) | Surface Area ($m^2$) | Maximum Depth (m) | Mean Depth (m) | Volume ($m^3$) | Number of Islands | Perimeter (m) | | Shoreline Development Index | Incidental Fish Observed | Substrate | Habitat Assessment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Main Shore | Islands | | | | |
| A (Icelander River) | Lake LA-1 | LA-1 | 11-Aug-12 and 12-Aug-12 | 494.386 | 1.7 | 1,485,480 | 9.67 | 5.51 | 8,189,320 | 0 | 5,291 | - | 1.22 | adult sucker | sand/boulder | Shoreline vegetation mainly consisted of shrubs and black spruce backed by jack pine forest; shallow to steep slopes with presence of old and active erosional areas; cover observed included emergent vegetation, interstitial spaces in coarse substrate, and overhanging vegetation. |
| | Lake LA-5 | LA-5 | 13-Aug-12 | 500.037 | 1.5 | 324,049 | 4.07 | 1.08 | 332,502 | 2 | 5,487 | 146 | 2.79 | juvenile sucker; juvenile and adult (60 cm) northern pike | sand/organic material | Shoreline vegetation mainly consisted of shrubs and black spruce backed by jack pine forest; shallow to steep slopes; cover observed included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation, and woody debris. |
| | Lake LA-6 | LA-6 | 13-Aug-12 | 500.058 | 0.78 | 262,740 | 2.71 | 1.57 | 413,505 | 1 | 2,654 | 153 | 1.54 | juvenile northern pike | sand/organic material | Shoreline vegetation mainly consisted of shrubs and black spruce backed by jack pine forest; shallow to steep slopes with presence of active erosional areas; cover observed included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation, and woody debris. |
| | South-east bay of Kratchkowsky Lake | LA-7 | 09-Aug-12 | 520.482 | 2.5 | 795,937 | 6.78 | 2.90 | - | 0 | 7,843 | - | 2.48 | none observed | boulder/sand | Shoreline vegetation mainly consisted of shrubs and black spruce backed by jack pine forest; shallow to steep slopes; cover observed included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation, and woody debris. |

**Table 6: Aquatic Habitat Summary for Lakes in the Wheeler River Project Area, Summer 2012 (continued)**

| Drainage | Waterbody | Code | Date of Survey (dd-mmm-yy) | Lake Elevation (masl) | Maximum Length (km) | Surface Area ($m^2$) | Maximum Depth (m) | Mean Depth (m) | Volume ($m^3$) | Number of Islands | Perimeter (m) | | Shoreline Development Index | Incidental Fish Observed | Substrate | Habitat Assessment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Main Shore | Islands | | | | |
| B (Unnamed) | Williams Lake[(a)] | LB-3 | 08-Aug-12 | 518.524 | 3.5 | 1,522,984 | 17.82 | 4.55 | 6,933,788 | 3 | 10,925 | 544 | 2.62 | juvenile northern pike; juvenile and adult yellow perch; spottail shiner; lake chub; abundant small-bodied fish | boulder/sand | Shoreline vegetation mainly consisted of shrubs and black spruce backed by jack pine forest; shallow to steep slopes; cover observed included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation, and woody debris. |
| Russell Lake | Icelander River outlet bay of Russell Lake | RL-A | 10-Aug-12 and 11-Aug-12 | 488.167 | 1.2 | 751,485 | 18.78 | 3.04 | - | 0 | 3,325 | - | 1.08 | juvenile northern pike; ninespine stickleback | sand/cobble | Shoreline vegetation mainly consisted of shrubs and black spruce backed by jack pine forest; shallow to steep slopes with presence of old and active erosional areas; cover observed included emergent and submergent vegetation, interstitial spaces in coarse substrate, and overhanging vegetation. |

[(a)] Local lake name.

dd-mmm-yy = dd-month-year; masl = metre above sea level; km = kilometre; $m^2$ = square metre; $m^3$ = cubic metre; m = metre; Aug = August; cm = centimetre.

## 5.0 CLOSURE

Golder appreciates the opportunity to assist Denison with this project. We trust that the information contained in this report meets your requirements. If you have any questions or concerns regarding the information presented, please contact the undersigned at (306) 665-7989 or brian_christensen@golder.com.

**GOLDER ASSOCIATES LTD.**

Prepared By:



Francine Audy, B.Sc.
Aquatic Biologist

Reviewed By:



Brian Christensen, M.Sc.
Associate, Senior Environmental Scientist



Brent Topp, B.Sc., P.Geo.
Associate, Senior Hydrologist

RP/FA/BLC/BT/pls/jlb

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

n:\active\2012\1362\12-1362-0050 denison wheeler project hydrologyaquatics\2000 aquatics\2012 + 2013 + 2014 report\12-1362-0050 rpt 14 may 28 field summary report final.docx

# 6.0 REFERENCES

CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Aquatic Life Summary Table, with updates to 2014. Winnipeg, MB, Canada. Available at: http://st-ts.ccme.ca/. Accessed January 22, 2014.

Water Security Agency. 2006. Saskatchewan Surface Water Quality Objectives. EPB 356. July 2006.

# APPENDIX A

## Water Chemistry

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lakes | | | | Streams | | | | | |
| | | | | Lake LA-1 | Lake LA-5 | Lake LA-6 | Kratchkowsky Lake | SA-1 | | | SA-2 | | |
| | | | | LA-1b-WQ-U12 | LA-5a-WQ-U12 | LA-6a-WQ-U12 | LA-7a-WQ-U12 | SA-1c-WQ-P12 | SA-1c-WQ-U12 | SA-1c-WQ-F12[c] | SA-2b-WQ-P12 | SA-2b-WQ-U12 | SA-2b-WQ-F12[c] |
| | | | | 12-Aug-12 | 13-Aug-12 | 13-Aug-12 | 9-Aug-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 8-Aug-12 | 24-Oct-12 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[g] | 6.5 and 9.5[g] | **8.69** | **9.43** | **9.08** | **9.17** | 10.67 | **8.88** | 15.15 | 11.96 | **9.01** | 16.20 |
| pH | pH units | 6.5 to 9.0 | - | **6.36** | 7.06 | 6.73 | 7.22 | **6.07** | 6.73 | **6.08** | 6.76 | 6.82 | **5.31** |
| Specific conductivity | µS/cm | - | - | 18 | 17 | 17 | 17 | 19 | 18 | 17 | 16 | 17 | 17 |
| Water temperature | °C | - | - | 18.06 | 17.93 | 17.48 | 18.52 | 5.67 | 20.54 | 2.19 | 5.62 | 17.10 | 0.96 |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 6.52 | 6.57 | 6.55 | 6.73 | 6.60 | 6.55 | 6.78 | 6.77 | 6.58 | 6.79 |
| Specific conductivity | uS/cm | - | - | 17 | 16 | 16 | 18 | 20 | 16 | 17 | 16 | 14 | 16 |
| Total alkalinity | mg/L | - | - | 4 | 3 | 4 | 21 | 4 | 4 | 10 | 2 | 2 | 8 |
| Total dissolved solids | mg/L | - | - | 23 | 22 | 24 | 26 | 20 | 21 | 25 | 13 | 19 | 23 |
| Total hardness | mg/L | - | - | 6 | 5 | 5 | 6 | 6 | 5 | 5 | 4 | 4 | 4 |
| Total suspended solids | mg/L | - | - | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 |
| **Nutrients** | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [h] | [h] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.06 | <0.01 | 0.11 | 0.12 | 0.05 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 2.6 | 4.3 | 2.9 | 3.2 | 2.2 | 2.5 | 2.6 | 2.4 | 2.4 | 2.4 |
| Organic carbon, dissolved | mg/L | - | - | 2.4 | 2.5 | 2.5 | 2.8 | 2.1 | 2.3 | 2.2 | 2.2 | 2.4 | 2.2 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | - | <0.01 | <0.01 | - |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.31 | 0.34 | 0.29 | 0.34 | 0.28 | 0.24 | 0.28 | 0.16 | 0.24 | 0.20 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | - | - | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Organics** | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 5.6 | 3.7 | 2.8 | 4.4 | 3.4 | <0.1 | 1.0 | 2.9 | <0.1 | 0.8 |
| **Major Ions** | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 5 | 4 | 5 | 26 | 5 | 5 | 12 | 2 | 2 | 10 |
| Calcium | mg/L | - | - | 1.4 | 1.3 | 1.3 | 1.5 | 1.6 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.4 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 |
| Fluoride | mg/L | 0.12 | - | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.4 | 0.4 | 0.3 | 0.4 | 0.3 | 0.2 | 0.4 | 0.1 | 0.3 | 0.4 |
| Sodium | mg/L | - | - | 1.5 | 1.5 | 1.5 | 1.6 | 1.6 | 1.4 | 1.5 | 1.2 | 1.3 | 1.4 |
| Sulphate | mg/L | - | - | 0.8 | 0.6 | 0.7 | 0.6 | 0.8 | 0.9 | 0.5 | 0.6 | 0.6 | 0.7 |
| Sum of ions | mg/L | - | - | 10 | 8 | 10 | 32 | 10 | 10 | 16 | 6 | 6 | 14 |
| **Other** | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 3.2 | 3.2 | 3.2 | 3.7 | 3.3 | 3.1 | 2.6 | 2.8 | 3.1 | 2.6 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lakes | | | | Streams | | | | | |
| | | | | Lake LA-1 | Lake LA-5 | Lake LA-6 | Kratchkowsky Lake | SA-1 | | | SA-2 | | |
| | | | | LA-1b-WQ-U12 | LA-5a-WQ-U12 | LA-6a-WQ-U12 | LA-7a-WQ-U12 | SA-1c-WQ-P12 | SA-1c-WQ-U12 | SA-1c-WQ-F12[c] | SA-2b-WQ-P12 | SA-2b-WQ-U12 | SA-2b-WQ-F12[c] |
| | | | | 12-Aug-12 | 13-Aug-12 | 13-Aug-12 | 9-Aug-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 8-Aug-12 | 24-Oct-12 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [i] | 0.005 to 0.1 [i] | 0.0010 | 0.0056 | 0.073 | 0.0051 | 0.0040 | 0.0056 | 0.0022 | 0.081 | 0.0068 | 0.0041 |
| Aluminum, dissolved | mg/L | - | - | <0.0005 | 0.014 | 0.0013 | 0.0021 | <0.0005 | 0.0021 | <0.0005 | 0.0054 | 0.0027 | <0.0005 |
| Antimony | mg/L | - | - | <0.0002 | 0.0003 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 |
| Arsenic, dissolved | µg/L | - | - | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | 0.1 | 0.3 | <0.1 | 0.2 | 0.1 |
| Barium | mg/L | - | - | 0.0027 | 0.0021 | 0.0051 | 0.0024 | 0.0035 | 0.0025 | 0.0026 | 0.0041 | 0.0029 | 0.0023 |
| Barium, dissolved | mg/L | - | - | 0.0021 | 0.0017 | 0.0017 | 0.0020 | 0.0020 | 0.0022 | 0.0020 | <0.0005 | 0.0024 | 0.012 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004[j] | 0.000017 [j] | 0.00002 | 0.00002 | **0.00004** | 0.00003 | <0.00001 | 0.00002 | <0.00001 | 0.00002 | 0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | 0.00002 | 0.00002 | 0.00002 | 0.00003 | <0.00001 | 0.00002 | 0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [k] | 0.001 [k] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0034 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [j] | 0.002 [j] | <0.0002 | <0.0002 | 0.0004 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0008 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0010 | 0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.3 | 0.3 | 0.22 | 0.10 | 0.11 | 0.14 | 0.14 | 0.21 | 0.081 | 0.11 | 0.091 | 0.063 |
| Iron, dissolved | mg/L | - | - | 0.021 | 0.023 | 0.018 | 0.011 | 0.013 | 0.10 | 0.0057 | 0.020 | 0.050 | 0.0081 |
| Lead | mg/L | 0.001 [j] | 0.001 [j] | <0.0001 | <0.0001 | **0.0012** | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0003 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.8 | 0.6 | 0.7 | 0.7 | 0.7 | 0.8 | 0.6 | 0.6 | 0.6 | 0.6 |
| Lithium, dissolved | µg/L | - | - | 0.9 | 0.7 | 0.6 | 0.5 | 0.7 | 0.7 | 0.5 | 0.6 | 0.6 | 0.7 |
| Manganese | mg/L | - | - | 0.029 | 0.018 | 0.017 | 0.019 | 0.021 | 0.025 | 0.012 | 0.017 | 0.017 | 0.0091 |
| Manganese, dissolved | mg/L | - | - | 0.0008 | <0.0005 | <0.0005 | 0.0008 | 0.0008 | 0.0078 | 0.0010 | 0.0007 | 0.0034 | <0.0005 |
| Mercury | µg/L | 0.026 [l] | 0.026 [l] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0002 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [j] | 0.025 [j] | <0.0001 | <0.0001 | 0.0004 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | 0.0042 | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | 0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.014 | 0.012 | 0.014 | 0.014 | 0.014 | 0.013 | 0.012 | 0.012 | 0.012 | 0.012 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lakes | | | | Streams | | | | | |
| | | | | Lake LA-1 | Lake LA-5 | Lake LA-6 | Kratchkowsky Lake | SA-1 | | | SA-2 | | |
| | | | | LA-1b-WQ-U12 | LA-5a-WQ-U12 | LA-6a-WQ-U12 | LA-7a-WQ-U12 | SA-1c-WQ-P12 | SA-1c-WQ-U12 | SA-1c-WQ-F12[c] | SA-2b-WQ-P12 | SA-2b-WQ-U12 | SA-2b-WQ-F12[c] |
| | | | | 12-Aug-12 | 13-Aug-12 | 13-Aug-12 | 9-Aug-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 8-Aug-12 | 24-Oct-12 |
| **Metals (Total and Dissolved) (Continued)** | | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.014 | 0.012 | 0.012 | 0.013 | 0.015 | 0.014 | 0.011 | 0.011 | 0.013 | 0.010 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | 0.0001 | 0.0001 | <0.0001 | 0.0004 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | 0.0002 | 0.0003 | <0.0002 | <0.0002 | <0.0002 | 0.0015 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | 0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | 0.020 | <0.0005 | 0.0028 | 0.0006 | <0.0005 | 0.0096 | 0.0008 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | 0.0026 | <0.0005 | <0.0005 | 0.0006 | <0.0005 | <0.0005 | <0.0005 |
| **Radionuclides** | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | <0.02 | <0.02 | 0.05 |
| Polonium-210 | Bq/L | - | - | <0.005 | 0.008 | <0.005 | 0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[m] | <0.005 | <0.005 | <0.005 | <0.005 | 0.006 | <0.005 | 0.008 | <0.005 | 0.01 | 0.006 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | |
| | | | | SA-3 | | | SA-4 | | | SA-5 | | |
| | | | | SA-3b-WQ-P12 | SA-3b-WQ-U12 | SA-3b-WQ-F12[c] | SA-4b-WQ-P12 | SA-4b-WQ-U12[d] | SA-4b-WQ-F12[c] | SA-5b-WQ-P12 | SA-5b-WQ-U12[d] | SA-5b-WQ-F12[e] |
| | | | | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[g] | 6.5 and 9.5[g] | 10.23 | **9.22** | 15.78 | 16.10 | **9.12** | 16.03 | 11.23 | **9.45** | 10.47 |
| pH | pH units | 6.5 to 9.0 | - | 6.52 | 7.47 | **5.99** | **6.45** | 7.31 | **5.86** | 6.89 | 7.30 | **5.51** |
| Specific conductivity | µS/cm | - | - | 20 | 19 | 20 | 20 | 18 | 19 | 16 | 16 | 16 |
| Water temperature | °C | - | - | 6.55 | 18.70 | 1.34 | 7.73 | 17.62 | 1.30 | 9.41 | 17.51 | 1.38 |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 6.60 | 6.60 | 6.85 | 6.80 | 6.58 | 6.88 | 6.76 | 6.57 | 6.78 |
| Specific conductivity | uS/cm | - | - | 20 | 18 | 19 | 20 | 17 | 18 | 16 | 14 | 15 |
| Total alkalinity | mg/L | - | - | 2 | 1 | 23 | 8 | 3 | 11 | 2 | 4 | 8 |
| Total dissolved solids | mg/L | - | - | 17 | 21 | 24 | 21 | 23 | 26 | 17 | 13 | 20 |
| Total hardness | mg/L | - | - | 6 | 5 | 6 | 6 | 5 | 5 | 5 | 4 | 4 |
| Total suspended solids | mg/L | - | - | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 |
| **Nutrients** | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [h] | [h] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | <0.01 | <0.01 | <0.01 | 0.02 | 0.03 | <0.01 | 0.03 | 0.61 | <0.01 |
| Organic carbon | mg/L | - | - | 2.2 | 2.6 | 2.6 | 2.6 | 2.5 | 2.4 | 2.7 | 2.3 | 2.5 |
| Organic carbon, dissolved | mg/L | - | - | 2.2 | 2.4 | 2.5 | 2.4 | 2.4 | 2.4 | 2.5 | 2.3 | 2.4 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | - | <0.01 | <0.01 | - | <0.01 | <0.01 | - |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.25 | 0.25 | 0.28 | 0.22 | 0.19 | 0.28 | 0.28 | 0.18 | 0.29 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Organics** | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 3.0 | 0.5 | 0.4 | 6.2 | <0.1 | 0.3 | 2.8 | <0.1 | 0.4 |
| **Major Ions** | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 2 | 1 | 28 | 10 | 4 | 13 | 2 | 5 | 10 |
| Calcium | mg/L | - | - | 1.6 | 1.5 | 1.5 | 1.7 | 1.4 | 1.4 | 1.3 | 1.2 | 1.2 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.6 | 0.6 | 0.6 | 0.5 | 0.4 | 0.4 | 0.2 | 0.2 | 0.2 |
| Fluoride | mg/L | 0.12 | - | <0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | <0.01 | 0.02 | 0.01 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.5 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 | 0.2 | 0.3 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.4 | 0.3 | 0.4 | 0.3 | 0.3 | 0.4 | 0.2 | 0.3 | 0.4 |
| Sodium | mg/L | - | - | 1.5 | 1.5 | 1.5 | 1.6 | 1.4 | 1.6 | 1.4 | 1.3 | 1.4 |
| Sulphate | mg/L | - | - | 0.8 | 0.7 | 0.8 | 0.6 | 0.4 | 0.5 | 0.7 | 0.7 | 0.8 |
| Sum of ions | mg/L | - | - | 7 | 6 | 33 | 15 | 8 | 18 | 6 | 12 | 14 |
| **Other** | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 3.3 | 3.1 | 3.1 | 3.9 | 3.6 | 3.5 | 2.7 | 2.7 | 2.1 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | |
| | | | | SA-3 | | | SA-4 | | | SA-5 | | |
| | | | | SA-3b-WQ-P12 | SA-3b-WQ-U12 | SA-3b-WQ-F12[c] | SA-4b-WQ-P12 | SA-4b-WQ-U12[d] | SA-4b-WQ-F12[c] | SA-5b-WQ-P12 | SA-5b-WQ-U12[d] | SA-5b-WQ-F12[e] |
| | | | | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [i] | 0.005 to 0.1 [i] | 0.0031 | 0.0039 | 0.0018 | **0.0099** | 0.0064 | 0.0033 | 0.014 | 0.0071 | 0.0047 |
| Aluminum, dissolved | mg/L | - | - | 0.0024 | 0.0007 | <0.0005 | 0.0059 | 0.0038 | <0.0005 | <0.0005 | 0.0039 | <0.0005 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 | <0.1 | 0.1 | 0.1 | 0.1 |
| Arsenic, dissolved | µg/L | - | - | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | <0.1 |
| Barium | mg/L | - | - | 0.0039 | 0.0027 | 0.0030 | 0.0029 | 0.0024 | 0.0022 | 0.0030 | 0.0031 | 0.0022 |
| Barium, dissolved | mg/L | - | - | 0.0016 | 0.0025 | 0.0013 | 0.0036 | 0.0022 | <0.0005 | <0.0005 | 0.0022 | 0.0009 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004[j] | 0.000017 [j] | <0.00001 | 0.00002 | <0.00001 | <0.00001 | **0.00007** | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | <0.00001 | 0.00001 | <0.00001 | <0.00001 | 0.00004 | <0.00001 | <0.00001 | 0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [k] | 0.001 [k] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [j] | 0.002 [j] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | 0.0004 | <0.0002 | <0.0002 | 0.0004 | 0.0008 | <0.0002 | 0.0005 |
| Iron | mg/L | 0.3 | 0.3 | 0.072 | 0.13 | 0.062 | 0.086 | 0.13 | 0.064 | 0.11 | 0.11 | 0.067 |
| Iron, dissolved | mg/L | - | - | 0.0071 | 0.053 | 0.0026 | 0.013 | 0.042 | 0.0058 | 0.026 | 0.049 | 0.0067 |
| Lead | mg/L | 0.001 [j] | 0.001 [j] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.6 | 0.7 | 0.6 | 0.7 | 0.9 | 0.7 | 0.5 | 0.4 | 0.5 |
| Lithium, dissolved | µg/L | - | - | 0.7 | 0.7 | 0.6 | 0.8 | 0.8 | 0.7 | 0.5 | 0.4 | 0.6 |
| Manganese | mg/L | - | - | 0.018 | 0.016 | 0.0084 | 0.0095 | 0.017 | 0.010 | 0.0086 | 0.018 | 0.010 |
| Manganese, dissolved | mg/L | - | - | 0.0066 | 0.0073 | <0.0005 | 0.0021 | 0.0045 | <0.0005 | 0.0014 | 0.0019 | <0.0005 |
| Mercury | µg/L | 0.026 [j] | 0.026 [j] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01* | <0.01 | <0.01 | <0.01* | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [j] | 0.025 [j] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | 0.0002 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.015 | 0.014 | 0.014 | 0.015 | 0.013 | 0.013 | 0.012 | 0.011 | 0.011 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | |
| | | | | SA-3 | | | SA-4 | | | SA-5 | | |
| | | | | SA-3b-WQ-P12 | SA-3b-WQ-U12 | SA-3b-WQ-F12[c] | SA-4b-WQ-P12 | SA-4b-WQ-U12[d] | SA-4b-WQ-F12[c] | SA-5b-WQ-P12 | SA-5b-WQ-U12[d] | SA-5b-WQ-F12[e] |
| | | | | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.015 | 0.015 | 0.013 | 0.015 | 0.014 | 0.012 | 0.011 | 0.012 | 0.0096 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | 0.0008 | 0.0005 | 0.0012 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0005 | 0.0009 | 0.0006 | 0.0013 |
| **Radionuclides** | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | 0.03 | <0.02 | <0.02 | 0.03 | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[m] | 0.006 | <0.005 | 0.01 | <0.005 | <0.005 | 0.006 | <0.005 | 0.007 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | Drainage B (Unnamed) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | Lake | Streams | | | | | | |
| | | | | SA-6 | | | Williams Lake[f] | SB-1 | | | | SB-2 | | |
| | | | | SA-6a-WQ-P12 | SA-6a-WQ-U12 | SA-6a-WQ-F12[c] | LB-3a-WQ-U12 | SB-1a-WQ-P12 | Dup1-P12 | SB-1a-WQ-U12 | SB-1a-WQ-F12[c] | SB-2b-WQ-P12 | SB-2b-WQ-U12 | SB-2b-WQ-F12[c] |
| | | | | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 11-Aug-12 | 9-May-12 | | 7-Aug-12 | 25-Oct-12 | 9-May-12 | 7-Aug-12 | 25-Oct-12 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[g] | 6.5 and 9.5[g] | 11.45 | **9.32** | 16.19 | **8.86** | 10.60 | | 9.61 | 14.00 | **8.29** | **3.62** | 11.11 |
| pH | pH units | 6.5 to 9.0 | - | 6.88 | 7.29 | **6.00** | 7.03 | **5.26** | | **6.43** | **5.83** | **5.16** | 6.59 | **5.82** |
| Specific conductivity | µS/cm | - | - | 16 | 16 | 17 | 15 | 15 | | 16 | 15 | 15 | 19 | 14 |
| Water temperature | °C | - | - | 5.10 | 17.63 | 0.62 | 18.73 | 5.73 | | 18.42 | 0.06 | 5.00 | 18.42 | 0.13 |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 6.74 | 6.54 | 6.82 | 6.58 | 6.54 | **6.42** | **6.38** | 6.64 | **6.21** | **6.05** | **6.41** |
| Specific conductivity | uS/cm | - | - | 17 | 14 | 16 | 17 | 16 | 15 | 14 | 15 | 15 | 15 | 14 |
| Total alkalinity | mg/L | - | - | 3 | 3 | 8 | 6 | 3 | 3 | 5 | 8 | 5 | 5 | 5 |
| Total dissolved solids | mg/L | - | - | 16 | 19 | 15 | 22 | 19 | 18 | 22 | 25 | 19 | 26 | 28 |
| Total hardness | mg/L | - | - | 5 | 4 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 6 | 4 |
| Total suspended solids | mg/L | - | - | 2 | 5 | 6 | 2 | 2 | 2 | <1 | 4 | 2 | 8 | 1 |
| **Nutrients** | | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [h] | [h] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.06 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.03 | <0.01 | <0.01 | 0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 2.6 | 2.4 | 2.5 | 3.0 | 4.6 | 4.8 | 4.6 | 4.5 | 6.7 | 5.3 | 7.6 |
| Organic carbon, dissolved | mg/L | - | - | 2.5 | 2.5 | 2.3 | 2.8 | 4.5 | 4.8 | 4.6 | 4.3 | 6.2 | 5.1 | 6.4 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | - | <0.01 | <0.01 | - |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.30 | 0.32 | 0.41 | 0.34 | 0.25 | 0.26 | 0.25 | 0.27 | 0.27 | 0.31 | 0.35 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Organics** | | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 2.5 | <0.1 | 2.6 | 2.2 | 2.7 | 1.2 | <0.1 | 1.7 | 1.6 | 2.0 | <0.1 |
| **Major Ions** | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 4 | 4 | 10 | 7 | 4 | 4 | 6 | 10 | 6 | 6 | 6 |
| Calcium | mg/L | - | - | 1.3 | 1.2 | 1.3 | 1.4 | 1.2 | 1.2 | 1.3 | 1.2 | 1.3 | 1.4 | 1.1 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.5 | 0.5 | 0.5 |
| Fluoride | mg/L | 0.12 | - | <0.01 | 0.02 | 0.01 | 0.02 | <0.01 | <0.01 | 0.02 | 0.01 | <0.01 | 0.02 | 0.01 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.6 | 0.4 | 0.5 | 0.4 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.2 | 0.3 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.4 | 0.2 | 0.3 | 0.3 |
| Sodium | mg/L | - | - | 1.4 | 1.3 | 1.4 | 1.4 | 1.3 | 1.2 | 1.2 | 1.4 | 1.0 | 1.1 | 1.2 |
| Sulphate | mg/L | - | - | 0.7 | 0.6 | 0.5 | 0.8 | 0.8 | 0.6 | 0.6 | 0.9 | 0.6 | 0.8 | 0.9 |
| Sum of ions | mg/L | - | - | 8 | 8 | 14 | 12 | 8 | 8 | 10 | 15 | 10 | 11 | 10 |
| **Other** | | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 2.8 | 2.9 | 2.6 | 2.3 | 2.7 | 2.7 | 2.8 | 2.9 | 2.4 | 3.1 | 2.9 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | Drainage B (Unnamed) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | Lake | Streams | | | | | | |
| | | | | SA-6 | | | Williams Lake[f] | SB-1 | | | | SB-2 | | |
| | | | | SA-6a-WQ-P12 | SA-6a-WQ-U12 | SA-6a-WQ-F12[c] | LB-3a-WQ-U12 | SB-1a-WQ-P12 | Dup1-P12 | SB-1a-WQ-U12 | SB-1a-WQ-F12[c] | SB-2b-WQ-P12 | SB-2b-WQ-U12 | SB-2b-WQ-F12[c] |
| | | | | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 11-Aug-12 | 9-May-12 | | 7-Aug-12 | 25-Oct-12 | 9-May-12 | 7-Aug-12 | 25-Oct-12 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [i] | 0.005 to 0.1 [i] | 0.020 | 0.016 | **0.014** | 0.0035 | **0.022** | **0.019** | **0.016** | **0.025** | **0.051** | 0.024 | **0.020** |
| Aluminum, dissolved | mg/L | - | - | 0.0045 | 0.0034 | <0.0005 | <0.0005 | 0.014 | 0.013 | 0.010 | <0.0005 | 0.015 | 0.013 | <0.0005 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.2 | 0.1 |
| Arsenic, dissolved | µg/L | - | - | <0.1 | 0.1 | <0.1 | 0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | 0.1 | <0.1 |
| Barium | mg/L | - | - | 0.0030 | 0.0029 | 0.0029 | 0.0041 | 0.0025 | 0.0025 | 0.0026 | 0.0023 | 0.0022 | 0.0036 | 0.0017 |
| Barium, dissolved | mg/L | - | - | <0.0005 | 0.0020 | 0.010 | 0.0034 | 0.029 | 0.0015 | 0.0026 | 0.014 | 0.011 | 0.0028 | <0.0005 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004[(i)] | 0.000017 [j] | 0.00001 | 0.00002 | 0.00001 | 0.00002 | <0.00001 | 0.00001 | 0.00001 | <0.00001 | 0.00001 | <0.00001 | 0.00001 |
| Cadmium, dissolved | mg/L | - | - | <0.00001 | 0.00001 | <0.00001 | 0.00002 | <0.00001 | <0.00001 | 0.00002 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [k] | 0.001 [k] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0002 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [j] | 0.002 [j] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | 0.0003 | <0.0002 | <0.0002 | <0.0002 | 0.0005 | 0.0004 | <0.0002 | <0.0002 | 0.0006 | <0.0002 | 0.0003 |
| Iron | mg/L | 0.3 | 0.3 | 0.098 | 0.16 | 0.14 | 0.24 | 0.20 | 0.20 | 0.16 | 0.16 | **0.49** | **1.34** | 0.25 |
| Iron, dissolved | mg/L | - | - | 0.021 | 0.048 | 0.0064 | 0.084 | 0.13 | 0.11 | 0.12 | 0.071 | 0.26 | 0.56 | 0.19 |
| Lead | mg/L | 0.001 [j] | 0.001 [j] | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.6 | 0.7 | 0.6 | 0.8 | 0.7 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 | 0.6 |
| Lithium, dissolved | µg/L | - | - | 0.6 | 0.7 | 0.4 | 0.8 | 0.7 | 0.7 | 0.6 | 0.6 | 0.7 | 0.6 | 0.7 |
| Manganese | mg/L | - | - | 0.0095 | 0.029 | 0.018 | 0.028 | 0.0098 | 0.010 | 0.0071 | 0.0088 | 0.011 | 0.054 | 0.0085 |
| Manganese, dissolved | mg/L | - | - | 0.0013 | 0.0054 | <0.0005 | 0.019 | 0.0063 | 0.0047 | 0.0025 | 0.0034 | 0.0073 | 0.040 | 0.0074 |
| Mercury | µg/L | 0.026 [(i)] | 0.026 [(i)] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [(j)] | 0.025 [(j)] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0003 | 0.0002 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0004 | 0.0002 | 0.0002 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.012 | 0.012 | 0.012 | 0.013 | 0.011 | 0.011 | 0.013 | 0.011 | 0.012 | 0.015 | 0.010 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | Drainage B (Unnamed) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | Lake | Streams | | | | | | |
| | | | | SA-6 | | | Williams Lake[f] | SB-1 | | | | SB-2 | | |
| | | | | SA-6a-WQ-P12 | SA-6a-WQ-U12 | SA-6a-WQ-F12[c] | LB-3a-WQ-U12 | SB-1a-WQ-P12 | Dup1-P12 | SB-1a-WQ-U12 | SB-1a-WQ-F12[c] | SB-2b-WQ-P12 | SB-2b-WQ-U12 | SB-2b-WQ-F12[c] |
| | | | | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 11-Aug-12 | 9-May-12 | | 7-Aug-12 | 25-Oct-12 | 9-May-12 | 7-Aug-12 | 25-Oct-12 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.012 | 0.012 | 0.011 | 0.012 | 0.012 | 0.011 | 0.013 | 0.010 | 0.012 | 0.016 | 0.0096 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | - | - | 0.0003 | <0.0002 | 0.0003 | <0.0002 | 0.0004 | 0.0003 | 0.0003 | 0.0010 | 0.0018 | 0.0009 | 0.0003 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0002 | 0.0004 | 0.0003 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | 0.0001 | <0.0001 | <0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0002 | 0.0002 | 0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | 0.0005 | 0.0006 | 0.0031 | <0.0005 | <0.0005 | 0.0007 | <0.0005 | 0.0032 | 0.0006 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | 0.0006 | <0.0005 | 0.0008 | 0.0009 | <0.0005 | <0.0005 | 0.0012 | 0.0010 | <0.0005 |
| **Radionuclides** | | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | 0.006 | <0.005 | 0.006 | <0.005 | <0.005 | <0.005 | 0.008 | 0.01 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[m] | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.009 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) Streams | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SB-3 | | | SB-4 | | | SB-5 | | | |
| | | | | SB-3b-WQ-P12 | SB-3b-WQ-U12 | SB-3b-WQ-F12[c] | SB-4a-WQ-P12 | SB-4a-WQ-U12 | SB-4a-WQ-F12[c] | SB-5a-WQ-P12 | SB-5a-WQ-U12 | SB-5a-WQ-F12[c] | Dup1-F12[c] |
| | | | | 9-May-12 | 8-Aug-12 | 25-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 9-May-12 | 7-Aug-12 | 25-Oct-12 | |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[g] | 6.5 and 9.5[g] | 9.63 | **8.91** | 13.85 | 10.20 | **7.15** | 14.14 | 10.73 | **8.71** | 13.50 | |
| pH | pH units | 6.5 to 9.0 | - | **5.78** | 6.81 | **6.12** | **6.16** | 6.90 | **6.19** | **5.52** | **6.45** | 6.73 | |
| Specific conductivity | µS/cm | - | - | 17 | 17 | 17 | 15 | 15 | 14 | 17 | 17 | 17 | |
| Water temperature | °C | - | - | 4.48 | 20.01 | 1.21 | 4.46 | 18.13 | 0.65 | 4.40 | 20.13 | 1.15 | |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | **6.50** | 6.61 | 6.78 | **6.37** | **6.35** | **6.50** | 6.61 | 6.59 | 6.77 | 6.82 |
| Specific conductivity | uS/cm | - | - | 17 | 15 | 16 | 15 | 12 | 12 | 18 | 15 | 16 | 16 |
| Total alkalinity | mg/L | - | - | 3 | 3 | 24 | 2 | 4 | 7 | 5 | 4 | 9 | 12 |
| Total dissolved solids | mg/L | - | - | 14 | 18 | 21 | 19 | 22 | 26 | 16 | 20 | 19 | 26 |
| Total hardness | mg/L | - | - | 5 | 6 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 5 |
| Total suspended solids | mg/L | - | - | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| **Nutrients** | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [h] | [h] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.02 | <0.01 | <0.01 | <0.01 | 0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 2.4 | 3.4 | 3.6 | 5.8 | 5.0 | 5.9 | 2.9 | 3.2 | 3.2 | 3.2 |
| Organic carbon, dissolved | mg/L | - | - | 2.2 | 3.4 | 3.4 | 5.9 | 4.8 | 5.6 | 2.9 | 3.1 | 3.2 | 3.2 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | - | <0.01 | <0.01 | - | <0.01 | <0.01 | - | - |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.34 | 0.24 | 0.32 | 0.26 | 0.30 | 0.65 | 0.28 | 0.22 | 0.30 | 0.33 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Organics** | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 3.6 | 0.2 | 3.7 | 1.7 | <0.1 | 8.4 | 3.8 | <0.1 | 4.3 | 4.4 |
| **Major Ions** | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 4 | 4 | 29 | 2 | 5 | 8 | 6 | 5 | 11 | 15 |
| Calcium | mg/L | - | - | 1.4 | 1.4 | 1.4 | 1.4 | 1.2 | 1.0 | 1.4 | 1.2 | 1.3 | 1.3 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | 0.2 | 0.2 | 0.2 | <0.1 |
| Fluoride | mg/L | 0.12 | - | 0.01 | 0.02 | 0.01 | <0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.4 | 0.5 | 0.4 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.2 | 0.3 | 0.4 | 0.1 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 |
| Sodium | mg/L | - | - | 1.3 | 1.2 | 1.4 | 0.9 | 1.1 | 1.1 | 1.4 | 1.3 | 1.4 | 1.4 |
| Sulphate | mg/L | - | - | 0.8 | 0.6 | 0.8 | 0.5 | 0.4 | 0.4 | 0.7 | 0.6 | 1.0 | 0.8 |
| Sum of ions | mg/L | - | - | 8 | 8 | 34 | 5 | 8 | 11 | 10 | 9 | 16 | 19 |
| **Other** | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 2.4 | 1.8 | 2.0 | 1.8 | 1.9 | 1.9 | 2.1 | 2.1 | 2.1 | 2.0 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | |
| | | | | SB-3 | | | SB-4 | | | SB-5 | | | |
| | | | | SB-3b-WQ-P12 | SB-3b-WQ-U12 | SB-3b-WQ-F12[c] | SB-4a-WQ-P12 | SB-4a-WQ-U12 | SB-4a-WQ-F12[c] | SB-5a-WQ-P12 | SB-5a-WQ-U12 | SB-5a-WQ-F12[c] | Dup1-F12[c] |
| | | | | 9-May-12 | 8-Aug-12 | 25-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 9-May-12 | 7-Aug-12 | 25-Oct-12 | |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [i] | 0.005 to 0.1 [i] | **0.0074** | 0.0084 | **0.0081** | **0.033** | 0.022 | **0.026** | **0.0086** | **0.0074** | 0.0038 | 0.0040 |
| Aluminum, dissolved | mg/L | - | - | 0.0032 | 0.0040 | <0.0005 | 0.025 | 0.014 | <0.0005 | 0.0018 | 0.0037 | <0.0005 | <0.0005 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | <0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Arsenic, dissolved | µg/L | - | - | <0.1 | 0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 |
| Barium | mg/L | - | - | 0.0035 | 0.0030 | 0.0029 | 0.0034 | 0.0031 | 0.0025 | 0.0034 | 0.0028 | 0.0028 | 0.0029 |
| Barium, dissolved | mg/L | - | - | 0.011 | 0.0029 | 0.0026 | 0.0046 | 0.0031 | 0.0041 | 0.014 | 0.0024 | 0.0054 | 0.0049 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004[i] | 0.000017 [i] | <0.00001 | <0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | 0.00001 | <0.00001 | 0.00001 |
| Cadmium, dissolved | mg/L | - | - | <0.00001 | 0.00001 | <0.00001 | <0.00001 | 0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [k] | 0.001 [k] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [j] | 0.002 [j] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | 0.0003 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.3 | 0.3 | 0.11 | 0.15 | 0.059 | 0.18 | 0.22 | 0.095 | 0.11 | 0.084 | 0.084 | 0.086 |
| Iron, dissolved | mg/L | - | - | 0.030 | 0.092 | 0.012 | 0.088 | 0.15 | 0.072 | 0.030 | 0.052 | 0.021 | 0.022 |
| Lead | mg/L | 0.001 [j] | 0.001 [j] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.7 | 0.6 | 0.6 | 0.4 | 0.4 | 0.3 | 0.7 | 0.6 | 0.7 | 0.6 |
| Lithium, dissolved | µg/L | - | - | 0.7 | 0.6 | 0.6 | 0.4 | 0.3 | 0.3 | 0.7 | 0.4 | 0.6 | 0.5 |
| Manganese | mg/L | - | - | 0.020 | 0.017 | 0.0061 | 0.0066 | 0.011 | 0.0036 | 0.016 | 0.010 | 0.0071 | 0.0075 |
| Manganese, dissolved | mg/L | - | - | 0.011 | 0.0029 | <0.0005 | 0.0021 | 0.0046 | 0.0098 | 0.011 | 0.0016 | <0.0005 | <0.0005 |
| Mercury | µg/L | 0.026 [l] | 0.026 [l] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [j] | 0.025 [j] | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | <0.0001 | <0.0001 | 0.0001 | 0.0002 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.013 | 0.013 | 0.012 | 0.012 | 0.012 | 0.0089 | 0.012 | 0.011 | 0.011 | 0.011 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | |
| | | | | SB-3 | | | SB-4 | | | SB-5 | | | |
| | | | | SB-3b-WQ-P12 | SB-3b-WQ-U12 | SB-3b-WQ-F12[c] | SB-4a-WQ-P12 | SB-4a-WQ-U12 | SB-4a-WQ-F12[c] | SB-5a-WQ-P12 | SB-5a-WQ-U12 | SB-5a-WQ-F12[c] | Dup1-F12[c] |
| | | | | 9-May-12 | 8-Aug-12 | 25-Oct-12 | 8-May-12 | 7-Aug-12 | 24-Oct-12 | 9-May-12 | 7-Aug-12 | 25-Oct-12 | |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.013 | 0.014 | 0.011 | 0.012 | 0.012 | 0.0078 | 0.012 | 0.012 | 0.010 | 0.011 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | 0.0004 | 0.0003 | 0.0003 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | 0.0003 | 0.0004 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | 0.0002 | 0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | 0.0012 | <0.0005 | <0.0005 | 0.0007 | <0.0005 | <0.0005 | 0.0016 | <0.0005 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | 0.0007 | 0.0008 | 0.0014 | 0.0006 | 0.0009 | <0.0005 | <0.0005 | 0.0011 | 0.0010 | 0.0008 |
| **Radionuclides** | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | 0.006 | <0.005 | 0.006 | 0.005 | 0.01 | <0.005 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[m] | 0.01 | <0.005 | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.006 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Russell Lake | | QA/QC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lake | | Streams | | | |
| | | | | Russell Lake | | FIELD BLANK | | TRIP BLANK | |
| | | | | RL-Aa-WQ-U12 | Dup1-U12 | Field S-P12 | Field S-F12 | Trip S-P12 | Trip S-F12[c] |
| | | | | 10-Aug-12 | 10-Aug-12 | 8-May-12 | 25-Oct-12 | 8-May-12 | 25-Oct-12 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[g] | 6.5 and 9.5[g] | **8.95** | | - | - | - | - |
| pH | pH units | 6.5 to 9.0 | - | 6.59 | | - | - | - | - |
| Specific conductivity | µS/cm | - | - | 34 | | - | - | - | - |
| Water temperature | °C | - | - | 18.62 | | - | - | - | - |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 6.65 | 6.71 | **6.44** | **5.32** | **6.33** | **5.30** |
| Specific conductivity | uS/cm | - | - | 38 | 38 | <1 | <1 | <1 | <1 |
| Total alkalinity | mg/L | - | - | 2 | 3 | 4 | <1 | 1 | <1 |
| Total dissolved solids | mg/L | - | - | 35 | 33 | <1 | <1 | <1 | <1 |
| Total hardness | mg/L | - | - | 13 | 13 | <1 | <1 | <1 | <1 |
| Total suspended solids | mg/L | - | - | 1 | <1 | <1 | <1 | <1 | 1 |
| **Nutrients** | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [h] | [h] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.30 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 2.6 | 2.6 | <0.2 | 0.3 | <0.2 | 0.3 |
| Organic carbon, dissolved | mg/L | - | - | 2.5 | 2.6 | <0.2 | 0.2 | <0.2 | 0.2 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | - | - | - | - |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.22 | 0.26 | <0.05 | 0.05 | <0.05 | <0.05 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | - | - | N/R | N/R | N/R | N/R |
| **Organics** | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 2.0 | 1.7 | 0.2 | <0.1 | 0.4 | <0.1 |
| **Major Ions** | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 2 | 4 | 5 | <1 | 1 | <1 |
| Calcium | mg/L | - | - | 3.9 | 4.0 | <0.1 | <0.1 | <0.1 | <0.1 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.4 | 0.4 | <0.1 | <0.1 | <0.1 | 0.4 |
| Fluoride | mg/L | 0.12 | - | 0.03 | 0.03 | <0.01 | <0.01 | <0.01 | <0.01 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.7 | 0.7 | <0.1 | <0.1 | <0.1 | <0.1 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.6 | 0.6 | <0.1 | <0.1 | <0.1 | <0.1 |
| Sodium | mg/L | - | - | 1.7 | 1.7 | <0.1 | <0.1 | <0.1 | <0.1 |
| Sulphate | mg/L | - | - | 7.8 | 7.7 | <0.2 | <0.2 | <0.2 | <0.2 |
| Sum of ions | mg/L | - | - | 18 | 19 | 5 | <1 | 1 | <1 |
| **Other** | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 3.7 | 3.7 | <0.01 | <0.01 | <0.01 | <0.01 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Russell Lake | | QA/QC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lake | | Streams | | | |
| | | | | Russell Lake | | FIELD BLANK | | TRIP BLANK | |
| | | | | RL-Aa-WQ-U12 | Dup1-U12 | Field S-P12 | Field S-F12 | Trip S-P12 | Trip S-F12[c] |
| | | | | 10-Aug-12 | 10-Aug-12 | 8-May-12 | 25-Oct-12 | 8-May-12 | 25-Oct-12 |
| **Metals (Total and Dissolved)** | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [i] | 0.005 to 0.1 [i] | 0.0023 | 0.0026 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Aluminum, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0028 | <0.0005 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Arsenic, dissolved | µg/L | - | - | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Barium | mg/L | - | - | 0.0033 | 0.0033 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Barium, dissolved | mg/L | - | - | 0.0028 | 0.0028 | <0.0005 | 0.014 | <0.0005 | 0.0017 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004[j] | 0.000017 [j] | 0.00001 | 0.00002 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | 0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [k] | 0.001 [k] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [j] | 0.002 [j] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0004 |
| Iron | mg/L | 0.3 | 0.3 | 0.056 | 0.051 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Iron, dissolved | mg/L | - | - | 0.0056 | 0.0059 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Lead | mg/L | 0.001 [j] | 0.001 [j] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 12 | 12 | <0.1 | <0.1 | <0.1 | <0.1 |
| Lithium, dissolved | µg/L | - | - | 11 | 11 | <0.1 | <0.1 | <0.1 | <0.1 |
| Manganese | mg/L | - | - | 0.029 | 0.027 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Manganese, dissolved | mg/L | - | - | 0.0017 | 0.0016 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Mercury | µg/L | 0.026 [l] | 0.026 [l] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | 0.0007 | 0.0006 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | 0.0019 | 0.0013 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [j] | 0.025 [j] | 0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | 0.0001 | 0.0001 | <0.0001 | 0.0002 | <0.0001 | 0.0002 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | 0.00008 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.018 | 0.018 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |

**Table A1. Water Chemistry Data for Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Russell Lake | | QA/QC | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lake | | Streams | | | |
| | | | | Russell Lake | | FIELD BLANK | | TRIP BLANK | |
| | | | | RL-Aa-WQ-U12 | Dup1-U12 | Field S-P12 | Field S-F12 | Trip S-P12 | Trip S-F12[c] |
| | | | | 10-Aug-12 | 10-Aug-12 | 8-May-12 | 25-Oct-12 | 8-May-12 | 25-Oct-12 |
| **Metals (Total and Dissolved)** | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.018 | 0.018 | <0.0005 | <0.0005 | <0.0005 | 0.0024 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | 0.0003 | 0.0002 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | 0.0007 | <0.0005 | 0.0011 | <0.0005 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| **Radionuclides** | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | 0.03 | <0.02 | 0.05 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[m] | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.006 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

Notes:

Values that exceed the CCME WQG are **bolded**. Values that Exceed the SSWQO are underlined.

[a] CCME CWQG = Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME 1999 with updates).

[b] SSWQO = Saskatchewan Surface Water Quality Objectives (Water Security Agency [WSA] 2006).

[c] This sample was reanalyzed for dissolved ICP-MS analytes. Reanalysis confirmed original results within the expected measurement uncertainty.

[d] Mercury results were reported from the Nitric acid preserved container. For best results the Mercury should be reported from the $HNO_3$/HCl preserved container.

[e] This sample was reanalyzed for dissolved ICP-MS analytes and Soluble Silicon. Reanalysis confirmed original results within the expected measurement uncertainty.

[f] Local lake name.

[g] The objectives and guidelines of dissolved oxygen for cold-water biota are 9.5 mg/L for early life stages and 6.5 mg/L for other life stages.

[h] The objectives/guidelines for ammonia are dependent on temperature and pH; the objective/guideline for each sample was calculated separately using the rounded field pH and rounded temperature measured at depth.

[i] The objectives/guidelines for aluminum are dependent on pH; the field pH for each sample was used in the screening.

[j] The objective/guidelines for cadmium, copper, lead, and nickel are hardness-dependent; The range of CCME WQG and SSWQO are listed and were calculated separately for each sample.

[k] The objective is for hexavalent chromium; total chromium was analyzed.

[l] The objective/guidelines are for inorganic mercury.

[m] The objective for radium-226 was missed in the 2006 SSWQO (WSA) revisions; an objective of 0.11 Bq/L was presented in 1997 SSWQO (SMOE) and is expected to be added to the next SSWQO revision (T. Moulding pers. comm.).

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; µg/L = micrograms per litre; Bq/L = Becquerels per litre; < = less than; - = not available; N/R = not reported; ICP-MS = Inductively coupled plasma mass spectrometry; $HNO_3$ = nitric acid; HCl = hydrochloric acid; SMOE = Saskatchewan Ministry of Environment.

**Table A2. Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | | |
| | | | | SA-1 | | | | | SA-2 | | | SA-3 | | |
| | | | | SA-1c-WQ-P13 | SA-1c-WQ-U13 | Dup1-U13 | SA-1c-WQ-F13 | Dup1-F13 | SA-2b-WQ-P13 | SA-2b-WQ-U13[c] | SA-2b-WQ-F13 | SA-3b-WQ-P13 | SA-3b-WQ-U13 | SA-3b-WQ-F13 |
| | | | | 22-May-13 | 15-Aug-13 | | 18-Oct-13 | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[f] | 6.5 and 9.5[f] | 11.98 | **9.03** | | 12.5 | | 11.17 | **8.72** | 12.74 | 11.41 | **9.29** | 12.44 |
| pH | pH units | 6.5 to 9.0 | - | 6.96 | 6.69 | | 6.93 | | 7.31 | **6.19** | 6.6 | 7.23 | **6.5** | 7.36 |
| Specific conductivity | µS/cm | - | - | 17 | 17 | | 18 | | 15 | 18 | 15 | 19 | 19 | 21 |
| Water temperature | °C | - | - | 6.84 | 21.72 | | 4.72 | | 11.6 | 21.24 | 2.51 | 8.81 | 21.37 | 2.43 |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | **6.34** | 6.68 | 6.70 | 6.95 | 6.99 | 6.59 | 6.72 | 7.01 | **6.42** | 6.66 | 7.02 |
| Specific conductivity | uS/cm | - | - | 19 | 18 | 17 | 18 | 18 | 16 | 18 | 18 | 20 | 19 | 20 |
| Total alkalinity | mg/L | - | - | 8 | 2 | 4 | 4 | 4 | 9 | 8 | 5 | 7 | 4 | 6 |
| Total dissolved solids | mg/L | - | - | 23 | 21 | 18 | 22 | 19 | 21 | 20 | 20 | 19 | 21 | 24 |
| Total hardness | mg/L | - | - | 5 | 5 | 5 | 5 | 6 | 4 | 5 | 6 | 6 | 5 | 6 |
| Total suspended solids | mg/L | - | - | 2 | 2 | 3 | 2 | 2 | 1 | <1 | 1 | <1 | 1 | 2 |
| **Nutrients** | | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [g] | [g] | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 1.8 | 2.2 | 2.2 | 2.2 | 2.2 | 2.1 | 2.4 | 2.2 | 1.8 | 2.5 | 2.5 |
| Organic carbon, dissolved | mg/L | - | - | 1.7 | 2.2 | 2.1 | 2.2 | 2.1 | 2 | 2.2 | 2.4 | 1.7 | 2.4 | 2.6 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | 0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.19 | 0.21 | 0.27 | 0.28 | 0.3 | 0.25 | 0.31 | <0.05 | 0.16 | 0.3 | 0.27 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | N/R | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Organics** | | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 2 | 1.3 | 2.3 | 5.1 | 3.7 | 2.5 | 1.1 | 2.1 | 2.7 | 2.7 | 3.2 |
| **Major Ions** | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 10 | 2 | 5 | 5 | 5 | 11 | 10 | 6 | 8 | 5 | 7 |
| Calcium | mg/L | - | - | 1.4 | 1.4 | 1.4 | 1.3 | 1.3 | 1.2 | 1.4 | 1.4 | 1.6 | 1.5 | 1.6 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.4 | 0.4 | 0.6 | 0.4 | 0.6 | 0.2 | 0.4 | 0.3 | 0.5 | 0.7 | 0.6 |
| Fluoride | mg/L | 0.12 | - | 0.01 | 0.02 | 0.02 | 0.04 | 0.04 | 0.01 | 0.02 | 0.03 | 0.01 | 0.02 | 0.04 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.3 | 0.4 | 0.3 | 0.4 | 0.7 | 0.3 | 0.4 | 0.6 | 0.5 | 0.4 | 0.4 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.4 | 0.5 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| Sodium | mg/L | - | - | 1.4 | 1.6 | 1.5 | 1.6 | 1.6 | 1.4 | 1.5 | 1.6 | 1.5 | 1.6 | 1.6 |
| Sulphate | mg/L | - | - | 0.4 | 0.9 | 0.8 | 0.5 | 0.8 | <0.2 | 0.6 | 0.7 | 0.4 | 0.8 | 0.7 |
| Sum of ions | mg/L | - | - | 14 | 7 | 10 | 10 | 10 | 14 | 15 | 11 | 13 | 10 | 12 |
| **Other** | | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 3.1 | 3.4 | 3.4 | 2.7 | 2.7 | 2.6 | 3.4 | 3 | 3.3 | 3.6 | 3.8 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | | |
| | | | | SA-1 | | | | | SA-2 | | | SA-3 | | |
| | | | | SA-1c-WQ-P13 | SA-1c-WQ-U13 | Dup1-U13 | SA-1c-WQ-F13 | Dup1-F13 | SA-2b-WQ-P13 | SA-2b-WQ-U13[c] | SA-2b-WQ-F13 | SA-3b-WQ-P13 | SA-3b-WQ-U13 | SA-3b-WQ-F13 |
| | | | | 22-May-13 | 15-Aug-13 | | 18-Oct-13 | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [h] | 0.005 to 0.1 [h] | 0.0044 | 0.005 | 0.0035 | 0.0037 | 0.0035 | 0.0093 | **0.005** | 0.0039 | 0.0018 | 0.0017 | 0.006 |
| Aluminum, dissolved | mg/L | - | - | 0.004 | <0.0005 | <0.0005 | 0.004 | 0.0054 | 0.0019 | <0.0005 | 0.0063 | 0.0005 | <0.0005 | 0.0047 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | <0.1 | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | 0.1 |
| Arsenic, dissolved | µg/L | - | - | <0.1 | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 | <0.1 |
| Barium | mg/L | - | - | 0.003 | 0.0024 | 0.0022 | 0.0026 | 0.0024 | 0.0023 | 0.0024 | 0.0023 | 0.0038 | 0.0025 | 0.0035 |
| Barium, dissolved | mg/L | - | - | 0.0018 | 0.0032 | <0.0005 | <0.0005 | <0.0005 | 0.002 | 0.0032 | <0.0005 | 0.0024 | 0.0011 | 0.0016 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004 [i] | 0.000017 [i] | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | 0.00002 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | 0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | 0.00002 | 0.00001 | <0.00001 | 0.00001 | 0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [j] | 0.001 [j] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [i] | 0.002 [i] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.3 | 0.3 | **0.31** | 0.098 | 0.091 | 0.073 | 0.078 | 0.074 | 0.098 | 0.058 | 0.12 | 0.084 | 0.096 |
| Iron, dissolved | mg/L | - | - | 0.084 | 0.0088 | 0.0017 | 0.011 | 0.012 | 0.015 | 0.0088 | 0.0092 | 0.0094 | 0.0066 | 0.011 |
| Lead | mg/L | 0.001 [i] | 0.001 [i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.5 | 0.9 | 0.6 | 0.6 | 0.6 | 0.7 | 0.9 | 0.6 | 0.8 | 0.9 | 0.6 |
| Lithium, dissolved | µg/L | - | - | 0.7 | 0.6 | 0.7 | 0.6 | 0.7 | 0.6 | 0.6 | 0.5 | 0.7 | 0.6 | 0.7 |
| Manganese | mg/L | - | - | 0.023 | 0.015 | 0.016 | 0.011 | 0.01 | 0.0077 | 0.015 | 0.0062 | 0.023 | 0.013 | 0.011 |
| Manganese, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0037 | <0.0005 | <0.0005 |
| Mercury | µg/L | 0.026 [k] | 0.026 [k] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | 0.0004 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0005 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [i] | 0.025 [i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.013 | 0.013 | 0.013 | 0.012 | 0.011 | 0.011 | 0.013 | 0.011 | 0.015 | 0.014 | 0.015 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | | | |
| | | | | SA-1 | | | | | SA-2 | | | SA-3 | | | |
| | | | | SA-1c-WQ-P13 | SA-1c-WQ-U13 | Dup1-U13 | SA-1c-WQ-F13 | Dup1-F13 | SA-2b-WQ-P13 | SA-2b-WQ-U13[c] | SA-2b-WQ-F13 | SA-3b-WQ-P13 | SA-3b-WQ-U13 | SA-3b-WQ-F13 |
| | | | | 22-May-13 | 15-Aug-13 | | 18-Oct-13 | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved) (Continued)** | | | | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.013 | 0.012 | 0.012 | 0.012 | 0.012 | 0.011 | 0.013 | 0.011 | 0.015 | 0.014 | 0.014 | |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | |
| Tin, dissolved | mg/L | - | - | 0.0002 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0003 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0006 | |
| **Radionuclides** | | | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | |
| Polonium-210 | Bq/L | - | - | <0.005 | 0.01 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.01 | |
| Radium-226 | Bq/L | - | 0.11[l] | <0.005 | <0.005 | 0.008 | <0.005 | <0.005 | 0.008 | <0.005 | <0.005 | 0.006 | <0.005 | 0.01 | |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | |
| | | | | SA-4 | | | SA-5 | | | SA-6 | | |
| | | | | SA-4b-WQ-P13 | SA-4b-WQ-U13 | SA-4b-WQ-F13 | SA-5b-WQ-P13 | SA-5b-WQ-U13 | SA-5b-WQ-F13 | SA-6a-WQ-P13 | SA-6a-WQ-U13 | SA-6a-WQ-F13 |
| | | | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[f] | 6.5 and 9.5[f] | 11.64 | **8.99** | 12.67 | 11.91 | **9.28** | 13 | 11.14 | **9.16** | 12.65 |
| pH | pH units | 6.5 to 9.0 | - | 7.3 | **6.12** | 6.89 | 7.28 | **6.22** | 6.9 | 7.66 | **5.95** | 6.82 |
| Specific conductivity | µS/cm | - | - | 18 | 19 | 20 | 15 | 15 | 17 | 16 | 18 | 18 |
| Water temperature | °C | - | - | 7.8 | 20.37 | 2.83 | 7.65 | 20.22 | 2.03 | 10.61 | 19.67 | 2.94 |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 6.67 | 6.76 | 7.02 | **6.17** | 6.66 | 6.92 | **6.48** | 6.75 | 6.94 |
| Specific conductivity | uS/cm | - | - | 19 | 19 | 20 | 16 | 15 | 17 | 16 | 18 | 18 |
| Total alkalinity | mg/L | - | - | 2 | 5 | 8 | 6 | 4 | 4 | 5 | 6 | 4 |
| Total dissolved solids | mg/L | - | - | 22 | 24 | 24 | 20 | 18 | 19 | 20 | 20 | 21 |
| Total hardness | mg/L | - | - | 6 | 5 | 6 | 5 | 4 | 5 | 5 | 5 | 6 |
| Total suspended solids | mg/L | - | - | 1 | 3 | 2 | 2 | 2 | <1 | 3 | 5 | 1 |
| **Nutrients** | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [g] | [g] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.02 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 2 | 2.4 | 2.2 | 1.9 | 2.3 | 2.2 | 2 | 2.5 | 2.1 |
| Organic carbon, dissolved | mg/L | - | - | 2 | 2.4 | 2.2 | 1.8 | 2.3 | 2.3 | 2 | 2.3 | 2.2 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.16 | 0.3 | 0.22 | 0.18 | 0.27 | 0.11 | 0.17 | 0.35 | 0.27 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Organics** | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 1.5 | 1.5 | 2.2 | 2.3 | 0.7 | 2.8 | 2.3 | 1.7 | 3.5 |
| **Major Ions** | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 2 | 6 | 10 | 7 | 5 | 5 | 6 | 7 | 5 |
| Calcium | mg/L | - | - | 1.5 | 1.5 | 1.7 | 1.2 | 1.2 | 1.3 | 1.2 | 1.4 | 1.4 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.4 | 0.5 | 0.4 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 |
| Fluoride | mg/L | 0.12 | - | 0.01 | 0.03 | 0.04 | 0.01 | 0.02 | 0.03 | 0.01 | 0.02 | 0.04 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.6 | 0.4 | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.5 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.6 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Sodium | mg/L | - | - | 1.5 | 1.7 | 1.7 | 1.6 | 1.4 | 1.4 | 1.4 | 1.4 | 1.6 |
| Sulphate | mg/L | - | - | 0.6 | 0.5 | 0.4 | 0.6 | 0.5 | 0.4 | 0.3 | 0.7 | 0.8 |
| Sum of ions | mg/L | - | - | 7 | 11 | 15 | 11 | 9 | 9 | 10 | 12 | 10 |
| **Other** | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 3.6 | 3.9 | 3.9 | 2.6 | 3 | 2.4 | 2.7 | 3.4 | 2.9 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | |
| | | | | SA-4 | | | SA-5 | | | SA-6 | | |
| | | | | SA-4b-WQ-P13 | SA-4b-WQ-U13 | SA-4b-WQ-F13 | SA-5b-WQ-P13 | SA-5b-WQ-U13 | SA-5b-WQ-F13 | SA-6a-WQ-P13 | SA-6a-WQ-U13 | SA-6a-WQ-F13 |
| | | | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [h] | 0.005 to 0.1 [h] | 0.006 | **0.0065** | 0.0035 | 0.0078 | **0.0058** | 0.004 | 0.0084 | **0.009** | 0.0044 |
| Aluminum, dissolved | mg/L | - | - | 0.0042 | 0.0065 | 0.0064 | <0.0005 | <0.0005 | 0.0078 | 0.004 | <0.0005 | 0.0056 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | <0.1 | 0.1 | 0.1 | <0.1 | <0.1 | 0.1 | <0.1 | 0.1 | <0.1 |
| Arsenic, dissolved | µg/L | - | - | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 | <0.1 |
| Barium | mg/L | - | - | 0.0028 | 0.0024 | 0.0025 | 0.0028 | 0.0021 | 0.0022 | 0.0024 | 0.0028 | 0.0023 |
| Barium, dissolved | mg/L | - | - | 0.0022 | 0.0027 | 0.0034 | 0.0022 | 0.0022 | 0.0005 | 0.0023 | 0.0011 | 0.0008 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004 [i] | 0.000017 [i] | <0.00001 | <0.00001 | <0.00001 | <0.00001 | **0.00004** | <0.00001 | 0.00003 | **0.00005** | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | <0.00001 | 0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | 0.00002 | <0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [j] | 0.001 [j] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [i] | 0.002 [i] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0005 |
| Iron | mg/L | 0.3 | 0.3 | 0.077 | 0.12 | 0.058 | 0.095 | 0.086 | 0.035 | 0.061 | 0.12 | 0.052 |
| Iron, dissolved | mg/L | - | - | 0.017 | 0.0038 | 0.0049 | 0.022 | 0.0064 | 0.0081 | 0.017 | 0.0074 | 0.0079 |
| Lead | mg/L | 0.001 [i] | 0.001 [i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.6 | 0.8 | 0.7 | 0.4 | 0.6 | 0.4 | 0.6 | 0.7 | 0.3 |
| Lithium, dissolved | µg/L | - | - | 0.7 | 0.6 | 0.8 | 0.6 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 |
| Manganese | mg/L | - | - | 0.0089 | 0.019 | 0.011 | 0.0063 | 0.012 | 0.0047 | 0.0062 | 0.018 | 0.007 |
| Manganese, dissolved | mg/L | - | - | 0.0033 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Mercury | µg/L | 0.026 [k] | 0.026 [k] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | 0.0004 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [i] | 0.025 [i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.014 | 0.014 | 0.014 | 0.011 | 0.011 | 0.011 | 0.011 | 0.013 | 0.011 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | |
| | | | | SA-4 | | | SA-5 | | | SA-6 | | |
| | | | | SA-4b-WQ-P13 | SA-4b-WQ-U13 | SA-4b-WQ-F13 | SA-5b-WQ-P13 | SA-5b-WQ-U13 | SA-5b-WQ-F13 | SA-6a-WQ-P13 | SA-6a-WQ-U13 | SA-6a-WQ-F13 |
| | | | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved) (Continued)** | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.014 | 0.013 | 0.014 | 0.011 | 0.011 | 0.011 | 0.012 | 0.013 | 0.011 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0016 |
| **Radionuclides** | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | 0.007 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[l] | 0.009 | 0.007 | <0.005 | 0.005 | 0.007 | <0.005 | <0.005 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | |
| | | | | SB-1 | | | | SB-2 | | | SB-3 | | |
| | | | | SB-1a-WQ-P13 | Dup1-P13 | SB-1a-WQ-U13 | SB-1a-WQ-F13 | SB-2b-WQ-P13 | SB-2b-WQ-U13 | SB-2b-WQ-F13 | SB-3b-WQ-P13 | SB-3b-WQ-U13[d] | SB-3b-WQ-F13 |
| | | | | 22-May-13 | | 15-Aug-13 | 19-Oct-13 | 22-May-13 | 15-Aug-13 | 19-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[f] | 6.5 and 9.5[f] | 10.38 | | **6.97** | 10.88 | **7.66** | **5.08** | 10.28 | 10.95 | **8.87** | 12.32 |
| pH | pH units | 6.5 to 9.0 | - | 6.8 | | **5.7** | **6.25** | **6.39** | **5.62** | **5.82** | 6.84 | 6.53 | 7.01 |
| Specific conductivity | µS/cm | - | - | 15 | | 20 | 17 | 16 | 21 | 15 | 16 | 17 | 17 |
| Water temperature | °C | - | - | 12.32 | | 16.86 | 1.84 | 12.11 | 17.89 | 1.73 | 9.44 | 21.6 | 4.29 |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | **6.27** | **6.29** | 6.53 | **6.46** | **6.08** | **6.44** | **6.37** | **6.18** | 6.68 | 6.99 |
| Specific conductivity | uS/cm | - | - | 14 | 14 | 18 | 16 | 16 | 19 | 15 | 16 | 17 | 18 |
| Total alkalinity | mg/L | - | - | 4 | 6 | 6 | 6 | 4 | 3 | 3 | 7 | 4 | 4 |
| Total dissolved solids | mg/L | - | - | 18 | 18 | 22 | 25 | 21 | 24 | 25 | 22 | 17 | 22 |
| Total hardness | mg/L | - | - | 4 | 4 | 6 | 3 | 5 | 7 | 4 | 5 | 5 | 5 |
| Total suspended solids | mg/L | - | - | 1 | <1 | 2 | <1 | 2 | 3 | 2 | 2 | 4 | 2 |
| **Nutrients** | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [g] | [g] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.03 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 3.1 | 3 | 4 | 3.8 | 4.2 | 5.3 | 4.6 | 2.8 | 3.4 | 3 |
| Organic carbon, dissolved | mg/L | - | - | 2.8 | 2.9 | 3.9 | 3.8 | 3.9 | 5.6 | 4.7 | 2.6 | 3.4 | 3 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.15 | 0.16 | 0.24 | 0.28 | 0.18 | 0.4 | 0.29 | 0.16 | 0.28 | 0.26 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | N/R | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Organics** | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 1.2 | 1.1 | 0.7 | 1.4 | 0.9 | 1.4 | 2 | 3.2 | 2.4 | 3.7 |
| **Major Ions** | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 5 | 7 | 7 | 7 | 5 | 4 | 4 | 8 | 5 | 5 |
| Calcium | mg/L | - | - | 1.2 | 1.2 | 1.6 | 1.1 | 1.3 | 1.8 | 1.1 | 1.4 | 1.4 | 1.4 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.2 | 0.2 | 0.2 | 0.4 | 0.3 | 0.5 | 0.6 | 0.1 | 0.2 | 0.2 |
| Fluoride | mg/L | 0.12 | - | 0.01 | 0.01 | 0.02 | 0.03 | 0.01 | 0.02 | 0.03 | 0.01 | 0.02 | 0.04 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.3 | 0.3 | 0.5 | <0.1 | 0.4 | 0.6 | 0.2 | 0.3 | 0.4 | 0.3 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.3 | 0.4 | 0.2 | 0.4 | 0.4 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 |
| Sodium | mg/L | - | - | 1.2 | 1.4 | 1.3 | 1.3 | 1 | 1.2 | 1.3 | 1.5 | 1.7 | 1.4 |
| Sulphate | mg/L | - | - | 0.7 | 0.5 | 0.5 | 1.1 | 0.6 | 0.7 | 0.8 | 0.7 | 0.8 | 0.3 |
| Sum of ions | mg/L | - | - | 9 | 11 | 11 | 11 | 9 | 9 | 8 | 12 | 10 | 9 |
| **Other** | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 2.3 | 2.3 | 3.1 | 3.2 | 2.3 | 2.8 | 2.8 | 2.5 | 2 | 1.9 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | |
| | | | | SB-1 | | | | SB-2 | | | SB-3 | | |
| | | | | SB-1a-WQ-P13 | Dup1-P13 | SB-1a-WQ-U13 | SB-1a-WQ-F13 | SB-2b-WQ-P13 | SB-2b-WQ-U13 | SB-2b-WQ-F13 | SB-3b-WQ-P13 | SB-3b-WQ-U13[d] | SB-3b-WQ-F13 |
| | | | | 22-May-13 | | 15-Aug-13 | 19-Oct-13 | 22-May-13 | 15-Aug-13 | 19-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [h] | 0.005 to 0.1 [h] | 0.015 | 0.015 | **0.018** | **0.015** | **0.023** | **0.026** | **0.02** | 0.012 | 0.0091 | 0.0052 |
| Aluminum, dissolved | mg/L | - | - | 0.001 | <0.0005 | 0.0049 | 0.015 | <0.0005 | 0.0062 | 0.021 | 0.008 | <0.0005 | 0.0056 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | <0.1 | 0.1 | 0.1 | 0.1 | <0.1 | 0.2 | 0.1 | <0.1 | <0.1 | 0.1 |
| Arsenic, dissolved | µg/L | - | - | 0.1 | 0.1 | 0.1 | <0.1 | <0.1 | 0.2 | <0.1 | 0.1 | 0.1 | <0.1 |
| Barium | mg/L | - | - | 0.0023 | 0.0023 | 0.0032 | 0.002 | 0.0023 | 0.0030 | 0.0018 | 0.0035 | 0.0025 | 0.0027 |
| Barium, dissolved | mg/L | - | - | 0.0027 | 0.0022 | 0.0012 | <0.0005 | 0.0026 | 0.0008 | <0.0005 | 0.003 | <0.0005 | 0.0009 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004 [i] | 0.000017 [i] | **0.00004** | 0.00002 | <0.00001 | 0.00001 | 0.00003 | 0.00002 | 0.00002 | 0.00002 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | 0.00001 | 0.00001 | <0.00001 | <0.00001 | 0.00001 | 0.00003 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | 0.001 [j] | 0.001 [j] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002 [i] | 0.002 [i] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | 0.0003 | <0.0002 | 0.0003 | <0.0002 | 0.0006 | 0.0009 | <0.0002 | 0.0005 | <0.0002 |
| Iron | mg/L | 0.3 | 0.3 | 0.18 | 0.18 | **0.33** | 0.18 | **0.46** | **0.92** | **0.32** | 0.22 | 0.062 | 0.042 |
| Iron, dissolved | mg/L | - | - | 0.071 | 0.093 | 0.11 | 0.13 | 0.17 | 0.29 | 0.15 | 0.055 | 0.0071 | 0.0072 |
| Lead | mg/L | 0.001 [i] | 0.001 [i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.4 | 0.6 | 0.8 | 0.8 | 0.5 | 0.7 | 0.8 | 0.6 | 0.6 | 0.4 |
| Lithium, dissolved | µg/L | - | - | 0.6 | 0.6 | 0.7 | 0.7 | 0.4 | 0.7 | 0.7 | 0.9 | 0.7 | 0.8 |
| Manganese | mg/L | - | - | 0.01 | 0.011 | 0.014 | 0.0084 | 0.024 | 0.036 | 0.011 | 0.015 | 0.01 | 0.0053 |
| Manganese, dissolved | mg/L | - | - | 0.0052 | 0.0064 | 0.0019 | 0.0077 | 0.019 | 0.007 | 0.009 | 0.0007 | <0.0005 | <0.0005 |
| Mercury | µg/L | 0.026 [k] | 0.026 [k] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | 0.0003 | 0.0011 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0003 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025 [i] | 0.025 [i] | <0.0001 | <0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0003 | 0.0002 | <0.0001 | 0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0002 | <0.0001 | <0.0001 | <0.0001 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.012 | 0.012 | 0.016 | 0.011 | 0.014 | 0.019 | 0.01 | 0.012 | 0.013 | 0.012 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | | | | | | |
| | | | | SB-1 | | | | SB-2 | | | SB-3 | | |
| | | | | SB-1a-WQ-P13 | Dup1-P13 | SB-1a-WQ-U13 | SB-1a-WQ-F13 | SB-2b-WQ-P13 | SB-2b-WQ-U13 | SB-2b-WQ-F13 | SB-3b-WQ-P13 | SB-3b-WQ-U13[d] | SB-3b-WQ-F13 |
| | | | | 22-May-13 | | 15-Aug-13 | 19-Oct-13 | 22-May-13 | 15-Aug-13 | 19-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved) (Continued)** | | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.012 | 0.012 | 0.014 | 0.01 | 0.014 | 0.018 | 0.01 | 0.012 | 0.012 | 0.012 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | 0.0004 | 0.0003 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0004 | <0.0001 | <0.0001 |
| Titanium | mg/L | - | - | 0.0002 | 0.0003 | 0.0004 | 0.0003 | 0.0006 | 0.0005 | 0.0006 | <0.0002 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | 0.0003 | <0.0002 | 0.0003 | <0.0002 | 0.0004 | 0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0002 | 0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0009 | <0.0005 | <0.0005 | <0.0005 |
| **Radionuclides** | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | <0.005 | 0.005 | 0.005 | 0.005 | 0.009 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[l] | 0.005 | <0.005 | <0.005 | <0.005 | 0.006 | 0.008 | 0.007 | 0.007 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) Streams | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SB-4 | | | SB-5 | | | FIELD BLANK | | | TRIP BLANK | | |
| | | | | SB-4a-WQ-P13 | SB-4a-WQ-U13[d] | SB-4a-WQ-F13 | SB-5a-WQ-P13 | SB-5a-WQ-U13[e] | SB-5a-WQ-F13 | Field S-P13 | Field S-U13 | Field S-F13 | Trip S-P13 | Trip S-U13 | Trip S-F13 |
| | | | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Conventional Parameters (Field-Measured)** | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[f] | 6.5 and 9.5[f] | **7.67** | **7.19** | 11.87 | 11.34 | **8.6** | 12.29 | - | | - | - | | - |
| pH | pH units | 6.5 to 9.0 | - | **6.47** | **5.53** | **6.31** | 6.75 | **6.48** | 6.74 | - | | - | - | | - |
| Specific conductivity | µS/cm | - | - | 13 | 18 | 15 | 16 | 17 | 17 | - | | - | - | | - |
| Water temperature | °C | - | - | 11.52 | 15.64 | 2.01 | 10.2 | 21.62 | 4.21 | - | | - | - | | - |
| **Conventional Parameters (Lab-Measured)** | | | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | **6.07** | **6.49** | 6.7 | **6.47** | 6.62 | 6.99 | **5.43** | **5.36** | **5.82** | **5.52** | **5.32** | **5.68** |
| Specific conductivity | uS/cm | - | - | 13 | 16 | 16 | 16 | 16 | 18 | <1 | <1 | <1 | <1 | <1 | <1 |
| Total alkalinity | mg/L | - | - | 4 | 3 | 4 | 6 | 3 | 7 | 1 | 1 | <1 | 1 | <1 | <1 |
| Total dissolved solids | mg/L | - | - | 18 | 22 | 24 | 18 | 17 | 21 | 3 | <1 | <1 | 3 | <1 | <1 |
| Total hardness | mg/L | - | - | 5 | 5 | 5 | 4 | 5 | 4 | <1 | <1 | <1 | <1 | <1 | <1 |
| Total suspended solids | mg/L | - | - | 2 | 4 | <1 | 2 | 3 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| **Nutrients** | | | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [g] | [g] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrite | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | |
| Nitrite+Nitrate nitrogen | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 4.5 | 4.1 | 4 | 2.7 | 3.1 | 2.8 | 0.3 | <0.2 | <0.2 | 0.3 | <0.2 | <0.2 |
| Organic carbon, dissolved | mg/L | - | - | 4.2 | 4.5 | 4 | 2.6 | 3.1 | 2.8 | | | 0.2 | | | |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Phosphorus | mg/L | - | - | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | <0.01 | | | |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.22 | 0.3 | 0.35 | 0.25 | 0.3 | 0.3 | <0.05 | <0.05 | 0.08 | <0.05 | <0.05 | 0.08 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | N/R | N/R | N/R | N/R | N/R | N/R |
| **Organics** | | | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 0.9 | 0.7 | 0.6 | 2.4 | 2.7 | 4.5 | | | <0.1 | | | |
| **Major Ions** | | | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 5 | 4 | 5 | 7 | 4 | 8 | 1 | 1 | <1 | 1 | <1 | <1 |
| Calcium | mg/L | - | - | 1.2 | 1.4 | 1.2 | 1.3 | 1.3 | 1.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | <0.1 | 0.1 | <0.1 | 0.1 | 0.2 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Fluoride | mg/L | 0.12 | - | 0.01 | 0.02 | 0.03 | 0.01 | 0.02 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.4 | 0.4 | 0.4 | 0.3 | 0.4 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.3 | 0.1 | 0.4 | 0.3 | 0.4 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Sodium | mg/L | - | - | 1.1 | 1.3 | 1.3 | 1.4 | 1.4 | 1.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Sulphate | mg/L | - | - | 0.5 | 0.6 | 0.5 | 0.6 | 0.8 | 0.5 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Sum of ions | mg/L | - | - | 8 | 8 | 9 | 11 | 8 | 12 | 1 | 1 | <1 | 1 | <1 | <1 |
| **Other** | | | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 1.6 | 2.2 | 2.2 | 2.2 | 2.2 | 2.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) Streams | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SB-4 | | | SB-5 | | | FIELD BLANK | | | TRIP BLANK | | |
| | | | | SB-4a-WQ-P13 | SB-4a-WQ-U13[d] | SB-4a-WQ-F13 | SB-5a-WQ-P13 | SB-5a-WQ-U13[e] | SB-5a-WQ-F13 | Field S-P13 | Field S-U13 | Field S-F13 | Trip S-P13 | Trip S-U13 | Trip S-F13 |
| | | | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved)** | | | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1 [h] | 0.005 to 0.1 [h] | **0.029** | **0.023** | **0.019** | 0.0086 | **0.0066** | 0.0025 | 0.0071 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Aluminum, dissolved | mg/L | - | - | <0.0005 | 0.011 | 0.016 | 0.005 | 0.0095 | 0.0056 | | | 0.0037 | | | |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | | | <0.0002 | | | |
| Arsenic | µg/L | 5 | 5 | <0.1 | 0.2 | 0.1 | <0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Arsenic, dissolved | µg/L | - | - | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | | <0.1 | | | |
| Barium | mg/L | - | - | 0.0035 | 0.0036 | 0.0025 | 0.0033 | 0.0026 | 0.0027 | 0.0071 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Barium, dissolved | mg/L | - | - | 0.0015 | 0.0016 | 0.0008 | 0.0028 | <0.0005 | <0.0005 | | | <0.0005 | | | |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | <0.01 | | | |
| Cadmium | mg/L | 0.00004 [i] | 0.000017 [i] | 0.00002 | <0.00001 | <0.00001 | **0.00004** | 0.00002 | 0.00002 | 0.00002 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | | | <0.00001 | | | |
| Chromium | mg/L | 0.001 [ij] | 0.001 [ij] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | | | <0.0005 | | | |
| Cobalt | mg/L | - | - | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Copper | mg/L | 0.002 [ij] | 0.002 [ij] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | 0.0005 | <0.0002 | 0.0012 | <0.0002 | 0.0005 | | | <0.0002 | | | |
| Iron | mg/L | 0.3 | 0.3 | 0.25 | 0.29 | 0.11 | 0.16 | 0.097 | 0.13 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Iron, dissolved | mg/L | - | - | 0.13 | 0.08 | 0.046 | 0.1 | 0.0087 | 0.03 | | | <0.0005 | | | |
| Lead | mg/L | 0.001 [ij] | 0.001 [ij] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Lithium | µg/L | - | - | 0.2 | 0.4 | 0.3 | 0.5 | 0.7 | 0.8 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Lithium, dissolved | µg/L | - | - | 0.2 | 0.5 | 0.4 | 0.5 | 0.6 | 0.6 | | | <0.1 | | | |
| Manganese | mg/L | - | - | 0.0074 | 0.016 | 0.0067 | 0.012 | 0.012 | 0.009 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Manganese, dissolved | mg/L | - | - | 0.0008 | 0.0011 | 0.0053 | 0.0019 | <0.0005 | <0.0005 | | | <0.0005 | | | |
| Mercury | µg/L | 0.026 [k] | 0.026 [k] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | <0.01 | | | |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | 0.0006 | <0.0001 | <0.0001 | 0.0038 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Nickel | mg/L | 0.025 [ij] | 0.025 [ij] | <0.0001 | 0.0003 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | 0.0002 | 0.0002 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | | | <0.00005 | | | |
| Strontium | mg/L | - | - | 0.012 | 0.013 | 0.01 | 0.012 | 0.011 | 0.012 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |

**Table A2 Water Chemistry Data for Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013 (Continued)**

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage B (Unnamed) Streams | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SB-4 | | | SB-5 | | | FIELD BLANK | | | TRIP BLANK | | |
| | | | | SB-4a-WQ-P13 | SB-4a-WQ-U13[d] | SB-4a-WQ-F13 | SB-5a-WQ-P13 | SB-5a-WQ-U13[e] | SB-5a-WQ-F13 | Field S-P13 | Field S-U13 | Field S-F13 | Trip S-P13 | Trip S-U13 | Trip S-F13 |
| | | | | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 | 22-May-13 | 15-Aug-13 | 18-Oct-13 |
| **Metals (Total and Dissolved) (Continued)** | | | | | | | | | | | | | | | |
| Strontium, dissolved | mg/L | - | - | 0.011 | 0.013 | 0.01 | 0.012 | 0.011 | 0.011 | | | <0.0005 | | | |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | | | <0.0002 | | | |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Titanium | mg/L | - | - | 0.0005 | 0.0004 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | 0.0003 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | | | <0.0002 | | | |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | <0.1 | | | |
| Vanadium | mg/L | - | - | 0.0002 | 0.0002 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | | <0.0001 | | | |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0006 | 0.0009 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0008 | | | <0.0005 | | | |
| **Radionuclides** | | | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[l] | <0.005 | <0.005 | 0.007 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

Notes:

Values that exceed the CCME WQG are **bolde**d. Values that Exceed the SSWQO are underlined.

[a] CCME CWQG = Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME 1999 with updates).

[b] SSWQO = Saskatchewan Surface Water Quality Objectives (Water Security Agency [WSA] 2006).

[c] This sample was reanalyzed for barium. Reanalysis confirmed original results within the expected measurement uncertainty.

[d] This sample was reanalyzed for copper. Reanalysis confirmed original results within the expected measurement uncertainty.

[e] This sample was reanalyzed for aluminumm. Reanalysis confirmed original results within the expected measurement uncertainty.

[f] The objectives and guidelines of dissolved oxygen for cold-water biota are 9.5 mg/L for early life stages and 6.5 mg/L for other life stages.

[g] The objectives/guidelines for ammonia are dependent on temperature and pH; the objective/guideline for each sample was calculated separately using the rounded field pH and rounded temperature measured at depth.

[h] The objectives/guidelines for aluminum are dependent on pH; the field pH for each sample was used in the screening.

[i] The objective/guidelines for cadmium, copper, lead, and nickel are hardness-dependent; The range of CCME WQG and SSWQO are listed and were calculated separately for each sample.

[j] The objective is for hexavalent chromium; total chromium was analyzed.

[k] The objective/guidelines are for inorganic mercury.

[l] The objective for radium-226 was missed in the 2006 SSWQO (WSA) revisions; an objective of 0.11 Bq/L was presented in 1997 SSWQO (SMOE) and is expected to be added to the next SSWQO revision (T. Moulding pers. comm.).

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; µg/L = micrograms per litre; Bq/L = Becquerels per litre; < = less than; - = not available; N/R = not reported; SMOE = Saskatchewan Ministry of Environment.

Table A3. Water Chemistry Data for Waterbodies and Watercourses of the Denison Minew Wheeler River Project, March 28 to April 1, 2014

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lakes | | | | | | | Streams | | |
| | | | | Lake LA-1 | Lake LA-2 | Lake LA-3 | Lake LA-4 | Lake LA-5 | Lake LA-6 | Kratchkowsky Lake | SA-1 | SA-2 | SA-3 |
| | | | | LA-1b-WQ-W14 | LA-2a-WQ-W14 | LA-3a-WQ-W14 | LA-4a-WQ-W14 | LA-5b-WQ-W14 | LA-6a-WQ-W14 | LA-7a-WQ-W14 | SA-1c-WQ-W14 | SA-2b-WQ-W14 | SA-3b-WQ-W14 |
| | | | | 29-Mar-14 | 28-Mar-14 | 28-Mar-14 | 29-Mar-14 | 1-Apr-14 | 30-Mar-14 | 29-Mar-14 | 30-Mar-14 | 29-Mar-14 | 31-Mar-14 |
| Conventional Parameters (Field-Measured) | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[d] | 6.5 and 9.5[d] | 12.9 | 12.3 | 13.9 | 13.2 | 9.3 | 11.8 | 12.1 | 11.4 | 13.7 | 9.8 |
| pH | pH unis | 6.5 to 9.0 | - | 6.9 | 7.0 | 7.7 | 7.6 | 6.6 | 7.1 | 7.1 | 7.2 | 6.5 | 6.9 |
| Specific conductivity[e] | µS/cm | - | - | - | - | - | - | - | - | - | - | - | - |
| Water Temperature | °C | - | - | 4.1 | 3.2 | 1.0 | 1.6 | 0.4 | 2.4 | 2.0 | 1.1 | 0.4 | 0.9 |
| Conventional Parameters (Lab-Measured) | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 6.83 | 6.9 | 6.92 | 6.98 | 7.01 | 5.71 | 6.82 | 6.98 | 6.87 | 6.99 |
| Specific conductivity | µS/cm | - | - | 24 | 25 | 24 | 26 | 22 | 21 | 26 | 22 | 22 | 24 |
| Total alkalinity | mg/L | - | - | 10 | 12 | 10 | 16 | 13 | 38 | 19 | 13 | 11 | 13 |
| Total dissolved solids | mg/L | - | - | 22 | 26 | 25 | 36 | 29 | 29 | 29 | 24 | 30 | 26 |
| Total hardness | mg/L | - | - | 6 | 7 | 6 | 7 | 6 | 5 | 7 | 6 | 6 | 7 |
| Total suspended solids | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Nutrients | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [f] | [f] | 0.09 | 0.04 | 0.04 | 0.07 | 0.05 | 0.05 | 0.12 | 0.04 | 0.04 | 0.04 |
| Nitrate (calc. from NO2+NO3-N) | mg/L | 13.0 | - | 0.49 | 0.53 | 0.4 | 0.18 | 0.26 | 0.31 | 0.26 | 0.26 | 0.31 | 0.26 |
| Nitrite[g] | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.11 | 0.12 | 0.09 | 0.04 | 0.06 | 0.07 | 0.06 | 0.06 | 0.07 | 0.06 |
| Organic carbon | mg/L | - | - | 2.3 | 2.2 | 2.3 | 1.5 | 1.9 | 2.2 | 2 | 2.1 | 2.1 | 2.3 |
| Organic carbon, dissolved | mg/L | - | - | 2.1 | 2.1 | 2.2 | 1.6 | 2 | 2 | 2.1 | 2 | 1.9 | 2.2 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.17 | 0.15 | 0.16 | 0.08 | 0.14 | 0.24 | 0.44 | 0.11 | 0.12 | 0.13 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organics | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 0.4 | 0.8 | 0.8 | 0.5 | 0.1 | <0.1 | 0.7 | 0.3 | 0.4 | 1.1 |
| Major Ions | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 12 | 15 | 12 | 20 | 16 | 46 | 23 | 16 | 13 | 16 |
| Calcium | mg/L | - | - | 1.7 | 1.9 | 1.8 | 2 | 1.6 | 1.5 | 2 | 1.7 | 1.7 | 1.9 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.5 | 0.7 | 0.9 | 0.6 | 0.4 | 0.3 | 0.7 | 0.5 | 0.4 | 0.7 |
| Fluoride | mg/L | 0.12 | - | 0.03 | 0.07 | 0.07 | 0.01 | 0.07 | 0.07 | 0.06 | 0.07 | 0.01 | 0.07 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.5 | 0.6 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.5 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.4 | 0.4 | 0.5 |
| Sodium | mg/L | - | - | 1.8 | 1.8 | 1.8 | 2 | 1.7 | 1.8 | 2 | 1.7 | 1.8 | 1.8 |
| Sulfate | mg/L | - | - | 0.8 | 0.8 | 0.9 | 1.3 | 0.7 | 0.7 | 0.5 | 0.8 | 0.7 | 0.8 |
| Sum of ions | mg/L | - | - | 18 | 22 | 19 | 27 | 22 | 51 | 30 | 22 | 19 | 22 |
| Other | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 4.2 | 4.4 | 3.7 | 5.9 | 4 | 3.7 | 4.7 | 3.9 | 4.2 | 4 |
| Metals (Total and Dissolved) | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1[h] | 0.005 to 0.1[h] | 0.0023 | 0.001 | 0.0014 | 0.0009 | 0.0048 | 0.005 | 0.0006 | 0.0029 | 0.0042 | 0.0013 |
| Aluminum, dissolved | mg/L | - | - | 0.0017 | 0.0006 | 0.0006 | <0.0005 | 0.0031 | 0.0033 | 0.0006 | 0.0024 | 0.003 | 0.0007 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Arsenic, dissolved | µg/L | - | - | 0.1 | <0.1 | <0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

Table A3. Water Chemistry Data for Waterbodies and Watercourses of the Denison Minew Wheeler River Project, March 28 to April 1, 2014 (continued)

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lakes | | | | | | | Streams | | |
| | | | | Lake LA-1 | Lake LA-2 | Lake LA-3 | Lake LA-4 | Lake LA-5 | Lake LA-6 | Kratchkowsky Lake | SA-1 | SA-2 | SA-3 |
| | | | | LA-1b-WQ-W14 | LA-2a-WQ-W14 | LA-3a-WQ-W14 | LA-4a-WQ-W14 | LA-5b-WQ-W14 | LA-6a-WQ-W14 | LA-7a-WQ-W14 | SA-1c-WQ-W14 | SA-2b-WQ-W14 | SA-3b-WQ-W14 |
| | | | | 29-Mar-14 | 28-Mar-14 | 28-Mar-14 | 29-Mar-14 | 1-Apr-14 | 30-Mar-14 | 29-Mar-14 | 30-Mar-14 | 29-Mar-14 | 31-Mar-14 |
| Barium | mg/L | - | - | 0.0038 | 0.0043 | 0.0041 | 0.0039 | 0.0032 | 0.0032 | 0.0038 | 0.0032 | 0.0031 | 0.004 |
| Barium, dissolved | mg/L | - | - | 0.0038 | 0.0044 | 0.004 | 0.0037 | 0.0032 | 0.0032 | 0.0039 | 0.0033 | 0.0032 | 0.0039 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004[i] | 0.000017[i] | 0.00001 | 0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | 0.00001 | 0.00001 | 0.00001 | 0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | 0.00001 | <0.00001 |
| Chromium | mg/L | 0.001[i] | 0.001[i] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002[i] | 0.002[i] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.3 | 0.3 | 0.051 | 0.081 | 0.066 | 0.0087 | 0.04 | 0.085 | 0.15 | 0.031 | 0.041 | 0.036 |
| Iron, dissolved | mg/L | - | - | 0.014 | 0.014 | 0.017 | 0.0011 | 0.02 | 0.045 | 0.07 | 0.012 | 0.018 | 0.0098 |
| Lead | mg/L | 0.001[i] | 0.001[i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.8 | 0.7 | 0.7 | 1 | 0.7 | 0.7 | 0.8 | 0.8 | 0.6 | 0.7 |
| Lithium, dissolved | µg/L | - | - | 0.8 | 0.8 | 0.7 | 1 | 0.7 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 |
| Manganese | mg/L | - | - | 0.02 | 0.03 | 0.014 | 0.029 | 0.0046 | 0.0062 | 0.026 | 0.0041 | 0.0044 | 0.0098 |
| Manganese, dissolved | mg/L | - | - | 0.018 | 0.026 | 0.011 | 0.027 | 0.0042 | 0.0056 | 0.025 | 0.0027 | 0.0035 | 0.0081 |
| Mercury | µg/L | 0.026[k] | 0.026[k] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025[i] | 0.025[i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | <0.0001 | 0.0002 | 0.0002 | <0.0001 | <0.0001 | <0.0001 | 0.0002 | 0.0001 | <0.0001 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.016 | 0.018 | 0.018 | 0.017 | 0.015 | 0.014 | 0.019 | 0.015 | 0.015 | 0.018 |
| Strontium, dissolved | mg/L | - | - | 0.016 | 0.018 | 0.018 | 0.018 | 0.015 | 0.014 | 0.018 | 0.015 | 0.015 | 0.018 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | 0.0013 | 0.0004 | 0.0004 | 0.0012 | 0.0008 | 0.0011 | 0.0009 | <0.0001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | 0.0013 | 0.0011 | 0.0006 | 0.0011 | 0.0009 | 0.0012 | 0.0009 | <0.0001 | <0.0001 | <0.0001 |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0002 | <0.0002 | <0.0002 | 0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | 0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0011 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | 0.0015 | 0.0008 | 0.001 | <0.0005 | 0.0009 | <0.0005 | 0.0008 | 0.0008 | 0.0006 |
| Radionuclides | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[l] | <0.005 | <0.005 | 0.006 | <0.005 | 0.01 | <0.005 | <0.005 | 0.009 | <0.005 | 0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

Table A3. Water Chemistry Data for Waterbodies and Watercourses of the Denison Minew Wheeler River Project, March 28 to April 1, 2014 (continued)

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | Drainage B (Unnamed) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | Lakes | | | Streams | | |
| | | | | SA-4 | SA-5 | SA-6 | | LB-2 | | Williams Lake[c] | SB-1 | SB-3 | SB-5 |
| | | | | SA-4b-WQ-W14 | SA-5b-WQ-W14 | SA-6a-WQ-W14 | Dup1-W14 | LB-2a-WQ-W14 | Dup2-W14 | LB-3a-WQ-W14 | SB-1a-WQ-W14 | SB-3b-WQ-W14 | SB-5a-WQ-W14 |
| | | | | 30-Mar-14 | 30-Mar-14 | 1-Apr-14 | | 1-Apr-14 | | 1-Apr-14 | 31-Mar-14 | 31-Mar-14 | 31-Mar-14 |
| Conventional Parameters (Field-Measured) | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[d] | 6.5 and 9.5[d] | 13.3 | 12.3 | 7.0 | | 6.2 | | 13.0 | 8.1 | 8.6 | 8.9 |
| pH | pH unis | 6.5 to 9.0 | - | 6.8 | 6.7 | 6.5 | | 6.8 | | 7.5 | 6.6 | 6.3 | 6.6 |
| Specific conductivity[e] | µS/cm | - | - | - | - | - | | - | | - | - | - | - |
| Water Temperature | °C | - | - | 0.6 | 0.6 | 0.2 | | 3.5 | | 3.1 | 0.4 | 0.7 | 0.4 |
| Conventional Parameters (Lab-Measured) | | | | | | | | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 7.16 | 6.97 | 7.07 | 7.02 | 6.82 | 6.86 | 7 | 6.86 | 6.86 | 6.96 |
| Specific conductivity | µS/cm | - | - | 25 | 20 | 23 | 24 | 22 | 22 | 22 | 26 | 22 | 23 |
| Total alkalinity | mg/L | - | - | 15 | 7 | 13 | 14 | 12 | 12 | 14 | 20 | 12 | 13 |
| Total dissolved solids | mg/L | - | - | 32 | 28 | 28 | 31 | 30 | 30 | 23 | 36 | 26 | 24 |
| Total hardness | mg/L | - | - | 7 | 5 | 6 | 6 | 6 | 6 | 6 | 8 | 6 | 6 |
| Total suspended solids | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | <1 | <1 |
| Nutrients | | | | | | | | | | | | | |
| Ammonia as nitrogen | mg/L | [f] | [f] | 0.05 | 0.05 | 0.04 | 0.05 | 0.04 | 0.04 | 0.04 | 0.1 | 0.04 | 0.04 |
| Nitrate (calc. from NO2+NO3-N) | mg/L | 13.0 | - | 0.35 | 0.31 | 0.35 | 0.35 | 0.66 | 0.66 | 0.44 | 0.31 | 0.4 | 0.4 |
| Nitrite[g] | mg/L | 0.06 | - | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.08 | 0.07 | 0.08 | 0.08 | 0.15 | 0.15 | 0.1 | 0.07 | 0.09 | 0.09 |
| Organic carbon | mg/L | - | - | 2.1 | 2.1 | 1.9 | 1.9 | 2.7 | 2.7 | 3.1 | 3.3 | 3.2 | 2.9 |
| Organic carbon, dissolved | mg/L | - | - | 2.1 | 2 | 1.9 | 1.9 | 2.6 | 2.7 | 2.9 | 3.2 | 3.1 | 2.9 |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.13 | 0.11 | 0.15 | 0.14 | 0.13 | 0.11 | 0.18 | 0.2 | 0.2 | 0.18 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organics | | | | | | | | | | | | | |
| Chlorophyll a | µg/L | - | - | 0.7 | 0.5 | <0.1 | 0.3 | 0.7 | 0.8 | 0.9 | <0.1 | 0.4 | 1.7 |
| Major Ions | | | | | | | | | | | | | |
| Bicarbonate | mg/L | - | - | 18 | 8 | 16 | 17 | 15 | 15 | 17 | 24 | 15 | 16 |
| Calcium | mg/L | - | - | 2 | 1.4 | 1.8 | 1.8 | 1.8 | 1.8 | 1.7 | 2.2 | 1.7 | 1.7 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.6 | 0.3 | 0.5 | 0.5 | 0.2 | 0.2 | 0.2 | 0.4 | 0.2 | 0.2 |
| Fluoride | mg/L | 0.12 | - | 0.07 | 0.08 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.4 | 0.3 | 0.4 | 0.5 | 0.4 | 0.4 | 0.4 | 0.7 | 0.4 | 0.5 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.5 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 |
| Sodium | mg/L | - | - | 2.1 | 1.6 | 1.9 | 1.9 | 1.6 | 1.6 | 1.8 | 2.1 | 1.7 | 1.7 |
| Sulfate | mg/L | - | - | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 | 0.9 | 0.8 | 1.1 | 0.9 | 0.8 |
| Sum of ions | mg/L | - | - | 25 | 13 | 22 | 23 | 21 | 21 | 23 | 31 | 21 | 22 |
| Other | | | | | | | | | | | | | |
| Silicon, soluble | mg/L | - | - | 4.8 | 3.6 | 4.3 | 4.3 | 3.2 | 3.2 | 2.7 | 4.9 | 3.1 | 2.6 |
| Metals (Total and Dissolved) | | | | | | | | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1[h] | 0.005 to 0.1[h] | 0.0025 | 0.0044 | 0.0032 | 0.0034 | 0.0067 | 0.0067 | 0.0018 | 0.014 | 0.0086 | 0.0016 |
| Aluminum, dissolved | mg/L | - | - | 0.0015 | 0.0033 | 0.0022 | 0.0026 | 0.0045 | 0.0045 | 0.0006 | 0.0084 | 0.0069 | 0.0017 |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Arsenic | µg/L | 5 | 5 | 0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 0.1 |
| Arsenic, dissolved | µg/L | - | - | 0.1 | 0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

Table A3. Water Chemistry Data for Waterbodies and Watercourses of the Denison Minew Wheeler River Project, March 28 to April 1, 2014 (continued)

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Drainage A (Icelander River) | | | | Drainage B (Unnamed) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Streams | | | | Lakes | | | Streams | | |
| | | | | SA-4 | SA-5 | SA-6 | | LB-2 | | Williams Lake[c] | SB-1 | SB-3 | SB-5 |
| | | | | SA-4b-WQ-W14 | SA-5b-WQ-W14 | SA-6a-WQ-W14 | Dup1-W14 | LB-2a-WQ-W14 | Dup2-W14 | LB-3a-WQ-W14 | SB-1a-WQ-W14 | SB-3b-WQ-W14 | SB-5a-WQ-W14 |
| | | | | 30-Mar-14 | 30-Mar-14 | 1-Apr-14 | | 1-Apr-14 | | 1-Apr-14 | 31-Mar-14 | 31-Mar-14 | 31-Mar-14 |
| Barium | mg/L | - | - | 0.0032 | 0.003 | 0.0032 | 0.0032 | 0.0046 | 0.0045 | 0.0037 | 0.0039 | 0.0041 | 0.004 |
| Barium, dissolved | mg/L | - | - | 0.0032 | 0.003 | 0.0031 | 0.0032 | 0.0045 | 0.0044 | 0.0036 | 0.0038 | 0.004 | 0.0041 |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cadmium | mg/L | 0.00004[i] | 0.000017[i] | <0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | 0.00001 | 0.00001 | 0.00001 | <0.00001 | <0.00001 |
| Chromium | mg/L | 0.001[i] | 0.001[i] | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Copper | mg/L | 0.002[i] | 0.002[i] | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0004 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Iron | mg/L | 0.3 | 0.3 | 0.034 | 0.03 | 0.036 | 0.036 | 0.15 | 0.15 | 0.045 | 0.64 | 0.042 | 0.036 |
| Iron, dissolved | mg/L | - | - | 0.013 | 0.014 | 0.015 | 0.015 | 0.057 | 0.057 | 0.028 | 0.18 | 0.024 | 0.015 |
| Lead | mg/L | 0.001[i] | 0.001[i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Lithium | µg/L | - | - | 0.9 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.8 | 0.9 | 0.8 | 0.8 |
| Lithium, dissolved | µg/L | - | - | 0.9 | 0.6 | 0.8 | 0.8 | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 |
| Manganese | mg/L | - | - | 0.0029 | 0.0025 | 0.0037 | 0.0035 | 0.037 | 0.035 | 0.0025 | 0.036 | 0.01 | 0.009 |
| Manganese, dissolved | mg/L | - | - | 0.0021 | 0.0018 | 0.0029 | 0.0029 | 0.033 | 0.033 | 0.0024 | 0.035 | 0.0094 | 0.0086 |
| Mercury | µg/L | 0.026[k] | 0.026[k] | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Molybdenum | mg/L | 0.073 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Nickel | mg/L | 0.025[i] | 0.025[i] | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0002 | 0.0002 | <0.0001 | 0.0006 | 0.0002 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | <0.0001 | 0.0001 | <0.0001 | <0.0001 | 0.0002 | 0.0002 | <0.0001 | 0.0003 | 0.0002 | 0.0001 |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Strontium | mg/L | - | - | 0.018 | 0.013 | 0.016 | 0.016 | 0.016 | 0.016 | 0.015 | 0.021 | 0.015 | 0.015 |
| Strontium, dissolved | mg/L | - | - | 0.018 | 0.013 | 0.016 | 0.016 | 0.016 | 0.016 | 0.015 | 0.021 | 0.015 | 0.016 |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Tin | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0008 | <0.0001 | 0.0016 | 0.0007 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | 0.0006 | 0.0003 | 0.0002 | <0.0001 | 0.0009 | 0.0002 | 0.003 | 0.0014 | 0.0007 | 0.0001 |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0004 | <0.0002 | 0.0003 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | 0.0002 | <0.0002 | <0.0002 |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.03 | 0.03 | 0.0006 | <0.0005 | <0.0005 | 0.0011 | 0.0018 | 0.0006 | 0.002 | 0.0005 | 0.0006 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | <0.0005 | 0.0005 | <0.0005 | 0.0009 | 0.0008 | 0.0009 | 0.0012 | 0.0014 | <0.0005 | <0.0005 |
| Radionuclides | | | | | | | | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.006 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[i] | 0.008 | <0.005 | <0.005 | <0.005 | 0.008 | <0.005 | <0.005 | 0.01 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |

Table A3. Water Chemistry Data for Waterbodies and Watercourses of the Denison Minew Wheeler River Project, March 28 to April 1, 2014 (continued)

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Russell Lake | QA/QC | |
|---|---|---|---|---|---|---|
| | | | | Lake | Streams | |
| | | | | RL-Aa-WQ-W14 | Field Blank | Trip Blank |
| | | | | 31-Mar-14 | Field S-W14 | Trip S-W14 |
| | | | | Russell Lake | 28-Mar-14 | 1-Apr-14 |
| Conventional Parameters (Field-Measured) | | | | | | |
| Dissolved Oxygen | mg/L | 6.5 and 9.5[d] | 6.5 and 9.5[d] | 12.7 | - | - |
| pH | pH unis | 6.5 to 9.0 | - | 7.7 | - | - |
| Specific conductivity[e] | µS/cm | - | - | - | - | - |
| Water Temperature | °C | - | - | 3.5 | - | - |
| Conventional Parameters (Lab-Measured) | | | | | | |
| pH | pH units | 6.5 to 9.0 | - | 6.98 | 5.63 | 6.1 |
| Specific conductivity | µS/cm | - | - | 30 | <1 | <1 |
| Total alkalinity | mg/L | - | - | 14 | <1 | 1 |
| Total dissolved solids | mg/L | - | - | 31 | <1 | <1 |
| Total hardness | mg/L | - | - | 9 | <1 | <1 |
| Total suspended solids | mg/L | - | - | <1 | <1 | <1 |
| Nutrients | | | | | | |
| Ammonia as nitrogen | mg/L | [f] | [f] | 0.05 | 0.02 | 0.02 |
| Nitrate (calc. from NO2+NO3-N) | mg/L | 13.0 | - | 0.44 | <0.04 | <0.04 |
| Nitrite[g] | mg/L | 0.06 | - | <0.03 | <0.03 | - |
| Nitrite+Nitrate nitrogen | mg/L | - | - | 0.1 | <0.01 | <0.01 |
| Organic carbon | mg/L | - | - | 2.2 | <0.2 | <0.2 |
| Organic carbon, dissolved | mg/L | - | - | 2.1 | <0.2 | - |
| Ortho-phosphate as P | mg/L | - | - | <0.01 | <0.01 | - |
| Phosphorus | mg/L | - | - | <0.01 | <0.01 | <0.01 |
| Phosphorus, dissolved | mg/L | - | - | <0.01 | <0.01 | - |
| Total Kjeldahl nitrogen | mg/L | - | - | 0.14 | <0.05 | <0.05 |
| Un-ionized ammonia-N | mg/L | 0.019 | - | <0.01 | N/R | N/R |
| Organics | | | | | | |
| Chlorophyll a | µg/L | - | - | 0.4 | - | - |
| Major Ions | | | | | | |
| Bicarbonate | mg/L | - | - | 17 | <1 | 1 |
| Calcium | mg/L | - | - | 2.7 | <0.1 | <0.1 |
| Carbonate | mg/L | - | - | <1 | <1 | <1 |
| Chloride | mg/L | 120 | - | 0.5 | <0.1 | <0.1 |
| Fluoride | mg/L | 0.12 | - | 0.07 | <0.01 | 0.01 |
| Hydroxide | mg/L | - | - | <1 | <1 | <1 |
| Magnesium | mg/L | - | - | 0.5 | <0.1 | <0.1 |
| P. alkalinity | mg/L | - | - | <1 | <1 | <1 |
| Potassium | mg/L | - | - | 0.6 | <0.1 | <0.1 |
| Sodium | mg/L | - | - | 2 | <0.1 | <0.1 |
| Sulfate | mg/L | - | - | 3.7 | <0.2 | <0.2 |
| Sum of ions | mg/L | - | - | 28 | <1 | 1 |
| Other | | | | | | |
| Silicon, soluble | mg/L | - | - | 4.4 | <0.01 | <0.01 |
| Metals (Total and Dissolved) | | | | | | |
| Aluminum | mg/L | 0.005 to 0.1[h] | 0.005 to 0.1[h] | 0.0024 | <0.0005 | 0.0006 |
| Aluminum, dissolved | mg/L | - | - | 0.0019 | <0.0005 | - |
| Antimony | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 |
| Antimony, dissolved | mg/L | - | - | <0.0002 | <0.0002 | - |
| Arsenic | µg/L | 5 | 5 | <0.1 | <0.1 | <0.1 |
| Arsenic, dissolved | µg/L | - | - | 0.1 | <0.1 | - |

Table A3. Water Chemistry Data for Waterbodies and Watercourses of the Denison Minew Wheeler River Project, March 28 to April 1, 2014 (continued)

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Russell Lake | QA/QC | |
|---|---|---|---|---|---|---|
| | | | | Lake | Streams | |
| | | | | RL-Aa-WQ-W14 | Field Blank | Trip Blank |
| | | | | 31-Mar-14 | Field S-W14 | Trip S-W14 |
| | | | | Russell Lake | 28-Mar-14 | 1-Apr-14 |
| Barium | mg/L | - | - | 0.0039 | <0.0005 | <0.0005 |
| Barium, dissolved | mg/L | - | - | 0.0038 | <0.0005 | - |
| Beryllium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 |
| Beryllium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | - |
| Boron | mg/L | 1.5 | - | <0.01 | <0.01 | <0.01 |
| Boron, dissolved | mg/L | - | - | <0.01 | <0.01 | - |
| Cadmium | mg/L | 0.00004[l] | 0.000017[l] | 0.00001 | <0.00001 | <0.00001 |
| Cadmium, dissolved | mg/L | - | - | <0.00001 | 0.00001 | - |
| Chromium | mg/L | 0.001[l] | 0.001[l] | <0.0005 | <0.0005 | <0.0005 |
| Chromium, dissolved | mg/L | - | - | <0.0005 | <0.0005 | - |
| Cobalt | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 |
| Cobalt, dissolved | mg/L | - | - | <0.0001 | <0.0001 | - |
| Copper | mg/L | 0.002[l] | 0.002[l] | <0.0002 | <0.0002 | <0.0002 |
| Copper, dissolved | mg/L | - | - | <0.0002 | <0.0002 | - |
| Iron | mg/L | 0.3 | 0.3 | 0.08 | <0.0005 | <0.0005 |
| Iron, dissolved | mg/L | - | - | 0.02 | <0.0005 | - |
| Lead | mg/L | 0.001[l] | 0.001[l] | <0.0001 | <0.0001 | <0.0001 |
| Lead, dissolved | mg/L | - | - | <0.0001 | <0.0001 | - |
| Lithium | µg/L | - | - | 4.8 | <0.1 | <0.1 |
| Lithium, dissolved | µg/L | - | - | 5.1 | <0.1 | - |
| Manganese | mg/L | - | - | 0.064 | <0.0005 | <0.0005 |
| Manganese, dissolved | mg/L | - | - | 0.06 | <0.0005 | - |
| Mercury | µg/L | 0.026[k] | 0.026[k] | 0.01 | <0.01 | <0.01 |
| Mercury, Dissolved | µg/L | - | - | 0.01 | <0.01 | - |
| Molybdenum | mg/L | 0.073 | - | 0.0003 | <0.0001 | <0.0001 |
| Molybdenum, dissolved | mg/L | - | - | 0.0003 | <0.0001 | - |
| Nickel | mg/L | 0.025[l] | 0.025[l] | <0.0001 | <0.0001 | <0.0001 |
| Nickel, dissolved | mg/L | - | - | 0.0001 | <0.0001 | - |
| Selenium | mg/L | 0.001 | 0.001 | <0.0001 | <0.0001 | <0.0001 |
| Selenium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | - |
| Silver | mg/L | 0.0001 | 0.0001 | <0.00005 | <0.00005 | <0.00005 |
| Silver, dissolved | mg/L | - | - | <0.00005 | <0.00005 | - |
| Strontium | mg/L | - | - | 0.017 | <0.0005 | <0.0005 |
| Strontium, dissolved | mg/L | - | - | 0.017 | <0.0005 | - |
| Thallium | mg/L | 0.0008 | - | <0.0002 | <0.0002 | <0.0002 |
| Thallium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | - |
| Tin | mg/L | - | - | 0.001 | <0.0001 | <0.0001 |
| Tin, dissolved | mg/L | - | - | 0.0011 | 0.0001 | - |
| Titanium | mg/L | - | - | <0.0002 | <0.0002 | <0.0002 |
| Titanium, dissolved | mg/L | - | - | <0.0002 | <0.0002 | - |
| Uranium | µg/L | 15 | 15 | <0.1 | <0.1 | <0.1 |
| Uranium, dissolved | µg/L | - | - | <0.1 | <0.1 | - |
| Vanadium | mg/L | - | - | <0.0001 | <0.0001 | <0.0001 |
| Vanadium, dissolved | mg/L | - | - | <0.0001 | <0.0001 | - |
| Zinc | mg/L | 0.03 | 0.03 | <0.0005 | <0.0005 | <0.0005 |
| Zinc, dissolved | mg/L | - | - | 0.0006 | <0.0005 | - |

Table A3. Water Chemistry Data for Waterbodies and Watercourses of the Denison Minew Wheeler River Project, March 28 to April 1, 2014 (continued)

| Parameters | Units | CCME CWQG[a] | SSWQO[b] | Russell Lake | QA/QC | |
|---|---|---|---|---|---|---|
| | | | | Lake | Streams | |
| | | | | RL-Aa-WQ-W14 | Field Blank | Trip Blank |
| | | | | 31-Mar-14 | Field S-W14 | Trip S-W14 |
| | | | | Russell Lake | 28-Mar-14 | 1-Apr-14 |
| Radionuclides | | | | | | |
| Lead-210 | Bq/L | - | - | <0.02 | <0.02 | <0.02 |
| Polonium-210 | Bq/L | - | - | <0.005 | <0.005 | <0.005 |
| Radium-226 | Bq/L | - | 0.11[l] | <0.005 | <0.005 | <0.005 |
| Thorium-228 | Bq/L | - | - | <0.01 | <0.01 | <0.01 |
| Thorium-230 | Bq/L | - | - | <0.01 | <0.01 | <0.01 |
| Thorium-232 | Bq/L | - | - | <0.01 | <0.01 | <0.01 |

Values that equal or exceed the CCME CWQG are **bolded**; values that equal or exceed the SSWQO are <u>underlined</u>. DL that exceed objectives or guidelines are *italicized* .

(a) CCME CWQG = Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME 1999, with updates).

(b) SSWQO = Saskatchewan Surface Water Quality Objectives (Water Security Agency 2006).

(c) Local lake name.

(d) The objectives and guidelines of dissolved oxygen for cold-water biota are 9.5 mg/L for early life stages and 6.5 mg/L for other life stages.

(e) Most field specific conductivity values are out of range for this area. Values were removed.

(f) The objectives/guidelines for ammonia are dependent on temperature and pH; the objective/guideline for each sample was calculated separately using the rounded field pH and rounded water temperature measured in the field.

(g) Time between sampling and receipt in lab exceeds the recommended 48 hours.

(h) The objective/guidelines for aluminum are dependent on pH; the field pH for each sample was used in the screening.

(i) The objective/guidelines for cadmium, copper, lead, and nickel are hardness-dependent; the range of CCME CWQG and SSWQO are listed and were calculated separately for each sample.

(j) The objective/guidelines are for hexavalent chromium; total chromium was analyzed.

(k) The objective/guidelines are for inorganic mercury.

(l) The objective for radium-226 was missed in the 2006 SSWQO (WSA) revisions; an objective of 0.11 Bq/L was presented in 1997 SSWQO (SMOE) and is expected to be added to the next SSWQO revision (T. Moulding pers. comm.).

mg/L = milligram per litre; µS/cm = microSiemens per centimetre; °C = degrees Celsius; µg/L = micrograms per litre; Bq/L = Becquerels per litre; < = less than; - = not available; SMOE = Saskatchewan Ministry of Environment.

# APPENDIX B

## Limnology

**Table B1. Limnology at Water Quality Stations in Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012**

| Drainage | Waterbody / Watercourse | Station Code | Date (dd-mmm-yy) | Time (hh:mm) | Air Temperature (°C) | Cloud Cover (%) | Precipitation Rate | Precipitation Type | Wind Direction | Wind Rate | Secchi Depth (m) | Maximum Depth (m) | Profile Depth (m) | Water Temperature (°C) | Dissolved Oxygen (mg/L) | Specific Conductivity (µS/cm) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A (Icelander River) | LA-1 | LA-1b-WQ | 12-Aug-12 | 13:04 | 16.1 | 75-100% | Light | Rain | North West | Moderate | 1.5 | 8.3 | 0.2 | 18.1 | 8.7 | 18 | 6.4 |
| | | | | | | | | | | | | | 1.0 | 18.1 | 8.7 | 18 | 6.4 |
| | | | | | | | | | | | | | 2.0 | 18.1 | 8.6 | 18 | 6.4 |
| | | | | | | | | | | | | | 3.0 | 18.1 | 8.6 | 18 | 6.4 |
| | | | | | | | | | | | | | 4.0 | 18.1 | 8.5 | 18 | 6.4 |
| | | | | | | | | | | | | | 5.0 | 18.1 | 8.5 | 18 | 6.4 |
| | | | | | | | | | | | | | 6.0 | 18.1 | 8.5 | 18 | 6.4 |
| | | | | | | | | | | | | | 7.0 | 18.0 | 8.3 | 18 | 6.4 |
| | | | | | | | | | | | | | 7.5 | 18.0 | 7.9 | 18 | 6.4 |
| | | | | | | | | | | | | | 8.0 | 17.0 | 4.4 | 22 | 6.3 |
| | LA-5 | LA-5a-WQ | 13-Aug-12 | 14:11 | 20.3 | <25% | - | None | South East | Light | 2.2 | 3.6 | 0.2 | 17.9 | 9.4 | 17 | 7.1 |
| | | | | | | | | | | | | | 0.5 | 17.9 | 9.4 | 17 | 7.1 |
| | | | | | | | | | | | | | 1.0 | 17.8 | 9.4 | 17 | 7.1 |
| | | | | | | | | | | | | | 1.5 | 17.8 | 9.4 | 17 | 7.0 |
| | | | | | | | | | | | | | 2.0 | 17.7 | 9.4 | 17 | 7.0 |
| | | | | | | | | | | | | | 2.5 | 17.5 | 9.3 | 17 | 7.0 |
| | | | | | | | | | | | | | 3.0 | 17.1 | 9.2 | 17 | 6.9 |
| | | | | | | | | | | | | | 3.5 | 17.0 | 9.6 | 17 | 7.0 |
| | LA-6 | LA-6a-WQ | 13-Aug-12 | 14:59 | 20.3 | 25-50% | - | None | South West | Light | 2 | 2.2 | 0.2 | 17.5 | 9.1 | 17 | 6.7 |
| | | | | | | | | | | | | | 0.5 | 17.4 | 9.0 | 17 | 6.8 |
| | | | | | | | | | | | | | 1.0 | 17.4 | 8.9 | 17 | 6.8 |
| | | | | | | | | | | | | | 1.5 | 17.3 | 8.9 | 17 | 6.8 |
| | | | | | | | | | | | | | 2.0 | 17.2 | 6.8 | 17 | 6.9 |
| | Kratchkowsky Lake (LA-7) | LA-7a-WQ | 9-Aug-12 | 15:32 | 16.8 | 75-100% | Light | Rain | North East | Light | 1.75 | 6.5 | 0.2 | 18.5 | 9.2 | 17 | 7.2 |
| | | | | | | | | | | | | | 0.5 | 18.7 | 9.1 | 17 | 7.1 |
| | | | | | | | | | | | | | 1.0 | 18.7 | 9.1 | 17 | 7.1 |
| | | | | | | | | | | | | | 1.5 | 18.7 | 9.0 | 17 | 7.0 |
| | | | | | | | | | | | | | 2.0 | 18.7 | 9.0 | 17 | 6.9 |
| | | | | | | | | | | | | | 2.5 | 18.6 | 8.9 | 17 | 6.8 |
| | | | | | | | | | | | | | 3.0 | 18.6 | 8.9 | 17 | 6.8 |
| | | | | | | | | | | | | | 3.5 | 18.6 | 8.8 | 17 | 6.8 |
| | | | | | | | | | | | | | 4.0 | 18.6 | 8.8 | 17 | 6.8 |
| | | | | | | | | | | | | | 4.5 | 18.1 | 8.3 | 17 | 6.8 |
| | | | | | | | | | | | | | 5.0 | 18.0 | 8.1 | 17 | 6.8 |
| | | | | | | | | | | | | | 5.5 | 17.9 | 7.3 | 17 | 6.8 |
| | | | | | | | | | | | | | 5.8 | 17.8 | 6.6 | 18 | 6.7 |
| | | | | | | | | | | | | | 6.0 | 17.7 | 3.7 | 28 | 6.5 |
| | SA-1 | SA-1c-WQ | 8-May-12 | 19:00 | 18.9 | NR | - | None | South West | Moderate | - | NR | 0.2 | 5.7 | 10.7 | 19 | 6.1 |
| | | SA-1c-WQ | 7-Aug-12 | 14:30 | 22.8 | NR | - | None | North West | Moderate | - | NR | 0.4 | 20.5 | 8.9 | 18 | 6.7 |
| | | SA-1c-WQ | 24-Oct-12 | 16:00 | -1.7 | NR | - | None | North East | Moderate | - | NR | 0.1 | 2.2 | 15.2 | 17 | 6.1 |
| | SA-2 | SA-2b-WQ | 8-May-12 | 16:15 | 18.7 | NR | - | None | South West | Moderate | - | NR | 0.2 | 5.6 | 12.0 | 16 | 6.8 |
| | | SA-2b-WQ | 8-Aug-12 | 10:30 | 14.5 | NR | - | None | South East | Light | - | NR | 0.5 | 17.1 | 9.0 | 17 | 6.8 |
| | | SA-2b-WQ | 24-Oct-12 | 13:00 | -1.4 | NR | - | None | North East | Moderate | - | NR | 0.1 | 1.0 | 16.2 | 17 | 5.3 |
| | SA-3 | SA-3b-WQ | 8-May-12 | 18:15 | 19.8 | NR | - | None | South West | Moderate | - | NR | 0.2 | 6.6 | 10.2 | 20 | 6.5 |
| | | SA-3b-WQ | 7-Aug-12 | 10:30 | 21.0 | NR | - | None | North West | Moderate | - | NR | 0.3 | 18.7 | 9.2 | 19 | 7.5 |
| | | SA-3b-WQ | 24-Oct-12 | 16:30 | -1.9 | NR | - | None | North East | Moderate | - | NR | 0.2 | 1.3 | 15.8 | 20 | 6.0 |
| | SA-4 | SA-4b-WQ | 8-May-12 | 13:00 | 14.8 | NR | - | None | South West | Moderate | - | NR | 0.2 | 7.7 | 16.1 | 20 | 6.5 |
| | | SA-4b-WQ | 7-Aug-12 | 11:30 | 21.4 | NR | - | None | North West | Moderate | - | NR | 0.3 | 17.6 | 9.1 | 18 | 7.3 |
| | | SA-4b-WQ | 24-Oct-12 | 14:15 | -1.5 | NR | - | None | North East | Moderate | - | NR | 0.1 | 1.3 | 16.0 | 19 | 5.9 |
| | SA-5 | SA-5b-WQ | 8-May-12 | 13:30 | 15.6 | NR | - | None | South West | Moderate | - | NR | 0.2 | 9.4 | 11.2 | 16 | 6.9 |
| | | SA-5b-WQ | 7-Aug-12 | 11:15 | 21.0 | NR | - | None | North West | Moderate | - | NR | 0.4 | 17.5 | 9.5 | 16 | 7.3 |
| | | SA-5b-WQ | 24-Oct-12 | 14:00 | -1.5 | NR | - | None | North East | Moderate | - | NR | 0.9 | 1.4 | 10.5 | 16 | 5.5 |
| | SA-6 | SA-6a-WQ | 8-May-12 | 15:00 | 16.6 | NR | - | None | South West | Moderate | - | NR | 0.2 | 5.1 | 11.5 | 16 | 6.9 |
| | | SA-6a-WQ | 7-Aug-12 | 12:00 | 21.4 | NR | - | None | North West | Moderate | - | NR | 0.3 | 17.6 | 9.3 | 16 | 7.3 |
| | | SA-6a-WQ | 24-Oct-12 | 14:30 | -1.6 | NR | - | None | North East | Moderate | - | NR | 0.2 | 0.6 | 16.2 | 17 | 6.0 |

**Table B1. Limnology at Water Quality Stations in Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Drainage | Waterbody / Watercourse | Station Code | Date (dd-mmm-yy) | Time (hh:mm) | Air Temperature (°C) | Cloud Cover (%) | Precipitation Rate | Precipitation Type | Wind Direction | Wind Rate | Secchi Depth (m) | Maximum Depth (m) | Profile Depth (m) | Water Temperature (°C) | Dissolved Oxygen (mg/L) | Specific Conductivity (µS/cm) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B (Unnamed) | Williams Lake* (LB-3) | LB-3a-WQ | 11-Aug-12 | 9:47 | 17.5 | <25% | - | None | West | Light | 3.5 | 17.1 | 0.2 | 18.7 | 8.9 | 15 | 7.0 |
| | | | | | | | | | | | | | 1.0 | 18.7 | 8.8 | 15 | 7.0 |
| | | | | | | | | | | | | | 2.0 | 18.7 | 8.8 | 15 | 7.0 |
| | | | | | | | | | | | | | 3.0 | 18.7 | 8.7 | 15 | 6.9 |
| | | | | | | | | | | | | | 4.0 | 18.7 | 8.6 | 15 | 6.9 |
| | | | | | | | | | | | | | 5.0 | 18.5 | 8.5 | 15 | 6.8 |
| | | | | | | | | | | | | | 6.0 | 18.3 | 8.4 | 15 | 6.8 |
| | | | | | | | | | | | | | 7.0 | 17.0 | 7.6 | 15 | 6.9 |
| | | | | | | | | | | | | | 7.5 | 15.3 | 7.0 | 14 | 6.8 |
| | | | | | | | | | | | | | 8.0 | 12.7 | 7.0 | 14 | 6.8 |
| | | | | | | | | | | | | | 8.5 | 10.5 | 6.5 | 13 | 6.8 |
| | | | | | | | | | | | | | 9.0 | 9.3 | 4.4 | 13 | 6.7 |
| | | | | | | | | | | | | | 9.5 | 8.6 | 3.2 | 13 | 6.7 |
| | | | | | | | | | | | | | 10.0 | 8.2 | 2.6 | 13 | 6.7 |
| | | | | | | | | | | | | | 10.5 | 7.9 | 1.4 | 14 | 6.6 |
| | | | | | | | | | | | | | 11.0 | 7.7 | 0.6 | 14 | 6.5 |
| | | | | | | | | | | | | | 11.5 | 7.5 | 0.3 | 14 | 6.5 |
| | | | | | | | | | | | | | 12.0 | 7.2 | 0.2 | 18 | 6.4 |
| | | | | | | | | | | | | | 13.0 | 6.9 | 0.2 | 23 | 6.4 |
| | | | | | | | | | | | | | 14.0 | 6.8 | 0.2 | 27 | 6.3 |
| | | | | | | | | | | | | | 15.0 | 6.7 | 0.2 | 28 | 6.3 |
| | | | | | | | | | | | | | 15.5 | 6.6 | 0.2 | 28 | 6.2 |
| | | | | | | | | | | | | | 16.0 | 6.6 | 0.2 | 29 | 6.2 |
| | | | | | | | | | | | | | 16.5 | 6.6 | 0.2 | 31 | 6.2 |
| | | | | | | | | | | | | | 17.0 | 6.6 | 0.2 | 32 | 6.2 |
| | SB-1 | SB-1a-WQ | 9-May-12 | 9:45 | 15.8 | NR | - | None | South | Light | - | NR | 0.2 | 5.7 | 10.6 | 15 | 5.3 |
| | | SB-1a-WQ | 7-Aug-12 | 15:45 | 22.0 | NR | - | None | North West | Moderate | - | NR | 0.4 | 18.4 | 9.6 | 16 | 6.4 |
| | | SB-1a-WQ | 25-Oct-12 | 9:30 | -5.6 | NR | Light | Snow | North | Moderate | - | NR | 0.2 | 0.1 | 14.0 | 15 | 5.8 |
| | SB-2 | SB-2b-WQ | 9-May-12 | 9:35 | 15.8 | NR | - | None | South | Light | - | NR | 0.2 | 5.0 | 8.3 | 15 | 5.2 |
| | | SB-2b-WQ | 7-Aug-12 | 15:45 | 22.0 | NR | - | None | North West | Moderate | - | NR | 0.3 | 18.4 | 3.6 | 19 | 6.6 |
| | | SB-2b-WQ | 25-Oct-12 | 9:30 | -5.6 | NR | Light | Snow | North | Moderate | - | NR | 0.2 | 0.1 | 11.1 | 14 | 5.8 |
| | SB-3 | SB-3b-WQ | 9-May-12 | 8:30 | 14.7 | NR | - | None | South | Moderate | - | NR | 0.2 | 4.5 | 9.6 | 17 | 5.8 |
| | | SB-3b-WQ | 8-Aug-12 | 14:30 | 20.7 | NR | - | None | South East | Light | - | NR | 0.5 | 20.0 | 8.9 | 17 | 6.8 |
| | | SB-3b-WQ | 25-Oct-12 | 9:00 | -5.8 | NR | Light | Snow | North | Light | - | NR | 0.2 | 1.2 | 13.9 | 17 | 6.1 |
| | SB-4 | SB-4a-WQ | 8-May-12 | 10:00 | 14.9 | NR | - | None | South West | Moderate | - | NR | 0.2 | 4.5 | 10.2 | 15 | 6.2 |
| | | SB-4a-WQ | 7-Aug-12 | 8:45 | 19.2 | NR | - | None | North West | Moderate | - | NR | 0.3 | 18.1 | 7.2 | 15 | 6.9 |
| | | SB-4a-WQ | 24-Oct-12 | 18:00 | -2.0 | NR | - | None | North | Moderate | - | NR | 0.1 | 0.7 | 14.1 | 14 | 6.2 |
| | SB-5 | SB-5a-WQ | 9-May-12 | 7:30 | 12.7 | NR | - | None | South | Light | - | NR | 0.2 | 4.4 | 10.7 | 17 | 5.5 |
| | | SB-5a-WQ | 7-Aug-12 | 16:30 | 20.9 | NR | - | None | North | Moderate | - | NR | 0.4 | 20.1 | 8.7 | 17 | 6.5 |
| | | SB-5a-WQ | 25-Oct-12 | 8:30 | -5.8 | NR | Light | Snow | North | Light | - | NR | 0.3 | 1.2 | 13.5 | 17 | 6.7 |
| Russell Lake | Russell Lake | RL-Aa-WQ | 10-Aug-12 | 12:50 | 21.5 | 75-100% | - | None | South West | Moderate | 3.5 | 17 | 0.2 | 18.6 | 9.0 | 34 | 6.6 |
| | | | | | | | | | | | | | 1.0 | 18.6 | 8.9 | 34 | 6.6 |
| | | | | | | | | | | | | | 2.0 | 18.5 | 8.9 | 34 | 6.6 |
| | | | | | | | | | | | | | 3.0 | 18.5 | 8.9 | 34 | 6.6 |
| | | | | | | | | | | | | | 4.0 | 18.4 | 8.9 | 34 | 6.6 |
| | | | | | | | | | | | | | 5.0 | 18.4 | 8.8 | 34 | 6.6 |
| | | | | | | | | | | | | | 6.0 | 18.3 | 8.7 | 34 | 6.6 |
| | | | | | | | | | | | | | 7.0 | 18.3 | 8.7 | 32 | 6.6 |
| | | | | | | | | | | | | | 8.0 | 18.2 | 8.6 | 34 | 6.6 |
| | | | | | | | | | | | | | 9.0 | 18.2 | 8.6 | 34 | 6.6 |
| | | | | | | | | | | | | | 10.0 | 18.2 | 8.5 | 33 | 6.6 |
| | | | | | | | | | | | | | 11.0 | 18.1 | 8.4 | 33 | 6.6 |
| | | | | | | | | | | | | | 12.0 | 18.1 | 8.3 | 33 | 6.7 |
| | | | | | | | | | | | | | 13.0 | 18.1 | 8.3 | 33 | 6.6 |
| | | | | | | | | | | | | | 14.0 | 18.0 | 8.1 | 32 | 6.6 |

**Table B1. Limnology at Water Quality Stations in Waterbodies and Watercourses of the Denison Mines Wheeler River Project, May 8, 2012 to October 25, 2012 (Continued)**

| Drainage | Waterbody / Watercourse | Station Code | Date (dd-mmm-yy) | Time (hh:mm) | Air Temperature (°C) | Cloud Cover (%) | Precipitation Rate | Precipitation Type | Wind Direction | Wind Rate | Secchi Depth (m) | Maximum Depth (m) | Profile Depth (m) | Water Temperature (°C) | Dissolved Oxygen (mg/L) | Specific Conductivity (µS/cm) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Russell Lake | Russell Lake | RL-Aa-WQ | 10-Aug-12 | 12:50 | 21.5 | 75-100% | - | None | South West | Moderate | 3.5 | 17 | 15.0 | 17.8 | 7.7 | 32 | 6.6 |
| | | | | | | | | | | | | | 15.5 | 14.0 | 2.7 | 31 | 6.6 |
| | | | | | | | | | | | | | 16.0 | 11.4 | 0.7 | 29 | 6.6 |
| | | | | | | | | | | | | | 16.5 | 10.6 | 0.2 | 28 | 6.5 |

Note: Cloud coverage and maximum depth were not recorded for stream water quality stations.

*Local name.

dd-mmm-yy = day-month-year; hh:mm = hour:minute; °C = degree Celsius; % = percent; m = metres; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; Aug = August; Oct = October; - = not applicable; NR = not recorded.

**Table B2. Limnology at Water Quality Stations in Watercourses of the Denison Mines Wheeler River Project, May 22, 2013 to October 19, 2013**

| Drainage | Watercourse | Station Code | Date (dd-mmm-yy) | Time (hh:mm) | Air Temperature (°C) | Cloud Cover (%) | Precipitation Rate | Precipitation Type | Wind Direction | Wind Rate | Secchi Depth (m) | Maximum Depth (m) | Profile Depth (m) | Water Temperature (°C) | Dissolved Oxygen (mg/L) | Specific Conductivity (µS/cm) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A (Icelander River) | SA-1 | SA-1c-WQ | 22-May-13 | 12:47 | 8.9 | NR | - | None | NR | NR | - | NR | 0.2 | 6.8 | 12.0 | 17 | 7.0 |
| | | SA-1c-WQ | 15-Aug-13 | 16:58 | 29.1 | NR | - | None | West | Moderate | - | NR | 0.2 | 21.7 | 9.0 | 17 | 6.7 |
| | | SA-1c-WQ | 18-Oct-13 | 16:00 | 0.5 | NR | Light | Rain | North | Light | - | NR | NR | 4.7 | 12.5 | 18 | 6.9 |
| | SA-2 | SA-2b-WQ | 22-May-13 | 10:50 | 6.2 | NR | - | None | NR | NR | - | NR | 0.3 | 11.6 | 11.2 | 15 | 7.3 |
| | | SA-2b-WQ | 15-Aug-13 | 15:10 | 28.8 | NR | - | None | West | Moderate | - | NR | 0.3 | 21.2 | 8.7 | 18 | 6.2 |
| | | SA-2b-WQ | 18-Oct-13 | 9:30 | -2.1 | NR | Light | Snow | North | Light | - | NR | NR | 2.5 | 12.7 | 15 | 6.6 |
| | SA-3 | SA-3b-WQ | 22-May-13 | 11:30 | 6.2 | NR | - | None | NR | NR | - | NR | 0.1 | 8.8 | 11.4 | 19 | 7.2 |
| | | SA-3b-WQ | 15-Aug-13 | 15:45 | 29.3 | NR | - | None | West | Moderate | - | NR | 0.2 | 21.4 | 9.3 | 19 | 6.5 |
| | | SA-3b-WQ | 18-Oct-13 | 8:35 | -2.1 | NR | Light | Snow | North | Light | - | NR | NR | 2.4 | 12.4 | 21 | 7.4 |
| | SA-4 | SA-4b-WQ | 22-May-13 | 8:49 | 3.8 | NR | - | None | NR | NR | - | NR | 0.1 | 7.8 | 11.6 | 18 | 7.3 |
| | | SA-4b-WQ | 15-Aug-13 | 13:10 | 25.7 | NR | - | None | South West | Light | - | NR | 0.1 | 20.4 | 9.0 | 19 | 6.1 |
| | | SA-4b-WQ | 18-Oct-13 | 11:30 | -1.3 | NR | Light | Snow | North East | Light | - | NR | NR | 2.8 | 12.7 | 20 | 6.9 |
| | SA-5 | SA-5b-WQ | 22-May-13 | 9:15 | 3.8 | NR | - | None | NR | NR | - | NR | 0.4 | 7.7 | 11.9 | 15 | 7.3 |
| | | SA-5b-WQ | 15-Aug-13 | 13:30 | 27.7 | NR | - | None | South West | Moderate | - | NR | 0.2 | 20.2 | 9.3 | 15 | 6.2 |
| | | SA-5b-WQ | 18-Oct-13 | 10:50 | -1.5 | NR | Light | Snow | North | Light | - | NR | NR | 2.0 | 13.0 | 17 | 6.9 |
| | SA-6 | SA-6a-WQ | 22-May-13 | 8:15 | 3.3 | NR | - | None | NR | NR | - | NR | 0.2 | 10.6 | 11.1 | 16 | 7.7 |
| | | SA-6a-WQ | 15-Aug-13 | 12:40 | 25.7 | NR | - | None | South West | Light | - | NR | 0.2 | 19.7 | 9.2 | 18 | 6.0 |
| | | SA-6a-WQ | 18-Oct-13 | 12:05 | -1.3 | NR | Light | Snow | North East | Light | - | NR | NR | 2.9 | 12.7 | 18 | 6.8 |
| B (Unnamed) | SB-1 | SB-1a-WQ | 22-May-13 | 15:17 | 10.6 | NR | - | None | NR | NR | - | NR | 0.3 | 12.3 | 10.4 | 15 | 6.8 |
| | | SB-1a-WQ | 15-Aug-13 | 10:50 | 25 | NR | - | None | South West | Light | - | NR | 0.2 | 16.9 | 7.0 | 20 | 5.7 |
| | | SB-1a-WQ | 19-Oct-13 | 9:50 | -1.5 | NR | Light | Snow | North East | Light | - | NR | NR | 1.8 | 10.9 | 17 | 6.3 |
| | SB-2 | SB-2b-WQ | 22-May-13 | 15:32 | 12.3 | NR | - | None | NR | NR | - | NR | 0.5 | 12.1 | 7.7 | 16 | 6.4 |
| | | SB-2b-WQ | 15-Aug-13 | 11:05 | 25 | NR | - | None | South West | Light | - | NR | 0.2 | 17.9 | 5.1 | 21 | 5.6 |
| | | SB-2b-WQ | 19-Oct-13 | 10:55 | -1.8 | NR | Light | Snow | North East | Moderate | - | NR | NR | 1.7 | 10.3 | 15 | 5.8 |
| | SB-3 | SB-3b-WQ | 22-May-13 | 13:28 | 8.9 | NR | - | None | NR | NR | - | NR | 0.4 | 9.4 | 11.0 | 16 | 6.8 |
| | | SB-3b-WQ | 15-Aug-13 | 18:05 | 26.8 | NR | - | None | North West | NR | - | NR | 0.2 | 21.6 | 8.9 | 17 | 6.5 |
| | | SB-3b-WQ | 18-Oct-13 | 17:05 | -0.1 | NR | Light | Snow | North East | Light | - | NR | NR | 4.3 | 12.3 | 17 | 7.0 |
| | SB-4 | SB-4a-WQ | 22-May-13 | 18:36 | 13.8 | NR | - | None | NR | NR | - | NR | 0.2 | 11.5 | 7.7 | 13 | 6.5 |
| | | SB-4a-WQ | 15-Aug-13 | 10:00 | 21.7 | NR | - | None | South West | NR | - | NR | 0.3 | 15.6 | 7.2 | 18 | 5.5 |
| | | SB-4a-WQ | 18-Oct-13 | 13:05 | -0.4 | NR | Light | Snow | North West | Light | - | NR | NR | 2.0 | 11.9 | 15 | 6.3 |
| | SB-5 | SB-5a-WQ | 22-May-13 | 14:08 | 10 | NR | - | None | NR | NR | - | NR | 0.3 | 10.2 | 11.3 | 16 | 6.8 |
| | | SB-5a-WQ | 15-Aug-13 | 18:43 | 26 | NR | - | None | West | Light | - | NR | 0.4 | 21.6 | 8.6 | 17 | 6.5 |
| | | SB-5a-WQ | 18-Oct-13 | 17:40 | -1.9 | NR | Light | Snow | East | Light | - | NR | NR | 4.2 | 12.3 | 17 | 6.7 |

Note: Cloud coverage and maximum depth were not recorded for stream water quality stations.

dd-mmm-yy = day-month-year; hh:mm = hour:minute; °C = degree Celsius; % = percent; m = metres; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; Aug = August; Oct = October; NR = not recorded; - = not applicable.

Table B3. Limnology at Water Quality Stations in Waterbodies and Watercourses of the Denison Mines Wheeler River Project, March 28 to April 1, 2014

| Drainage | Waterbody / Watercourse | Station Code | Date (dd-mmm-yy) | Time (hh:mm) | Air Temperature (°C) | Cloud Cover (%) | Precipitation Rate | Precipitation Type | Wind Direction | Wind Rate | Snow Depth (m) | Ice Thickness (m) | Secchi Depth (m) | Maximum Depth (m) | Profile Depth (m) | Water Temperature (°C) | Dissolved Oxygen (mg/L) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A (Icelander River) | LA-1 | LA-1b-WQ | 29-Mar-14 | 15:50 | -7 | 50-75 | Not applicable | None | South West | Moderate | 0.3 | 0.97 | 2.5 | 8.5 | 1.0 | 4.1 | 12.9 | 6.9 |
| | | | | | | | | | | | | | | | 2.0 | 2.3 | 12.5 | 6.7 |
| | | | | | | | | | | | | | | | 3.0 | 1.8 | 12.2 | 6.5 |
| | | | | | | | | | | | | | | | 4.0 | 2.0 | 11.9 | 6.3 |
| | | | | | | | | | | | | | | | 5.0 | 2.8 | 10.7 | 6.0 |
| | | | | | | | | | | | | | | | 6.0 | 3.8 | 7.5 | 5.7 |
| | | | | | | | | | | | | | | | 7.0 | 4.4 | 5.0 | 5.6 |
| | | | | | | | | | | | | | | | 8.0 | 4.5 | 2.9 | 5.5 |
| | LA-2 | LA-2a-WQ | 28-Mar-14 | 18:00 | -10 | 25-50 | Not applicable | None | South West | Moderate | 0.35 | 0.76 | 3.5 | 6 | 1.0 | 3.2 | 12.3 | 7.0 |
| | | | | | | | | | | | | | | | 2.0 | 4.3 | 8.2 | 6.5 |
| | | | | | | | | | | | | | | | 3.0 | 4.6 | 5.7 | 6.3 |
| | | | | | | | | | | | | | | | 4.0 | 4.6 | 4.3 | 6.2 |
| | | | | | | | | | | | | | | | 5.0 | 4.6 | 3.2 | 6.1 |
| | LA-3 | LA-3a-WQ | 28-Mar-14 | 16:45 | -5 | 25-50 | Not applicable | None | South West | Moderate | 0.45 | 0.8 | 4.5 | 10 | 1.0 | 1.0 | 13.9 | 7.7 |
| | | | | | | | | | | | | | | | 2.0 | 1.5 | 13.2 | 7.6 |
| | | | | | | | | | | | | | | | 3.0 | 2.6 | 11.8 | 7.5 |
| | | | | | | | | | | | | | | | 4.0 | 2.9 | 10.7 | 7.4 |
| | | | | | | | | | | | | | | | 5.0 | 3.2 | 9.9 | 7.2 |
| | | | | | | | | | | | | | | | 6.0 | 3.4 | 8.6 | 7.0 |
| | | | | | | | | | | | | | | | 7.0 | 3.7 | 7.4 | 6.8 |
| | | | | | | | | | | | | | | | 8.0 | 3.8 | 6.0 | 6.6 |
| | | | | | | | | | | | | | | | 9.0 | 3.9 | 5.4 | 6.5 |
| | LA-4 | LA-4a-WQ | 29-Mar-14 | 9:45 | -7 | 50-75 | Not applicable | None | West | Light | 0.25 | 0.82 | 3.5 | 13 | 1.0 | 1.6 | 13.2 | 7.6 |
| | | | | | | | | | | | | | | | 2.0 | 2.4 | 12.5 | 7.4 |
| | | | | | | | | | | | | | | | 3.0 | 3.0 | 11.6 | 7.2 |
| | | | | | | | | | | | | | | | 4.0 | 3.1 | 11.2 | 7.1 |
| | | | | | | | | | | | | | | | 5.0 | 3.3 | 10.9 | 7.0 |
| | | | | | | | | | | | | | | | 6.0 | 3.3 | 10.4 | 6.8 |
| | | | | | | | | | | | | | | | 7.0 | 3.4 | 10.1 | 6.7 |
| | | | | | | | | | | | | | | | 8.0 | 3.4 | 9.8 | 6.6 |
| | | | | | | | | | | | | | | | 9.0 | 3.5 | 9.0 | 6.5 |
| | | | | | | | | | | | | | | | 10.0 | 3.6 | 8.5 | 6.4 |
| | | | | | | | | | | | | | | | 11.0 | 3.7 | 7.0 | 6.3 |
| | | | | | | | | | | | | | | | 12.0 | 3.8 | 6.0 | 6.2 |
| | LA-5 | LA-5b-WQ | 1-Apr-14 | 11:30 | -8 | 0 | Not applicable | None | South West | Light | 0.35 | 0.7 | 2.1 | 2.1 | 1.0 | 0.4 | 9.3 | 6.6 |
| | | | | | | | | | | | | | | | 1.5 | 0.5 | 9.8 | 6.4 |
| | LA-6 | LA-6a-WQ | 30-Mar-14 | 9:50 | -28 | 0 | Not applicable | None | South West | Light | 0.3 | 0.94 | 2 | 2.5 | 1.0 | 2.4 | 11.8 | 7.1 |
| | | | | | | | | | | | | | | | 1.5 | 1.5 | 11.8 | 6.9 |
| | | | | | | | | | | | | | | | 2.0 | 2.4 | 7.6 | 6.4 |
| | Kratchkowsky Lake (LA-7) | LA-7a-WQ | 29-Mar-14 | 12:15 | -5 | 75-100 | Light | Snow | North West | Moderate | 0.3 | 0.85 | 3.5 | 6 | 1.0 | 2.0 | 12.1 | 7.1 |
| | | | | | | | | | | | | | | | 2.0 | 3.8 | 7.3 | 6.4 |
| | | | | | | | | | | | | | | | 3.0 | 4.2 | 5.3 | 6.2 |
| | | | | | | | | | | | | | | | 4.0 | 4.3 | 3.8 | 6.1 |
| | | | | | | | | | | | | | | | 5.0 | 4.3 | 3.2 | 6.1 |
| | SA-1 | SA-1c-WQ | 30-Mar-14 | 17:00:00 | -15 | 0 | Not applicable | None | North East | Light | Not available | Not available | Not available | 0.30 | 0.15 | 1.1 | 11.4 | 7.2 |
| | SA-2 | SA-2b-WQ | 29-Mar-14 | 17:50:00 | -7 | 50-75 | Not applicable | None | South West | Moderate | Not available | Not available | Not available | 0.44 | 0.15 | 0.4 | 13.7 | 6.5 |
| | SA-3 | SA-3b-WQ | 31-Mar-14 | 16:30:00 | -15 | 0 | Not applicable | None | South West | Moderate | Not available | Not available | Not available | 0.25 | 0.10 | 0.9 | 9.8 | 6.9 |
| | SA-4 | SA-4b-WQ | 30-Mar-14 | 11:00:00 | -20 | 25 | Not available | Not available | Not available | Not available | Not available | Not available | Not available | 0.40 | 0.15 | 0.6 | 13.3 | 6.8 |
| | SA-5 | SA-5b-WQ | 30-Mar-14 | 11:55:00 | -20 | 25 | Not available | Not available | Not available | Not available | Not available | Not available | Not available | 0.45 | 0.22 | 0.6 | 12.3 | 6.7 |
| | SA-6 | SA-6a-WQ | 1-Apr-14 | 14:00:00 | -5 | 0 | Not applicable | None | South West | Light | Not available | Not available | Not available | 0.80 | 0.40 | 0.2 | 7.0 | 6.5 |

Table B3. Limnology at Water Quality Stations in Waterbodies and Watercourses of the Denison Mines Wheeler River Project, March 28 to April 1, 2014 (Continued)

| Drainage | Waterbody / Watercourse | Station Code | Date (dd-mmm-yy) | Time (hh:mm) | Air Temperature (°C) | Cloud Cover (%) | Precipitation Rate | Precipitation Type | Wind Direction | Wind Rate | Snow Depth (m) | Ice Thickness (m) | Secchi Depth (m) | Maximum Depth (m) | Profile Depth (m) | Water Temperature (°C) | Dissolved Oxygen (mg/L) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B (Unnamed) | LB-2-WQ | LB-2a-WQ | 1-Apr-14 | 16:15 | -5 | 0 | Not applicable | None | NW | Light | 0.3 | 0.78 | 2.5 | 6.2 | 1.0 | 3.5 | 6.2 | 6.8 |
| | | | | | | | | | | | | | | | 2.0 | 3.5 | 6.4 | 6.5 |
| | | | | | | | | | | | | | | | 3.0 | 4.5 | 4.9 | 6.1 |
| | | | | | | | | | | | | | | | 4.0 | 4.6 | 3.3 | 6.0 |
| | | | | | | | | | | | | | | | 5.0 | 4.5 | 2.3 | 6.0 |
| | Williams Lake* (LB-3) | LB-3a-WQ | 1-Apr-14 | 9:00 | -8 | 0 | Not applicable | None | SW | Light | 0.35 | 0.82 | 4 | 17 | 1.0 | 3.1 | 13.0 | 7.5 |
| | | | | | | | | | | | | | | | 2.0 | 3.2 | 11.3 | 6.8 |
| | | | | | | | | | | | | | | | 3.0 | 3.7 | 10.6 | 6.7 |
| | | | | | | | | | | | | | | | 4.0 | 3.9 | 10.1 | 6.5 |
| | | | | | | | | | | | | | | | 5.0 | 3.9 | 9.7 | 6.4 |
| | | | | | | | | | | | | | | | 6.0 | 4.0 | 8.1 | 6.3 |
| | | | | | | | | | | | | | | | 7.0 | 4.0 | 7.0 | 6.2 |
| | | | | | | | | | | | | | | | 8.0 | 4.0 | 4.2 | 6.1 |
| | | | | | | | | | | | | | | | 9.0 | 4.1 | 3.0 | 6.0 |
| | | | | | | | | | | | | | | | 10.0 | 4.1 | 1.9 | 6.0 |
| | | | | | | | | | | | | | | | 11.0 | 4.2 | 1.4 | 6.0 |
| | | | | | | | | | | | | | | | 12.0 | 4.2 | 0.9 | 6.0 |
| | | | | | | | | | | | | | | | 13.0 | 4.2 | 0.6 | 6.4 |
| | | | | | | | | | | | | | | | 14.0 | 4.3 | 0.5 | 6.5 |
| | | | | | | | | | | | | | | | 15.0 | 4.3 | 0.3 | 6.8 |
| | | | | | | | | | | | | | | | 16.0 | 4.4 | 0.3 | 6.9 |
| | SB-1 | SB-1a-WQ | 31-Mar-14 | 10:00:00 | -25 | 0 | Not applicable | None | Not applicable | Calm | Not available | 0.55 | Not available | 0.9 | 0.45 | 0.4 | 8.1 | 6.6 |
| | SB-3 | SB-3b-WQ | 31-Mar-14 | 17:50:00 | -15 | 0 | Not applicable | None | South West | Moderate | Not available | Not available | Not available | 0.2 | 0.07 | 0.7 | 8.6 | 6.3 |
| | SB-5 | SB-5a-WQ | 31-Mar-14 | 18:25:00 | -15 | 0 | Not applicable | None | South West | Moderate | Not available | Not available | Not available | 0.2 | 0.09 | 0.4 | 8.9 | 6.6 |
| Russell Lake | Russell Lake | RL-Aa-WQ | 31-Mar-14 | 14:40 | -15 | 0 | Not applicable | None | South West | Moderate | 0.4 | 0.83 | 3.5 | 14.5 | 1.0 | 3.5 | 12.7 | 7.7 |
| | | | | | | | | | | | | | | | 2.0 | 2.5 | 12.2 | 7.5 |
| | | | | | | | | | | | | | | | 3.0 | 2.8 | 11.7 | 7.3 |
| | | | | | | | | | | | | | | | 4.0 | 2.9 | 11.4 | 7.2 |
| | | | | | | | | | | | | | | | 5.0 | 2.9 | 11.4 | 7.1 |
| | | | | | | | | | | | | | | | 6.0 | 2.9 | 11.3 | 7.1 |
| | | | | | | | | | | | | | | | 7.0 | 2.9 | 11.2 | 7.0 |
| | | | | | | | | | | | | | | | 8.0 | 2.9 | 11.1 | 7.0 |
| | | | | | | | | | | | | | | | 9.0 | 3.0 | 10.9 | 6.9 |
| | | | | | | | | | | | | | | | 10.0 | 3.4 | 10.0 | 6.8 |
| | | | | | | | | | | | | | | | 11.0 | 3.6 | 7.0 | 6.7 |
| | | | | | | | | | | | | | | | 12.0 | 3.7 | 6.1 | 6.7 |
| | | | | | | | | | | | | | | | 13.0 | 3.8 | 5.5 | 6.6 |
| | | | | | | | | | | | | | | | 14.0 | 3.9 | 4.6 | 6.6 |

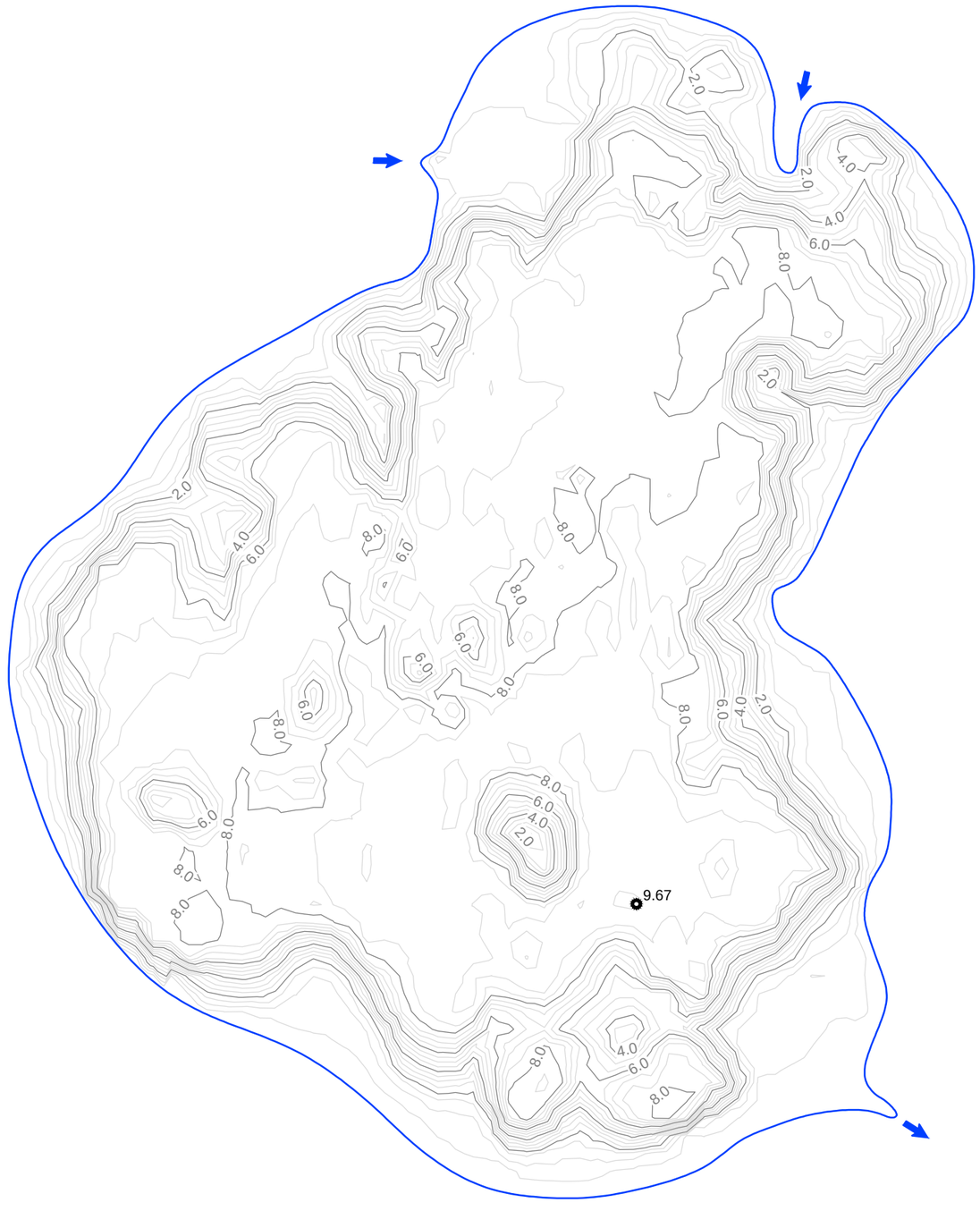
Note: Snow depth and ice thickness as well as Secchi were often not recorded for stream water quality stations. All field specific conductivity values were out of range for this area; Values were removed.

*Local name.

dd-mmm-yy = day-month-year; hh:mm = hour:minute; °C = degree Celsius; % = percent; m = metres; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; Mar = March; Apr = April.

# APPENDIX C

## Bathymetry Maps




| STATISTICS AT TIME OF SURVEY 11/08/2012 AND 12/08/2012 | |
|---|---|
| ELEVATION (mASL) | 494.386m |
| MAXIMUM LENGTH | 1.7km |
| SURFACE AREA | 1 485 480m² |
| VOLUME | 8 189 320m³ |
| MEAN DEPTH | 5.51m |
| MAXIMUM DEPTH | 9.67m |
| PERIMETER, MAIN SHORE | 5 291m |
| PERIMETER, ISLANDS | n/a |

NOTE

BATHYMETRIC MAPS ARE NOT FOR NAVIGATION OR DESIGN PURPOSES.
BATHYMETRIC DATA WAS COLLECTED ALONG TRANSECTS AND THE DEPTH DATA BETWEEN THE TRANSECTS HAS BEEN INTERPOLATED. BATHYMETRIC CONTOURS SHOWN AT 0.5m INTERVALS.

150 0 150
SCALE 1:7,500 METRES

PROJECT
DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE
**BATHYMETRY MAP**
**LAKE LA1**

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 21/08/12 | | |
| CHECK | BDH | 27/05/13 | **FIGURE: C1** | |
| REVIEW | BLC | 27/05/13 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\12-1362-0050 - LA1 Bathymetry Map.dwg 1/30/2013 2:44 PM

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\12-1362-0050 - LA5 LA6 SA6 Bathymetry Map.dwg 1/30/2013 2:52 PM




| STATISTICS AT TIME OF SURVEY 13/08/2012 | |
|---|---|
| ELEVATION (mASL) | 500.037m |
| MAXIMUM LENGTH | 1.5km |
| SURFACE AREA | 324 049m² |
| VOLUME | 332 502m³ |
| MEAN DEPTH | 1.08m |
| MAXIMUM DEPTH | 4.07m |
| PERIMETER, MAIN SHORE | 5 487m |
| PERIMETER, ISLANDS | 146m |

2.5 0 2.5

SCALE 1:125 METRES

PROJECT

DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE

**BATHYMETRY MAP**
**LAKE LA5**

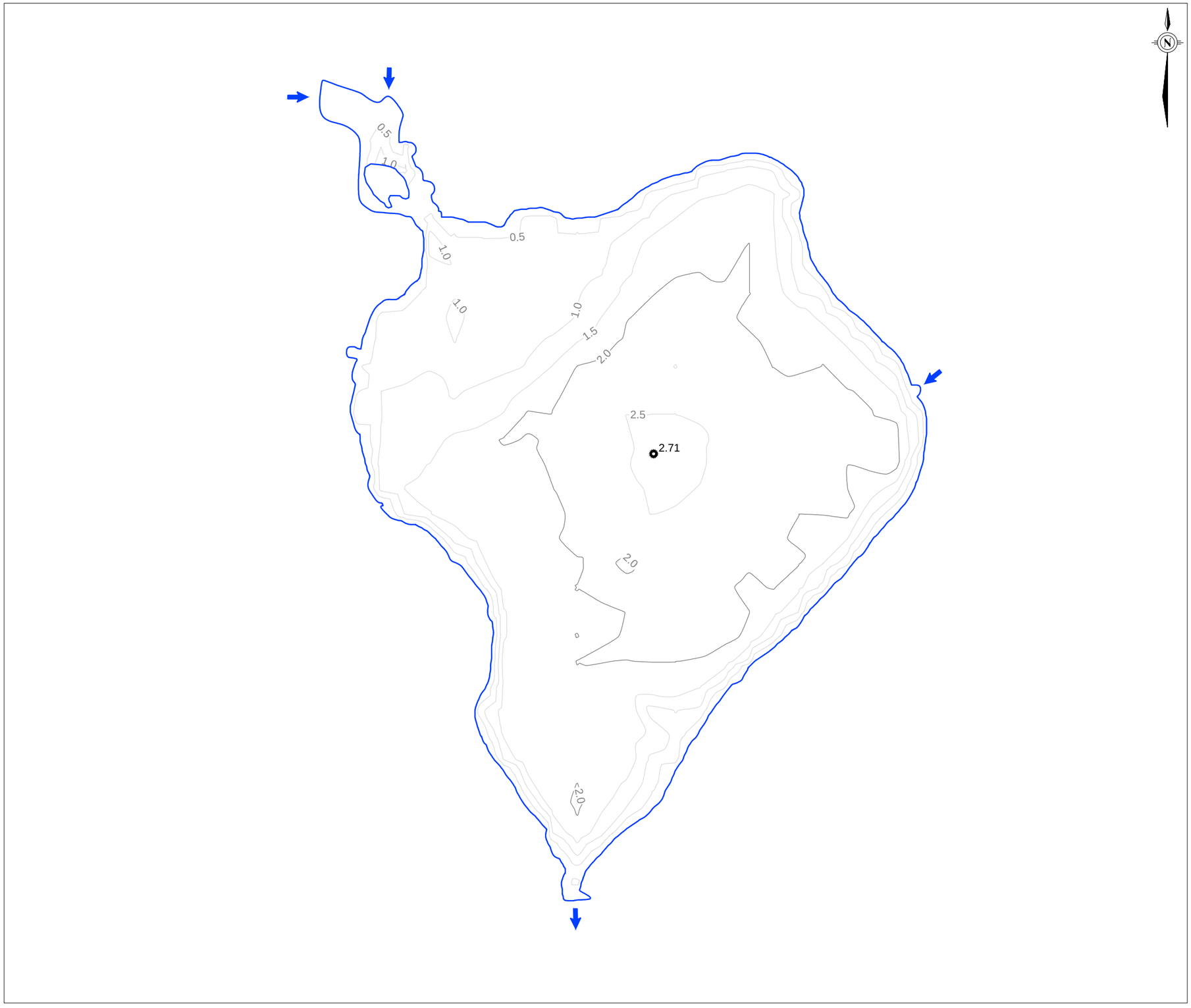
NOTE

BATHYMETRIC MAPS ARE NOT FOR NAVIGATION OR DESIGN PURPOSES.
BATHYMETRIC DATA WAS COLLECTED ALONG TRANSECTS AND THE DEPTH DATA BETWEEN THE TRANSECTS HAS BEEN INTERPOLATED. BATHYMETRIC CONTOURS SHOWN AT 0.5m INTERVALS.

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | | 12-1362-0050 | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 21/08/12 | | |
| CHECK | BDH | 27/05/13 | | |
| REVIEW | BLC | 27/05/13 | | |

**FIGURE: C2**




STATISTICS AT TIME OF SURVEY
13/08/2012

| | |
|---|---|
| ELEVATION (mASL) | 500.058m |
| MAXIMUM LENGTH | 0.78km |
| SURFACE AREA | 262 740m² |
| VOLUME | 413 505m³ |
| MEAN DEPTH | 1.57m |
| MAXIMUM DEPTH | 2.71m |
| PERIMETER, MAIN SHORE | 2 654m |
| PERIMETER, ISLANDS | 153m |

NOTE

BATHYMETRIC MAPS ARE NOT FOR NAVIGATION OR DESIGN PURPOSES.
BATHYMETRIC DATA WAS COLLECTED ALONG TRANSECTS AND THE DEPTH DATA BETWEEN THE TRANSECTS HAS BEEN INTERPOLATED. BATHYMETRIC CONTOURS SHOWN AT 0.5m INTERVALS.

100 0 100
SCALE 1:4,000 METRES

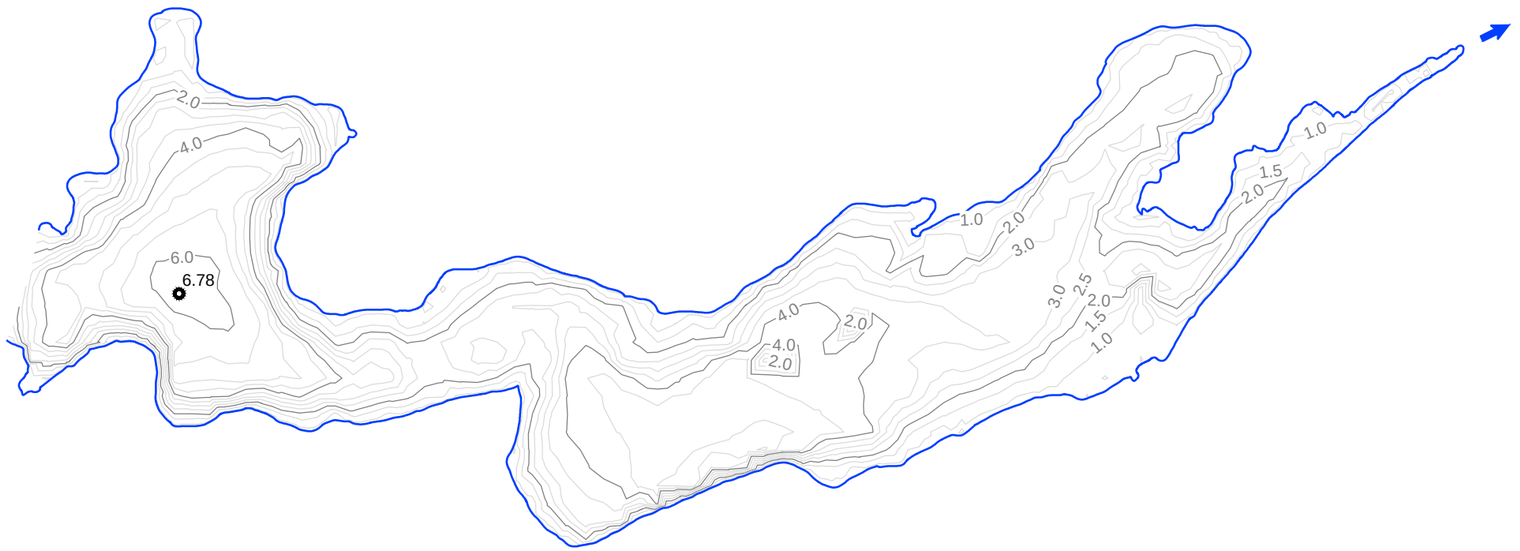
PROJECT
DENISON MINES CORPORATION
WHEELER RIVER PROJECT

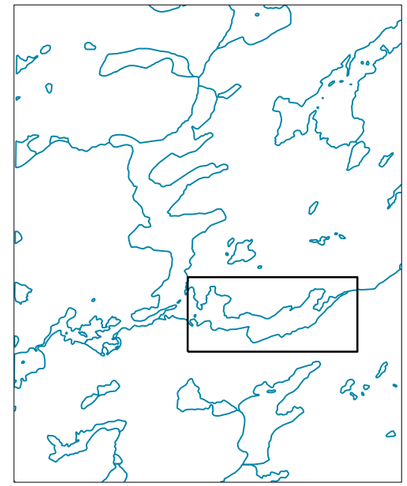
TITLE
**BATHYMETRY MAP**
**LAKE LA6**

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 21/08/12 | | |
| CHECK | BDH | 27/05/13 | **FIGURE: C3** | |
| REVIEW | BLC | 27/05/13 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\12-1362-0050 - LA5 LA6 SA6 Bathymetry Map.dwg 1/30/2013 2:52 PM



KEY PLAN

| STATISTICS AT TIME OF SURVEY 09/08/2012 | |
|---|---|
| ELEVATION (mASL) | 520.482m |
| MAXIMUM LENGTH | 2.5km |
| SURFACE AREA | 795 937m² |
| VOLUME | - |
| MEAN DEPTH | 2.90m |
| MAXIMUM DEPTH | 6.78m |
| PERIMETER, MAIN SHORE | 7 843m |
| PERIMETER, ISLANDS | n/a |

NOTE

BATHYMETRIC MAPS ARE NOT FOR NAVIGATION OR DESIGN PURPOSES.
BATHYMETRIC DATA WAS COLLECTED ALONG TRANSECTS AND THE DEPTH DATA BETWEEN THE TRANSECTS HAS BEEN INTERPOLATED. BATHYMETRIC CONTOURS SHOWN AT 0.5m INTERVALS.

200 0 200
SCALE 1:10,000 METRES

PROJECT
DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE
**BATHYMETRY MAP**
**KRATCHKOWSKY LAKE (LA7)**
**(SOUTH-EAST BAY)**

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 20/08/12 | **FIGURE: C4** | |
| CHECK | BDH | 27/05/13 | | |
| REVIEW | BLC | 27/05/13 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\12-1362-0050 - Kratchkowsky Lake Bathymetry Map.dwg 1/30/2013 3:03 PM

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\12-1362-0050 - Williams Lake Bathymetry Map.dwg 1/31/2013 9:41 AM




| STATISTICS AT TIME OF SURVEY 08/08/2012 | |
|---|---|
| ELEVATION (mASL) | 518.524m |
| MAXIMUM LENGTH | 3.5km |
| SURFACE AREA | 1 522 984m² |
| VOLUME | 6 933 788m³ |
| MEAN DEPTH | 4.55m |
| MAXIMUM DEPTH | 17.82m |
| PERIMETER, MAIN SHORE | 10 925m |
| PERIMETER, ISLANDS | 544m |

200 0 200
SCALE 1:10,000 METRES

PROJECT
DENISON MINES COPORATION
WHEELER RIVER PROJECT

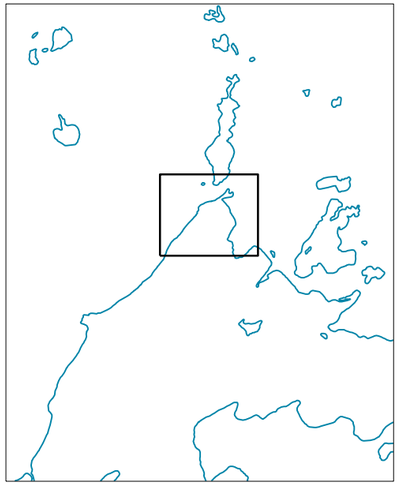
TITLE
**BATHYMETRY MAP**
**WILLIAMS LAKE* (LB3)**

NOTE
* LOCAL LAKE NAME
BATHYMETRIC MAPS ARE NOT FOR NAVIGATION OR DESIGN PURPOSES. BATHYMETRIC DATA WAS COLLECTED ALONG TRANSECTS AND THE DEPTH DATA BETWEEN THE TRANSECTS HAS BEEN INTERPOLATED. BATHYMETRIC CONTOURS SHOWN AT 1.0m INTERVALS.

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | | 12-1362-0050 | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 20/08/12 | **FIGURE: C5** | |
| CHECK | BDH | 27/05/13 | | |
| REVIEW | BLC | 27/05/13 | | |



KEY PLAN

| STATISTICS AT TIME OF SURVEY 10/08/2012 AND 11/08/2012 | |
|---|---|
| ELEVATION (mASL) | 488.167m |
| MAXIMUM LENGTH | 1.2km |
| SURSFACE AREA | 751 485m² |
| VOLUME | - |
| MEAN DEPTH | 3.04m |
| MAXIMUM DEPTH | 18.78m |
| PERIMETER, MAIN SHORE | 3 325m |
| PERIMETER, ISLANDS | n/a |

NOTE

BATHYMETRIC MAPS ARE NOT FOR NAVIGATION OR DESIGN PURPOSES.
BATHYMETRIC DATA WAS COLLECTED ALONG TRANSECTS AND THE DEPTH DATA BETWEEN THE TRANSECTS HAS BEEN INTERPOLATED. BATHYMETRIC CONTOURS SHOWN AT 0.5m INTERVALS.

1 0 1

SCALE 1:50,000 KILOMETRES

PROJECT

DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE

# BATHYMETRY MAP
# RUSSELL LAKE
# (ICELANDER RIVER OUTLET BAY)

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 20/08/12 | | |
| CHECK | BDH | 27/05/13 | | |
| REVIEW | BLC | 27/05/13 | | |

**FIGURE: C6**

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\12-1362-0050 - Russell Lake Bathymetry Map.dwg 5/27/2013 2:25 PM

# APPENDIX D

## Fish Habitat Maps

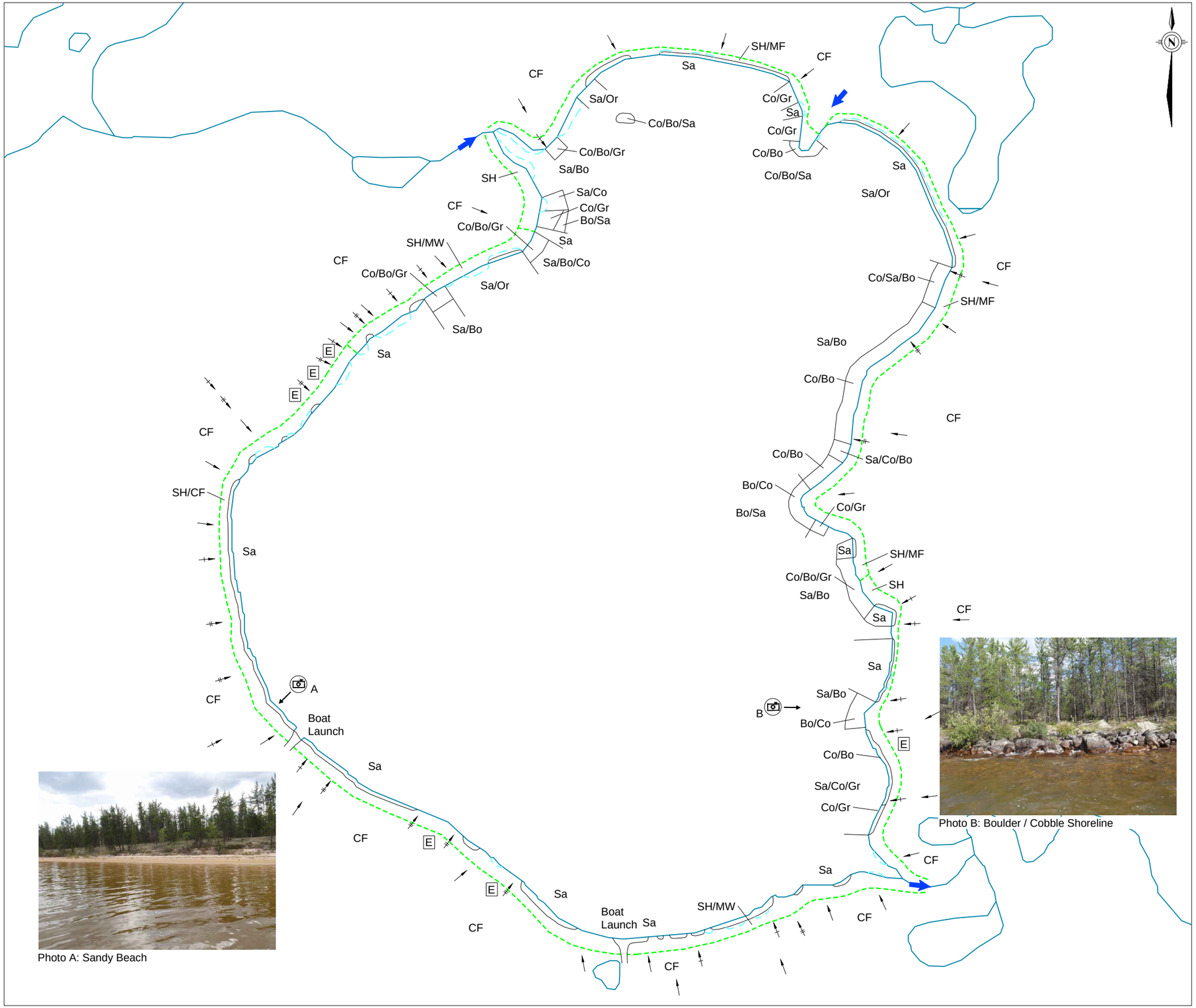



Photo A: Sandy Beach



Photo B: Boulder / Cobble Shoreline

REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/06, 74H/11
NAD83 UTM ZONE 14

150 0 150
SCALE 1:7,500 METRES

PROJECT

DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE

**HABITAT MAP**
**LAKE LA1**

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | BDS | 16/01/13 | | |
| CHECK | BDH | 27/05/13 | | |
| REVIEW | BLC | 27/05/13 | | |

**FIGURE: D1**

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\12-1362-0050 - Habitat Map LA1.dwg 1/31/2013 9:51 AM

# Legend - Lakes, Wetlands, Ponds

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | |
|---|---|
| | Water |
| | Sediment |
| | Benthic |
| | Fish |

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | EM | Emergent Vegetation |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microseimens per centimetre
Max depth was the depth recorded at sampling locations.

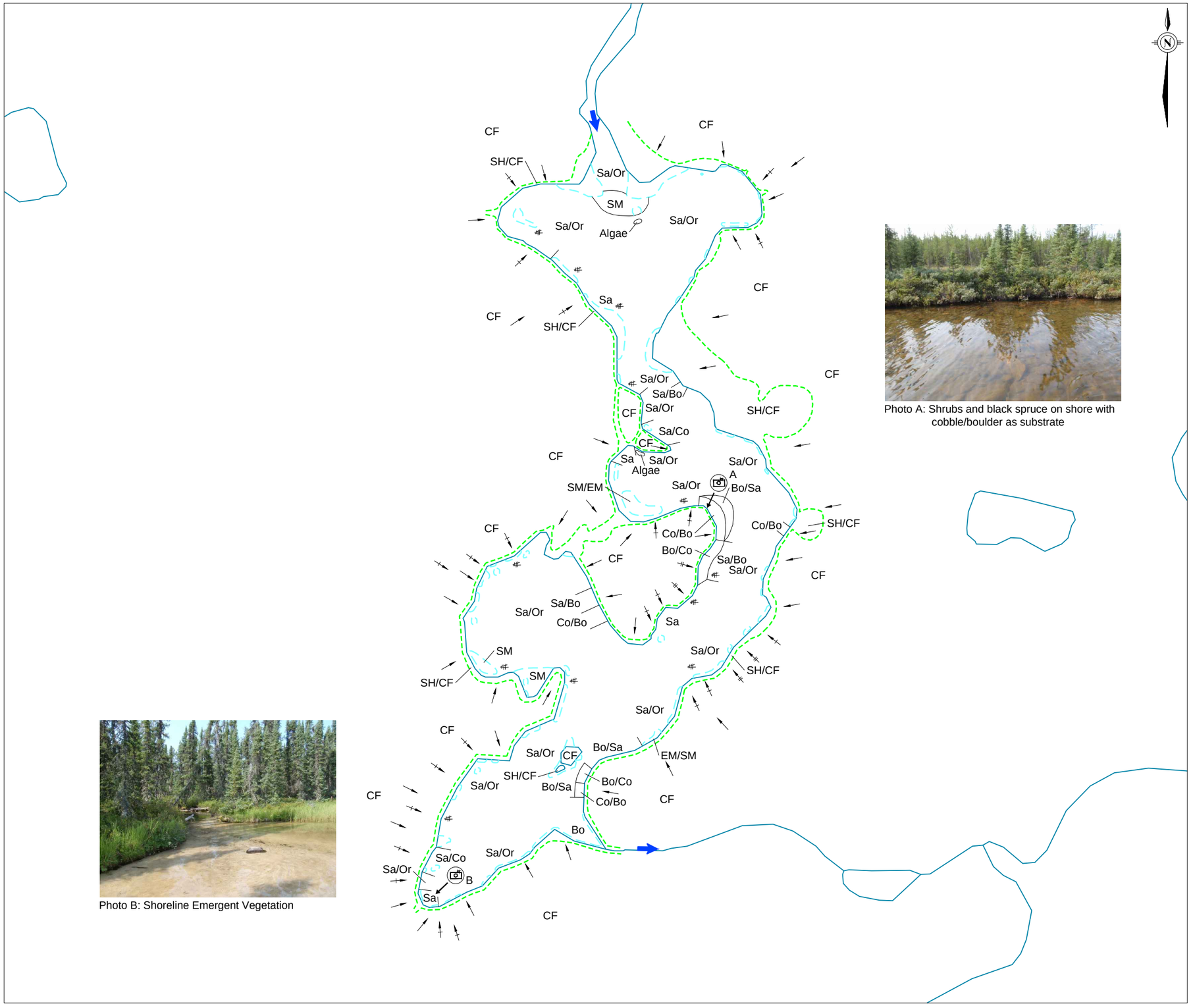





Photo A: Shrubs and black spruce on shore with cobble/boulder as substrate



Photo B: Shoreline Emergent Vegetation

REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/06, 74H/11
NAD83 UTM ZONE 14

150 0 150
SCALE 1:7,500 METRES

PROJECT

DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE

**HABITAT MAP**
**LAKE LA5**

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | BDS | 16/01/13 | | |
| CHECK | BDH | 27/05/13 | | |
| REVIEW | BLC | 27/05/13 | | |

**FIGURE: D2**

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\12-1362-0050 - Habitat Map LA5.dwg 1/31/2013 9:53 AM

# Legend - Lakes, Wetlands, Ponds

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | |
|---|---|
| | Water |
| | Sediment |
| | Benthic |
| | Fish |

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | EM | Emergent Vegetation |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microseimens per centimetre
Max depth was the depth recorded at sampling locations.



Photo A: Emergent vegeation



Photo B: Overhanging vegetation with sand as substrate

CF
SH/CF
Bo
Bo/Co
Bo/Sa
Bo/Co/Si
SM
Bo/Co/Sa
Sa
E
CF
Sa/Co
Sa/Bo
Sa
Sa/Or
A
Sa/Or
CF
Sa/Or
Sa
SH/CF
Sa/Bo
Sa/Or
CF
SM
Access
Road
Sa/Si/Or
Sa/Or
Sa/Or
Sa Beach
B
Sa/Bo
Sa
CF
Sa/Or
Bo/Co
SH/CF
CF
Co/Bo
Sa/Bo
Sa/Or
SH/CF
Sa/Bo/Co
Sa
SM
CF

REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/11
NAD83 UTM ZONE 14

100 0 100
SCALE 1:4,000 METRES

PROJECT

DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE

**HABITAT MAP**
**LAKE LA6**

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 18/01/13 | | |
| CHECK | BDH | 27/05/13 | **FIGURE: D3** | |
| REVIEW | BLC | 27/05/13 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\12-1362-0050 - Habitat Map LA6.dwg 1/31/2013 9:54 AM

# Legend - Lakes, Wetlands, Ponds

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | |
|---|---|
| | Water |
| | Sediment |
| | Benthic |
| | Fish |

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | EM | Emergent Vegetation |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

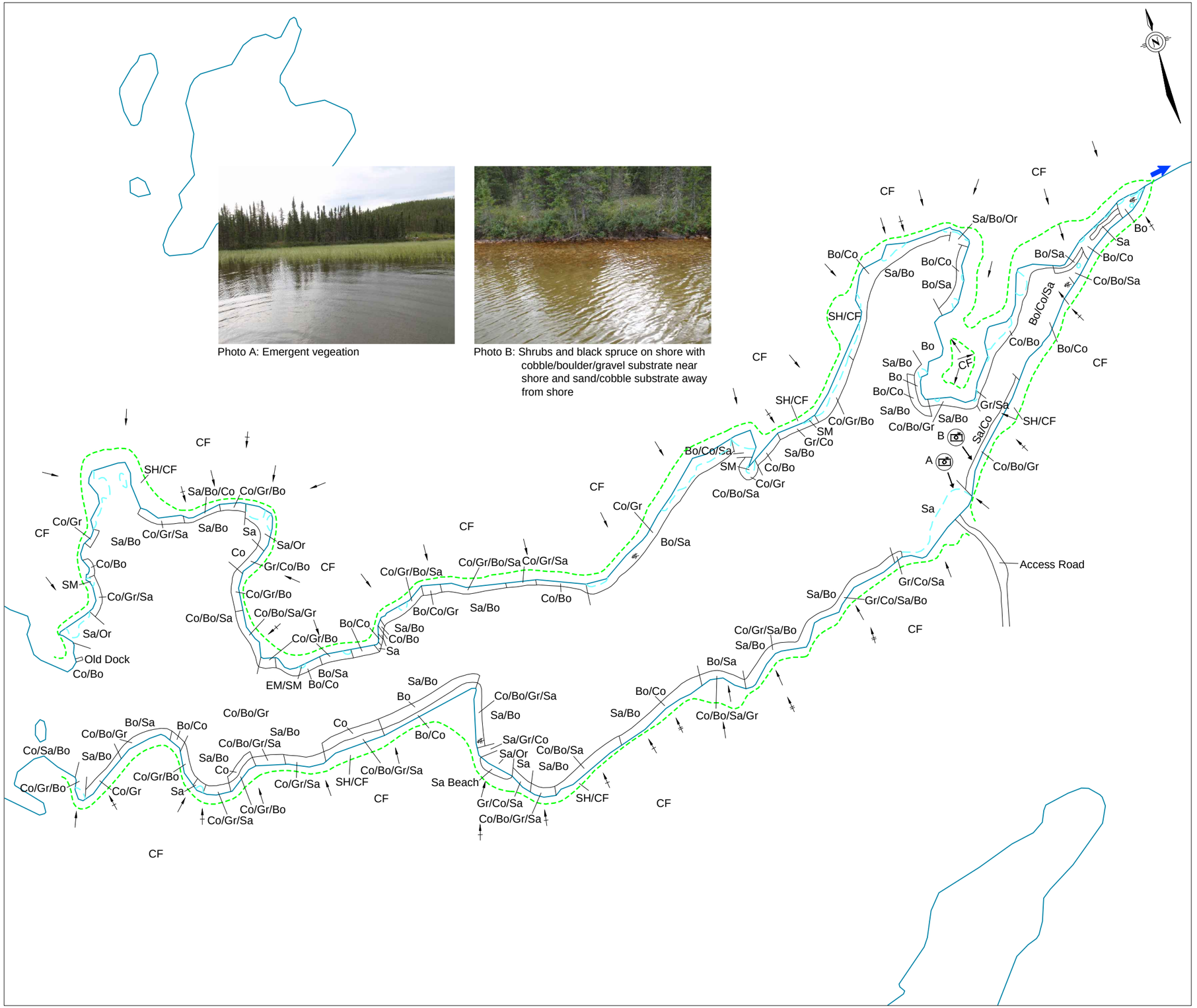
Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microseimens per centimetre
Max depth was the depth recorded at sampling locations.

Photo A: Emergent vegeation



Photo B: Shrubs and black spruce on shore with cobble/boulder/gravel substrate near shore and sand/cobble substrate away from shore




## REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/11
NAD83 UTM ZONE 14

200 0 200
SCALE 1:8,000 METRES

PROJECT
DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE
# HABITAT MAP KRATCHKOWSKY LAKE (SOUTH-EAST BAY)

Golder Associates
Saskatoon, Saskatchewan

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | | |
| DESIGN | | | SCALE | AS SHOWN | REV. 0 |
| CADD | BDS | 22/01/13 | FIGURE: D4 | | |
| CHECK | BDH | 27/05/13 | | | |
| REVIEW | BLC | 27/05/13 | | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\12-1362-0050 - Habiat Map LA7.dwg 1/31/2013 9:57 AM

# Legend - Lakes, Wetlands, Ponds

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | |
|---|---|
| | Water |
| | Sediment |
| | Benthic |
| | Fish |

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | EM | Emergent Vegetation |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

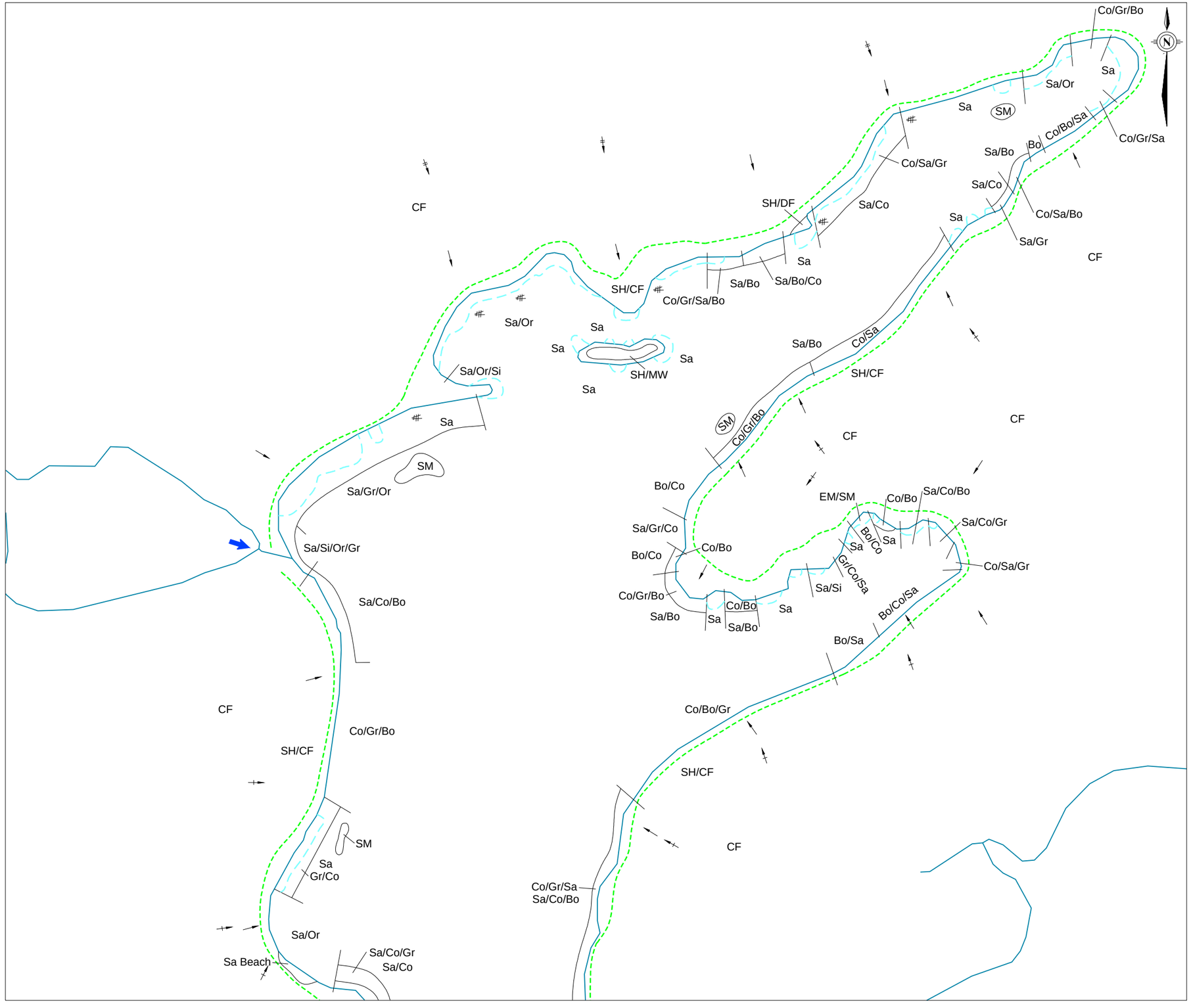
| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microseimens per centimetre
Max depth was the depth recorded at sampling locations.




G:\CLIENT\SDENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\12-1362-0050 - Habitat Map LA3.dwg 1/31/2013 10:02 AM

## NOTES

* LOCAL LAKE NAME

## REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/06, 74H/11
NAD83 UTM ZONE 14

100 0 100
SCALE 1:6,000 METRES

PROJECT
DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE
**HABITAT MAP**
**NORTH HALF OF WILLIAMS LAKE***

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | TAH | 22/01/13 | | |
| CHECK | BDH | 27/05/13 | **FIGURE: D5a** | |
| REVIEW | BLC | 27/05/13 | | |

# Legend - Lakes, Wetlands, Ponds

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | |
|---|---|
| | Water |
| | Sediment |
| | Benthic |
| | Fish |

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | EM | Emergent Vegetation |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

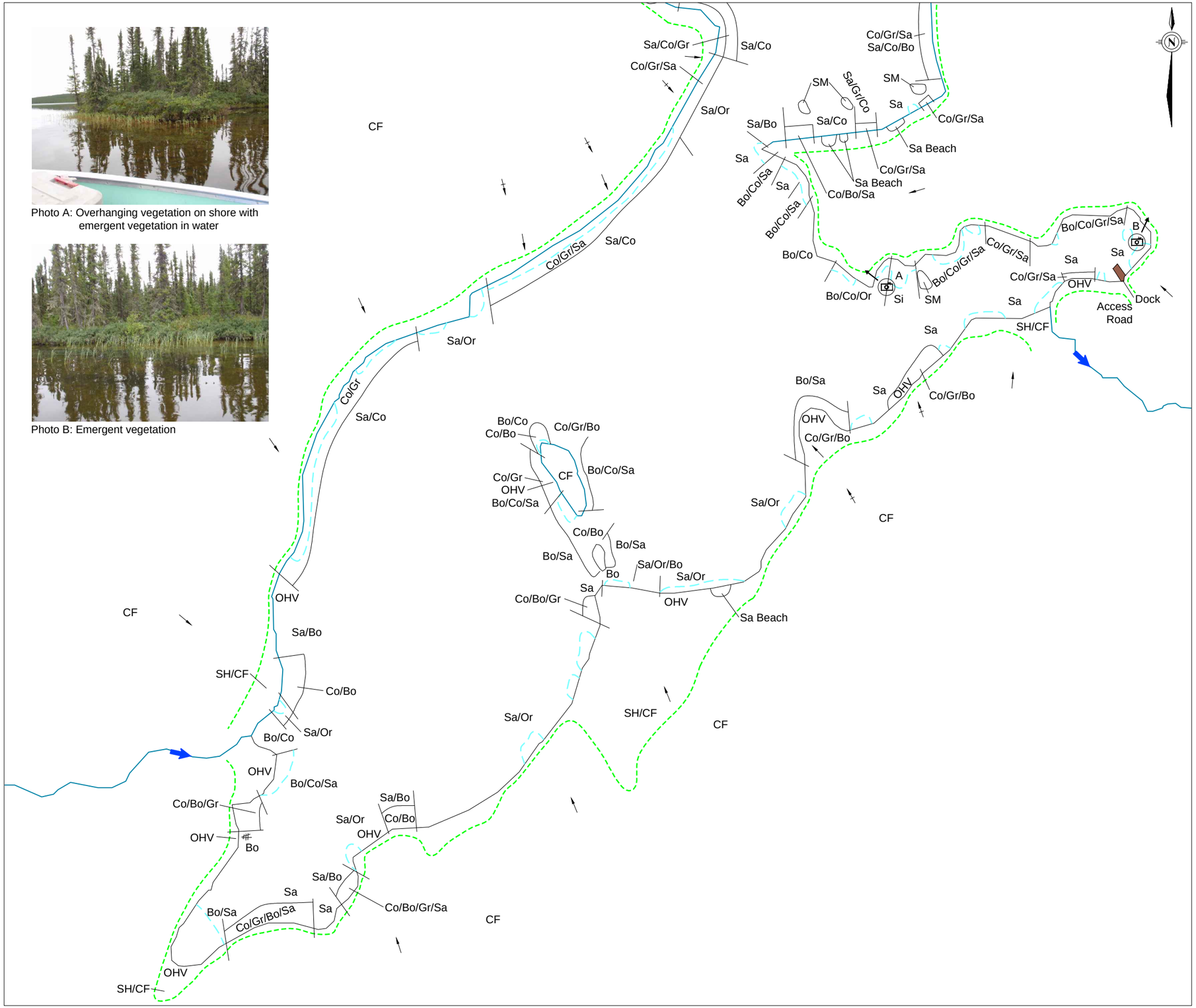
Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microseimens per centimetre
Max depth was the depth recorded at sampling locations.

Photo A: Overhanging vegetation on shore with emergent vegetation in water



Photo B: Emergent vegetation




NOTES

* LOCAL LAKE NAME

REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/06, 74H/11
NAD83 UTM ZONE 14

100 0 100
SCALE 1:6,000 METRES

PROJECT

DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE

# HABITAT MAP
# SOUTH HALF OF WILLIAMS LAKE*

Golder Associates
Saskatoon, Saskatchewan

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | | |
| DESIGN | | | SCALE | AS SHOWN | REV. 0 |
| CADD | TAH | 22/01/13 | FIGURE: D5b | | |
| CHECK | BDH | 27/05/13 | | | |
| REVIEW | BLC | 27/05/13 | | | |

G:\CLIENT\SDENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\12-1362-0050 - Habitat Map LA3.dwg 1/31/2013 10:02 AM

# Legend - Lakes, Wetlands, Ponds

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | |
|---|---|
| | Water |
| | Sediment |
| | Benthic |
| | Fish |

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | EM | Emergent Vegetation |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

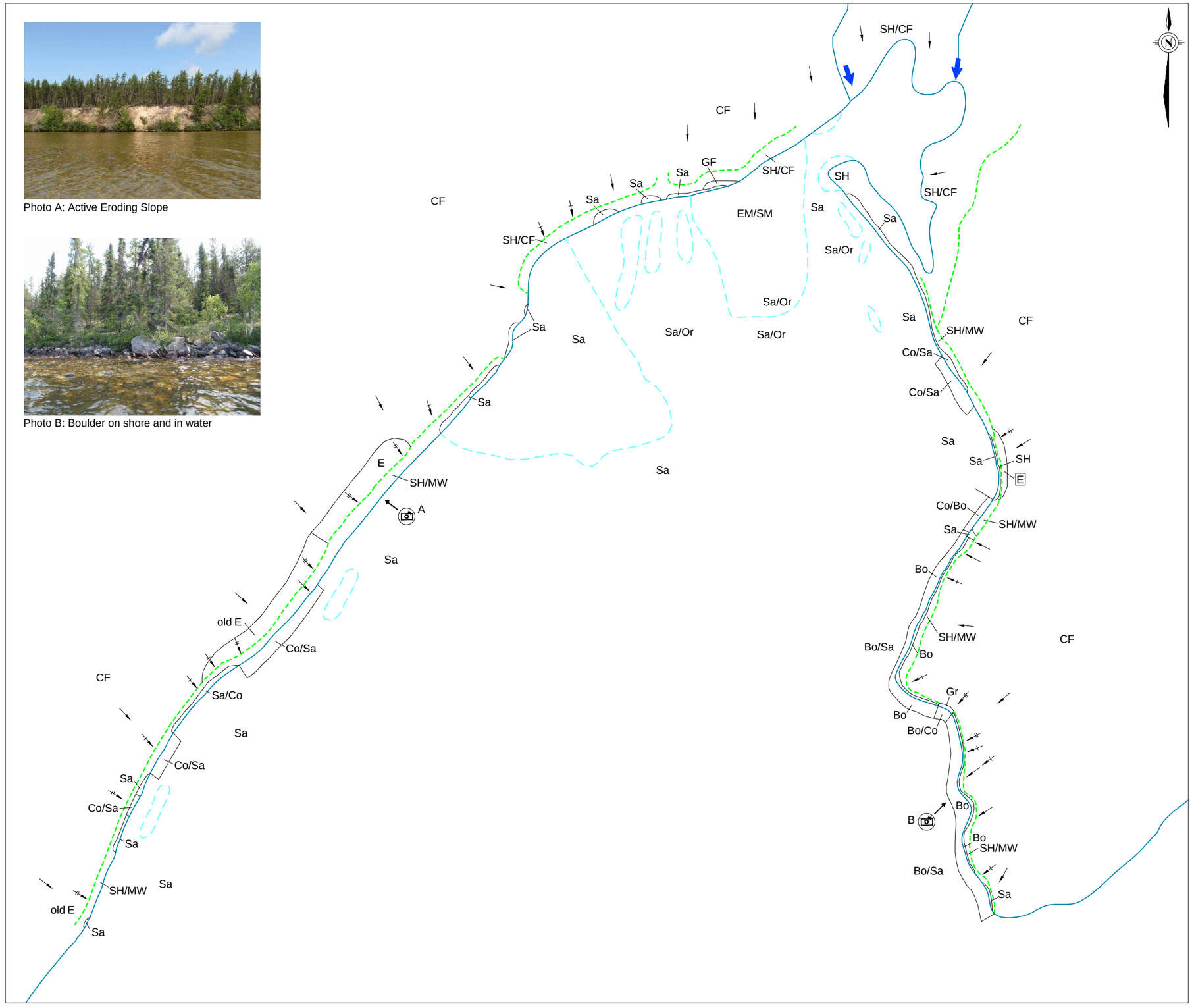
Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microseimens per centimetre
Max depth was the depth recorded at sampling locations.

Photo A: Active Eroding Slope



Photo B: Boulder on shore and in water




REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/11
NAD83 UTM ZONE 14

100 0 100
SCALE 1:5,000 METRES

PROJECT

DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE

# HABITAT MAP
# RUSSELL LAKE
# (ICELANDER RIVER OUTLET BAY)

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | 12-1362-0050 | | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| CADD | BDS | 23/01/13 | | |
| CHECK | BDH | 27/05/13 | | |
| REVIEW | BLC | 27/05/13 | | |

**FIGURE: D6**

G:\CLIENT\SDENISON MINES\Wheeler River\Figures\12-1362-0050\Aquatics\Phase 2000\12-1362-0050 - Habitat Map Russell Lake.dwg 1/31/2013 10:04 AM

# Legend - Lakes, Wetlands, Ponds

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | |
|---|---|
| | Water |
| | Sediment |
| | Benthic |
| | Fish |

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | EM | Emergent Vegetation |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microseimens per centimetre
Max depth was the depth recorded at sampling locations.

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.


| | |
|---|---|
| Africa | + 27 11 254 4800 |
| Asia | + 86 21 6258 5522 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 55 21 3095 9500 |

solutions@golder.com
www.golder.com

**Golder Associates Ltd.**
**1721 8th Street East**
**Saskatoon, Saskatchewan, Canada S7H 0T4**
**Canada**
**T: +1 (306) 665 7989**


Golder Associates

# Appendix G EcoMetrix Incorporated. 2019. 2011-2019 Hydrology Baseline Summary Report for Wheeler River Project

# 2011 – 2019 BASELINE HYDROLOGY SUMMARY REPORT - WHEELER RIVER PROJECT, DENISON MINES

Report prepared for:

DENISON MINES CORP.
230 22nd Street East, Suite 200
Saskatoon, SK
S7K 0E9, Canada

Report prepared by:

ECOMETRIX INCORPORATED
www.ecometrix.ca
Mississauga, ON

**Ref. 19-2589**
25 March 2020

# 2011 – 2019 BASELINE HYDROLOGY SUMMARY REPORT - WHEELER RIVER PROJECT, DENISON MINES

Fei Luo, PhD
Project Manager

Brian Fraser, MSc
Project Principal and Reviewer

# EXECUTIVE SUMMARY

The Denison Mines Corp. (Denison) Wheeler River Project (Project) is located in north central Saskatchewan, in the eastern portion of the Athabasca Basin. It is situated approximately 35 kilometres northeast of Cameco Corporation's Key Lake Operation and 35 kilometres southwest of Cameco Corporation's McArthur River Operation. Hydrology baseline studies in the Project area are required to support feasibility engineering studies, technical assessments and environmental approvals processes. EcoMetrix Incorporated (EcoMetrix) was retained by Denison to implement hydrology baseline studies over the period 2016 through 2019 and to synthesize this more recent data with existing hydrological information for the study area. The current understanding of hydrological conditions in the study area based on the full hydrological data set is provided herein.

## Project Site Setting

The Project site is located in the Athabasca Plain Ecoregion that extends south from Lake Athabasca to Cree Lake. The area is characterized as a morainal plain, with southwest trending drumlins and eskers and glaciofluvial outwash areas overlying Athabasca sandstones. Numerous interconnected lakes occur in the area, along with low-lying, poorly drained areas of muskeg. The area is in the subarctic climate zone with long, usually cold winters, and short, cool to mild summers. The ice-covered season extends from late October to late April or early May. Precipitation in the Project area is low throughout the year, and mostly occurs in the warmer months.

The Project area lies within the Wheeler River watershed, which is part of the Churchill River Basin. Surface water from the Project site is drained by two sub-basins of the Wheeler River, the Icelander River drainage and the Williams Lake drainage. Both drainages flow generally south into the northwest portion of Russell Lake. The estimated drainage areas of the Icelander River and the Williams Lake drainages are 371 $km^2$ and 78 $km^2$, respectively. Downstream of Russell Lake, the Wheeler River flows into the Geikie River, which subsequently discharges to Wollaston Lake.

## 2011 to 2014 Hydrological Characterization Program

Golder Associates (Golder) surveyed and summarized the hydrological characteristics of the Project site over the period 2011 to 2014. Water elevation survey locations were established at nine stream stations and eleven lake stations. Manual flow measurements were performed at each of the nine stream stations, and automated stream elevation instruments (level data loggers) were installed at all stream stations. Rating curves were established for each station based on the manual stream discharge measurements to permit estimation of hydrographic profiles for each location. The hydrological data collected during this period indicated that the average daily streamflow at the most downstream location in the Icelander River and the Williams Lake drainage areas ranged from 0.84 to

3.13 $m^3/s$ and 0.067 to 1.5 $m^3/s$, respectively. Lake and pond surface water elevations ranged from 520.42 masl in the headwater lake of the Icelander River drainage to 488.24 masl at Russell Lake.

**2016 to 2019 Hydrological Characterization Program**

Hydrological surveys conducted between 2016 and 2019 built on the hydrological baseline work completed from 2011 to 2014. In addition to the previously established hydrometric stations, seven new stream stations and four new lake and pond stations were established. The scope of the 2016 to 2019 program included: the measurement of water level elevations at thirteen lakes and two ponds within the study area; the collection of manual streamflow measurements at seventeen watercourses to validate existing rating curves or establish rating curves for new monitoring locations; and, the installation of continuous streamflow monitoring equipment at eight stream locations in 2016 and elevation data loggers at two lake locations in 2018 and 2019. Six field programs were completed from fall 2016 to summer 2019 to capture seasonal flow conditions in spring, summer and fall. One winter field program was completed between March 15 and 19, 2018, to assess ice cover in the area and to gain a better understanding of winter baseflow conditions.

**Key Hydrological Characteristics of the Study Area**

Over the entire monitoring program (2011 to 2019), lake and pond surface water elevations ranged from 520.86 masl in the Icelander River drainage area headwater lake LA-8 to 487.99 masl at Russell Lake. In the Icelander River basin, water level elevations at the stream stations ranged from 520.84 masl at SA-11 to 492.55 masl at the most downstream station SA-1. In Williams River drainage area, water levels at stream stations ranged from 519.24 masl at SB-4, to 488.34 masl at the most downstream station. The hydrological data collected also indicated that the average daily streamflow at the most downstream location in the Icelander River and the Williams Lake drainage areas ranged from 0.655 to 3.23 $m^3/s$ and 0.067 to 1.5 $m^3/s$, respectively.

Currently, continuous monitoring equipment is installed in stream stations SA-1, SA-4, SA-5, SA-6, SA-8, SA-9, SA-10, and SA-11, and lake station LA-1. For SA-1, SA-4, SA-5, SA-6 and SA-11, the water level data can be used to estimate stream flow using established rating curve relationships. Rating curves have not yet been established at other stations, as more manual stream measurements are needed over the range of expected flows to adequately characterize the relationship between stage and discharge.

# TABLE OF CONTENTS

Page

**1.0 INTRODUCTION ..... 1.1**
1.1 Site Location and General Area Description ..... 1.1
1.2 Climate and Weather ..... 1.3
1.3 Regional Hydrology ..... 1.6
1.4 Local Hydrology ..... 1.10
**2.0 SCOPE OF THE HYDROLOGY BASELINE PROGRAM ..... 2.1**
2.1 2016 to 2019 Water Elevation Surveys ..... 2.5
2.2 2016 to 2019 Instantaneous Flow Measurements ..... 2.5
2.3 2016 to 2019 Continuous Water Level Recording ..... 2.5
2.4 Rating Curve Development and Validation ..... 2.6
2.5 2018 Measurement of Ice Thickness ..... 2.7
**3.0 EXISTING HYDROLOGICAL CONDITIONS ..... 3.1**
3.1 Streams ..... 3.1
3.1.1 Stream Monitoring Locations ..... 3.1
3.1.2 Stream Stage and Discharge ..... 3.5
3.1.3 Relationship to Regional Hydrology ..... 3.8
3.1.4 Effect of ice formation on discharge ratings ..... 3.8
3.2 Lakes ..... 3.9
3.2.1 Lake Elevation Measurements ..... 3.9
3.2.2 Ice Thickness Measurements ..... 3.10
**4.0 References ..... 4.1**
**Appendix A Ground Survey Results: Elevations of Benchmark at Each Monitoring Station A.1**
**Appendix B Stage and Discharge Measurement ..... B.1**
**Appendix C Summary of Hydrometric Monitoring Stations in the Icelander River Drainage Area ..... C.1**
**Appendix D 2012-2014 Baseline Hydrology Summary Report. Golder Associates D.1**
**Appendix E Wheeler River Lake Level Survey and 2016/2017 Streamflow Monitoring. Calder Engineering Ltd. ..... E.1**
**Appendix F Wheeler River Hydrometric Monitoring Activity Summary 2019. Missinipi Water Solutions. ..... F.1**

# LIST OF TABLES

Table 1-1: Temperature norms (daily average per month, °C) reported for the Key Lake Weather Station ..... 1.3
Table 2-1: Hydrology monitoring stations and monitoring activities ..... 2.3
Table 3-1: Lake Water Level Summary during open water conditions, 2011-2019 ..... 3.9

# LIST OF FIGURES

Figure 1-1: Location of the Wheeler River Project Site in north central Saskatchewan ..... 1.2
Figure 1-2: Key Lake Monthly Precipitation for Hydrological Years between 2011-2019 ..... 1.5
Figure 1-3: Wheeler River mean monthly discharge for the hydrological years between 2011 and 2019 ..... 1.9
Figure 1-4: Overview of the local drainage areas, Wheeler River Project. ..... 1.11
Figure 2-1: Hydrometric Monitoring Locations at Wheeler River Drainage ..... 2.2
Figure 3-1: Monthly mean discharge at stream stations in the Wheeler River drainage area where level data logger was installed ..... 3.7

# 1.0 INTRODUCTION

EcoMetrix Incorporated (EcoMetrix) was retained by Denison Mines Corp. (Denison) to undertake hydrological baseline studies over the period 2016 through 2019 at the Wheeler River Project (Project) site that is located in the eastern portion of the Athabasca Basin region in northern Saskatchewan. Hydrology baseline studies in the Project area are required to support feasibility design and engineering studies, technical assessments and environmental approvals processes. The information collected over the period 2016 through 2019 has been synthesized with existing hydrological information in order to characterize the current understanding of hydrological conditions in the study area.

The Wheeler River hydrology baseline project started in 2011. Golder Associated Ltd. (Golder) collected and analyzed field data from 2011 through 2014 (Golder, 2014; see **Appendix D**). This current report builds on the earlier hydrological survey work, documents and analyzes all hydrologic data collected to date, serving as an updated hydrology baseline report for the Project. To avoid repetition, discussion about study design and monitoring methods presented herein focuses on the monitoring efforts started from 2016 and extending through 2019.

## 1.1 Site Location and General Area Description

The Project is located in north central Saskatchewan, in the south-eastern portion of the Athabasca Basin region (**Figure 1-1**). It is situated approximately 35 kilometres (km) northeast of Cameco Corporation's Key Lake Operation and 35 km southwest of Cameco's McArthur River Operation. Access to the Project site is by the provincial highway system to the Key Lake mill, then by the ore haul road between the Key Lake and McArthur River operations that leads to the eastern part of the property.

The Project site is located in the Athabasca Plain Ecoregion which extends south from Lake Athabasca to Cree Lake (ESWG, 1996). The area in which the Project is located is characterized as a morainal plain, with southwest trending drumlins and eskers and glaciofluvial outwash areas overlying Athabasca sandstones. Numerous interconnected lakes occur in the area, along with low-lying, poorly drained areas of muskeg.

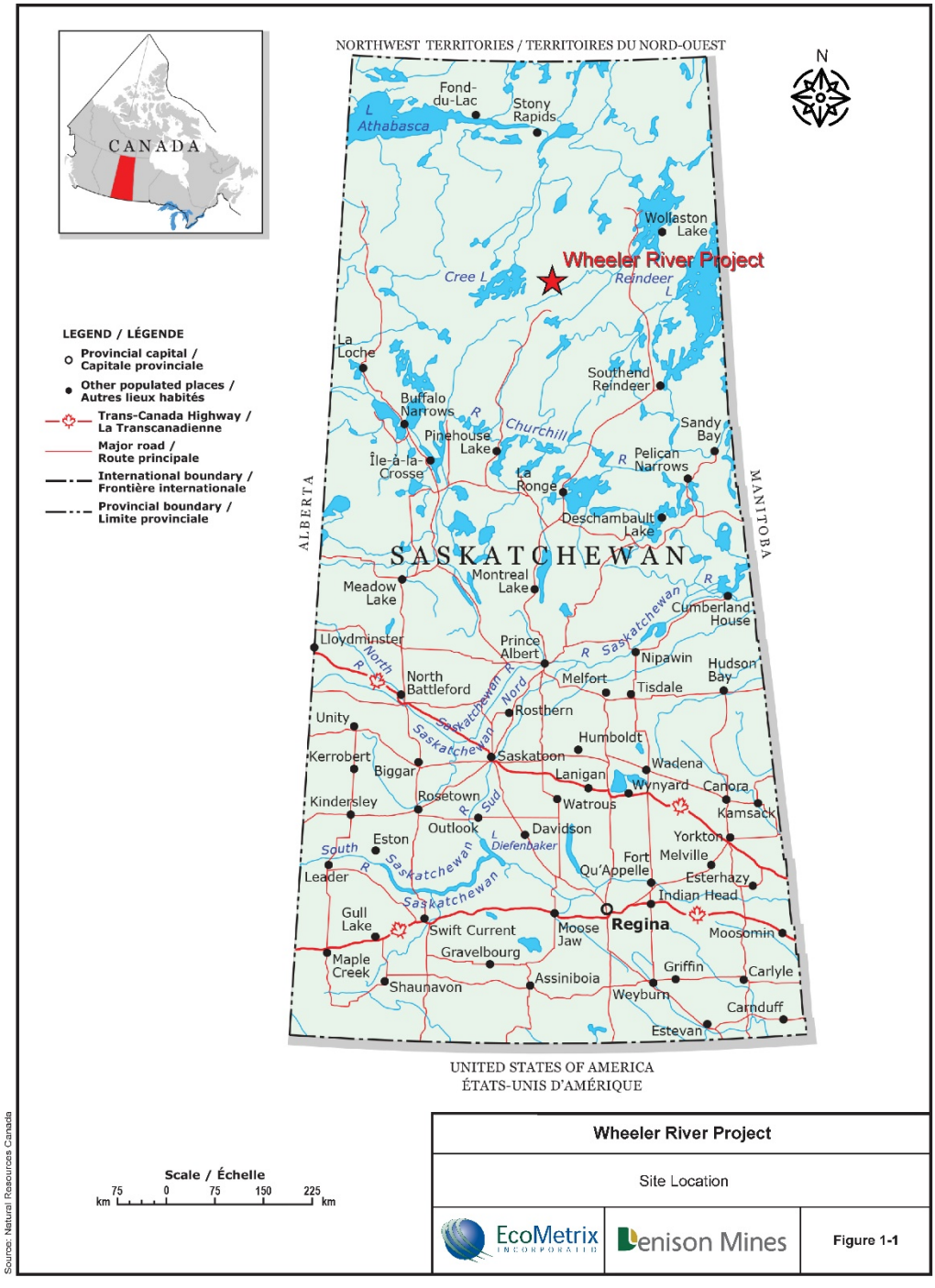



**Figure 1-1: Location of the Wheeler River Project Site in north central Saskatchewan**

## 1.2 Climate and Weather

Regional climatic characteristics are a function of various conditions, such as proximity to large bodies of water, altitude, and latitude. The Project site is in the subarctic climate zone that extends across mid and high latitude areas across the entirety of the country excluding coastal areas in the west. The subarctic climate zone is characterized by long, usually cold winters, and short, cool to mild summers. Precipitation in subarctic climates is typically low on an annual basis and precipitation occurs mostly in the warmer months in areas not influenced by coastal climate effects.

On a more local scale, climate conditions, such as temperature, precipitation, evaporation and other processes play a crucial role in the hydrological cycle. Historical climate data collected by Environment Canada and Climate Change (ECCC) weather stations near Key Lake are appropriate to characterize general climate and weather conditions for the Project site. There are three weather stations in the vicinity of Key Lake, though climate norm data were only available for Climate Station 4063755, and therefore data for this station were used to represent the Project site[1]. Data from Station 4063755 were not available subsequent to September 2018. Climate data collected at Station 4063753, situated approximately 1 km from Station 4063755, was used to represent the 2019 climate data for the Project site. Daily average monthly air temperatures are shown below in **Table 1-1**. On average, January is the coldest month and six months have average daily temperatures below 0°C. July is the warmest month with an average daily temperature of 16.3°C. The annual average daily temperature for the Key Lake Station is -2.3°C.

**Table 1-1: Temperature norms (daily average per month, °C) reported for the Key Lake Weather Station**

| Jan | Feb | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -22.3 | -18.7 | -11.7 | -1.9 | 6.5 | 13.3 | 16.3 | 14.7 | 8.0 | 0.0 | -11.8 | -19.5 | -2.3 |

Precipitation is the primary input of surface water and as such, it provides important context for observed flow characteristics. **Figure 1-2** presents the precipitation record for the period 2011 through 2019, as well as historical averages for comparison. The data are presented on the basis of hydrological years that run from October 1 of one year to September 30 of the following year.

Total annual precipitation for the period 2011 through 2019 was on average 473 mm, similar to the total annual average precipitation reported for the period 1981 through 2010

[1] http://climate.weather.gc.ca/historical_data/search_historic_data_e.html

(483 mm). On average, precipitation is the greatest through the warmer months of the year (June, July, August) and relatively low during winter months extending into early spring.

Yearly observations for the period of 2011 through 2019 are provided below in **Section 1.3**, along with observations of local hydrology, as the precipitations significantly impact discharge in the monitoring station.

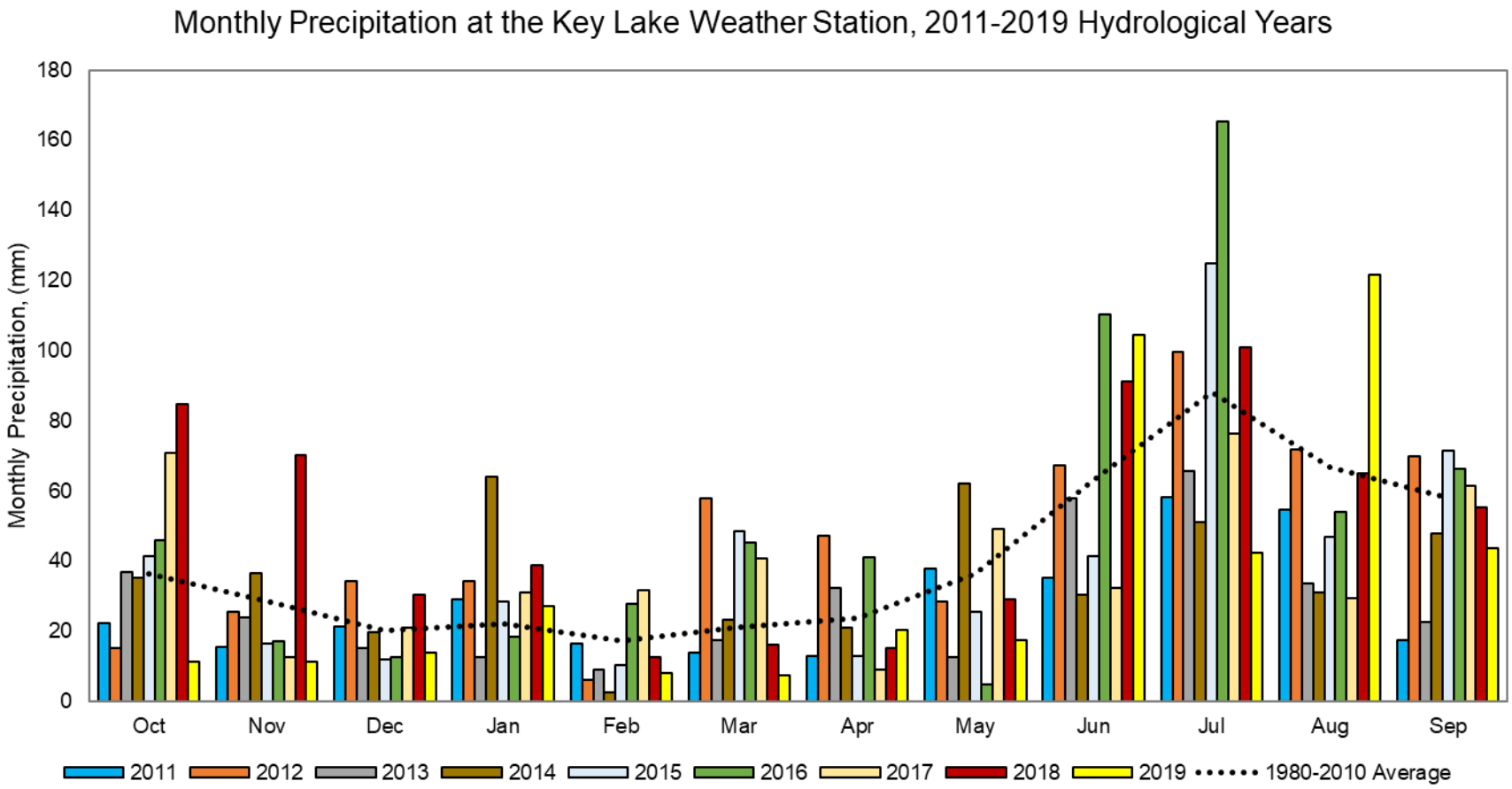



**Figure 1-2: Key Lake Monthly Precipitation for Hydrological Years between 2011-2019 (ECCC, 2019).**

## 1.3 Regional Hydrology

The Project site lies within the Wheeler River watershed, which is part of the Churchill River Basin. The Water Survey of Canada operates a hydrometric station on the Wheeler River downstream of Russell Lake (Station 06DA005). The station is located about 25 km east of the Project site and records flows from a contributing drainage area of 3,030 square kilometres ($km^2$). The hydrometric station has been in operation from 1973 to the present. Both real time and historical discharge and water level data are available in five minutes intervals. Although the drainage area of the hydrometric station is much larger than the drainage areas that are associated with surface water features on and around the Project site, as well as the Project site as a whole, the flow data collected at the station are relevant at the Project site level. The surface water features on the Project site are tributaries of the Wheeler River and land use on the Project site is characteristic of land use within the larger geographical area.

The mean monthly discharge rates at the Wheeler River for the period 2011 through 2019 are presented in **Figure 1-3**. Data corresponding to the period 1981 through 2010 are also presented in **Figure 1-3** for comparison. The data are presented on the basis of hydrological years that run from October 1 of one year to September 30 of the following year. It is noted that only provisional data are available for 2018 and 2019.

The annual average monthly discharge for the period 2011 through 2019 is on the order of 15 $m^3/s$, about 8% lower than the period 1981 through 2010. Average monthly flows for the period 2011 through 2019 ranged from 11.9 $m^3/s$ in March to 19.6 $m^3/s$ in June. The seasonal hydrograph for the river is represented by relatively low flows through the fall and winter, freshet-dominated flows that appear in May, peak in June and wane in July.

Yearly observations for period 2011 through 2019 are provided below, along with observations of annual precipitations:

- During the 2011 hydrological year (Oct 2010 to Sep 2011), the discharge at the Wheeler River monitoring station was slightly below the historical average throughout the winter (October–March) and remained well below average during the spring freshet (May and June), as well as the remainder of the summer and early fall. During this time, flows ranged from 58 percent (%) (September) to 82% (April) of the 1973-2009 normal. This observation may be in response to the low precipitation, as the precipitation during the 2011 hydrological year was less than average during most months, except January, May, and July. The low precipitation throughout most of the winter may have contributed to a smaller snowpack and a reduced spring freshet. Low summer and early fall precipitation may have also contributed to lower than normal flows during these periods.

- Precipitation during the 2012 hydrological year (Oct 2011 to Sep 2012) fluctuated around the 1981-2010 historical average, except in October and February when it

was less than 50% of historical average, and in March and April when the precipitation was higher than twice the historical average. The discharge in the first half of the hydrological year did not correspond to the precipitation

- Precipitation during the 2013 hydrological year (Oct 2012-Sep 2013) was generally below the 1981-2010 historical average, except in April. This precipitation pattern contributed to a lower flow in the study area throughout the hydrological year of 2013, except between Oct to Dec 2012. The additional precipitation that was seen in April did not translate into higher river flows.

- During the late fall and winter of the 2014 hydrological year (Oct 2013-Mar 2014), the discharge at the Wheeler River monitoring station was well below normal. This did not correspond to the precipitation level, as the cumulative precipitation during this period of time was slightly higher than 1981-2010 historical normal, and in January 2014, snow fall was more than two times normal. Flows in the spring (April-May 2014) increased to almost the historical normal discharge, which may be a result from the May precipitation, which was 1.5 times compared to the historical average. It was a dry summer and early fall in the 2014 hydrological year; in contrast, the discharge in June and July 2014 surpassed the historical average, while it fell below average in the following two months.

- During the 2015 hydrological year, discharge was consistently less than the historical average. Peak discharge in May was 15.4 $m^3/s$, 30% below the historical average. Flows remained more than 30% below average during June to September. This flow pattern may be because the precipitation was near or below historical average in most months of this hydrological year. The snowfall in March exceeded the historical average by 130%, which may be the reason for increased discharge in April, despite low precipitation in that month. In July and September 2015, the precipitation was 40% and 23% above historical average, respectively; however, no increase in discharge was observed.

- Precipitation in the 2016 hydrological year (Oct 2015-Sep 2016) fluctuated around the 1981-2010 historical average from October to March, with the cumulative precipitation 15% above the historical average. In response, the late fall 2015 to winter 2016 discharge was below historical level, and the freshet-dominant flow in May 2016 increased to near the historical level, despite the precipitation was only 13% of the historical normal. Heavy rainfalls were observed at the monitoring station in June and July 2016, which could have been the reason for increased discharge from June to September to near or above the historical average.

- During the first quarter of 2017 hydrological year, the flow was above the 1981-2010 historical average, likely in response to the high amount of precipitation in the summer of 2016 and the above-historical-average rainfall in early fall 2016. The precipitation was all higher than average in the next quarter. However, the discharge

data were not available from the hydrometric station in this period of time. From May to September, the monthly discharge rates in Wheeler River were all slightly above the historical average, despite the precipitation in the summer was lower than the historical average.

- During the first six months of the 2018 hydrological year, discharge in the Wheeler River was slightly above the historical average level, possibly corresponds to the high precipitation in the first quarter 2018 (50% above the historical average). From April through June, the discharge rate was similar to the historical average level, and slightly above average between July and September.

- During the 2019 hydrological year, despite the low precipitation in the first six months, the Wheeler River discharge was slightly above the historical average. The river discharge slowly decreased during the winter months, similar to the temporal trend in previous years. The discharge started to increase in May during the spring freshet and reached a peak of 24.9 $m^3/s$ in September. The increased discharge over the summer and early fall corresponded to the high precipitation in June and August, which was more than 1.5 and 2 times, respectively, compared to the historical average.

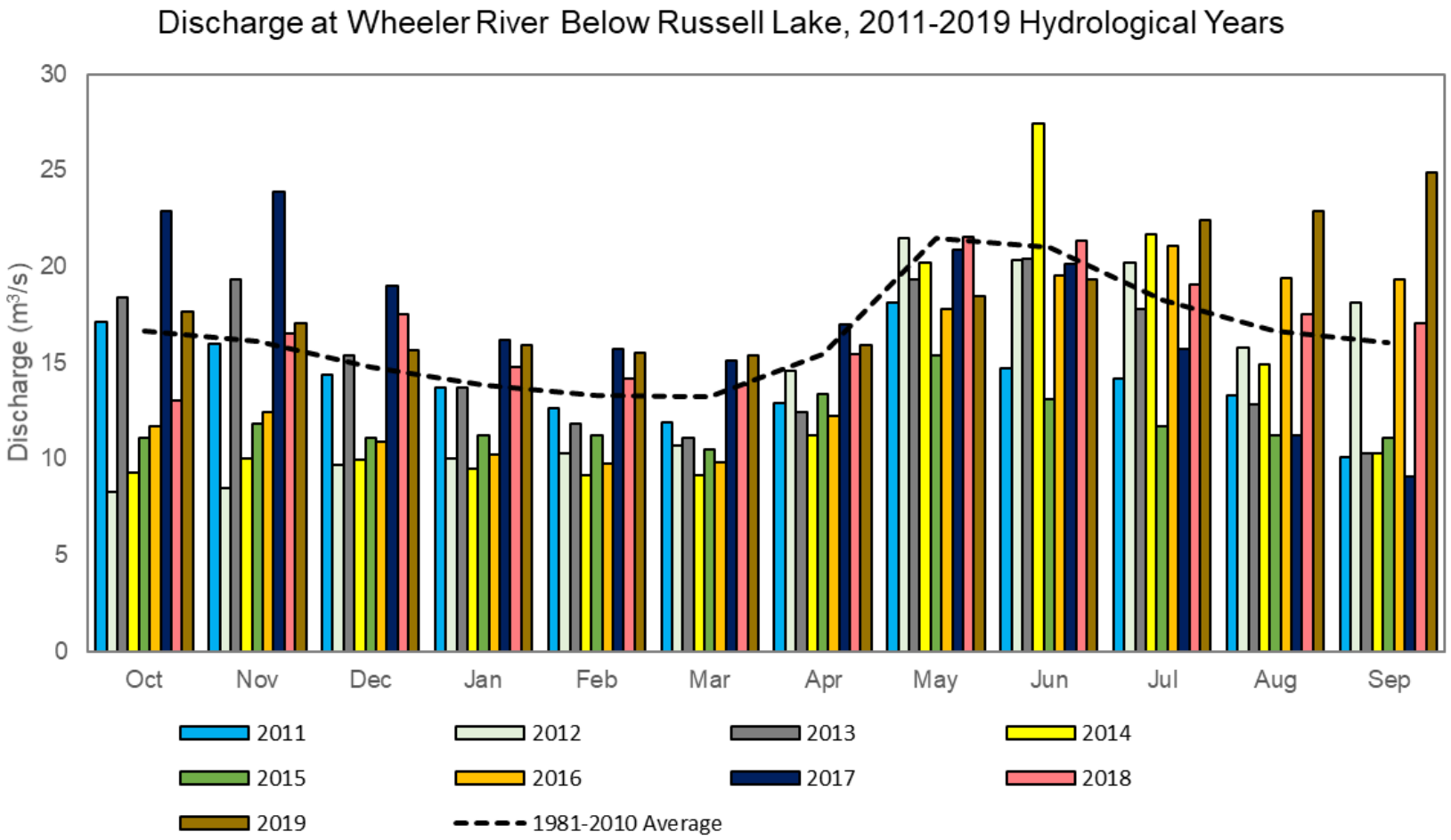



**Figure 1-3: Wheeler River mean monthly discharge for the hydrological years between 2011 and 2019. (WSC 2019a, b).**

## 1.4 Local Hydrology

As indicated above, the Project site lies within the Wheeler River watershed. Surface water from the Project area is drained by two sub-basins of the Wheeler River, the Icelander River drainage and the Williams Lake drainage (**Figure 1-4**). Both drainages flow generally south into the northwest portion of Russell Lake. The estimated drainage areas of the Icelander River drainage and the Williams Lake drainage are 371 $km^2$ and 78 $km^2$, respectively (**Appendix D**). Downstream of Russell Lake, the Wheeler River flows into the Geikie River which subsequently discharges to Wollaston Lake.

Hydrological information has been collected at the site by Denison since 2011. Details associated with the hydrological baseline program are described in **Section 3.0**.

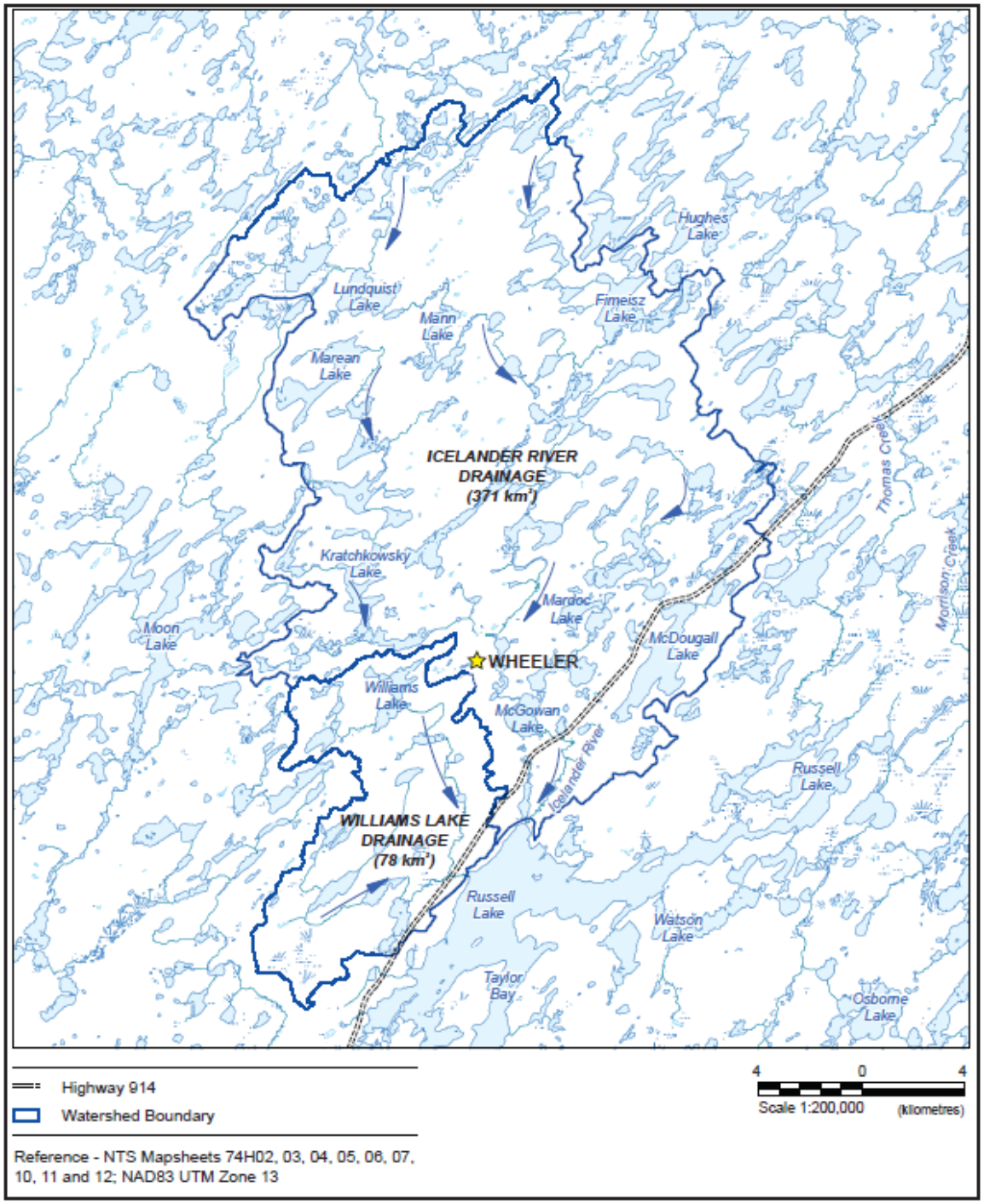



**Figure 1-4: Overview of the local drainage areas, Wheeler River Project.**

# 2.0 SCOPE OF THE HYDROLOGY BASELINE PROGRAM

Hydrology monitoring surveys were undertaken at the Project site between 2011 and 2014. The report associated with these efforts is provided as **Appendix D** of this current report (Golder, 2014). The data associated with the hydrological surveys completed at that time have been integrated with the data collected by EcoMetrix between 2016 and 2019 to provide a characterization of existing hydrologic conditions on the Project site over the entire period of record.

The Hydrology survey that was completed between 2016 and 2019 is described below. Other aquatic work completed between 2016 and 2019, including bathymetry, aquatic habitat characterization, stream morphology identification, etc., is provided in EcoMetrix (2020). The scope of the 2016 to 2019 hydrology program included: the measurement of water level elevations at thirteen lakes and two ponds within the study area; the collection of manual streamflow measurements at seventeen watercourses to validate existing rating curves or to establish rating curves for new monitoring locations; and, the installation of continuous streamflow monitoring equipment at eight stream locations and two lake locations in 2018. Four field programs were completed from fall 2016 to summer 2018 to capture seasonal flow conditions in spring, summer and fall. One additional winter field program was completed between March 15 and 19, 2018, to assess ice cover in the area and to gain a better understanding of winter baseflow conditions.

All monitoring activities that have been completed to date for which results are presented in this baseline study report are presented in **Table 2-1.** Corresponding monitoring locations in both streams and lakes are shown in **Figure 2-1**.

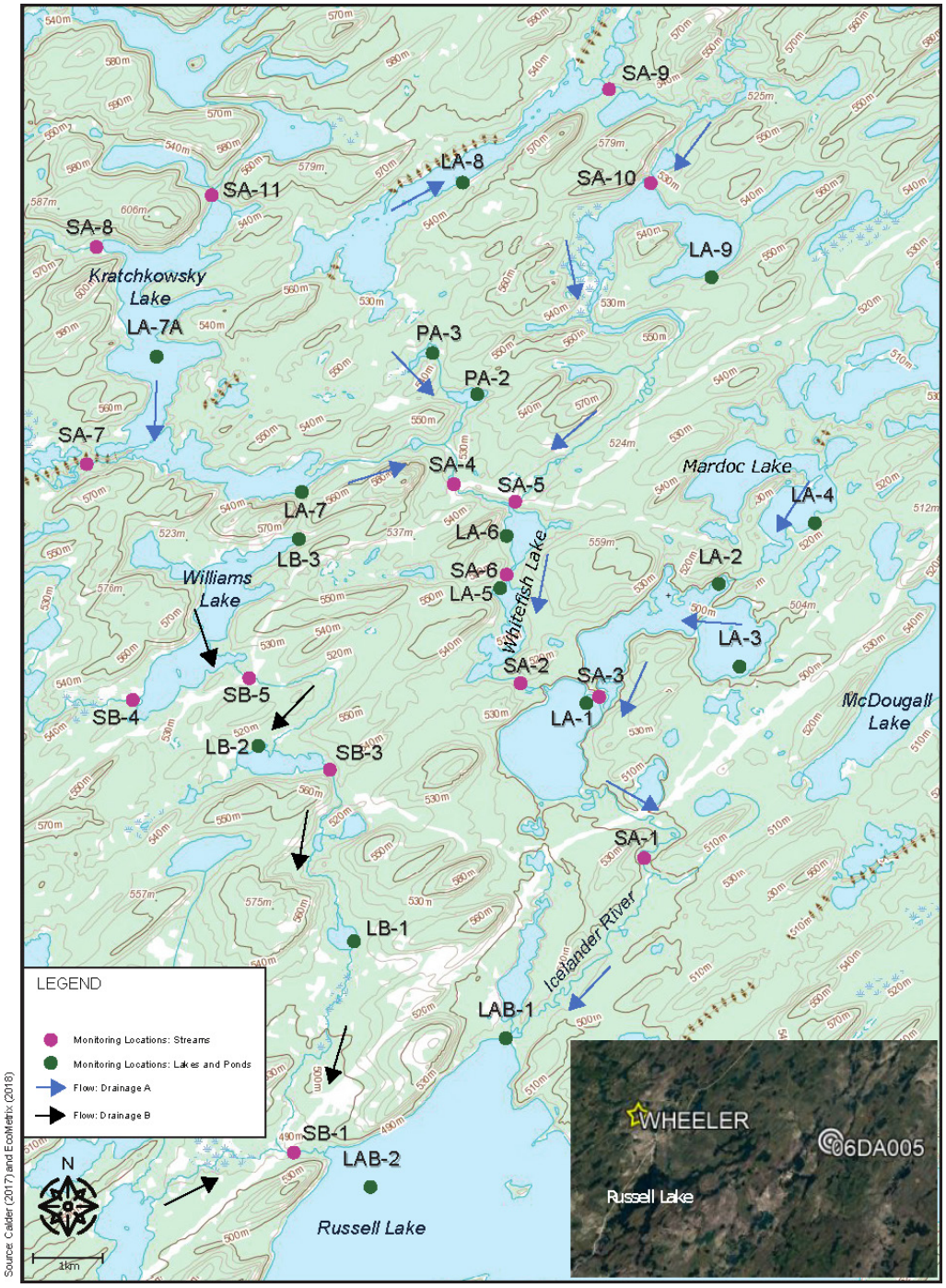



**Figure 2-1: Hydrometric Monitoring Locations at Wheeler River Drainage.** The location of the WSC hydrometric station 06DA005 downstream of Russell Lake is shown in the inset. Note: LA-5 and LA-6 are recognized as one waterbody (Whitefish Lake) by a local resident.

**Table 2-1: Hydrology monitoring stations and monitoring activities**

| Station Name | Location (UTM NAD 83) | Instantaneous Discharge Measurements | Continuous Water Level Recording | Staff Gauge | Elevation Survey |
|---|---|---|---|---|---|
| **Lake Level Monitoring Sites** | | | | | |
| McGowan Lake (LA-1) | 13 V 479399 6373215 | - | -2019 | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016, 2018, 2019 |
| LA-2 | 13 V 480852 6375164 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016 |
| LA-3 | 13 V 481477 6373989 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016 |
| Mardoc Lake (LA-4) | 13 V 481989 6376180 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016 |
| Whitefish Lake (LA-5) | 13 V 477830 6374521 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016 |
| Whitefish Lake (LA-6) | 13 V 477763 6375274 | - | | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016, 2018, 2019 |
| Kratchkowsky Lake (LA-7) | 13 V 474851 6375402 | - | 2012, 2013 | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016, 2017 |
| LA-8 | 13 V 476253 6379929 | | - | - | 2016, 2017 |
| LA-9 | 13 V 479732 6379231 | | - | - | 2016, 2017 |
| PA-2 | 13 V 477082 6377227 | | - | - | 2016 |
| PA-3 | 13 V 476460 6377650 | | - | - | 2016 |
| LAB-1 | 13 V 478705 6368323 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016 |
| LB-1 | 13 V 476598 6369377 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2016 |
| LB-2 | 13 V 474882 6371871 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016 |
| Williams Lake (LB-3) | 13 V 474925 6374767 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014, 2016 |

| Station Name | Location (UTM NAD 83) | Instantaneous Discharge Measurements | Continuous Water Level Recording | Staff Gauge | Elevation Survey |
|---|---|---|---|---|---|
| **Stream Discharge Monitoring Sites** | | | | | |
| SA-1 | 13 V 480368 6371123 | 2011, 2012, 2013, 2014, 2016, 2017, 2018, 2019 | 2011, 2012, 2013, 2014, 2016, 2017, 2018, 2019 | - | 2011, 2012, 2013, 2014, 2016, 2017, 2018, 2019 |
| SA-2 | 13 V 478524 6373216 | 2011, 2012, 2013, 2014, 2016, 2019 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014, 2016, 2019 |
| SA-3 | 13 V 479415 6373234 | 2011, 2012, 2013, 2014, 2016, 2019 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014, 2016, 2019 |
| Kratchowsky Creek Outlet (RC-1) | 13 V 475468 6375987 | 2016, 2018, 2019 | - | | 2016, 2019 |
| SA-4 | 13V 476926 6375868 | 2011, 2012, 2013, 2014, 2016, 2017, 2018, 2019 | 2012, 2013, 2014, 2016, 2017, 2018, 2019 | - | 2011, 2012, 2013, 2014, 2016, 2017, 2018, 2019 |
| SA-5 | 13 V 477804 6375716 | 2011, 2012, 2013, 2014 | 2012, 2013, 2014, 2019 | - | 2011, 2012, 2013, 2014 |
| | 13 V 477822 6375737 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | | 2016, 2017, 2018, 2019 |
| SA-6 | 13 V 477861 6374749 | 2011, 2012, 2013, 2014 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| | 13 V 477863 6374742 | 2016, 2017, 2018, 2019 | 2016, 2017, 2018, 2019 | - | 2016, 2017, 2018, 2019 |
| SA-7 | Not recorded | 2016 | - | - | - |
| SA-8 | 13 V 471579 6378303 | 2016, 2017, 2018 | 2016, 2017, 2018, 2019 | - | 2016, 2017, 2018 |
| | 13V 471542 6378314 | 2019 | 2019 | - | 2019 |
| SA-9 | 13 V 478226 6381589 | 2016, 2017, 2019 | 2016, 2017, 2018, 2019 | - | 2016, 2017, 2019 |
| SA-10 | 13 V 479003 6380421 | 2016, 2017, 2019 | 2016, 2017, 2018, 2019 | - | 2016, 2017, 2019 |
| SA-11 | 13 V 473026 6379260 | 2016, 2017, 2019 | 2016, 2017, 2018, 2019 | - | 2016, 2017, 2018, 2019 |
| SB-1 | 13 V 476041 6366362 | 2011, 2012, 2013, 2014, 2016 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014, 2016 |
| SB-3 | 13 V 475866 6371655 | 2011, 2012, 2013, 2014, 2016 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014, 2016 |
| SB-4 | 13 V 472952 6372222 | 2011, 2012, 2013, 2014, 2016 | 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014, 2016 |
| SB-5 | 13 V 474615 6372695 | 2016 | - | - | 2016 |

## 2.1 2016 to 2019 Water Elevation Surveys

Water elevation surveys were undertaken between September 09 and 22, 2016; May 30 and June 1, 2017; March 15 and 18, 2018; June 29 and July 3, 2018, July 4 and 6, 2019 and August 28 and September 1, 2019. Where possible, water elevations at previously established stations were referenced to geodetic benchmarks established by Golder. A description of how the geodetic elevations and benchmarks were established is described in **Appendix D**.

New locations (Lake and pond stations: LA-8, LA-9, PA-2 and PA-3; Stream stations: SA-8, SA-9, SA-10, SA-11, and SB-5) were referenced to temporary benchmarks, each with an assumed elevation of 100 masl, and subsequently converted to geodetic elevations using new benchmarks established in May 2017. The survey results of the all benchmarks used for this project are presented in **Appendix A**.

## 2.2 2016 to 2019 Instantaneous Flow Measurements

Between 2016 and 2019, streamflow measurements were taken at seventeen locations within the study area using the mid-section method detailed in in **Appendix E** and **Appendix F**. The mid-section method involves measuring the channel area and water velocities of a stream at a cross section. The channel is divided into a number of vertical subsections, adequate to characterize the irregular geometry of the channel. The depth and average velocity are measured at each subsection and are applied to a sub-area whose width extends half way to the preceding and following observation points. The area of each subsection is determined by directly measuring width and depth. The average water velocity in each sub-section is estimated using the measured velocity at selected locations in the vertical. The total discharge within the stream is the sum of the individual subsection discharges.

## 2.3 2016 to 2019 Continuous Water Level Recording

Eight temporary streamflow monitoring stations (SA-1, SA-4, SA-5, SA-6, SA-8, SA-9, SA-10, and SA-11) were installed in the fall of 2016. The streamflow monitoring stations were established to obtain information on local watercourse flow characteristics. The location of each flow station is presented in **Table 2-1**.

The Solinst Level data logger instrumentation measures absolute pressure, and therefore compensation is required for atmospheric pressure fluctuations. Barometric pressure compensation is achieved using an additional device (e.g., Barologger) to measure barometric pressure. A barologger was installed and deployed adjacent the SA-4 station.

The data collected from the barologger were used to apply barometric pressure compensation to data collected from the Solinst Level data logger instrumentation.

Level data loggers were installed by Golder in 2013 and left in place at SA-1, SA-6, SB-1, and SB-4. In the fall of 2016, level data loggers were located and retrieved at SB-1 and SA-6; however, no level data loggers were not found at SB-4 and SA-1. The logger at SA-6 was redeployed at the same location, and the logger at SB-1 was redeployed at SA-1. As no instantaneous stream data was recorded between April 2014 to September 2016 to validate the continuous flow measurement, the level data logger data collected during this time period was not presented in this report.

Recorded data from the level data loggers deployed in the fall of 2016 at streams SA-1, SA-4, SA-5, SA-6, SA-8, SA-9, SA10, SA-11 and the site barologger at SA-4 were retrieved in the spring of 2017, and all level data loggers were re-deployed after data downloading. Data were downloaded again in the summer of 2018 and 2019. Most level data loggers were re-deployed, except the logger at SA-6, which was replaced in 2019 due to battery life, and the logger at SA-8 that was moved upstream to mitigate influence of backwater from the Kratchowsky Lake In July 2018, level data loggers were installed in McGowan Lake (LA-1) and Whitefish Lake (LA-6). In early October 2018, the level data logger was dislodged from McGowan Lake by ice, and hence was removed. The logger was re-installed to LA-1 in August 2019. The level data logger installed in LA-6 was not located during the 2019 survey.

Barometric compensation for the 2016 to 2019 field program was completed using the barologger at SA-4, with any gaps filled using transformed data from the Key Lake Climate Station (Climate ID = 4063757) at 57°15'23.000" N, 105°37'03.000" W. The Key Lake Climate Station has an hourly barometric pressure record. The data were linearly interpolated to 15-minute intervals to develop the barometric compensation for the level data logger data.

## 2.4 Rating Curve Development and Validation

Rating curves are used to transform results from level data loggers installed in water courses to discharge rates. Golder (2014) presented rating curves for the stream stations SA-1, SA-2, SA-3, SA-4, SA-5, SA-6, SB-1, SB-3, and SB-4, and the lake stations McGowan Lake (LA-1), LA-2, Whitefish Lake (LA-5, LA-6), Kratchkowsky Lake (LA-7) and LB-2. The manual flow measurements taken as part of the 2016 to 2019 field program were graphed along with Golder's measurements and rating curves were reviewed for suitability for use with the new installations. For lake stations, discharge at the outlet stream was used to correlate to the water elevation. In 2019, the monitored stream discharge was greater at a few locations within the Icelander River Drainage (**Appendix B**),

and therefore, rating curves were adjusted accordingly. Rating curves are presented for each hydrometric station within the Icelander River Drainage in **Appendix C**.

Based on the data, manual measurements at SA-1, SA-2, SA-3, SA-4, and SA-6 between 2011 and 2019 appear to fit within stage-discharge relationships, despite a few outliers (shown in **Appendix C**). In 2016, the SA-5 hydrometric station was installed upstream of the 2011-2014 monitoring location, with similar channel width and gradient. The rating curve for SA-5 was shifted upstream based on the five manual flow measurements taken between 2016 and 2019 (**Appendix C**).

Stage-discharge curves established by Golder (2014, **Appendix D**) were validated or adjusted incorporating the most recent monitoring data. The curves were used to process hydrographs to reflect discharge at stream stations within each open water season. As the emphasis of this report is on the long-term discharge of streams, all flow rates were averaged for each day of monitoring and presented in **Appendix C**.

For stream stations SA-8, SA-9, and SA-10, the manual flow measurements obtained to date were not sufficient to develop a reliable rating curve for conversion from level to flow, as more high/low extreme flow conditions needed to be captured to reduce uncertainty. For these flow stations, water elevation results are presented in **Appendix C**. A preliminary stage-discharge relationship was developed at SA-11.

## 2.5 2018 Measurement of Ice Thickness

Ice thickness in McGowan Lake (LA-1), Whitefish Lake (LA-6) and Kratchkowsky Lake (LA-7) was measured between March 15 and 18, 2018, at the deepest point of the lake. An ice auger was used to drill through the ice and thickness was measured using a measuring tape.

# 3.0 EXISTING HYDROLOGICAL CONDITIONS

A description of existing hydrological conditions at the Project site in consideration of all baseline data collected to date is provided below. For the stream monitoring stations this includes consideration of the stream monitoring locations, stream discharge data, the relationship of local (measured) to regional hydrology for select locations and the effects of ice on local stream flows. For lake monitoring locations, this includes lake elevations and ice cover.

## 3.1 Streams

### 3.1.1 Stream Monitoring Locations

The following presents a discussion of the physical features and monitoring characteristics observed at each site.

#### 3.1.1.1 Icelander River Drainage

**SA-1**

SA-1 is located close to the outlet of Icelander River drainage area at Russell Lake. It is the most downstream monitoring station in Icelander River drainage area with an estimated upstream area of approximately 371 $km^2$. The monitoring station is located at the transition between an upstream low gradient meandering channel section and a downstream higher gradient riffle channel section. The stream substrate is comprised of boulders, cobble, gravel, and sand, and is approximately 15 m wide at the cross-section. Although the banks are well defined and stable with shrubs and moss, the left bank has a notable floodplain vegetated with shrubs and black spruce. SA-1 has a good cross-section and monitoring station. The station is in a low gradient section immediately upstream of a high gradient section. SA-1 produces a good stage- discharge relationship and accurate hydrograph. The logger left by Golder in 2014 was not located in the 2016 site visit, and was presumed to be lost. The level data logger retrieved from SB-1 was installed in this station. A level data logger is currently in place at SA-1.

**SA-2**

Streamflow monitoring station SA-2 flows into the northwest end of McGowan Lake. The monitoring station at SA-2 is located several meters downstream of the transition between an upstream meandering channel and a downstream riffle section. The monitoring site has a cross-section width of approximately 11 m, and is relatively shallow with high velocity flow. The stream is generally steep with vertical banks and high velocities. The substrate of SA-2 is primarily composed of boulders and cobble, with well-defined and stable vertical banks vegetated with shrubs and trees. SA-2 produces a fair stage-discharge relationship as shown in **Appendix C**. The two outliers correspond to 2016 and July 2019 measurements that were taken in a different stream cross section. The rest of the

measurements fit well to the established stage-discharge relationship. No continuous flow monitoring has been conducted at SA-2 since 2014.

**SA-3**

Streamflow monitoring station SA-3 flows from LA-2 to McGowan Lake (LA-1). The entire stream length has a sandy and silty bottom with well-defined vertical banks vegetated with shrubs, willows and jack pine. The monitoring station is located near the middle of the stream length and has a cross-sectional width of approximately 11 m. SA-3 produces a good stage-discharge relationship and therefore relatively accurate hydrograph. Due to the proximity to LA-1, flow/water levels at this station are believed to be affected by the water level at the lake, especially during the high flow conditions in 2019. No logger was installed at this location in monitoring program since 2014.

**SA-4**

The stream discharge monitoring station SA-4 drains Kratchkowsky Lake, and is to the east of SA-5 and flows into the northwest end of LA-6. The monitoring site is located upstream of the existing temporary bridge and a fast flowing and narrow channel section. The channel has a cross-section width of approximately 6 m. The channel substrate is composed of large angular cobble and boulders. SA-4 produces a good stage-discharge relationship, and hence an accurate hydrograph. A level data logger and a barologger are currently in place at SA-4.

**SA-5**

Station SA-5 is to the east of SA-4 and flows into the northwest end of LA-6. The monitoring station originally established by Golder was located downstream of a small temporary bridge in a straight and relatively steep section of the stream. The new flow station established in 2016 by EcoMetrix is in a similar location slightly upstream of the Golder station. The substrate at the cross-section is primarily boulders and small cobble overlain sand. The stream has a width of approximately 8 m and has stable vertical organic banks vegetated with shrubs. The new continuous flow station was installed on a straight run downstream of the removed bridge crossing in 2016. The level data logger is still in place, and the level data have been retrieved annually to monitor continuous flow conditions. Manual stream measurements at SA-5 have yielded a reasonable stage-discharge relationship.

**SA-6**

Streamflow monitoring Station SA-6 is in the channel that drains from LA-6 and is upstream of LA-5. It is recognized by local resident as a narrow connecting LA-5 and LA-6 (the south and north basins of Whitefish Lake), rather than a stream. It is a wide sandy-bottomed stream with vertical banks. Flow in this stream is deep and slow. Although the right bank is well defined, high, and vegetated with trees, sand, and moss, the left bank is low lying with

muskeg, shrubs and black spruce. The continuous monitoring station was installed approximately halfway between LA-6 and LA-5 and is currently active. The cross-section has a width of approximately 14 m. Manual stream measurements at SA-6 have yielded a fair stage-discharge relationship. The level data logger was replaced in 2019 due to battery life.

**SA-7**

SA-7 is a narrow marshy stream that flows into Kratchkowsky Lake. The stream channel has vertical, undercut banks. Flow in the stream is slow and deep. The gradient at the location is low and it is within the backwater area associated with the lake inlet and therefore water elevations there are influenced by the lake. SA-7 was originally identified for continuous water level monitoring. However, considering the flow condition, no logger was installed at this location. Elevation benchmark was not established, and instantaneous flow was monitored only once in September 2016. This station was replaced by SA-11.

**SA-8**

Streamflow station SA-8 is located in an inlet channel at the northwestern end of Kratchkowsky Lake. It is a meandering, narrow sandy bottom stream with deep banks. Some areas of the bank are undercut. The continuous monitoring station was installed in a relatively straight, faster flowing section of the channel immediately upstream of the lake in September 2016. In 2019, it was noted that this station is subject to backwater effects owing to its proximity to the lake, and therefore the station was moved upstream (**Appendix F**). A rating curve has yet to be established for this station – more manual measurements that include high and low flow events are needed to establish a reliable elevation-discharge relationship.

**SA-9**

SA-9 was initially located at the outlet of LA-8 that is accessible by an existing ATV trail. The stream channel in this section is shallow and relatively narrow. The stream substrate is comprised mainly of sand, gravel, and cobble. The monitoring station was located in a pool upstream of the road crossing. Stream banks are shallow and the surrounding land is relatively flat. The area has recently been impacted by a forest fire, so this station is at greater risk of trees/debris falling into the channel and impacting existing flow characteristics. Although level data logger data has been available since September 2016, the stage and discharge data collected from this site are not yet sufficient to establish a reliable rating curve.

**SA-10**

SA-10 is located in a wide sandy bottom stream channel that flows into the northwest part of LA-9. The stream banks are vertical and the water is deep and slow-moving. The continuous monitoring station was located in a relatively straight section of the channel with

wadable depths in 2016, at the time of installation. More stage and discharge data are required to establish a reliable rating curve.

**SA-11**

SA-11 is located at the northern-most inlet to Kratchkowsky Lake, and serves as a replacement station for SA-7. The stream substrate is comprised primarily of gravel and cobbles. The stream channel here is braided, though the monitoring station was located in an unbraided section immediately upstream of the lake. A level data logger was installed in September 2016, and is still recording continuous water level data. A preliminary stage and discharge relationship was developed in 2019 (**Appendix E**).

**RC-1**

Stream station RC-1 is situated immediately downstream of Kratchkowsky Lake. The stream banks were stable and the channel was meandering. The canopy was mostly dense with some partly open areas. Instream cover was diverse, afforded by boulders, deep pools, aquatic macrophytes, logs and trees, and undercut banks. Substrates were comprised of cobble, boulder, gravel and sand. Aquatic vegetation included sedges and burreed. Slight algae growth and sediment were observed overlying the substrate. This station encompasses the stream reach in the vicinity of the proposed mine road crossing. Discharge measurements have been recorded, but no level data logger has been installed at this location.

#### 3.1.1.2 Williams Lake Drainage

**SB-1**

SB-1 is located close to the outlet of the Williams Lake drainage at Russell Lake. The monitoring station is located immediately upstream of the culverts at the McArthur River haul road. The stream in this area is marshy with a thick organic base. The stream bottom in the immediate vicinity of the monitoring station has been altered as result of the road crossing and consists sand, gravel and boulders. Signs of beaver activity were observed both upstream and downstream of the monitoring location during work completed in 2016-2018. The rating curve associated with SB-1 shows a relatively weak stage-discharge relationship, likely the result of stream morphology at this location. The level data logger installed in 2014 was retrieved from this location in 2016, and no continuous flow monitoring has been conducted since then.

**SB-3**

SB-3 is located in the outlet channel of LB-2. The stream substrate is comprised of organics, sand, cobbles and boulders. The banks are nearly vertical with moss and shrubs, and the width is approximately 3 m. Manual stream measurements at SB-3 have yielded a

good stage-discharge relationship. Continuous flow monitoring was conducted between 2011 and 2014.

**SB-4**

SB-4 is located in an inlet channel of Williams Lake. The stream banks are shallow and poorly defined. The bottom of the stream consists of large angular cobbles and boulders. At the Golder continuous flow station, the width of the stream was approximately 5 m. Manual stream measurements at SB-4 have yielded a fair stage-discharge relationship and hydrograph between 2012 and 2014, according to Golder (2014). It is to EcoMetrix' understanding that continuous monitoring equipment was left at this location; however, the logger was not found and was assumed to be lost. No level data logger was installed at SB-4 since 2016.

**SB-5**

SB-5 is located at the outlet of Williams Lake. The stream substrate is composed of sand, gravel and cobbles. Gauging was conducted in a relatively straight section of the channel downstream of the camp road crossing and upstream of a low gradient pool and braid. SB-5 is accessible by road. No level data logger was installed at SB-5.

### 3.1.2 Stream Stage and Discharge

Stage and discharge measurements made between 2016 and 2019 were compiled in combination with results from 2011-2014 as appropriate and are presented in **Appendix B**. Detailed information associated with the monitoring completed between 2016 and 2019 that was largely focused in the Icelander River drainage, including station maps, updated flow and elevation measurements and rating curves (if established or updated), continuous flow measurements (if applicable); and, photographic records are provided in **Appendix C**.

The average monthly discharge from stream stations during the open water season in 2011, 2012, 2013, 2017, 2018 and 2019 are presented in **Figure 3-1**. It is apparent from the graph that the intra-annual flow pattern at each stream station is consistent with the flow pattern at the Wheeler River station. Stream discharge is highest during the freshet, with flows decreasing throughout the summer and into the fall and winter baseflow periods. Comments concerning flows measured in each monitoring year are provided below.

In 2011, the highest observed flows were in the spring during level data logger installation by Golder (2014). The spring peak flow rate was likely not captured at any site. The flow receded throughout May and June. At all sites a secondary peak was observed during July and early August, which corresponds to relatively high rainfall, although the monthly mean discharges were still lower than May. Flows receded again until September and remained static for the balance of the monitoring season.

The stream flows were considerably higher in 2012 monitoring season than those observed in 2011, especially in Stream SA-1. The spring peak discharge rate, which occurred shortly after the first discharge measurement, was approximately captured at all sites. Discharge peaked in mid-May, and remained high till August, responsive to the increasing precipitation in June and July. At SA-1, peak flow in July exceeded the spring peak flow rate. At most sites, flow rates reached seasonal lows in late August before rising again during September and October, and stayed at the level lower than the discharges measured in spring.

In 2013, discharge peaked in late June instead of May in earlier years, and steadily receded after the peak, until moderate runoff responses occurred in late August and early September. Flows receded to seasonal lows in late September and remain static till end of the open water season.

Although level data logger data was retrieved from SB-1 and SA-6 in 2014 and 2015, no instantaneous flow data were available during this time period to validate the logger data. Therefore, no hydrograph or monthly mean flow data are presented between winter 2014 to fall 2016.

In fall 2016, the discharge level exceeded previously reported spring peak in most streams, possibly in response to the high precipitation in summer and fall 2016, which exceeded the precipitation level during the spring.

In 2017, spring peaks occurred in mid-May, and they were approximately captured. At most sites, flows receded in the summer and reach the seasonal low in Mid-September. In late October, flows have recovered to almost the similar level as measured in the spring, likely due to the precipitation level that was higher than normal.

In 2018, spring peak flows occurred in Mid-May, and the discharge at most stations remained relatively high till early July, when discharge decreased at most of the stations, and increased again in mid- to late July. Discharge level at most stations receded in August till end of the open water season, corresponding to lower precipitation during these months.

To date, the level data logger data were collected till the end of August, 2019. There was no apparent spring peak, likely because of the low precipitation over the winter. Flow receded slightly in Late May and early June, and increased to its seasonal high flow in late June to early July, likely corresponds to high precipitation in late June.

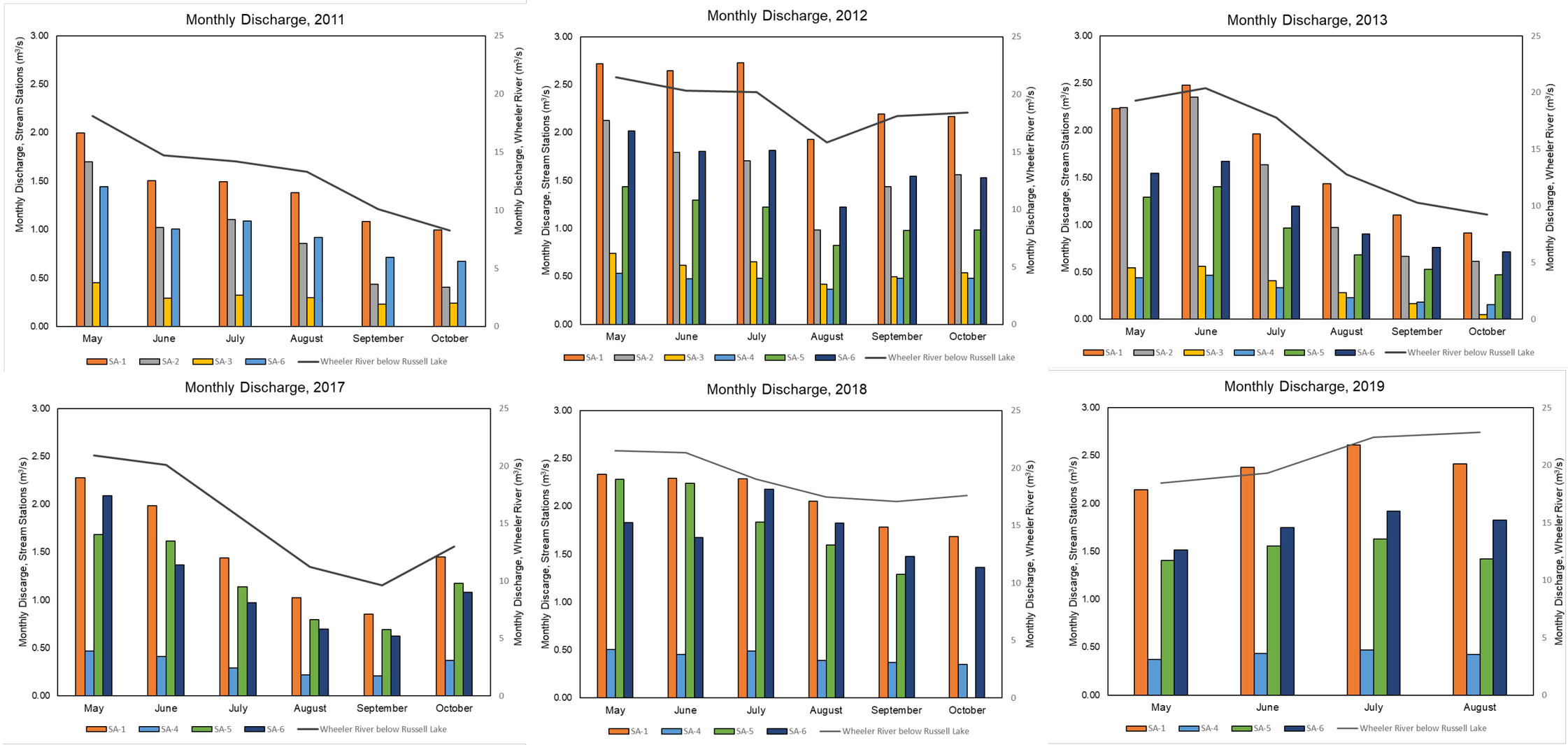



**Figure 3-1: Monthly mean discharge at stream stations in the Wheeler River drainage area where level data logger was installed. A Canada Hydrometric Station is installed at Wheeler River downstream of Russell Lake (06DA005). Note: 1) Early ice-up was observed in SA-5 in October 2018, and therefore, the discharge in SA-5 was not plotted for this month; 2) Continuous discharge monitoring was updated to the last field trip in August 28-September 1, 2019.**

### 3.1.3 Relationship to Regional Hydrology

Although the drainage area of the Water Survey of Canada (WSC, 2018a and 2018b) hydrometric station on the Wheeler River (3,030 km$^2$) is much larger than the drainage area associated with the site (371 km$^2$), these drainage areas are similar in terms of climate and geography. As shown in **Figure 3-1**, the flow patterns of at least a few stream stations are consistent with the flow pattern of the Wheeler River station at the WSC hydrometric station 06DA005. Therefore, a scaled relationship between flows at the WSC station 06DA005 and the project area could be established to project flows at the project area.

Golder (2014) provided examples of relationships between discharge for a subset of survey stations (SA-1, SB-3, SB-1) and WSC station 06DA005 using data measured between 2011 to 2013 (**Appendix D**). Such relationships can be developed for specific survey locations in the project area for the purpose of hindcasting and/or forecasting flows or developing site-specific flow statistics to support future project work, such as waste assimilative capacity assessments to support licensing. In this application, the flow data associated with WSC station 06DA005 and can be used to derive a watershed area adjusted low flow condition (7Q20) to assess the potential influence of mine site drainage on local receiving waters.

### 3.1.4 Effect of ice formation on discharge ratings

The formation of ice in stream channels affects stream flow and its measurement. Surface ice for example, changes streamflow from open-channel flow (i.e., flow having a free surface) to closed-conduit flow (i.e., flow not having a free surface). Under surface ice frictional resistance is increased because a water-ice interface replaces the water-air interface, hydraulic radius is decreased because of the additional wetted perimeter of the ice, and the cross-sectional area is decreased to a degree by the thickness of the ice (Rantz, 1982). As a result, the stream stage will therefore increase for a given discharge as the formation of surface ice causes a backwater effect. In these instances, an existing stage-discharge relationship that has been developed based on information collected in the ice-free season may not accurately represent winter flow conditions.

Rantz, (1982) describe three methods by which it is possible to compensate open-water discharge for ice effects. One such method is the discharge-ratio method whereby the open-water daily discharge is multiplied by a variable factor (K) to give the corrected discharge during periods of ice cover. The variable factor K, which varies from 0 to 1, is derived as the ratio of observed ice-covered discharge to the open-water rated discharge corresponding to the observed stage - K therefore varies with time and is a specific to each time a winter flow measurement is collected at each sampling location. The greater the ice cover the lower the K value. Golder (2014) calculated K for various stream survey locations in the project area in March 2014. These K values ranged from 0.3 to 0.8.

## 3.2 Lakes

### 3.2.1 Lake Elevation Measurements

The stages of McGowan Lake (LA-1), LA-2, LA-3, Mardoc Lake (LA-4), Whitefish Lake (LA-5 and LA-6), Kratchkowsky Lake (LA-7), LAB-1, LB-1, LB-2, and Williams Lake were measured during each site visit from 2011 to 2014, and in fall 2016. The compiled data are presented in **Appendix B, Table B-2**. In 2016, new survey stations were established at LA-8, LA-9, PA-2, and PA-3. The elevations of McGowan Lake and LA-6 were surveyed in 2018 and 2019. A summary of geodetic water level observed in all site visit are presented in **Table 3-1**. The difference between the minimum and maximum water levels were typically on the order of 0.4 m.

**Table 3-1: Lake Water Level Summary during open water conditions, 2011-2019**

| Station | Minimum Measured Water Level (masl) | Maximum Measured Water Level (masl) |
|---|---|---|
| McGowan Lake (LA-1) | 494.194 | 494.515 |
| LA-2 | 494.467 | 494.654 |
| LA-3 | 494.439 | 494.649 |
| Mardoc Lake (LA-4) | 498.507 | 498.649 |
| LA-5 | 499.949 | 500.076 |
| LA-6 | 499.943 | 500.118 |
| Kratchkowsky Lake (LA-7) | 520.424 | 520.536 |
| LA-8 | 520.8 | 520.86 |
| LA-9 | 514.25 | 514.28 |
| LB-1 | 503.66 | 504.079 |
| LB-2 | 510.392 | 510.573 |
| Williams Lake (LB-3) | 518.356 | 518.58 |
| LAB-1 | 487.994 | 488.382 |
| PA2 | 510.46 | 510.46 |
| PA3 | 510.36 | 510.36 |

Based on the Wheeler River Project Provincial Technical Proposal and Federal Project Description, the anticipated mine water discharge location is the north basin of Whitefish Lake (LA-6;Denison, 2019). LA-6 drains through SA-6 to LA-5 as the only outlet, and as indictive above the stream reach represented by SA-6 is considered as a lake narrowing connecting two basins of Whitefish Lake (LA-5 and LA-6) by a local resident. The elevation of SA-6 correlates well with LA-6 (**Appendix C**, **Appendix F**) and therefore, level data logger installed in SA-6 is sufficient to represent the continuous discharge from LA-6.

The stage-discharge relationship established by Golder (2014) for McGowan Lake was validated with data collected in 2016 to 2019 (**Appendix C**), where discharge in SA-1 was

measured to represent the discharge at McGowan Lake. This relationship can be used to calculate continuous discharge at LA-1 using the level data logger installed in August 2019.

### 3.2.2 Ice Thickness Measurements

Ice thickness has been measured at Project site lakes in March/April 2014 and again in March of 2018. This time of the year would generally be considered to be the period of maximum ice development, though year-to-year variability would be expected.

In 2014, ice thickness on study areas lakes was in the range of 0.70 m to 0.97 m with an average thickness of 0.83 m. Ice thickness values measured for McGowan Lake, LA-6, and Kratchkowsky Lake in March 2018 were 0.70, 0.71, and 0.70 m, respectively.

# 4.0 References

ATSM International (American Society for Testing and Materials). 2018. D3858: Standard Test Method for Open-Channel Flow Measurement of Water by Velocity-Area Method.

Denison Mines Corp. (Denison). 2019. Wheeler River Project – Provincial Technical Proposal and Federal Project Description.

ECCC (Environment and Climate Change Canada). 2019. Weather and Climate Historical Data. ECCC Website: http://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Ecological Stratification Working Group (ESWG). 1996. A National Ecological Framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resources Research, and Environment Canada, State of the Environment Directorate, Ecozone Analysis Branch, Ottawa/ Hull. Report and national map at 1:7 500 000 scale.

EcoMetrix Incorporated (EcoMetrix). 2019. Wheeler River Project – Baseline Aquatic Environment Study. Prepared for Denison Mines Corporation. May 2019.

Golder Associates Ltd. (Golder). 2014. Denison Mines-Wheeler River Project. 2012-2014 Aquatic Baseline Summary Report. Prepared for Denison Mines Corporation. May 2014.

Rantz, S.E. 1982. Measurement and Computation of Streamflow: Volume 2. Computation of Discharge. Geological Survey Water-Supply Paper 2175.

WSC (Water Survey of Canada). 2019a. Archived hydrometric data. Water Survey Branch, Environmental Canada and Climate Change. Website: https://wateroffice.ec.gc.ca/search/historical_e.html

WSC (Water Survey of Canada). 2019b. Real-time hydrometric data. Water Survey Branch, Environmental Canada and Climate Change. Website: https://wateroffice.ec.gc.ca/mainmenu/real_time_data_index_e.html

# Appendix A Ground Survey Results: Elevations of Benchmark at Each Monitoring Station

**Table A-1 Information about benchmarks at each hydrometric station for elevation survey**

| Benchmark | Type | Northing (m) | Easting (m) | Elevation (m) |
|---|---|---|---|---|
| LA-2 BM1 | Rebar | 6375172.712 | 480842.634 | 497.339 |
| LA-2 BM2 | Rebar | 6375174.795 | 480846.484 | 497.064 |
| LA-2 BM3 | Rebar | 6375171.611 | 480846.491 | 496.34 |
| LA-3 BM1 | Rock | 6373997.35 | 481487.807 | 496.134 |
| LA-3 BM2 | Rock | 6373994.256 | 481487.899 | 496.034 |
| LA-3 BM3 | Rock | 6373997.038 | 481478.058 | 494.831 |
| Mardoc Lake (LA-4) BM1 | Rebar | 6376186.639 | 481994.794 | 500.365 |
| Mardoc Lake (LA-4) BM2 | Rebar | 6376189.113 | 481991.522 | 500.252 |
| Mardoc Lake (LA-4) BM3 | Rebar | 6376187.971 | 481988.774 | 499.699 |
| LA-5 BM1 | Rebar | 6374540.225 | 477831.352 | 501.366 |
| LA-5 BM2 | Rebar | 6374541.11 | 477824.823 | 501.014 |
| LA-5 BM3 | Rebar | 6374538.032 | 477835.822 | 501.023 |
| LA-6 BM1 | Rebar | 6375257.733 | 477749.298 | 502.388 |
| LA-6 BM2 | Rebar | 6375254.317 | 477756.381 | 502.08 |
| Kratchowsky Lake (LA-7) BM1 | Rock | 6375365.152 | 474859.273 | 522.374 |
| Kratchowsky Lake (LA-7) BM2 | Rock | 6375370.136 | 474856.009 | 522.067 |
| Kratchowsky Lake (LA-7) BM3 | Rock | 6375373.196 | 474852.454 | 521.8 |
| LA-8 BM1 | Rock | 6379895.581 | 476250.738 | 523.991 |
| LA-9 BM1 | Rock | 6379225.363 | 479725.394 | 515.312 |
| PA-2 BM1 | Rock | 6377199.994 | 477105.453 | 511.303 |
| PA-3 BM1 | Rock | 6377659.01 | 476450.79 | 517.851 |
| LAB-1 BM1 | Rebar | 6368332.435 | 478695.192 | 489.243 |
| LAB-1 BM2 | Rebar | 6368331.85 | 478688.921 | 489.745 |
| LAB-1 BM3 | Rebar | 6368334.674 | 478697.583 | 489.597 |
| LB-1 BM1 | Rebar | 6369366.788 | 476603.997 | 505.231 |
| LB-1 BM2 | Rebar | 6369370.293 | 476602.209 | 505.04 |
| LB-1 BM3 | Rebar | 6369363.85 | 476597.929 | 505.073 |
| LB-2 BM1 | Rebar | 6371898.916 | 474903.385 | 511.767 |
| LB-2 BM2 | Rebar | 6371901.778 | 474906.357 | 511.819 |
| LB-2 BM3 | Rebar | 6371904.723 | 474900.057 | 511.806 |
| Williams Lake (LB-3) BM1 | Rebar | 6374839.646 | 474884.439 | 520.159 |
| Williams Lake (LB-3) BM2 | Rebar | 6374831.436 | 474893.291 | 519.42 |
| Williams Lake (LB-3) BM3 | Rebar | 6374834.862 | 474895.379 | 520.021 |
| SA-1 BM1 | Rebar | 6371129.601 | 480327.636 | 496.123 |
| SA-1 BM2 | Rock | 6371125.303 | 480328.743 | 495.576 |
| SA-1 BM3 | Rebar | 6371123.762 | 480357.257 | 494.361 |
| SA-2 BM1 | Rock | 6373258.113 | 478533.16 | 498.369 |
| SA-2 BM2 | Rock | 6373258.391 | 478529.59 | 498.354 |
| SA-3/LA-1 BM1 | Rebar | 6373226.219 | 479403.75 | 495.714 |

**Table A-1 Information about benchmarks at each hydrometric station for elevation survey**

| Benchmark | Type | Northing (m) | Easting (m) | Elevation (m) |
|---|---|---|---|---|
| SA-3/LA-1 BM2 | Rebar | 6373227.014 | 479408.484 | 495.55 |
| SA-3/LA-1 BM3 | Rebar | 6373222.211 | 479402.381 | 495.616 |
| SA-4 BM1 | Rebar | 6375855.114 | 476914.695 | 507.772 |
| SA-4 BM2 | Rock | 6375853.025 | 476915.57 | 508.373 |
| SA-5 BM1 | Rebar | 6375723.54 | 477791.074 | 502.58 |
| SA-5 BM2 | Rock | 6375739.656 | 477807.701 | 502.045 |
| SA-6 BM1 | Rebar | 6374757.968 | 477848.597 | 503.32 |
| SA-6 BM2 | Rebar | 6374752.648 | 477849.463 | 503.205 |
| SA-6 BM3 | Rebar | 6374746.296 | 477855.608 | 502.021 |
| SA-8 TBM1 | Nail | 471581 | 6378307 | 521.17 |
| SA-8 TBM2 | Nail | 471578 | 6378301 | 521.15 |
| SA-8 TBM3 | Nail | 471586 | 6378314 | 521.13 |
| SA-9 TBM1 | Nail | 478230 | 6381587 | 521.14 |
| SA-9 TBM2 | Nail | 478231 | 6381591 | 520.86 |
| SA-9 TBM3 | Rock | 478216 | 6381592 | 521.59 |
| SA-10 TBM1 | Nail | 478999 | 6380421 | 515.01 |
| SA-10 TBM2 | Nail | 479000 | 6380405 | 515.56 |
| SA-10 TBM3 | Nail | 478997 | 6380406 | 515.8 |
| SA-11 TBM1 | Nail | 473017 | 6379260 | 521.286 |
| SA-11 TBM2 | Rock | 473018 | 6379272 | 521.025 |
| SA-11 TBM3 | Nail | 473032 | 6379260 | 521.176 |
| SB-1 BM1 | Culvert | 6366351.011 | 476038.945 | 489.602 |
| SB-1 BM2 | Culvert | 6366355.284 | 476042.54 | 489.414 |
| SB-1 BM3 | Rock | 6366375.139 | 476028.439 | 489.217 |
| SB-3 BM1 | Rebar | 6371642.428 | 475847.211 | 511.473 |
| SB-3 BM2 | Rock | 6371638.405 | 475838.409 | 511.897 |
| SB-4 BM1 | Rock | 6372197.891 | 472953.818 | 520.307 |
| SB-4 BM2 | Rock | 6372197.46 | 472955.741 | 520.205 |
| SB-4 BM3 | Rock | 6372197.402 | 472957.726 | 520.305 |
| SB-5 BM1 | Nail | 6372738.116 | 474631.507 | 518.673 |

# Appendix B Stage and Discharge Measurement

**Table B-1: Stream Elevation and Instantaneous Discharge Measurements**

| Location | Date | Elevation (Masl) | Discharge ($m^3/s$) | Source |
|---|---|---|---|---|
| Icelander River (SA-1) | 14-May-11 | 492.714 | 2.307 | Golder (2014) |
| | 29-Jul-11 | 492.648 | 1.75 | |
| | 28-Oct-11 | 492.562 | 0.973 | |
| | 5-May-12 | 492.711 | 2.293 | |
| | 6-Aug-12 | 492.695 | 2.031 | |
| | 23-Oct-12 | 492.721 | 2.575 | |
| | 20-May-13 | 492.705 | 2.358 | |
| | 14-Aug-13 | 492.587 | 1.28 | |
| | 18-Oct-13 | 492.554 | 0.887 | |
| | 30-Mar-14 | 492.869 | 1.203 | |
| | 17-Sep-16 | 492.71 | 2.34 | Calder (2017) |
| | 31-May-17 | 492.72 | 2.43 | |
| | 2-Jul-19 | 494.043* | 2.41 | This report |
| | 5-Jul-19 | 492.744 | 3.06 | MWSI (2019) |
| | 30-Aug-19 | 492.733 | 2.78 | |
| SA-2 | 12-May-11 | 496.727 | 1.649 | Golder (2014) |
| | 30-Jul-11 | 496.698 | 1.387 | |
| | 27-Oct-11 | 496.667 | 0.809 | |
| | 8-May-12 | 496.748 | 2.008 | |
| | 8-Aug-12 | *496.689* | 1.305 | |
| | 24-Oct-12 | 496.734 | 2.03 | |
| | 21-May-13 | 496.727 | 1.842 | |
| | 14-Aug-13 | 496.66 | 0.863 | |
| | 16-Oct-13 | 496.641 | 0.741 | |
| | 24-Mar-14 | 496.805 | 1.18 | |
| | 16-Sep-16 | 496.46 | 2.24 | Calder (2017) |
| | 5-Jul-19 | 496.773 | 2.2095 | MWSI (2019) |
| | 30-Aug-19 | 496.748 | 1.9537 | |
| SA-3 | 13-May-11 | 494.459 | 0.476 | Golder (2014) |
| | 29-Jul-11 | 494.392 | 0.37 | |
| | 28-Oct-11 | 494.322 | 0.239 | |
| | 4-May-12 | 494.473 | 0.528 | |
| | 5-Aug-12 | 494.443 | 0.478 | |
| | 23-Oct-12 | 494.487 | 0.578 | |
| | 20-May-13 | 494.482 | 0.564 | |
| | 14-Aug-13 | 494.344 | 0.255 | |
| | 16-Oct-13 | 494.243 | 0.051 | |
| | 24-Mar-14 | 494.248 | 0.362 | |
| | 16-Sep-16 | 494.43 | 0.44 | Calder (2017) |
| | 5-Jul-19 | 494.541 | 0.6219 | MWSI (2019) |
| | 30-Aug-19 | 494.506 | 0.5474 | |

**Table B-1: Stream Elevation and Instantaneous Discharge Measurements**

| Location | Date | Elevation (Masl) | Discharge ($m^3/s$) | Source |
|---|---|---|---|---|
| SA-4 | 11-May-11 | 506.357 | 0.483 | Golder (2014) |
| | 30-Jul-11 | 506.314 | 0.335 | |
| | 31-Oct-11 | 506.31 | 0.199 | |
| | 4-May-12 | 506.348 | 0.466 | |
| | 5-Aug-12 | 506.329 | 0.361 | |
| | 22-Oct-12 | 506.367 | 0.497 | |
| | 19-May-13 | 506.369 | 0.519 | |
| | 13-Aug-13 | 506.277 | 0.276 | |
| | 17-Oct-13 | 506.249 | 0.206 | |
| | 23-Mar-14 | 506.381 | 0.33 | |
| | 10-Sep-16 | 506.35 | 0.49 | Calder (2017) |
| | 30-May-17 | 506.37 | 0.58 | |
| | 29-Jun-18 | 506.357 | 0.4845 | This report |
| | 4-Jul-19 | 506.387 | 0.6336 | MWSI (2019) |
| | 29-Aug-19 | 506.374 | 0.59 | |
| SA-5 | 12-May-11 | 500.708 | 1.1 | Golder (2014) |
| | 30-Jul-11 | 500.668 | 0.858 | |
| | 29-Oct-11 | 500.609 | 0.476 | |
| | 4-May-12 | 500.717 | 1.111 | |
| | 5-Aug-12 | 500.684 | 1.026 | |
| | 22-Oct-12 | 500.718 | 1.269 | |
| | 19-May-13 | 500.726 | 1.381 | |
| | 13-Aug-13 | 500.629 | 0.616 | |
| | 17-Oct-13 | 500.622 | 0.507 | |
| | 23-Mar-14 | 500.798 | 0.886 | |
| | 9-Sep-16 | 500.9 | 1.27 | Calder (2017) |
| | 21-Sep-16 | 500.91 | 1.58 | |
| | 30-May-17 | 500.92 | 1.95 | |
| | 30-Jun-18 | 500.89 | 1.6567 | This report |
| | 4-Jul-19 | 500.955 | 1.6137 | MWSI (2019) |
| | 29-Aug-19 | 500.927 | 1.3589 | |
| SA-6 | 13-May-11 | 500.084 | 1.631 | Golder (2014) |
| | 30-Jul-11 | 500.034 | 1.303 | |
| | 27-Oct-11 | 499.956 | 0.717 | |
| | 6-May-12 | 500.098 | 1.957 | |
| | 5-Aug-12 | 500.061 | 1.476 | |
| | 22-Oct-12 | 500.102 | 1.851 | |
| | 19-May-13 | 500.077 | 1.54 | |
| | 13-Aug-13 | 499.992 | 0.842 | |
| | 17-Oct-13 | 499.969 | 0.798 | |
| | 23-Mar-14 | 500.081 | 1.173 | |
| | 11-Sep-16 | 500.07 | 1.98 | Calder (2017) |
| | 31-May-17 | 500.08 | 1.77 | |
| | 30-Jun-18 | 500.125 | 1.56 | This report |
| | 4-Jul-19 | 500.125 | 2.27 | MWSI (2019) |
| | 29-Aug-19 | 500.11 | 2.02 | |
| SA-7 | 15-Sep-16 | No BM set | 0.04 | Calder (2017) |

**Table B-1: Stream Elevation and Instantaneous Discharge Measurements**

| Location | Date | Elevation (Masl) | Discharge ($m^3/s$) | Source |
|---|---|---|---|---|
| SA-8 | 15-Sep-16 | 520.6 | 0.01 | Calder (2017) |
| | 19-Sep-16 | 520.62 | 0.04 | |
| | 30-May-17 | 520.54 | 0.04 | |
| | 3-Jul-19 | 520.57 | 0.056 | This report |
| | 31-Aug-19 | 99.455** | 0.0443 | MWSI (2019) |
| SA-9 | 18-Sep-16 | 520.52 | 0.18 | Calder (2017) |
| | 1-Jun-17 | 520.49 | 0.16 | |
| | 31-Aug-19 | 520.55 | 0.1457 | MWSI (2019) |
| SA-10 | 18-Sep-16 | 514.35 | 1.55 | Calder (2017) |
| | 31-May-17 | 514.31 | 1.22 | |
| | 31-Aug-19 | 514.34 | 1.31 | MWSI (2019) |
| SA-11 | 19-Sep-16 | 520.73 | 0.42 | Calder (2017) |
| | 30-May-17 | 520.71 | 0.31 | |
| | 2-Jul-18 | 520.84 | Not Measured | This report |
| | 31-Aug-19 | 520.71 | 0.31 | MWSI (2019) |
| Kratchowsky Creek Outlet (RC-1) | 14-Sep-16 | 520.3 | 0.58 | Calder (2017) |
| | 15-Mar-18 | - | 0.2303 | This report |
| | 6-Jul-19 | - | 0.6041 | MWSI (2019) |
| | 1-Sep-19 | 520.56 | 0.5514 | |
| SB-1 | 14-May-11 | 488.486 | 0.517 | Golder (2014) |
| | 31-Jul-11 | 489.027 | 0.186 | |
| | 30-Oct-11 | 488.418 | 0.217 | |
| | 3-May-12 | 488.524 | 0.644 | |
| | 6-Aug-12 | 488.522 | 0.358 | |
| | 23-Oct-12 | 488.599 | 0.578 | |
| | 18-May-13 | 488.484 | 0.547 | |
| | 12-Aug-13 | 488.335 | 0.158 | |
| | 19-Oct-13 | 488.85 | 0.277 | |
| | 27-Mar-14 | 488.823 | 0.289 | |
| | 17-Sep-16 | 488.55 | 0.64 | Calder (2017) |
| SB-3 | 11-May-11 | 510.465 | 0.187 | Golder (2014) |
| | 31-Jul-11 | 510.406 | 0.109 | |
| | 30-Oct-11 | 510.389 | 0.082 | |
| | 5-May-12 | 510.506 | 0.235 | |
| | 8-Aug-12 | 510.456 | 0.136 | |
| | 21-Oct-12 | 510.517 | 0.255 | |
| | 20-May-13 | 510.476 | 0.209 | |
| | 14-Aug-13 | 510.421 | 0.107 | |
| | 17-Oct-13 | 510.414 | 0.08 | |
| | 25-Mar-14 | 510.423 | 0.09 | |
| | 11-Sep-16 | 510.47 | 0.2 | Calder (2017) |
| SB-4 | 15-May-11 | 519.134 | 0.074 | Golder (2014) |
| | 1-Aug-11 | 518.964 | 0.008 | |
| | 30-Oct-11 | 519.07 | 0.018 | |
| | 5-May-12 | 519.219 | 0.109 | |
| | 6-Aug-12 | 519.144 | 0.032 | |
| | 21-Oct-12 | 519.245 | 0.099 | |
| | 21-May-13 | 519.185 | 0.114 | |
| | 15-Aug-13 | 519.074 | 0.007 | |
| | 17-Oct-13 | 519.115 | 0.036 | |
| | 11-Sep-16 | 519.21 | 0.12 | Calder (2017) |
| SB-5 | 14-Sep-16 | 518.33 | 0.14 | |

* This may be an anomalous observation and therefore is not used in establishing stage-discharge curve.

** Referenced to local benchmark after moving measurement location.

Table B-2: Lake and Pond Surface Water Level Elevations

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (Masl) | Source |
|---|---|---|---|---|
| McGowan Lake (LA-1) | 13-May-11 | 98.725 | 494.439 | Golder (2014) |
| | 29-Jul-11 | 98.613 | 494.327 | |
| | 28-Oct-11 | 98.504 | 494.218 | |
| | 4-May-12 | 98.709 | 494.423 | |
| | 5-Aug-12 | 98.672 | 494.386 | |
| | 23-Oct-12 | 98.734 | 494.448 | |
| | 21-May-13 | 98.726 | 494.44 | |
| | 14-Aug-13 | 98.551 | 494.265 | |
| | 16-Oct-13 | 98.48 | 494.194 | |
| | 25-Mar-14 | 98.584 | 494.298 | |
| | 16-Sep-16 | | 494.39 | Calder (2017) |
| | 2-Jul-18 | 98.62 | 494.344 | This report |
| | 5-Jul-19 | | 494.515 | MWSI (2019) |
| | 30-Aug-19 | | 494.476 | |
| LA-2 | 13-May-11 | 97.269 | 494.615 | Golder (2014) |
| | 30-Jul-11 | 97.256 | 494.602 | |
| | 29-Oct-11 | 97.203 | 494.549 | |
| | 4-May-12 | 97.264 | 494.61 | |
| | 6-Aug-12 | 97.274 | 494.62 | |
| | 23-Oct-12 | 97.308 | 494.654 | |
| | 20-May-13 | 97.278 | 494.624 | |
| | 13-Aug-13 | 97.197 | 494.543 | |
| | 16-Oct-13 | 97.121 | 494.467 | |
| | 26-Mar-14 | 97.236 | 494.582 | |
| | 13-Sep-16 | | 494.58 | Calder (2017) |
| LA-3 | 13-May-11 | 98.427 | 494.561 | Golder (2014) |
| | 30-Jul-11 | 98.433 | 494.567 | |
| | 29-Oct-11 | 98.427 | 494.561 | |
| | 4-May-12 | 98.472 | 494.606 | |
| | 6-Aug-12 | 98.456 | 494.59 | |
| | 23-Oct-12 | 98.485 | 494.619 | |
| | 20-May-13 | 98.459 | 494.593 | |
| | 13-Aug-13 | 98.387 | 494.521 | |
| | 16-Oct-13 | 98.305 | 494.439 | |
| | 26-Mar-14 | 98.515 | 494.649 | |
| | 18-Sep-16 | | 494.57 | Calder (2017) |
| Mardoc Lake (LA-4) | 29-Jul-11 | 98.284 | 498.649 | Golder (2014) |
| | 30-Oct-11 | 98.152 | 498.517 | |
| | 4-May-12 | 98.223 | 498.588 | |
| | 5-Aug-12 | 98.248 | 498.613 | |
| | 6-Aug-12 | 98.257 | 498.622 | |
| | 23-Oct-12 | 98.262 | 498.627 | |
| | 20-May-13 | 98.259 | 498.624 | |
| | 13-Aug-13 | 98.164 | 498.529 | |
| | 16-Oct-13 | 98.142 | 498.507 | |
| | 27-Mar-14 | 98.249 | 498.614 | |
| | 13-Sep-16 | | 498.62 | Calder (2017) |

Table B-2: Lake and Pond Surface Water Level Elevations

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (Masl) | Source |
|---|---|---|---|---|
| Whitefish Lake, South Basin (LA-5) | 13-May-11 | 98.706 | 500.05 | Golder (2014) |
| | 31-Jul-11 | 98.67 | 500.014 | |
| | 27-Oct-11 | 98.605 | 499.949 | |
| | 6-May-12 | 98.73 | 500.074 | |
| | 5-Aug-12 | 98.693 | 500.037 | |
| | 22-Oct-12 | 98.728 | 500.072 | |
| | 21-May-13 | 98.729 | 500.073 | |
| | 13-Aug-13 | 98.625 | 499.969 | |
| | 17-Oct-13 | 98.606 | 499.95 | |
| | 23-Mar-14 | 98.732 | 500.076 | |
| | 12-Sep-16 | | 500.06 | Calder (2017) |
| Whitefish Lake, North Basin (LA-6) | 13-May-11 | 97.675 | 500.063 | Golder (2014) |
| | 31-Jul-11 | 97.64 | 500.028 | |
| | 27-Oct-11 | 97.555 | 499.943 | |
| | 6-May-12 | 97.7 | 500.088 | |
| | 5-Aug-12 | 97.67 | 500.058 | |
| | 22-Oct-12 | 97.704 | 500.092 | |
| | 19-May-13 | 97.7 | 500.088 | |
| | 13-Aug-13 | 97.585 | 499.973 | |
| | 17-Oct-13 | 97.559 | 499.947 | |
| | 23-Mar-14 | 97.67 | 500.058 | |
| | 12-Sep-16 | - | 500.07 | Calder (2017) |
| | 30-Jun-18 | 97.718 | 500.106 | This report |
| | 29-Aug-19 | - | 500.118 | MWSI (2019) |
| Kratchowsky Lake (LA-7) | 29-Jul-11 | 98.108 | 520.482 | Golder (2014) |
| | 31-Oct-11 | 98.05 | 520.424 | |
| | 6-May-12 | 98.149 | 520.523 | |
| | 8-Aug-12 | 98.108 | 520.482 | |
| | 21-Oct-12 | 98.162 | 520.536 | |
| | 24-May-13 | 98.157 | 520.531 | |
| | 13-Aug-13 | 98.083 | 520.457 | |
| | 16-Oct-13 | 98.066 | 520.44 | |
| | 27-Mar-14 | 98.128 | 520.502 | |
| | 12-Sep-16 | - | 520.53 | Calder (2017) |
| | 30-May-17 | - | 520.53 | |
| LA-8 | 20-Jan-00 | - | 520.86 | Calder (2017) |
| | 1-Jun-17 | - | 520.8 | |
| LA-9 | 13-Sep-16 | - | 514.25 | Calder (2017) |
| | 31-May-17 | - | 514.28 | |
| LAB-1 | 16-May-11 | 98.991 | 488.219 | Golder (2014) |
| | 1-Aug-11 | 98.891 | 488.119 | |
| | 30-Oct-11 | 98.776 | 488.004 | |
| | 9-May-12 | 99 | 488.228 | |
| | 6-Aug-12 | 98.939 | 488.167 | |
| | 23-Oct-12 | 98.987 | 488.215 | |
| | 21-May-13 | 99.005 | 488.233 | |
| | 12-Aug-13 | 98.879 | 488.107 | |
| | 19-Oct-13 | 98.766 | 487.994 | |
| | 25-Mar-14 | 99.154 | 488.382 | |
| | 22-Sep-16 | - | 488.26 | Calder (2017) |

Table B-2: Lake and Pond Surface Water Level Elevations

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (Masl) | Source |
|---|---|---|---|---|
| LB-1 | 14-May-11 | 98.666 | 503.902 | Golder (2014) |
| | 1-Aug-11 | 98.807 | 504.043 | |
| | 30-Oct-11 | 98.648 | 503.884 | |
| | 6-May-12 | 98.636 | 503.872 | |
| | 6-Aug-12 | 98.651 | 503.887 | |
| | 21-Oct-12 | 98.617 | 503.853 | |
| | 19-May-13 | 98.843 | 504.079 | |
| | 14-Aug-13 | 98.509 | 503.745 | |
| | 17-Oct-13 | 98.471 | 503.707 | |
| | 11-Sep-16 | | 503.66 | Calder (2017) |
| LB-2 | 14-May-11 | 98.767 | 510.523 | Golder (2014) |
| | 29-Jul-11 | 98.689 | 510.445 | |
| | 30-Oct-11 | 98.636 | 510.392 | |
| | 5-May-12 | 98.771 | 510.527 | |
| | 6-Aug-12 | 98.745 | 510.501 | |
| | 21-Oct-12 | 98.817 | 510.573 | |
| | 21-May-13 | 98.756 | 510.512 | |
| | 14-Aug-13 | 98.699 | 510.455 | |
| | 17-Oct-13 | 98.651 | 510.407 | |
| | 25-Mar-14 | 98.777 | 510.533 | |
| | 11-Sep-16 | - | 510.54 | Calder (2017) |
| Williams Lake (LB-3) | 15-May-11 | 98.365 | 518.519 | Golder (2014) |
| | 29-Jul-11 | 98.284 | 518.438 | |
| | 29-Oct-11 | 98.203 | 518.356 | |
| | 5-May-12 | 98.361 | 518.515 | |
| | 5-Aug-12 | 98.37 | 518.524 | |
| | 21-Oct-12 | 98.426 | 518.58 | |
| | 19-May-13 | 98.38 | 518.534 | |
| | 13-Aug-13 | 98.278 | 518.432 | |
| | 17-Oct-13 | 98.233 | 518.387 | |
| | 25-Mar-14 | 98.233 | 518.463 | |
| | 11-Sep-16 | - | 518.57 | Calder (2017) |
| PA-2 | 15-Sep-16 | - | 510.46 | Calder (2017) |
| PA-3 | 15-Sep-16 | - | 517.36 | Calder (2017) |

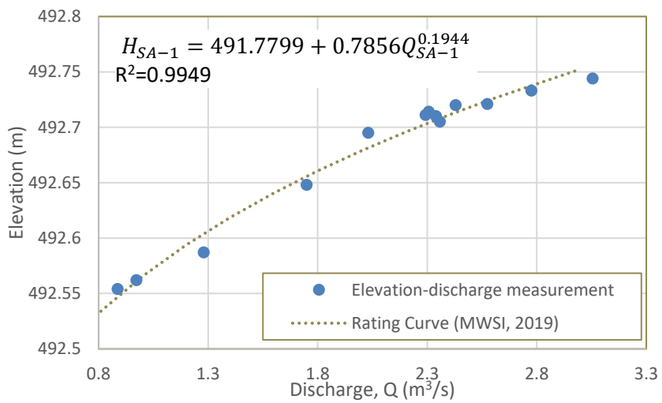
# Appendix C Summary of Hydrometric Monitoring Stations in the Icelander River Drainage Area

# Appendix C: Summary of Hydrometric Monitoring Stations in the Icelander River Drainage Area

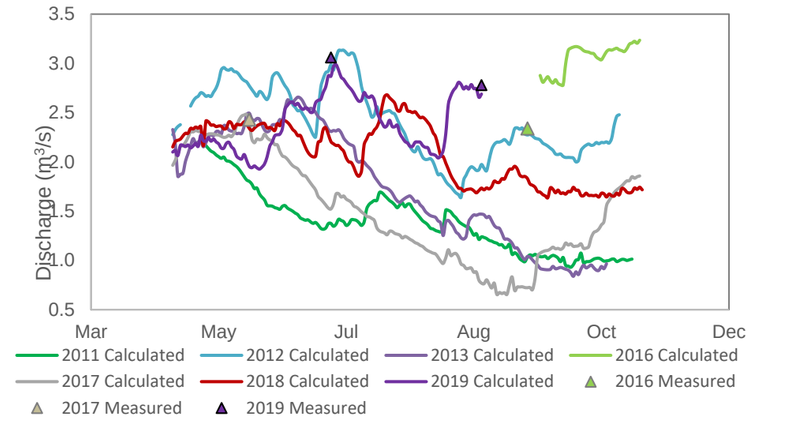
| | | | |
|---|---|---|---|
| **Station ID** | SA-1 | **Periods of continuous recording** | 2011-2014, 2016-2019 |
| **GPS Coordinates** | 13 V 480368 6371123 | **Instrument deployed** | Solinst levelogger, Serial number 1062051. |
| **Access** | By road | **Active measurement** | Continuous flow monitoring |
| **Periods of monitoring** | 2011-2014, 2016-2019 | **Comments** | SA-1 produces good stage and discharge relationship and accurate hydrograph. The stage-discharge relationship was modified in 2019 to fit new high discharge observed in 2019. |
| **Measurements** | Elevation, instantaneous discharge, continuous discharge | | |




**Map: SA-1 hydrometric monitoring station.**




**Stage – Discharge Curve**




**Continuous flow monitoring, 2011-14 and 2016-2019 open water season**



**SA-1 facing downstream, May 2017.**



**SA-1 facing upstream, July 2018.**

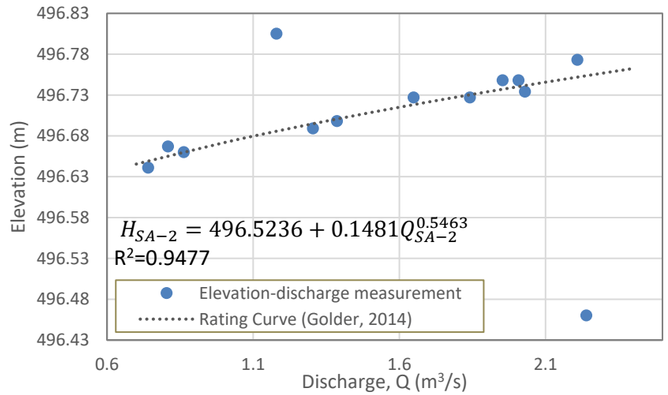


**SA-1 facing downstream, July 2018.**

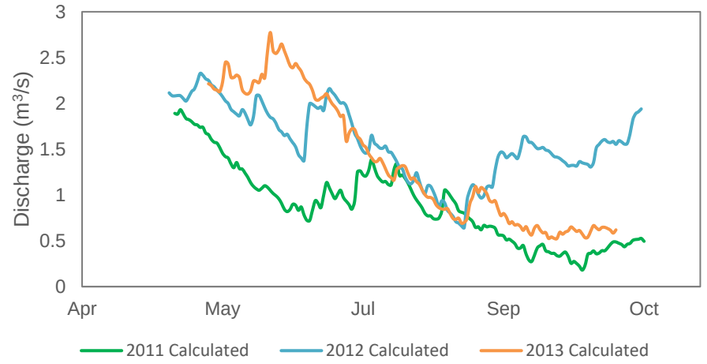
| | | | |
|---|---|---|---|
| **Station ID** | SA-2 | **Periods of continuous recording** | 2011-2013 |
| **GPS Coordinates** | 13 V 478524 6373216 | **Instrument deployed** | N.A. |
| **Access** | By boat | **Active measurement** | N.A. |
| **Periods of monitoring** | 2011-2014, 2016-2019 | **Comments** | No continuous monitoring device is installed since 2014. Two outliers were observed in the stage-discharge curve as different cross section was used in 2016 and 2017. These two data points were not used to validate the stage-discharge relationship. |
| **Measurements** | Elevation, instantaneous discharge | | |




**Map: SA-2 hydrometric monitoring station.**




**Stage – Discharge Curve**




**Continuous flow monitoring, 2011-2013 open water season**



**SA-2 facing upstream, May 2017.**



**SA-2 facing downstream, May 2017.**

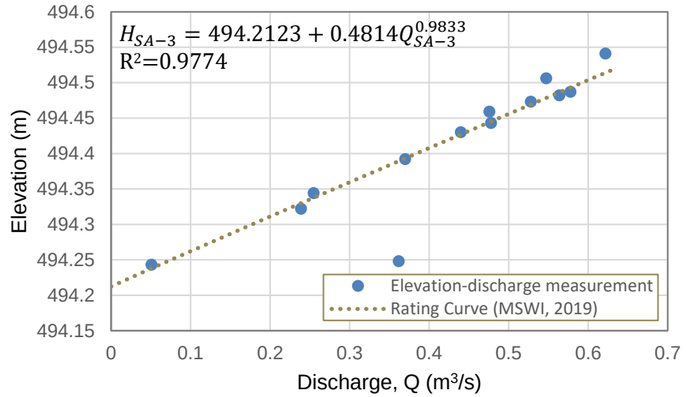


**SA-2 facing upstream, March 2018.**

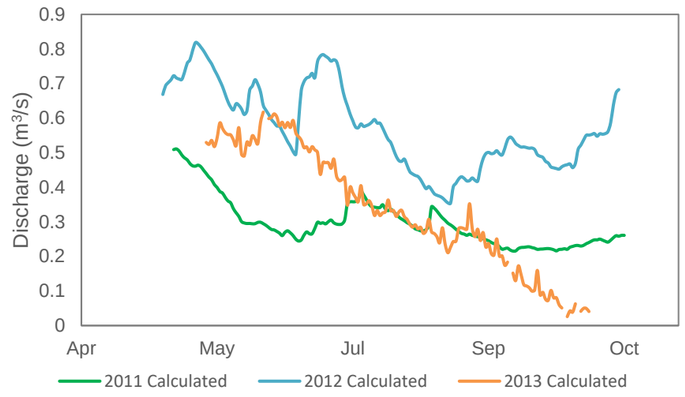
| | | | |
|---|---|---|---|
| **Station ID** | SA-3 | **Periods of continuous recording** | 2011-2013 |
| **GPS Coordinates** | 13 V 479415 6373234 | **Instrument deployed** | N.A. |
| **Access** | By boat | **Active measurement** | N.A. |
| **Periods of monitoring** | 2011-2014, 2016-2019 | **Comments** | SA-3 produces good stage and discharge relationship. No continuous flow monitoring device was installed after 2014. The stage-discharge relationship was updated in 2019 with more recent monitoring data to expand the discharge range. |
| **Measurements** | Elevation, instantaneous discharge | | |




**Map: SA-3 hydrometric monitoring station.**




**Stage – Discharge Curve**




**Continuous flow monitoring, 2011-2013 open water season**




**SA-3 facing upstream, September 2016.**

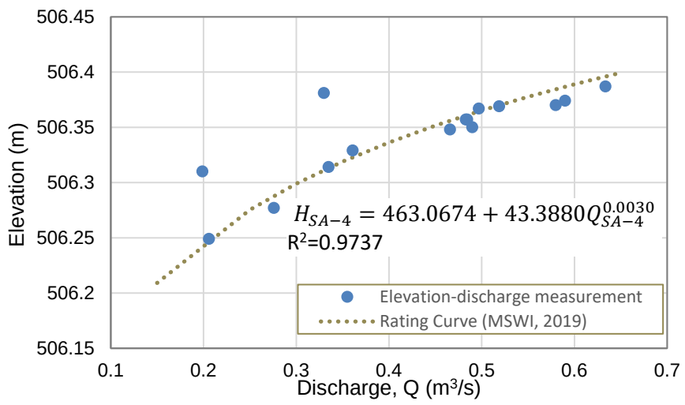


**SA-3 facing downstream, September 2016.**

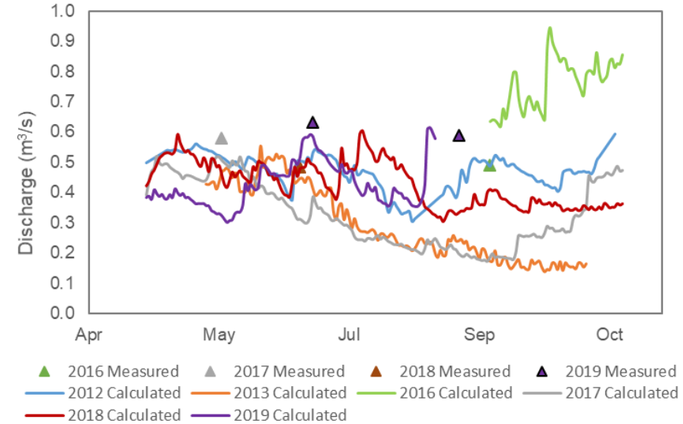
| | | | |
|---|---|---|---|
| **Station ID** | SA-4 | **Periods of continuous recording** | 2012-2014, 2016-2019 |
| **GPS Coordinates** | 13V 476926 6375868 | **Instrument deployed** | Solinst levelogger, Serial number 2065001; Solinst barologger, serial number 2064922. |
| **Access** | By road | **Active measurement** | Continuous flow measurement |
| **Periods of monitoring** | 2011-2014, 2016-2019 | **Comments** | SA-4 produces a good stage-discharge relationship and hence an accurate hydrograph. |
| **Measurements** | Elevation, instantaneous discharge, continuous discharge | | |




**Map: SA-4 hydrometric monitoring station.**




**Stage – Discharge Curve**




**Continuous flow monitoring, 2012-2014 and 2016-2019 open water season**



**SA-4 facing upstream, June 2018.**



**SA-4 facing downstream, June 2018.**

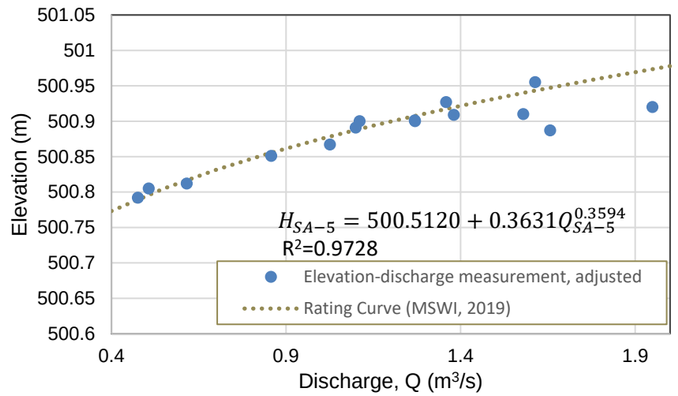


**SA-4 facing upstream, March 2018.**

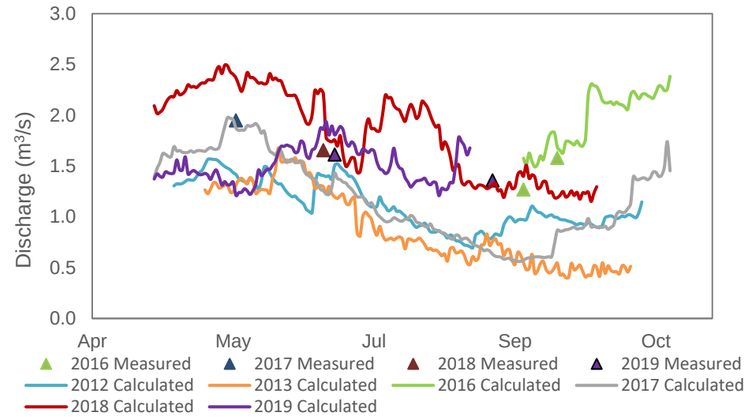
| | | | |
|---|---|---|---|
| **Station ID** | SA-5 | **Periods of continuous recording** | 2012-2014, 2016-2019 |
| **GPS Coordinates** | 13 V 477822 6375737 | **Instrument deployed** | Solinst levelogger, Serial number 2064994 |
| **Access** | By road | **Active measurement** | Continuous flow measurement |
| **Periods of monitoring** | 2011-2014, 2016-2019 | **Comments** | The monitoring station was moved upstream from previous location in 2016. The rating curve was adjusted to accommodate this change. SA-5 produces a fair stage-discharge relationship and hence hydrograph. |
| **Measurements** | Elevation, instantaneous discharge, continuous discharge | | |




**Map: SA-5 hydrometric monitoring station.**




**Stage – Discharge Curve**




**Continuous flow monitoring, 2012-2014 and 2016-2019 open water season**



**SA-5 facing upstream, May 2017.**



**SA-5 facing downstream, May 2017.**

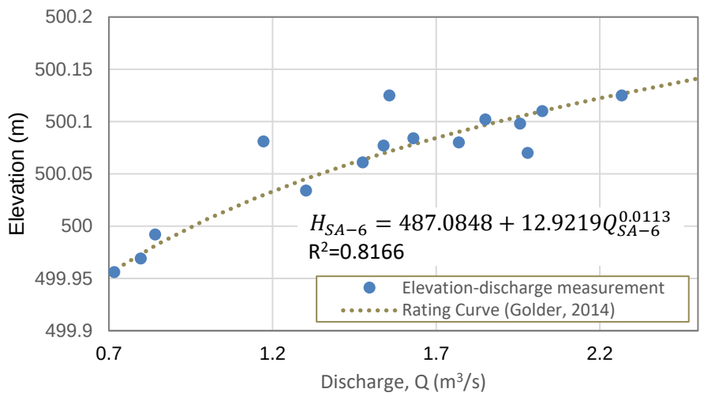


**SA-5 cross section, July 2019.**

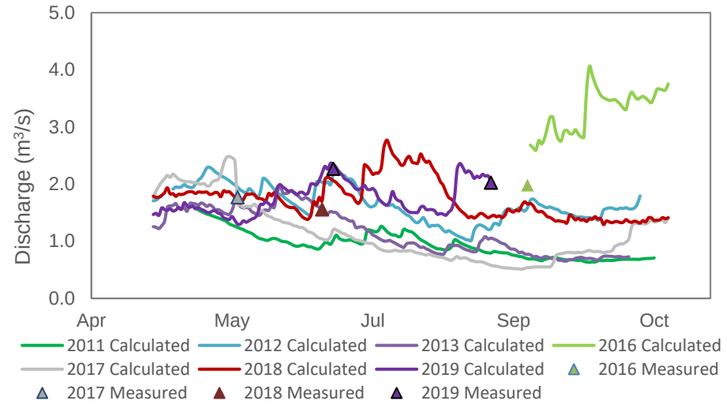
| | | | |
|---|---|---|---|
| **Station ID** | SA-6 | **Periods of continuous recording** | 2011-2014, 2016-2019 |
| **GPS Coordinates** | 13 V 477863 6374742 | **Instrument deployed** | Solinst levelogger, Serial number 1061428 (2016-2019). New logger deployed in August 2019 (Serial number 2110527). |
| **Access** | By road | **Active measurement** | Continuous flow measurement |
| **Periods of monitoring** | 2011-2014, 2016-2019 | **Comments** | SA-6 produced a fair stage-discharge relationship. SA-6 is recognized by local residence as a narrow connecting LA-5 and LA-6 as one lake (See LA-6 below). |
| **Measurements** | Elevation, instantaneous discharge, continuous discharge | | |




**Map: SA-6 hydrometric monitoring station.**




**Stage – Discharge Curve**




**Continuous flow monitoring, 2012-2014 and 2016-2019 open water season**







**SA-6 facing upstream, March 2018.**

| | | | |
|---|---|---|---|
| **Station ID** | SA-7 | **Periods of continuous recording** | N.A. |
| **GPS Coordinates** | 13 V 472315 6375473 | **Instrument deployed** | N.A. |
| **Access** | By boat | **Active measurement** | N.A. |
| **Periods of monitoring** | 2016 | **Comments** | SA-7 was a new station monitored since 2016. It is a narrow marshy stream and not suitable for continuous flow monitoring. This station was replaced by SA-11 in 2017. |
| **Measurements** | Elevation, instantaneous discharge. | | |




**Map: SA-7 hydrometric monitoring station**




**SA-7 facing upstream, September 2016.**

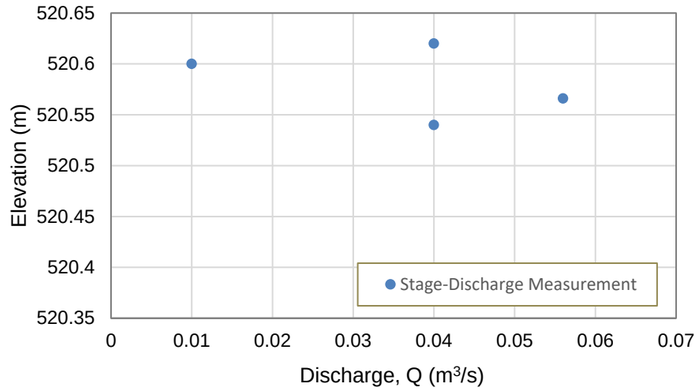



**SA-7 facing downstream, September 2016.**

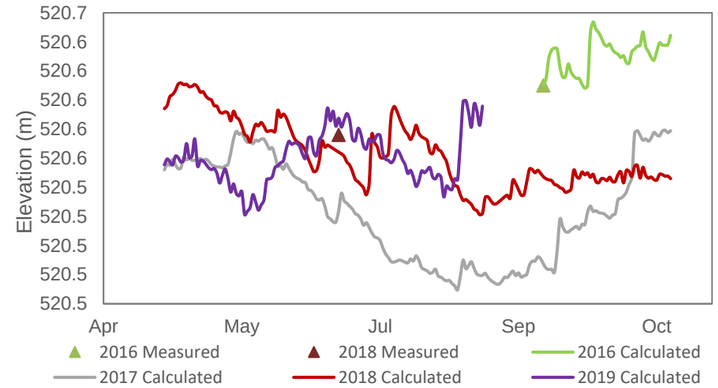
| | | | |
|---|---|---|---|
| **Station ID** | SA-8 | **Periods of continuous recording** | 2016-2019 |
| **GPS Coordinates** | 13 V 471579 6378303 | **Instrument deployed** | Solinst levelogger, Serial number 2064996 |
| **Access** | By boat | **Active measurement** | Continuous flow monitoring |
| **Periods of monitoring** | 2016-2019 | **Comments** | SA-8 is a new flow station has been monitored since 2016. It is a narrow stream with deep banks. More extreme flow data is required to establish a reliable rating curve. This station is believed to be impacted by elevation at the Kratchkowsy lake, and the station is moved upstream in 2019. |
| **Measurements** | Elevation, instantaneous discharge, continuous flow monitoring. | | |




**Map: SA-8 hydrometric monitoring station**




**Stage – Discharge Relationship**




**Levelogger elevation results, 2016-2019 open water season**



**SA-8 facing upstream, September 2016.**



**SA-8 Hydrometric station, 2016-2019**

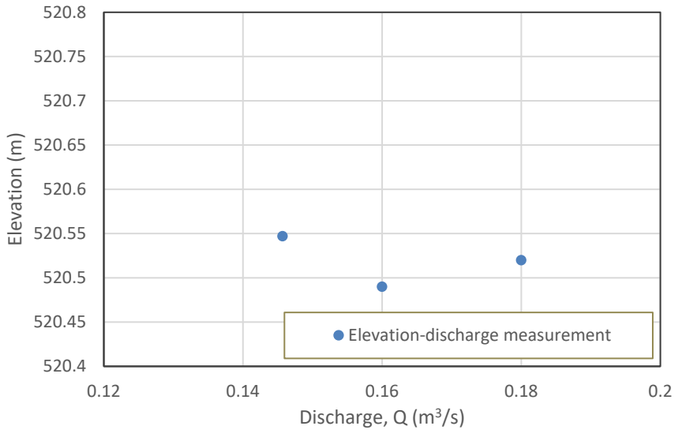


**SA-8 new hydrometric station, Aug 2019.**

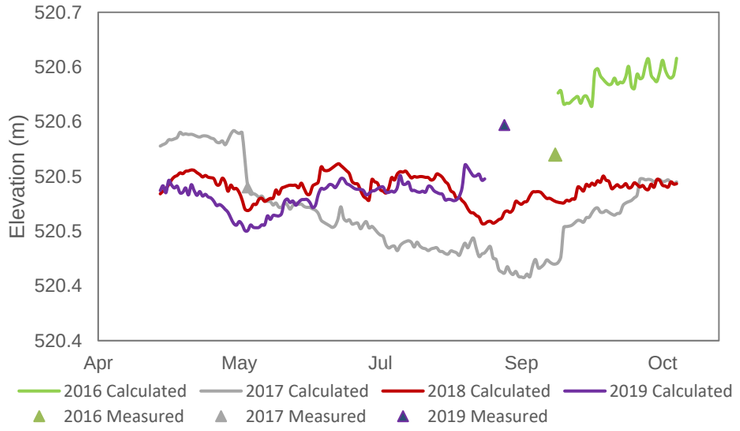
| | | | |
|---|---|---|---|
| **Station ID** | SA-9 | **Periods of continuous recording** | 2016-2019 |
| **GPS Coordinates** | 13 V 478226 6381589 | **Instrument deployed** | Solinst levelogger, serial number 2065002 |
| **Access** | By road | **Active measurement** | Continuous flow monitoring |
| **Periods of monitoring** | 2016-2019 | **Comments** | SA-9 was initially located at the outlet of a small lake downstream of LA-8. For access purpose, it was relocated to the outlet of LA-8 accessible by an existing ATV road. More stage and discharge data are required to establish a reliable rating curve. |
| **Measurements** | Elevation, instantaneous discharge, continuous flow monitoring. | | |




**Map: SA-9 hydrometric monitoring station**




**Stage – Discharge Relationship**




**Levelogger elevation results, 2016-2019 open water season**



**SA-9 facing upstream, Sep 2016.**




**SA-9 facing downstream, Sep 2016.**

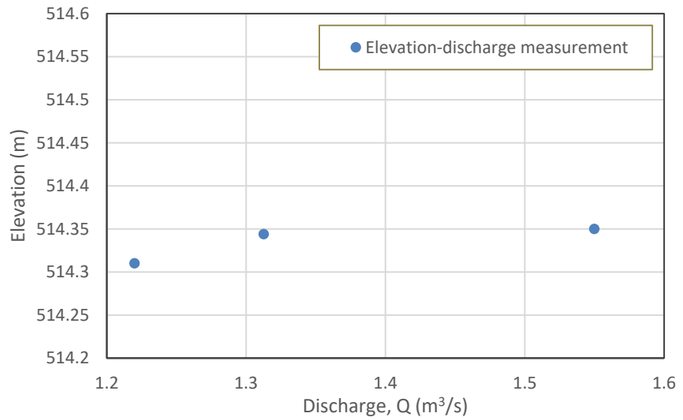


**SA-9 cross section, Aug 2019.**

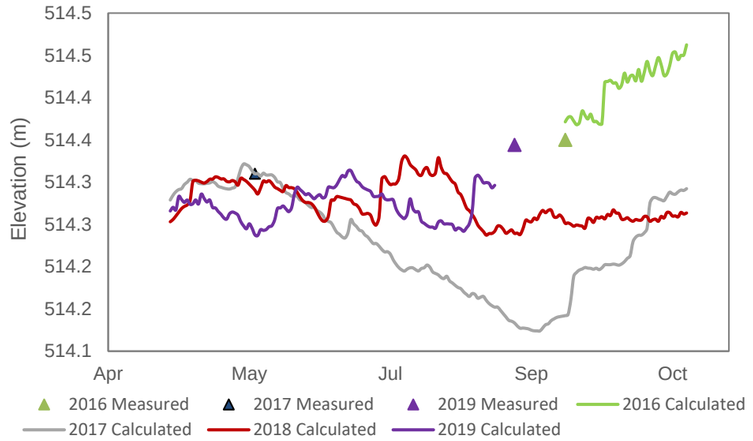
| | | | |
|---|---|---|---|
| **Station ID** | SA-10 | **Periods of continuous recording** | 2016-2019 |
| **GPS Coordinates** | 13 V 479003 6380421 | **Instrument deployed** | Solinst levelogger, serial number 2065023 |
| **Access** | By boat | **Active measurement** | Continuous flow monitoring |
| **Periods of monitoring** | 2016-2019 | **Comments** | More stage and discharge data are required to establish a reliable rating curve. |
| **Measurements** | Elevation, instantaneous discharge, continuous flow monitoring. | | |




**Map: SA-10 hydrometric monitoring station**




**Stage – Discharge Relationship**




**Levelogger elevation results, 2016-2019 open water season**

c



**SA-10 facing upstream, September 2016.**




**SA-10 facing downstream, September 2016.**

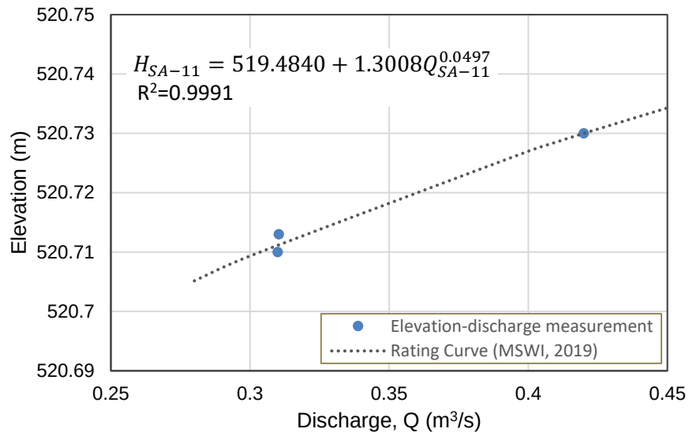


**SA-10 cross section, Aug 2019**

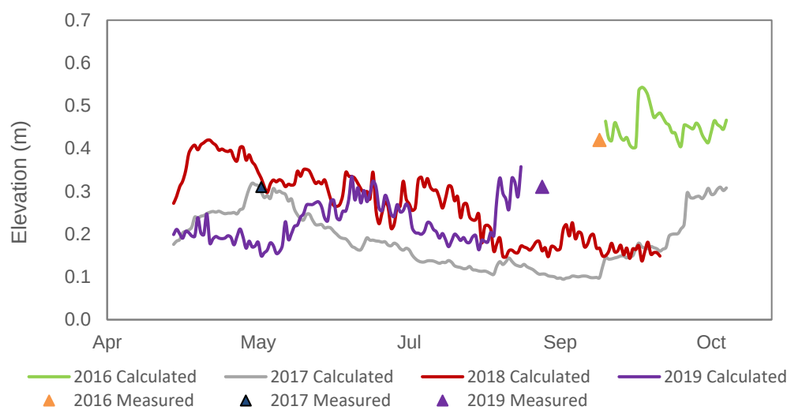
| | | | |
|---|---|---|---|
| **Station ID** | SA-11 | **Periods of continuous recording** | 2016-2019 |
| **GPS Coordinates** | 13 V 473026 6379260 | **Instrument deployed** | Solinst levelogger, serial number 2065010 |
| **Access** | By boat | **Active measurement** | Continuous flow monitoring |
| **Periods of monitoring** | 2016-2018 (EcoMetrix and Calder) | **Comments** | SA-11 is added to replace SA-7. A preliminary stage-discharge relationship is developed at SA-11. Validation is recommended to demonstrate accuracy of this relationship. |
| **Measurements** | Elevation, instantaneous discharge, continuous flow monitoring. | | |




**Map: SA-11 hydrometric monitoring station**




**Stage – Discharge Relationship**




**Levelogger elevation results, 2016-2019 open water season**



**SA-11 facing upstream, September 2016**



**SA-11 facing downstream, September 2016.**

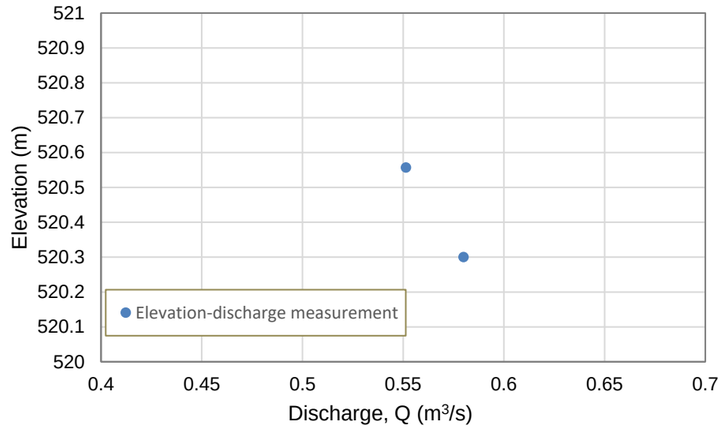


**SA-11 cross section, Aug 2019.**

| | | | |
|---|---|---|---|
| **Station ID** | RC-1 (Kratchkowsky Lake Outlet) | **Periods of continuous recording** | N.A. |
| **GPS Coordinates** | 13 V 475468 6375987 | **Instrument deployed** | N.A. |
| **Access** | By road | **Active measurement** | N.A. |
| **Periods of monitoring** | 2016, 2018 (EcoMetrix and Calder) | **Comments** | RC-1 is situated immediately downstream of Kratchkowsky Lake. As it is accessible by a road crossing, it was the only location with instantaneous flow measured during the winter, 2018. |
| **Measurements** | Elevation, instantaneous discharge. | | |




**Map: RC-1 hydrometric monitoring station**




**Stage – Discharge Relationship**




**RC-1 facing upstream, September 2016**




**RC-1 facing downstream, September 2016.**

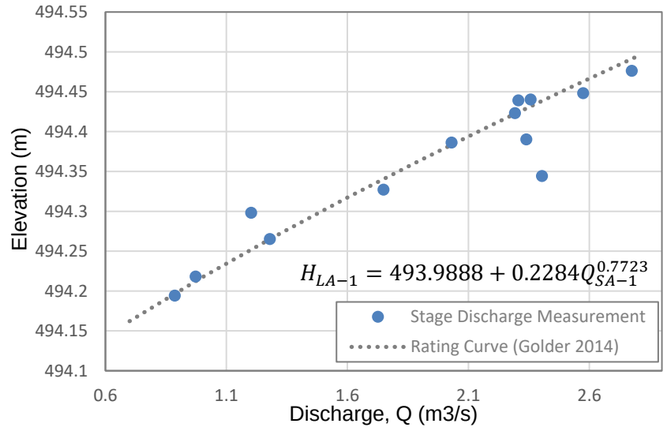


**RC-1 cross section, August 2019.**

| | | | |
|---|---|---|---|
| **Station ID** | McGowan Lake | **Periods of continuous recording** | 2011-2014, 2019 |
| **GPS Coordinates** | 13 V 479399 6373215 | **Instrument deployed** | Solinst levelogger, serial number 2110528 (installed August 2019). |
| **Access** | By road | **Active measurement** | Continuous flow monitoring |
| **Periods of monitoring** | 2011-2014 (Golder), 2016, 2018 (EcoMetrix and Calder) | **Comments** | Discharge at SA-1 is used as the outlet of LA-1 to evaluate the stage-discharge relationship. A new data logger is installed in LA-1 in August 2019. |
| **Measurements** | Elevation, instantaneous discharge (SA-1), continuous flow monitoring (June -Oct, 2018) | | |




**Map: McGowan Lake hydrometric monitoring station**




**Stage – Discharge Curve**

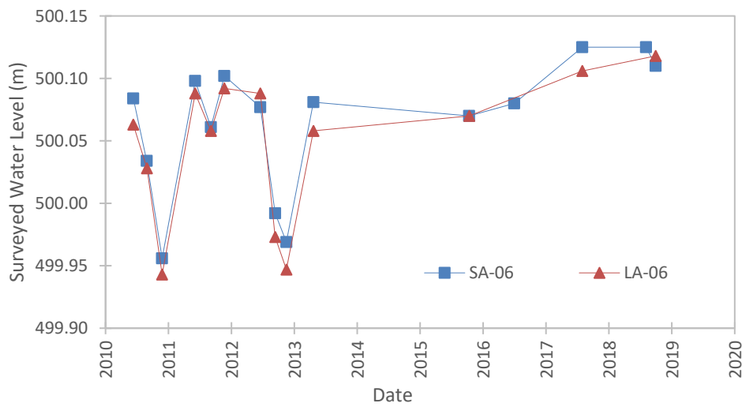



**McGowan Lake photo, Sep 2016.**

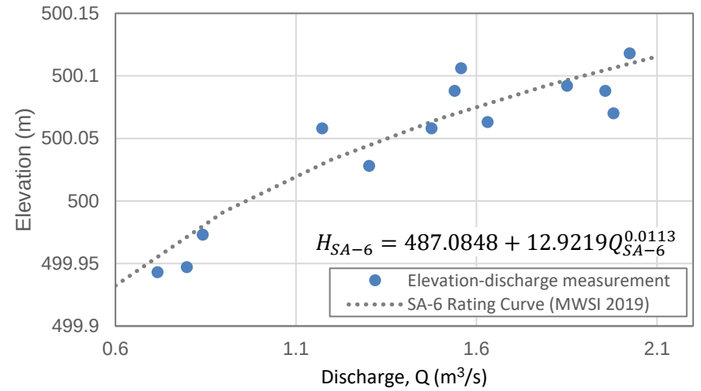
| | | | |
|---|---|---|---|
| **Station ID** | LA-6 | **Periods of continuous recording** | 2011-2014 |
| **GPS Coordinates** | 13 V 477763 6375274 | **Instrument deployed** | N.A. |
| **Access** | By road | **Active measurement** | N.A. |
| **Periods of monitoring** | 2011-2014 (Golder), 2016, 2018 (EcoMetrix and Calder) | **Comments** | Both water level and discharge at SA-6 is representative to LA-6, and therefore level logger installed in SA-6 is used to continuously record discharge at this location. In addition, LA-5 and LA-6 is recognized as one lake (Whitefish Lake), and SA-6 is recognized as a narrow in this lake. |
| **Measurements** | Elevation, instantaneous discharge (SA-6), continuous flow monitoring (2018) | | |




**Map: LA-6 hydrometric monitoring station**




**Water Elevation of LA-6 and SA-6**




**Stage – Discharge Curve**




**LA-6 photo, Sep 2016.**



**LA-6 photo, Aug 2019.**

# Appendix D 2012-2014 Baseline Hydrology Summary Report. Golder Associates

May 2014

# DENISON MINES - WHEELER RIVER PROJECT

# 2012 - 2014 Baseline Hydrology Summary Report

**Submitted to:**
Mr. Lawson Forand
Exploration Manager
Denison Mines Corp.
Suite 200 - 320 - 22nd Street East
Saskatoon, SK
S7K 0E9

**Report Number:** 12-1362-0050/5000

**Distribution:**

2 Copies Denison Mines Corporation.

2 Copies Golder Associates Limited.

REPORT

Golder Associates

# Table of Contents


**1.0 INTRODUCTION ..... 1**

1.1 Background Information ..... 1

1.2 Site Information ..... 1

1.3 Climate and Weather ..... 1

1.4 Regional Hydrology ..... 3

**2.0 LOCAL HYDROLOGY ..... 4**

2.1 Introduction ..... 4

2.2 Methods ..... 8

2.2.1 Instantaneous Streamflow Monitoring ..... 8

2.2.2 Staff Gauge and Elevation Measurements ..... 8

2.2.3 Continuous Water Level Recording ..... 9

2.3 Results ..... 9

2.3.1 Streams ..... 9

2.3.2 Relationship to Regional Hydrology ..... 12

2.3.3 Effect of Seasonal Ice Formation on Streamflow ..... 13

2.3.4 Lakes ..... 13

**3.0 CLOSURE ..... 14**

**4.0 REFERENCES ..... 15**


**TABLES**


Table 1: Hydrology Monitoring Stations ..... 7

Table 2: Field Program Dates ..... 8

Table 3: Adjustment Factors (K) observed for Ice Covered Discharge ..... 13

Table 4: Lake Water Level Summary ..... 13

Table 5: Lake Water Level Summary ..... 14

# Table of Contents (continued)

**FIGURES**

Figure 1: Key Lake Total Precipitation for Hydrological Years between 2010 and 2013 (EC 2013) ..... 2

Figure 2: Wheeler River Mean Monthly Discharge for the Hydrological Years Between 2010 and 2013 (WSC 2013, 2014). ..... 3

Figure 3: Watersheds Associated with the Project ..... 5

Figure 4: Stream and Lake Monitoring Sites ..... 6

**APPENDICES**

**APPENDIX A**
Denison Wheeler River Ground Survey Summary

**APPENDIX B**
Stage and Discharge Measurements

**APPENDIX C**
Open Water Stage-Discharge Curves for Lake Level and Streamflow Monitoring Stations

**APPENDIX D**
Hydrographs for Streamflow Monitoring Stations

**APPENDIX E**
Photos

# 1.0 INTRODUCTION

## 1.1 Background Information

In 2011, Golder Associates Ltd. (Golder) was retained by Denison Mines Corp. (Denison) to undertake a hydrological baseline program as part of a pre-feasibility study of the Phoenix deposit at the Wheeler River property (the Project) near Key Lake, Saskatchewan. Golder completed hydrological investigations during the open water season of 2011, 2012, and 2013 as well as one during the ice covered season in 2014. The work was to collect the necessary hydrological baseline data to support various project requirements including environmental assessments, regulatory permitting, and providing design basis information for engineered structures such as fresh water diversions, water management systems, sedimentation ponds, and cross-drainage structures.

This report summarizes the baseline study design, methods and presents the results from the 2011 to 2013 field seasons as well as winter data collected in March 2014. This report builds on a similar interim report produced following the 2013 field season.

## 1.2 Site Information

The Project is located in north central Saskatchewan, in the south-eastern portion of the Athabasca Basin region, approximately 35 kilometres (km) northeast of Cameco Corporation's (Cameco's) Key Lake Operation and 35 km southwest of Cameco's McArthur River Operation. The site is accessible from the Key Lake – McArthur River haul road. The general Project area is characterized as a morainal plain with southwest trending drumlins and eskers, and glaciofluvial outwash areas, overlying Athabasca sandstones. Numerous interconnected lakes occur in the area, along with low-lying, poorly drained areas of muskeg. The Project is located in the Athabasca Plain Ecoregion which is characterized by jack pine, birch and poplar, and dense spruce forests.

## 1.3 Climate and Weather

Climate conditions play an important role in the local hydrological cycle by governing the primary inputs and outputs to the surface water environment, including precipitation and evaporation. Environment Canada (EC 2013) has collected data from two weather stations near Key Lake, which can be used to represent general conditions for the Project.

Runoff is a function of several environmental conditions, including rainfall and snow accumulation, evaporation from open water surfaces, evapotranspiration from terrestrial areas, and soil types (infiltration). Although discharge is not exclusively a function of local precipitation, it can provide important context for observed flow characteristic. Figure 1 presents the precipitation record for Key Lake (compiled from two Environment Canada weather stations at Key Lake; EC 2011) for the 2010-2011, 2011-2012, and 2012-2013 hydrological years (October 1 to September 30) and historical averages. The first six months of the 2013-2014 hydrological year are also presented.

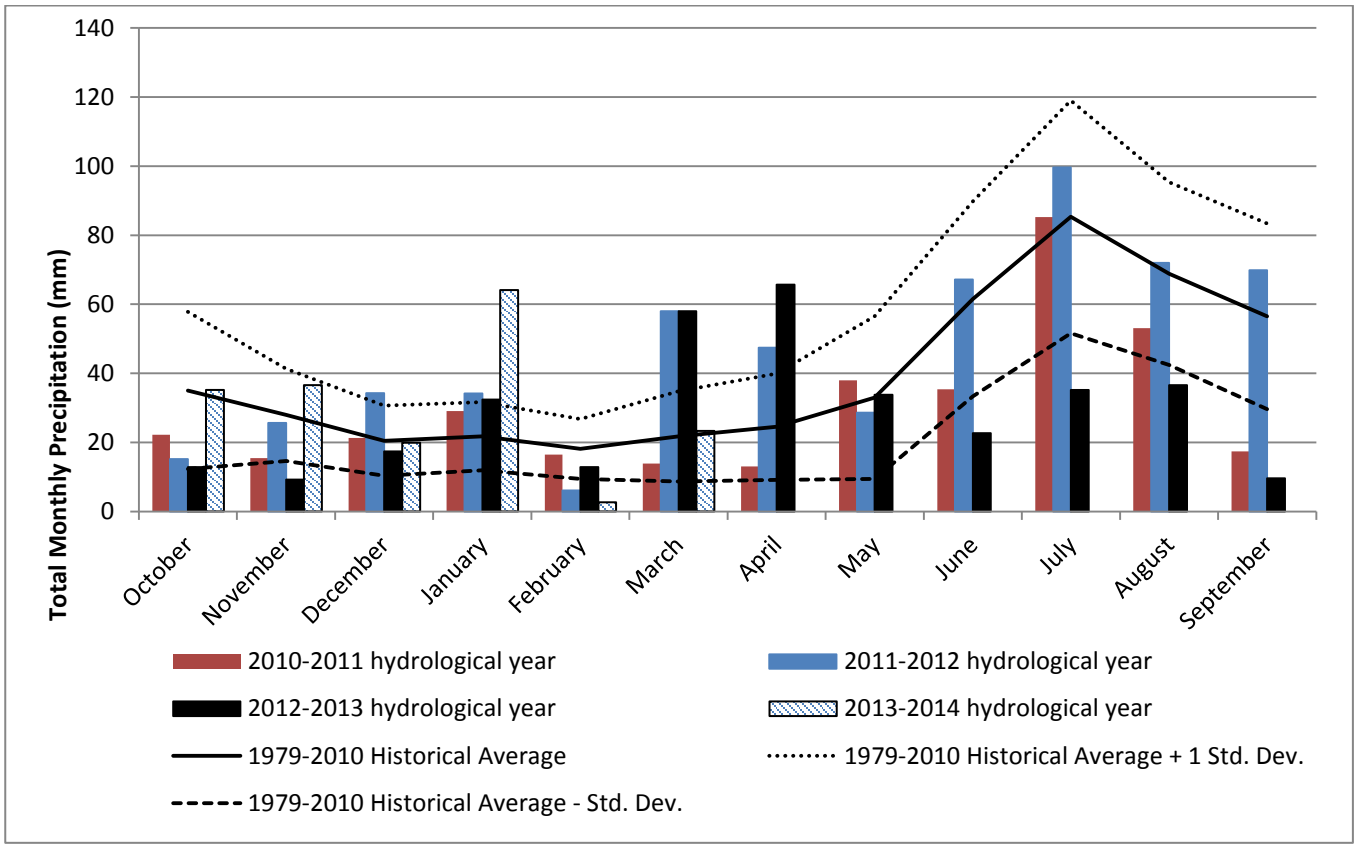



*Figure 1: Key Lake Total Precipitation for Hydrological Years between 2010 and 2013 (EC 2013)*

Precipitation during the 2010-2011 hydrological year was less than average during all months except January, May and July when precipitation was above average (January) or near average (May and July). The low precipitation throughout most of the winter would contribute to a smaller snowpack and a reduced spring freshet. Low summer and early fall precipitation would contribute to lower than normal flows during these periods.

Precipitation during the 2011-2012 hydrological year was generally near the 1979-2010 historical average. While cumulative precipitation from October to March was within 20% of the historical average, precipitation in March and April was more than twice the historical average. Near normal values were observed throughout the rest of the summer and early fall; the generally high precipitation rates in June through September could result in secondary peak flow events in summer and early fall.

Precipitation during the 2012-2013 hydrological year was below the 1979-2010 historical average. Cumulative precipitation from October to February was 30% below average. However, total precipitation of over twice the historic average during March and April resulted in cumulative precipitation of 20% above normal values by May. The summer of 2013 was dry with precipitation rates well below the historic average.

Precipitation during the first half of the 2013-2014 hydrological year was above the 1979-2010 historical average. Cumulative precipitation from October to March was 25% above average and snowfall during January was three times normal.

## 1.4 Regional Hydrology

Water Survey of Canada (WSC 2014a, 2014b) operates a hydrometric station on the Wheeler River, downstream of Russell Lake (Station 06DA005). The station is located about 25 km east of the Project site and records flows from a contributing drainage area of 3,030 square kilometres ($km^2$). The hydrometric station has been in operation from 1973 to the present and real time discharge and water level data are available. While the drainage area is much larger than those near the site (<371 $km^2$), the drainage areas relevant to the Project are tributaries to the Wheeler River and are thus expected to exhibit similar flow characteristics.

The mean monthly discharge rates at the Wheeler River for the hydrological years (October 1 to September 30) of 2010-2011 and 2011-2012 (WSC 2014a) as well as 2012-2013 and 2013-2014 (WSC 2014b) are presented in Figure 2.

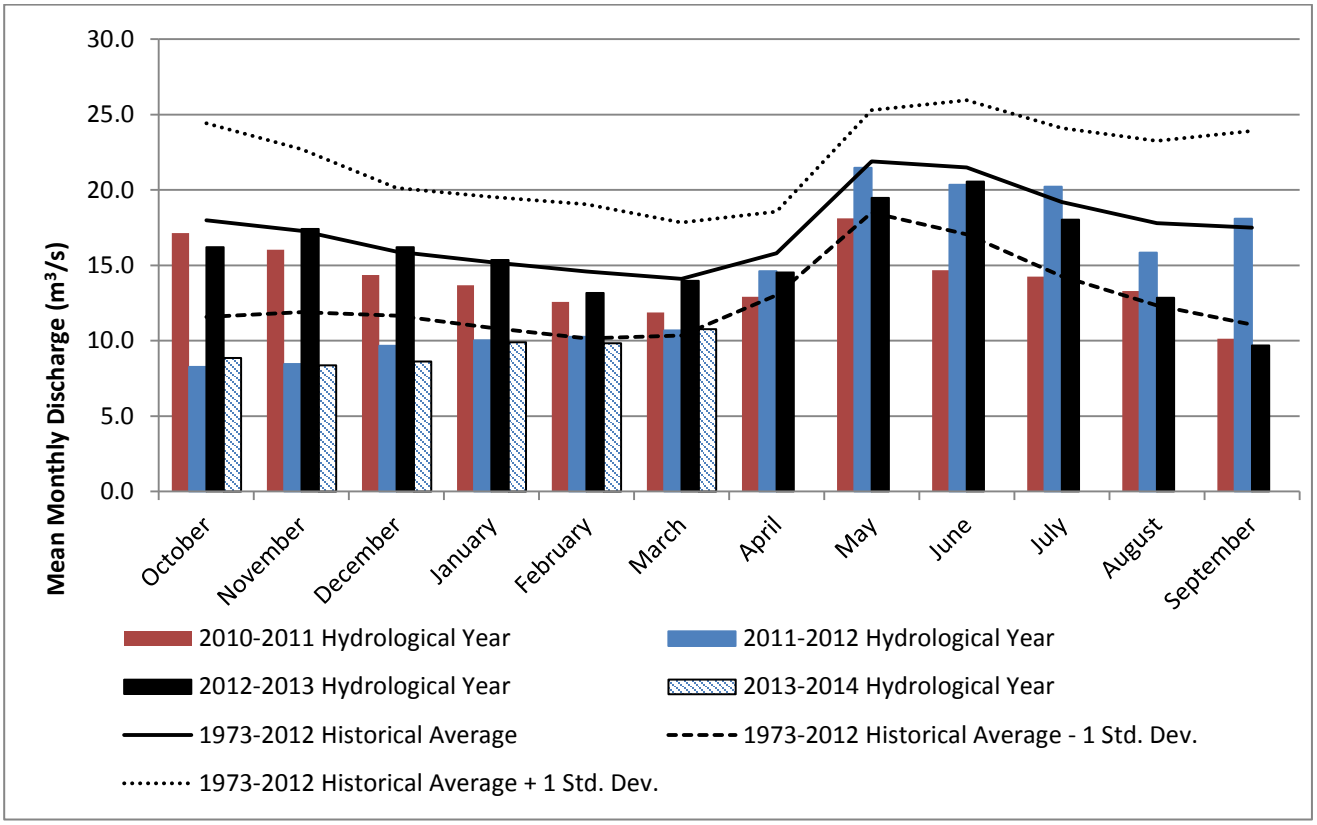



*Figure 2: Wheeler River Mean Monthly Discharge for the Hydrological Years Between 2010 and 2013 (WSC 2013, 2014).*

Although only provisional data that are subject to revision are available for 2012-2013 and 2013-2014 (Figure 2) these flow rates provide important context to the corresponding flow rates observed near the Project.

During the 2010-2011 hydrological year, discharge at the Wheeler River monitoring station was slightly below the historical average throughout the winter (October–March) and remained well below average during the spring freshet (May and June) and the remainder of the summer and early fall. During this time, flows ranged from 58 percent (%) (September) to 82% (April) of the 1973-2009 normal.

During the 2011-2012 hydrological year, discharge was below the historical average for the winter (January-March). Peak discharge in May approached the historical monthly average of 22 $m^3/s$, and remained near average during June, July, and September.

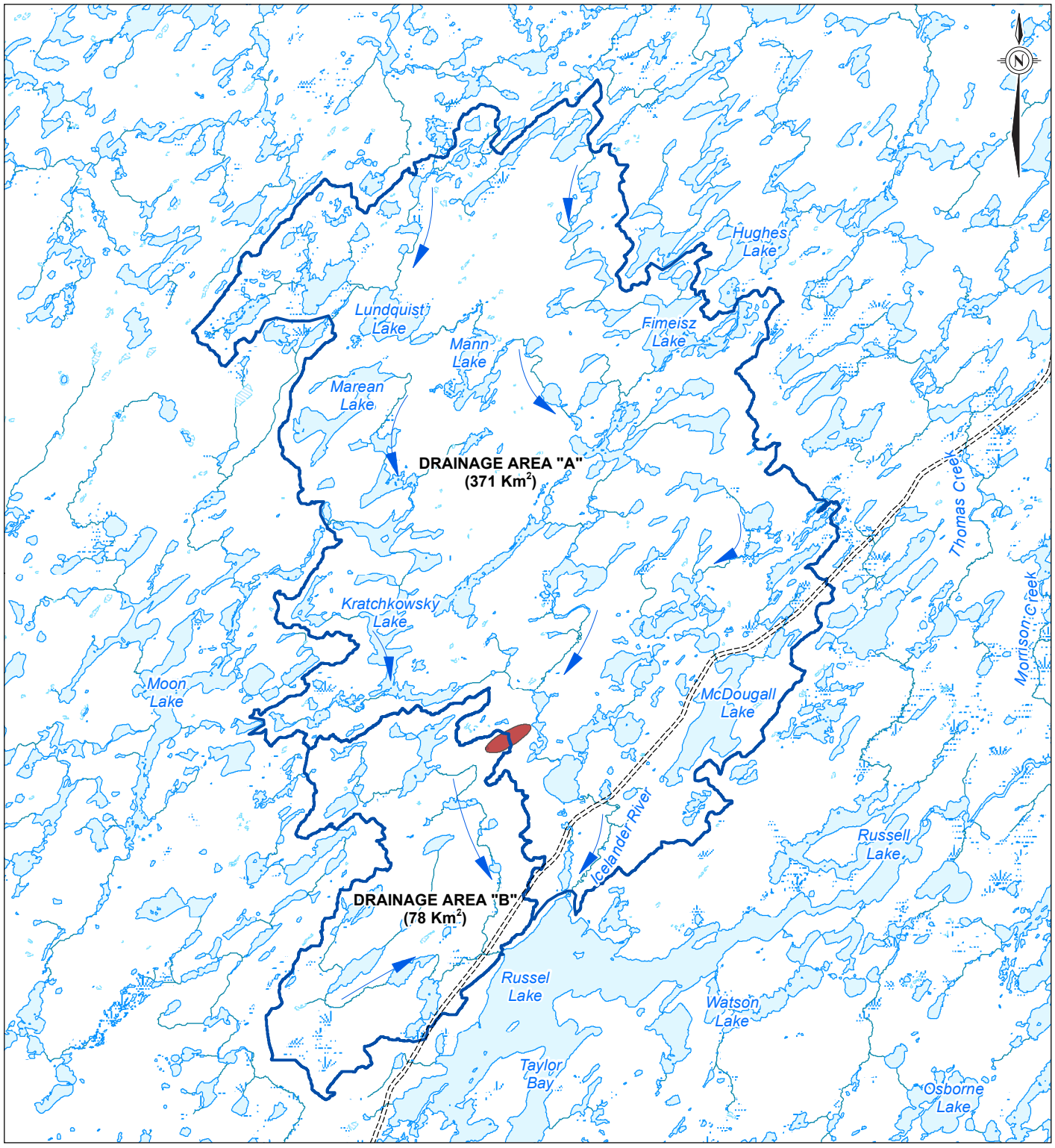
During the winter (October–March) of 2012-2013, discharge at the Wheeler River monitoring station was near or slightly below the historical average. Additional precipitation in April and March (Figure 1) were not matched by a similar streamflow response and discharge remained near but below average until July. In August and September discharge fell well below normal during late summer to 55% of the historical average by September.

During the winter (October–March) of 2013-2014, discharge at the Wheeler River monitoring station was slightly below the normal and rose slightly throughout the winter. The gradual increase in discharge over the winter is likely due to a combination of increased base flow and decreased lake storage. Base flow reaching the stream network is expected to have increased during the fall when evaporative demands ceased and base flow contributions originating in remote terrestrial uplands were free to flow slowly to the stream network. Above average snowfall shown on Figure 1 may also have contributed to higher flow between lakes by depressing the ice surface and decreasing lake storage volume. While flows recovered slightly throughout the winter, they remained one standard deviation below the mean. This increase in flows over winter from the very low levels in the fall of 2013 was also observed in flow data from Project monitoring stations.

# 2.0 LOCAL HYDROLOGY

## 2.1 Introduction

The Project is associated with two drainage areas that discharge into Russell Lake (Figure 3). Drainage Area A, with an estimated drainage area of 371 $km^2$, extends north and east of the Project area while Drainage Area B, with an estimated drainage area of 78 $km^2$, drains areas south of the Project. The drainage divide between Drainage Area A and Drainage Area B intersects the approximate location of the ore zone (Figure 3). Hydrological monitoring stations were established at six streams and seven lakes in Drainage Area A, and three streams and lakes in Drainage Area B during the 2011 to 2013 field programs; the monitored streams and lakes have been arbitrarily named (Figure 4). The monitored lakes and streams were selected to provide information on all the waterbodies potentially affected by the project and to characterise the general streamflow regime in the area. Table 1 provides the locations and monitoring activities at each waterbody.




**LEGEND**

- MCARTHUR RIVER MINE ACCESS ROAD
- ORE ZONE
- WATERSHED BOUNDARY

4 0 4

SCALE 1:200,000 KILOMETRES

**REFERENCE**

NTS MAPSHEETS 74H02,03,04,05,06,07,10,11,12
NAD83 UTM ZONE 13

PROJECT

DENISON MINES CORP.
WHEELER RIVER PROPERTY

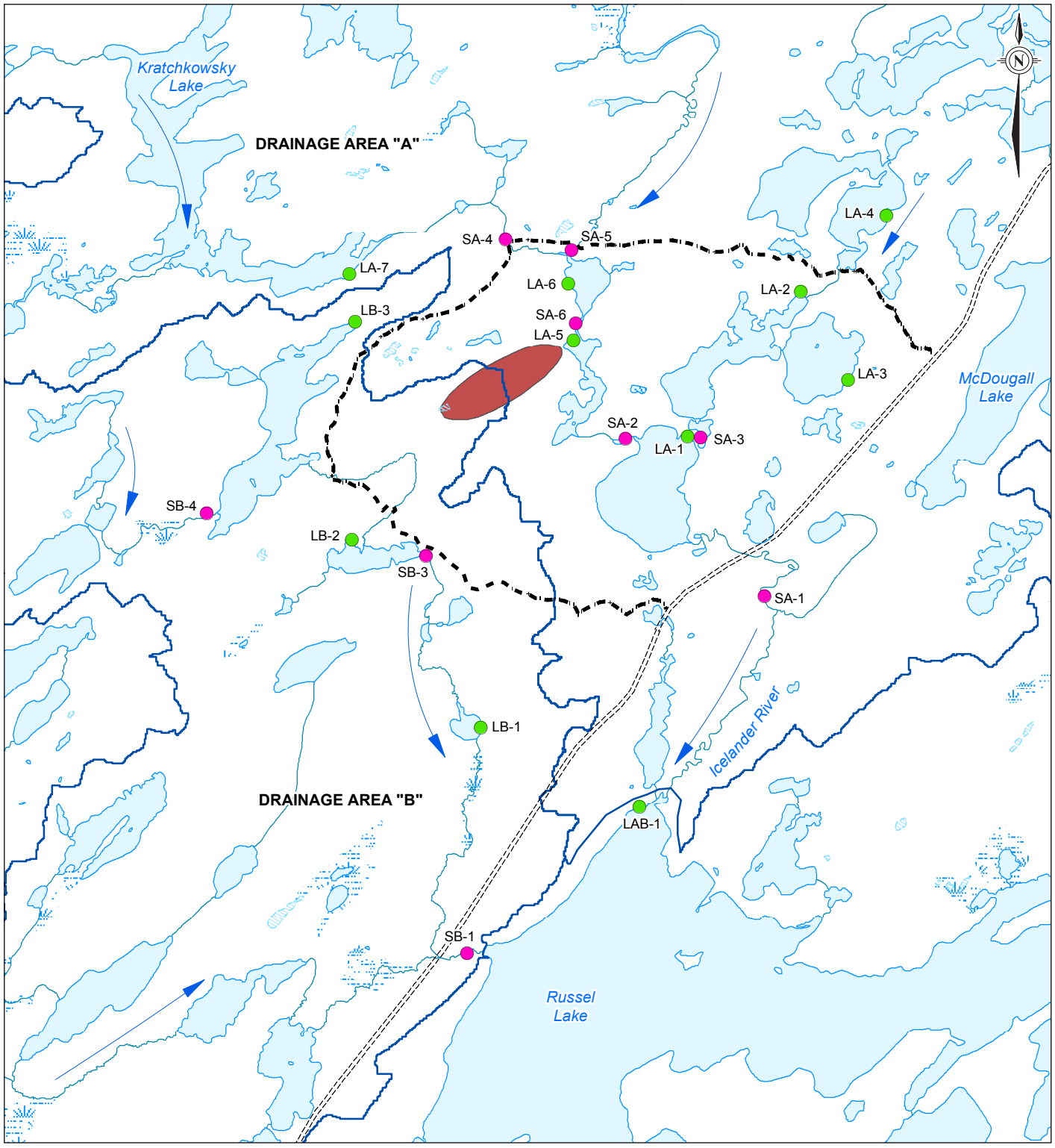
TITLE

# DRAINAGE AREAS ASSOCIATED WITH THE PROJECT

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | | 12-1362-0050 | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| GIS | LMR/ANK | 23/01/14 | FIGURE: 3 | |
| CHECK | RP | 29/05/14 | | |
| REVIEW | BT | 29/05/14 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Hydrology\12-1362-0050 - Aquatic Baseline Watersheds.mxd Date: 5/29/2014 1:14:12 PM




**LEGEND**

- MCARTHUR RIVER MINE ACCESS ROAD
- ORE ZONE
- WATERSHED BOUNDARY
- TRAIL
- LAKE MONITORING STATION
- STREAM MONITORING STATION

2 0 2

SCALE 1:75,000 KILOMETRES

**NOTE**

THE GEOGRAPHIC LOCATIONS OF THE MONITORING STATIONS HAVE BEEN ALTERED FOR GRAPHICAL REPRESENTATION.

**REFERENCE**

NTS MAPSHEETS 74H02,03,04,05,06,07,10,11,12
NAD83 UTM ZONE 13

PROJECT

DENISON MINES CORP.
WHEELER RIVER PROPERTY

TITLE

# STREAM AND LAKE MONITORING SITES

Golder Associates
Saskatoon, Saskatchewan

| | | | | |
|---|---|---|---|---|
| PROJECT | | 12-1362-0050 | FILE No. | |
| DESIGN | | | SCALE AS SHOWN | REV. 0 |
| GIS | LMR/JRC | 28/01/13 | FIGURE: 4 | |
| CHECK | RP | 29/05/14 | | |
| REVIEW | BT | 29/05/14 | | |

G:\CLIENTS\DENISON MINES\Wheeler River\Figures\12-1362-0050\Hydrology\12-1362-0050 - Aquatic Baseline Stream Monitoring Locations.mxd Date: 5/29/2014 1:07:44 PM

**Table 1: Hydrology Monitoring Stations**

| Station Name | Location (UTM NAD 83) | Instantaneous Discharge Measurements | Continuous Water Level Recording | Staff Gauge | Elevation Survey |
|---|---|---|---|---|---|
| **Lake Level Monitoring Sites** | | | | | |
| LA-1 | 13 V 479387 6373208 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LA-2 | 13 V 480852 6375164 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LA-3 | 13 V 479387 6373208 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LA-4 | 13 V 481989 6376180 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LA-5 | 13 V 477830 6374521 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LA-6 | 13 V 477763 6375274 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LA-7 | 13 V 474851 6375402 | - | 2012, 2013 | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LAB-1 | 13 V 478705 6368323 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LB-1 | 13 V 476598 6369377 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013 |
| LB-2 | 13 V 474882 6371871 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| LB-3 | 13 V 474925 6374767 | - | - | 2011, 2012, 2013 | 2011, 2012, 2013, 2014 |
| **Stream Discharge Monitoring Sites** | | | | | |
| SA-1 | 13 V 480368 6371123 | 2011, 2012, 2013, 2014 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SA-2 | 13 V 478524 6373216 | 2011, 2012, 2013, 2014 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SA-3 | 13 V 479415 6373234 | 2011, 2012, 2013, 2014 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SA-4 | 13 V 476929 6375866 | 2011, 2012, 2013, 2014 | 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SA-5 | 13 V 477804 6375716 | 2011, 2012, 2013, 2014 | 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SA-6 | 13 V 477861 6374749 | 2011, 2012, 2013, 2014 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SB-1 | 13 V 476041 6366362 | 2011, 2012, 2013, 2014 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SB-3 | 13 V 475866 6371655 | 2011, 2012, 2013, 2014 | 2011, 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |
| SB-4 | 13 V 472952 6372222 | 2011, 2012, 2013, 2014 | 2012, 2013, 2014 | - | 2011, 2012, 2013, 2014 |

Three field programs were completed each open water season in 2011, 2012, and 2013. The field programs were timed to capture the spring peak flows (spring program), summer, and fall, immediately prior to freeze-up. One additional winter field program was completed between March 22 and April 1, 2014. Table 2 indicates the dates of each field program.

**Table 2: Field Program Dates**

| | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|
| Spring | May 11 - May16 | May 3 – May 9 | May 18 – 24 | - |
| Summer | July 27 - July 31 | August 5 – August 8 | August 12 – 15 | - |
| Fall | October 27 - October 31 | October 21 – October 25 | October 16 – 19 | - |
| Winter | - | - | - | March 22 – April 1 |

## 2.2 Methods

### 2.2.1 Instantaneous Streamflow Monitoring

At each stream monitoring site, instantaneous streamflow measurements were taken during the spring, summer and fall field campaigns. A suitable cross-section was selected at each stream based on the following characteristics: good bank control, straight channel, most laminar flow, and accessibility. A tag line (a cable marked at regular intervals) was used to divide the channel into vertical segments, with each segment measuring approximately 5% of the channel width or less than 10% of the flow, for streams more than 2 m wide. The depth and velocity at each segment across the channel was measured using a SonTek Flow Tracker current meter attached to a top-set wading rod. The velocity was measured at a depth of 60% (for depths less than 0.75 m) or at 20% and 80% of the depth (for depths greater than 0.75 m). For each section, the product of the mean of the depths and the flow velocity was multiplied by the width of the section to determine the total discharge. This was repeated for each consecutive section across the stream and the total discharge for the stream was then obtained by summing the partial discharges (velocity-area method). The mid-section method was used for discharge calculations (Terzi 1981). Instantaneous winter streamflow measurements were collected for each stream monitoring site observed to have flowing water during the 2014 winter field program. Methods were similar to those used in the summer with the substitution of “effective” flow depth for open water depth to account for the influence of ice cover on flow. Standard methods for the observation of streamflow under ice were followed (Terzi 1981).

### 2.2.2 Staff Gauge and Elevation Measurements

Water level measurements were collected at each monitoring site. Primarily elevation measurements were collected using an engineer’s rod and level and at some sites secondary elevation measurements were recorded using a staff gauge. At each site, up to three benchmarks were established using the highest point on a large, stable boulder, or a 1.5 m length of rebar driven into the ground. The benchmarks were spray painted, marked as BM1, BM2 or BM3 with flagging tape, and the location was recorded.

An engineer’s rod and level were used to measure water elevations relative to BM1 at each location, which was assigned an arbitrary elevation of 100.000 m. The three benchmarks were used for quality control and to confirm benchmark stability. The water level was measured at the lake surface or at the streamflow monitoring location; if waves affected the accuracy of the reading, the potential error was also recorded. Staff gauges were installed using 2 m lengths of rebar or T-bar and the top (1.000 m) of the staff gauge was measured relative to

the local BM1 to monitor potential staff gauge movement between site visits, particularly over winter when ice can disturb the staff gauges.

To convert arbitrary benchmark datums into the geodetic datum, survey results from the 2012 Denison Wheeler River Ground Survey Summary were integrated (Appendix A). This survey used Real Time Kinematic (RTK) GPS to determine the geodetic elevation of the benchmarks. While elevation data were collected for all benchmarks at each site, the vertical error associated with the RTK survey is greater than that associated with the rod and level survey. Therefore, the geodetic elevation of the benchmark with the most accurate reading, i.e., lowest positional dilution of precision (PDOP) value at each site was used to calculate the elevations of the other benchmarks at the site using rod and level survey results.

### 2.2.3 Continuous Water Level Recording

Water level was continuously measured using a pressure transducer/data logger system. Leveloggers, manufactured by Solinst Canada Ltd, were programmed to record water levels at 30 minute intervals. At each 30 minute interval, the Levelogger records total pressure (atmospheric pressure and water pressure) acting on the sensor, which is internally compensated for temperature. A barologger was also installed near the Denison Mines Wheeler River Exploration Camp. The barologger was only exposed to atmospheric pressure, thereby allowing for barometric compensation of the Levelogger data. The resultant water pressure is related to height of water above the sensor and thus water elevation.

Each Levelogger was secured inside a bracket consisting of a small aluminum pipe that was welded to an aluminum plate or a 0.5 m pin. The plate or pin was fixed in place in the streambed, at or near the discharge measurement cross-section. The elevation of the top of the sensor bracket was measured relative to BM1 during the elevation survey to monitor potential movement between site visits. The sensor's water level measurement and coincident water elevation survey relative to BM1 were used to adjust the continuous water level data to the BM1 datum. An open water stage-discharge rating curve derived from coincident measurements of water depth (stage) and stream discharge was applied to the continuous water level record to derive a continuous discharge record for each site during the open water season.

## 2.3 Results

### 2.3.1 Streams

Stage and discharge measurements (Appendix B) were used to create stage-discharge curves for each streamflow monitoring site, as presented in Appendix C. While the three data points typically cover the range of flows and levels observed for the 2011, 2012, and 2013 monitored seasons, the curves are preliminary and discharge records are subject to modification as more measurements are collected and the stage-discharge curves are refined. The hydrograph and instantaneous discharge measurements for streams are provided in Appendix D. Photographs for all streamflow monitoring locations are provided in Appendix E.

In 2011, all hydrographs reflect highest observed flows in the spring during installation. The rising limb of the hydrograph, and spring peak flow rate was not captured at any site. The flow receded throughout May and June, and at all sites a secondary peak was observed during July and early August, which corresponds to relatively high rainfall (Figure 1). Flows receded again until September and remained static for the balance of the monitoring season.

Flows were considerably higher for the 2012 monitoring season than those observed in 2011. In 2012, the spring peak discharge rate, which occurred shortly after the first discharge measurement, was approximately captured at all sites. Discharge peaked in mid-May, and while it generally receded until late August, several other runoff events occurred, and at some sites, reached or exceeded the spring peak flow rate. At most sites, flow rates reached seasonal lows in late August before rising again during September and October to rates approaching those measured in the spring.

Flows were high relative to previous years during spring 2013 but a dry summer meant that by fall, flows were well below those observed in fall 2012 and similar to those observed in fall 2011. Discharge peaked in late June and steadily receded until moderate runoff responses occurred in late August and early September. Flows receded to seasonal lows in late September.

Flows rose above fall 2013 levels through the winter of 2013-2014. The increase in flow through the streams was not matched by increased lake levels. Increased winter flows are expected to result from decreased lake storage due in part to high snow load accumulated on the ice covered lake surfaces.

The following presents a discussion of the physical features and monitoring characteristics observed at each site.

## SA-1

SA-1 is the most downstream monitoring station in Drainage Area A with an estimated upstream area of approximately 371 $km^2$. The monitoring station is located at the transition between an upstream low gradient meandering channel section and a downstream higher gradient riffle channel section. The stream substrate is composed of boulders, cobble and sand and is approximately 15 m wide at the cross-section. Although the banks are well defined and stable with shrubs and moss, the left bank has a notable floodplain vegetated with shrubs and black spruce. SA-1 is a good cross-section and monitoring station, and produces a good stage-discharge relationship and accurate hydrograph.

## SA-2

Streamflow monitoring station SA-2 flows into the northwest end of LA-1. The monitoring station at SA-2 is located several meters downstream of the transition between an upstream meandering channel and a downstream riffle section. The monitoring site has a cross-section width of approximately 11 m, is relatively shallow with high velocity flow. The substrate is primarily composed of boulders and cobble, with well-defined and stable vertical banks vegetated with shrubs and trees. SA-2 produces a fair stage-discharge relationship; however the slope is nearly linear, so it may overestimate low and high flows. Further measurements at extreme flows would help verify the accuracy of this rating curve.

## SA-3

Streamflow monitoring station SA-3 flows from LA-2 to LA-1. The entire stream length has a sandy and silty substrate with well-defined high vertical banks vegetated with shrubs, willows and jack pine. The monitoring station is located near the middle of the stream length and has a cross-sectional width of approximately 11 m and is shallow. SA-3 produces a good stage-discharge relationship and therefore relatively accurate hydrograph.

## SA-4

The stream discharge monitoring station SA-4 drains LA-7, and is to the east of SA-5 and flows into the northwest end of LA-6. The monitoring site is located upstream of the existing temporary bridge and a fast flowing, narrow channel section. The channel has a cross-section width of approximately 6 m. The channel bottom is composed of large angular cobble and boulders. SA-4 produces a poor stage-discharge relationship, likely due to the coarse substrate which increases the stage at low discharge.

## SA-5

Station SA-5 is to the west of SA-4 and flows into the northwest end of LA-6. The monitoring station is located downstream of a small temporary bridge in a straight and relatively steep section of the stream. The substrate at the cross-section is primarily boulders and cobble with some sand. The stream has a width of approximately 8 m and has stable vertical organic banks vegetated with shrubs. SA-5 produces a fair stage-discharge relationship and therefore hydrograph.

## SA-6

Streamflow monitoring Station SA-6 drains from LA-6 and is upstream of SA-2. The stream section at this monitoring site is characterized by a sandy substrate, slow, deep, and laminar flow, and vertical banks. Although the right bank is well defined, high, and vegetated with trees, sand, and moss, the left bank is low lying with muskeg, shrubs and black spruce. The cross-section has a width of approximately 14 m. SA-6 produces a very good stage-discharge relationship and hydrograph.

## SB-1

SB-1 is the most downstream monitored stream in Drainage Area B. The monitoring station is located immediately upstream of the culverts on the Key Lake-McArthur River haul road. The location is characterized by a thick organic substrate, and anthropogenically altered, stable, sand, gravel, and boulder banks with grass, while the channel sections upstream and downstream of the road is generally classified as wetland. The cross-section is approximately 9 m wide and flow is typically deep with gentle laminar flow. SB-1 produces a poor stage-discharge relationship; spring discharge elevations are considerably lower for the corresponding discharge rates than summer and fall measurements. Beaver activity immediately upstream of the culverts affected the stage-discharge relationship during the summer of 2011. Beaver activity approximately 90 m downstream of the culverts resulted in affected water levels from early July and throughout the remainder of the 2013 open water season.

## SB-3

Streamflow station SB-3 is located downstream of LB-2. The monitoring station is located in a narrow deep section of the stream with a substrate composed of cobble, boulder, sand and organics. The cross-section has vertical banks with moss and shrubs and a width of approximately 3 m. Although the right bank gains relief within several meters of the stream, the left bank is low lying and reflects flood plain characteristics for tens of meters. SB-3 produces a good stage-discharge relationship and hydrograph.

## SB-4

Streamflow Station SB-4 flows into the southwest end of LB-3. The stream flows through low-lying muskeg and is poorly defined. A relatively controlled section was identified as suitable for the streamflow monitoring station;

however both banks are poorly defined, the substrate consists of angular cobbles and boulders, and the stream is surrounded by muskeg. This section of the stream is approximately 5 m wide, has organic banks, and an organic substrate with emergent aquatic vegetation. During the spring site visit, the channel upstream and downstream was blocked with ice. The low velocity and boulder substrate at the cross-section introduce considerable error into discharge measurements. Nevertheless, SB-4 produces a fair stage-discharge relationship and hydrograph. The flow characteristics here differ somewhat from the corresponding flow dynamics in Drainage Area A and SB-3, likely due to the flow characteristics through the muskeg, the buildup of ice during the winter and its gradual melting throughout the summer, and ice blockage during the spring and early summer. A Levelogger was not installed at this location during the 2011 open water season, and in 2012 an animal interfered with the continuous level measurements and disturbed measurements for a portion of July and August.

### 2.3.2 Relationship to Regional Hydrology

While the drainage area (3,030 $km^2$) of the Water Survey of Canada (WSC 2012a, 2012b) hydrometric station on the Wheeler River is much larger than those near the site (<371 $km^2$), the drainage areas relevant to the Project are climatically and physio-graphically similar to the other tributaries of the Wheeler River. As a result, a scaled relationship between flow observed at the larger streamflow stations and the Water Survey of Canada (WSC 2012a, 2012b) hydrometric station on the Wheeler River, downstream of Russell Lake (Station 06DA005) should be valid and could be used to simulate past daily flows in the Project Area based on the 1974-2012 record of flows in the Wheeler River, downstream of Russell Lake (Station 06DA005). A population of 509 samples of observed streamflow from station SA-1 collected over three years were regressed against WSC Station 06DA005 yielded Equation 1 with a correlation coefficient (R) of 0.972. A population of 509 samples of observed streamflow from station SB-3 were regressed against WSC Station 06DA005 yielded Equation 2 with a R= 0.903. A valid relationship between SB-1 and WSC station 06DA005 was not found based on the data collected to date.

$$Q_{SA1} = aQ_{06DA005}^{\ b} \quad (1)$$

Where:

$Q_{SA1}$ = Daily mean discharge for station SA-1 ($m^3/s$)
$Q_{06DA005}$= Daily mean discharge for WSC Station 06DA005 ($m^3/s$)
a = 0.091134488
b = 1.089166899

$$Q_{SB3} = aQ_{06DA005}^{\ b} \quad (2)$$

Where:

$Q_{SB3}$ = Daily mean discharge for station SB-3 ($m^3/s$)
$Q_{06DA005}$= Daily mean discharge for WSC Station 06DA005 ($m^3/s$)
a = 0.004426783
b = 1.272384298

### 2.3.3 Effect of Seasonal Ice Formation on Streamflow

The development of ice cover in stream channels causes a backwater which is influenced by the quantity and character of ice as well as the quantity of discharge flowing through the stream. Open water rating curves must be adapted to account for the backwater if they are to be applied during ice covered periods (USGS 1982). The backwater effect can be accounted for by comparison of streamflow data to weather records and nearby gaging stations as well as using adjustment factors. An adjustment factor, K, was derived as the ratio of observed ice covered discharge to the open water rated discharge corresponding to the observed stage. The K values observed during March 2014 are presented in Table 3. Late winter discharge could be estimated by multiplying the discharge read from the curves presented in Appendix C by the adjustment factor.

**Table 3: Adjustment Factors (K) observed for Ice Covered Discharge**

| Station | Date | K |
|---|---|---|
| SA1 | 25-Mar-14 | 0.277 |
| SA2 | 24-Mar-14 | 0.364 |
| SA3 | 24-Mar-14 | 0.524 |
| SA4 | 23-Mar-13 | 0.585 |
| SA5 | 23-Mar-14 | 0.409 |
| SA6 | 23-Mar-14 | 0.706 |
| SB3 | 25-Mar-14 | 0.788 |

### 2.3.4 Lakes

Lake stage was measured during each site visit (Table 2), unless snow cover prevented the collection of accurate water level measurements in the spring and winter. In cases where discharge measurements were collected at the outflow channel, lake stage-discharge curves are presented in Appendix C. These data can be used to create continuous lake level records for the measurement periods. Additionally, a continuous water level sensor was installed at LA-7. Table 4 presents a summary of geodetic water levels at each monitored lake during open water conditions between 2011 and 2013. The difference between maximum and minimum water levels measured at the monitored lakes has typically been less than 0.3 m.

**Table 4: Lake Water Level Summary**

| Station | Minimum Measured Water Level (masl) | Maximum Measured Water Level (masl) |
|---|---|---|
| LA-1 | 494.194 | 494.448 |
| LA-2 | 494.467 | 494.654 |
| LA-3 | 494.439 | 494.619 |
| LA-4 | 498.507 | 498.649 |
| LA-5 | 499.949 | 500.074 |
| LA-6 | 499.943 | 500.092 |
| LA-7 | 520.424 | 520.536 |
| LB-1 | 503.707 | 504.079 |
| LB-2 | 510.392 | 510.573 |
| LB-3 | 518.356 | 518.580 |
| LAB-1 | 487.994 | 488.233 |

masl = metres above sea level

Ice thickness was observed at the deepest point of each monitored lake between March 23, 2014 and April 1, 2014. Ice thickness observed at the end of March can be considered the maximum development of ice thickness for the winter of 2013-2014. Table 5 presents a summary of ice thicknesses. Observed lake ice thickness ranged from 0.70 m to 0.97 m with an average of 0.83 m.

**Table 5: Lake Water Level Summary**

| Station | Ice Surface | Ice Thickness | Water Surface |
|---|---|---|---|
| LA-1 | 494.258 | 0.97 | 494.298 |
| LA-2 | 494.582 | 0.76 | 494.582 |
| LA-3 | 494.589 | 0.80 | 494.649 |
| LA-4 | 498.634 | 0.82 | 498.614 |
| LA-5 | 500.076 | 0.70 | 500.076 |
| LA-6 | 500.058 | 0.94 | 500.058 |
| LA-7 | 520.472 | 0.85 | 520.502 |
| LB-1 | n/a | n/a | n/a |
| LB-2 | 510.533 | 0.78 | 510.533 |
| LB-3 | 518.463 | 0.82 | 518.463 |
| LAB-1 | 488.332 | 0.83 | 488.382 |

masl = metres above sea level

# 3.0 CLOSURE

Golder Associates Ltd. appreciates the opportunity to assist Denison with this project. We trust that this report meets your needs at this time. Should you have any questions or comments, please do not hesitate to contact the undersigned.

**GOLDER ASSOCIATES LTD.**





Ross Phillips, M.Sc., B.A.Sc.
Junior Water Resources Engineer

Brent Topp, B.Sc., P.Geo.
Associate, Senior Hydrologist

RP/BT/pls

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

n:\active\2012\1362\12-1362-0050 denison wheeler project hydrologyaquatics\1000 hydrology\hydro report\2014 hydro report\12-1362-0050 rpt 14 may 29 denison hydrology baseline final.docx

# 4.0 REFERENCES


EC (Environment Canada). 2013. National Climate Data and Information Archive. Environment Canada. Website: http://www.climate.weatheroffice.gc.ca/climateData/canada_e.html

Golder (Golder Associates Ltd). 2013. Denison Wheeler River Ground Survey Summary. Draft Technical Memorandum.

Terzi, R.A. 1981. Hydrometric Field Manual – Measurement of streamflow. Inland Waters Directorate, Water Resources Branch. Environment Canada.

USGS (United States Geological Survey). 1982.Measurement and Computation of Streamflow: Volume 2. Computation of Discharge. Geological Survey Water-Supply Paper 2175. Pp. 360 – 376.

WSC (Water Survey of Canada). 2014a. Archived hydrometric data. Water Survey Branch, Environment Canada. Website: http://www.wsc.ec.gc.ca/hydat/H2O/index_e.cfm?cname=main_e.cfm

WSC. 2014b. Real-time hydrometric data. Water Survey Branch, Environment Canada. Website: http://www.wateroffice.ec.gc.ca/index_e.html.

# APPENDIX A

## Denison Wheeler River Ground Survey Summary

# MEMORANDUM

**TO** Lawson Forand, Denison Mines Corp. **DATE** January 3, 2013

**CC** Clark Gamelin, Denison Mines Corp.

**FROM** Ashley Dubnick/Brent Topp **PROJECT No.** 12-1362-0050/1000

**DENISON WHEELER RIVER GROUND SURVEY SUMMARY**

## Introduction

Golder Associates Ltd. (Golder) was retained by Denison Mines Corp. (Denison) to perform a hydrological baseline program as part of a pre-feasibility study of the Phoenix deposit at the Wheeler River property (the Project) near Key Lake, Saskatchewan. As part of the program, Golder has established a number of hydrological monitoring stations to collect the necessary hydrological baseline data to support various project requirements including environmental assessments, regulatory permitting, and providing design basis information for engineered designs, including fresh water diversions, water management systems, sedimentation ponds, and cross-drainage structures. To most accurately complete these hydrological assessments, models that incorporate the hydrological information and the LiDAR surface, collected in June, 2010, may be created. However, to accurately combine these datasets, a topographic survey of the hydrological station benchmarks is necessary. This technical memorandum presents a summary of the geodetic survey results completed at the Denison Wheeler River property.

## Methods

The geodetic ground survey was completed on October 21 to 24, 2012 using a GPS Base Station and RTK GPS Rover with the following specifications:

### GPS Base Station

- Sokkia GRX1 base station receiver integrated with GPS and GLONASS tracking in conjunction with Satel differential correction external radio.
- Satel radio transmission repeater used to increase signal quality and range.

### RTK GPS Rover

- Sokkia GRX1 RTK rover receiver integrated with GPS and GLONASS tracking in conjunction with Satel differential correction internal radio.
- RTK GPS attached to a fixed-height carbon fibre pole.

Because the benchmark or the control points used for the LiDAR survey were not accessible or useable for the purposes of this ground survey, site control was established using planted iron pins at four locations. The base station reference point was established by averaging 2700 autonomous GPS readings and a site-specific geoid model was used for all surveys. Geodetic elevations at all benchmarks established at hydrometric monitoring stations were collected.

## Results

Over the course of the survey, no horizontal error exceeded 0.037m to established control and no vertical error exceeded 0.012m to established control. Table 1 presents the greatest errors to established control observed on each day of the survey.

**Table 1: Greatest Error to Established Control**

| | Northing (m) | Easting (m) | Elevation (m) |
|---|---|---|---|
| October 21, 2012 | 0.017 | 0.015 | 0.012 |
| October 22, 2012 | 0.016 | 0.013 | 0.006 |
| October 23, 2012 | 0.002 | 0.015 | 0.010 |
| October 24, 2012 | 0.021 | 0.037 | 0.007 |

Ground survey results are presented in Table 2 and include the location and elevation of each point as well as indicators of the point quality.

**Table 2: Geodetic Survey Results**

| Benchmark | Type | Location (WGS 84) | | | Point Quality | | | |
|---|---|---|---|---|---|---|---|---|
| | | Northing (m) | Easting (m) | Elevation (m) | HDOP Avg | VDOP Avg | PDOP Avg | Sat Avg |
| GolderWR CP1 | Rebar | 6372855.249 | 474661.887 | 519.868 | - | - | - | - |
| GolderWR CP2 | Rebar | 6374770.522 | 475606.918 | 540.993 | - | - | - | - |
| GolderWR CP2 | Rebar | 6370859.443 | 477535.796 | 556.213 | - | - | - | - |
| GolderWR CP2 | Rebar | 6370371.120 | 477093.253 | 558.542 | - | - | - | - |
| LA-2 BM1 | Rebar | 6375172.712 | 480842.634 | 497.339 | 0.8637 | 1.4567 | 1.6935 | 13 |
| LA-2 BM2 | Rebar | 6375174.795 | 480846.484 | 497.064 | 1.0822 | 1.6114 | 1.9415 | 12 |
| LA-2 BM3 | Rebar | 6375171.611 | 480846.491 | 496.34 | 0.8806 | 1.4144 | 1.6662 | 14 |
| LA-3 BM1 | Rock | 6373997.350 | 481487.807 | 496.134 | 0.6176 | 1.0483 | 1.2167 | 16 |
| LA-3 BM2 | Rock | 6373994.256 | 481487.899 | 496.034 | 0.6212 | 1.0813 | 1.2474 | 16 |
| LA-3 BM3 | Rock | 6373997.038 | 481478.058 | 494.831 | 0.6510 | 1.1243 | 1.2992 | 15 |
| LA-4 BM1 | Rebar | 6376186.639 | 481994.794 | 500.365 | 0.8486 | 1.2003 | 1.4700 | 15 |
| LA-4 BM2 | Rebar | 6376189.113 | 481991.522 | 500.252 | 0.8522 | 1.2156 | 1.4846 | 14 |
| LA-4 BM3 | Rebar | 6376187.971 | 481988.774 | 499.699 | 0.8540 | 1.2233 | 1.4919 | 15 |
| LA-5 BM1 | Rebar | 6374540.225 | 477831.352 | 501.366 | 0.7518 | 1.1807 | 1.3997 | 13 |
| LA-5 BM2 | Rebar | 6374541.110 | 477824.823 | 501.014 | 0.7609 | 1.1976 | 1.4189 | 13 |
| LA-5 BM3 | Rebar | 6374538.032 | 477835.822 | 501.023 | 0.7499 | 1.1325 | 1.3584 | 13 |
| LA-6 BM1 | Rebar | 6375257.733 | 477749.298 | 502.388 | 0.9719 | 1.7615 | 2.0118 | 12 |
| LA-6 BM2 | Rebar | 6375254.317 | 477756.381 | 502.08 | 0.9763 | 1.8564 | 2.0981 | 11 |
| LA-7 BM1 | Rock | 6375365.152 | 474859.273 | 522.374 | 0.7420 | 1.0764 | 1.3074 | 16 |
| LA-7 BM2 | Rock | 6375370.136 | 474856.009 | 522.067 | 0.7449 | 1.0884 | 1.3188 | 16 |
| LA-7 BM3 | Rock | 6375373.196 | 474852.454 | 521.8 | 0.7528 | 1.1217 | 1.3509 | 15 |
| LAB-1 BM1 | Rebar | 6368332.435 | 478695.192 | 489.243 | 0.6562 | 1.1309 | 1.3075 | 16 |
| LAB-1 BM2 | Rebar | 6368331.850 | 478688.921 | 489.745 | 0.7115 | 1.1969 | 1.3924 | 16 |
| LAB-1 BM3 | Rebar | 6368334.674 | 478697.583 | 489.597 | 0.6292 | 1.0883 | 1.2571 | 18 |
| LB-1 BM1 | Rebar | 6369366.788 | 476603.997 | 505.231 | 0.6245 | 1.0322 | 1.2066 | 17 |

| Benchmark | Type | Location (WGS 84) | | | Point Quality | | | |
|---|---|---|---|---|---|---|---|---|
| | | Northing (m) | Easting (m) | Elevation (m) | HDOP Avg | VDOP Avg | PDOP Avg | Sat Avg |
| LB-1 BM2 | Rebar | 6369370.293 | 476602.209 | 505.04 | 0.5854 | 0.9346 | 1.1029 | 19 |
| LB-1 BM3 | Rebar | 6369363.850 | 476597.929 | 505.073 | 0.6873 | 1.1251 | 1.3185 | 15 |
| LB-2 BM1 | Rebar | 6371898.916 | 474903.385 | 511.767 | 0.7817 | 1.3143 | 1.5293 | 14 |
| LB-2 BM2 | Rebar | 6371901.778 | 474906.357 | 511.819 | 0.7503 | 1.3058 | 1.5060 | 15 |
| LB-2 BM3 | Rebar | 6371904.723 | 474900.057 | 511.806 | 0.7563 | 1.3243 | 1.5251 | 15 |
| LB-3 BM1 | Rebar | 6374839.646 | 474884.439 | 520.159 | 0.8050 | 1.3752 | 1.5935 | 15 |
| LB-3 BM2 | Rebar | 6374831.436 | 474893.291 | 519.42 | 0.8075 | 1.3649 | 1.5859 | 14 |
| LB-3 BM3 | Rebar | 6374834.862 | 474895.379 | 520.021 | 0.8710 | 1.4123 | 1.6595 | 13 |
| SA-1 BM1 | Rebar | 6371129.601 | 480327.636 | 496.123 | 0.6503 | 1.1645 | 1.3338 | 16 |
| SA-1 BM2 | Rock | 6371125.303 | 480328.743 | 495.576 | 0.8882 | 1.4407 | 1.6926 | 15 |
| SA-1 BM3 | Rebar | 6371123.762 | 480357.257 | 494.361 | 0.6567 | 1.1236 | 1.3015 | 15 |
| SA-2 BM1 | Rock | 6373258.113 | 478533.160 | 498.369 | 0.7284 | 1.1748 | 1.3824 | 14 |
| SA-2 BM2 | Rock | 6373258.391 | 478529.590 | 498.354 | 0.7223 | 1.1761 | 1.3802 | 14 |
| SA-3/LA-1 BM1 | Rebar | 6373226.219 | 479403.750 | 495.714 | 0.6648 | 0.9753 | 1.1803 | 15 |
| SA-3/LA-1 BM2 | Rebar | 6373227.014 | 479408.484 | 495.55 | 0.6932 | 1.1317 | 1.3274 | 14 |
| SA-3/LA-1 BM3 | Rebar | 6373222.211 | 479402.381 | 495.616 | 0.7095 | 1.0651 | 1.2798 | 15 |
| SA-4 BM1 | Rebar | 6375855.114 | 476914.695 | 507.772 | 0.7494 | 1.1259 | 1.3528 | 12 |
| SA-4 BM2 | Rock | 6375853.025 | 476915.570 | 508.373 | 0.6744 | 1.0823 | 1.2752 | 13 |
| SA-5 BM1 | Rebar | 6375723.540 | 477791.074 | 502.58 | 0.8335 | 1.5526 | 1.7626 | 13 |
| SA-5 BM2 | Rock | 6375739.656 | 477807.701 | 502.045 | 0.7208 | 1.3664 | 1.5449 | 15 |
| SA-6 BM1 | Rebar | 6374757.968 | 477848.597 | 503.32 | 0.7968 | 1.2055 | 1.4451 | 13 |
| SA-6 BM2 | Rebar | 6374752.648 | 477849.463 | 503.205 | 0.6627 | 1.0256 | 1.2210 | 15 |
| SA-6 BM3 | Rebar | 6374746.296 | 477855.608 | 502.021 | 0.7816 | 1.2429 | 1.4682 | 13 |
| SB-1 BM1 | Culvert | 6366351.011 | 476038.945 | 489.602 | 0.7076 | 1.1207 | 1.3254 | 16 |
| SB-1 BM2 | Culvert | 6366355.284 | 476042.540 | 489.414 | 0.7191 | 1.1384 | 1.3465 | 15 |
| SB-1 BM3 | Rock | 6366375.139 | 476028.439 | 489.217 | 0.7107 | 1.2371 | 1.4268 | 15 |
| SB-3 BM1 | Rebar | 6371642.428 | 475847.211 | 511.473 | 0.6569 | 0.9922 | 1.1900 | 16 |
| SB-3 BM2 | Rock | 6371638.405 | 475838.409 | 511.897 | 0.6562 | 0.9889 | 1.1868 | 16 |
| SB-4 BM1 | Rock | 6372197.891 | 472953.818 | 520.307 | 0.6084 | 1.1287 | 1.2822 | 17 |
| SB-4 BM2 | Rock | 6372197.460 | 472955.741 | 520.205 | 0.7005 | 1.3090 | 1.4847 | 13 |
| SB-4 BM3 | Rock | 6372197.402 | 472957.726 | 520.305 | 0.6243 | 1.1415 | 1.3011 | 16 |

HDOPAvg: Horizontal dilution of precision

VDOPAvg Vertical dilution of precision

PDOPAvg: Positional (3D) dilution of precision

SatAvg: average number of satellites

## Closure

Golder Associates Ltd. appreciates the opportunity to assist Denison with this project. We trust that this report meets your needs at this time. Should you have any questions or comments, please do not hesitate to contact us.

N:\Active\2012\1362\12-1362-0050 Denison Wheeler Project HydrologyAquatics\1000 Hydrology\Hydro Report\Apendices\Appendix A\2013 01 03 Survey Summary_BT_AD.docx

# APPENDIX B

## Stage and Discharge Measurements

**Table B1: Lake Stage Measurements**

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (m) (Geodetic) |
|---|---|---|---|
| LA-1 | 13-May-11 | 98.725 | 494.439 |
| | 29-Jul-11 | 98.613 | 494.327 |
| | 28-Oct-11 | 98.504 | 494.218 |
| | 4-May-12 | 98.709 | 494.423 |
| | 5-Aug-12 | 98.672 | 494.386 |
| | 23-Oct-12 | 98.734 | 494.448 |
| | 21-May-13 | 98.726 | 494.44 |
| | 14-Aug-13 | 98.551 | 494.265 |
| | 16-Oct-13 | 98.48 | 494.194 |
| | 25-Mar-14 | 98.584 | 494.298 |
| LA-2 | 13-May-11 | 97.269 | 494.615 |
| | 30-Jul-11 | 97.256 | 494.602 |
| | 29-Oct-11 | 97.203 | 494.549 |
| | 4-May-12 | 97.264 | 494.61 |
| | 6-Aug-12 | 97.274 | 494.62 |
| | 23-Oct-12 | 97.308 | 494.654 |
| | 20-May-13 | 97.278 | 494.624 |
| | 13-Aug-13 | 97.197 | 494.543 |
| | 16-Oct-13 | 97.121 | 494.467 |
| | 26-Mar-14 | 97.236 | 494.582 |
| LA-3 | 13-May-11 | 98.427 | 494.561 |
| | 30-Jul-11 | 98.433 | 494.567 |
| | 29-Oct-11 | 98.427 | 494.561 |
| | 4-May-12 | 98.472 | 494.606 |
| | 6-Aug-12 | 98.456 | 494.59 |
| | 23-Oct-12 | 98.485 | 494.619 |
| | 20-May-13 | 98.459 | 494.593 |
| | 13-Aug-13 | 98.387 | 494.521 |
| | 16-Oct-13 | 98.305 | 494.439 |
| | 26-Mar-14 | 98.515 | 494.649 |

**Table B1: Lake Stage Measurements (continued)**

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (m) (Geodetic) |
|---|---|---|---|
| LA-4 | 29-Jul-11 | 98.284 | 498.649 |
| | 30-Oct-11 | 98.152 | 498.517 |
| | 4-May-12 | 98.223 | 498.588 |
| | 5-Aug-12 | 98.248 | 498.613 |
| | 6-Aug-12 | 98.257 | 498.622 |
| | 23-Oct-12 | 98.262 | 498.627 |
| | 20-May-13 | 98.259 | 498.624 |
| | 13-Aug-13 | 98.164 | 498.529 |
| | 16-Oct-13 | 98.142 | 498.507 |
| | 27-Mar-14 | 98.249 | 498.614 |
| LA-5 | 13-May-11 | 98.706 | 500.050 |
| | 31-Jul-11 | 98.67 | 500.014 |
| | 27-Oct-11 | 98.605 | 499.949 |
| | 6-May-12 | 98.73 | 500.074 |
| | 5-Aug-12 | 98.693 | 500.037 |
| | 22-Oct-12 | 98.728 | 500.072 |
| | 21-May-13 | 98.729 | 500.073 |
| | 13-Aug-13 | 98.625 | 499.969 |
| | 17-Oct-13 | 98.606 | 499.95 |
| | 23-Mar-14 | 98.732 | 500.076 |
| LA-6 | 13-May-11 | 97.675 | 500.063 |
| | 31-Jul-11 | 97.64 | 500.028 |
| | 27-Oct-11 | 97.555 | 499.943 |
| | 6-May-12 | 97.7 | 500.088 |
| | 5-Aug-12 | 97.67 | 500.058 |
| | 22-Oct-12 | 97.704 | 500.092 |
| | 19-May-13 | 97.7 | 500.088 |
| | 13-Aug-13 | 97.585 | 499.973 |
| | 17-Oct-13 | 97.559 | 499.947 |
| | 23-Mar-14 | 97.67 | 500.058 |

**Table B1: Lake Stage Measurements (continued)**

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (m) (Geodetic) |
|---|---|---|---|
| LA-7 | 29-Jul-11 | 98.108 | 520.482 |
| | 31-Oct-11 | 98.05 | 520.424 |
| | 6-May-12 | 98.149 | 520.523 |
| | 8-Aug-12 | 98.108 | 520.482 |
| | 21-Oct-12 | 98.162 | 520.536 |
| | 24-May-13 | 98.157 | 520.531 |
| | 13-Aug-13 | 98.083 | 520.457 |
| | 16-Oct-13 | 98.066 | 520.44 |
| | 27-Mar-14 | 98.128 | 520.502 |
| LAB-1 | 16-May-11 | 98.991 | 488.219 |
| | 1-Aug-11 | 98.891 | 488.119 |
| | 30-Oct-11 | 98.776 | 488.004 |
| | 9-May-12 | 99 | 488.228 |
| | 6-Aug-12 | 98.939 | 488.167 |
| | 23-Oct-12 | 98.987 | 488.215 |
| | 21-May-13 | 99.005 | 488.233 |
| | 12-Aug-13 | 98.879 | 488.107 |
| | 19-Oct-13 | 98.766 | 487.994 |
| | 25-Mar-14 | 99.154 | 488.382 |
| LB-1 | 14-May-11 | 98.666 | 503.902 |
| | 1-Aug-11 | 98.807 | 504.043 |
| | 30-Oct-11 | 98.648 | 503.884 |
| | 6-May-12 | 98.636 | 503.872 |
| | 6-Aug-12 | 98.651 | 503.887 |
| | 21-Oct-12 | 98.617 | 503.853 |
| | 19-May-13 | 98.843 | 504.079 |
| | 14-Aug-13 | 98.509 | 503.745 |
| | 17-Oct-13 | 98.471 | 503.707 |

**Table B1: Lake Stage Measurements (continued)**

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (m) (Geodetic) |
|---|---|---|---|
| LB-2 | 14-May-11 | 98.767 | 510.523 |
| | 29-Jul-11 | 98.689 | 510.445 |
| | 30-Oct-11 | 98.636 | 510.392 |
| | 5-May-12 | 98.771 | 510.527 |
| | 6-Aug-12 | 98.745 | 510.501 |
| | 21-Oct-12 | 98.817 | 510.573 |
| | 21-May-13 | 98.756 | 510.512 |
| | 14-Aug-13 | 98.699 | 510.455 |
| | 17-Oct-13 | 98.651 | 510.407 |
| | 25-Mar-14 | 98.777 | 510.533 |
| LB-3 | 15-May-11 | 98.365 | 518.519 |
| | 29-Jul-11 | 98.284 | 518.438 |
| | 29-Oct-11 | 98.203 | 518.356 |
| | 5-May-12 | 98.361 | 518.515 |
| | 5-Aug-12 | 98.37 | 518.524 |
| | 21-Oct-12 | 98.426 | 518.58 |
| | 19-May-13 | 98.38 | 518.534 |
| | 13-Aug-13 | 98.278 | 518.432 |
| | 17-Oct-13 | 98.233 | 518.387 |
| | 25-Mar-14 | 98.233 | 518.463 |

**Table B2: Stream Stage and Discharge Measurements**

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (m) (Geodetic) | Discharge ($m^3/s$) |
|---|---|---|---|---|
| SA-1 | 14-May-11 | 97.793 | 492.714 | 2.307 |
| | 29-Jul-11 | 97.727 | 492.648 | 1.750 |
| | 28-Oct-11 | 97.641 | 492.562 | 0.973 |
| | 5-May-12 | 97.79 | 492.711 | 2.293 |
| | 6-Aug-12 | 97.774 | 492.695 | 2.031 |
| | 23-Oct-12 | 97.8 | 492.721 | 2.575 |
| | 20-May-13 | 97.784 | 492.705 | 2.358 |
| | 14-Aug-13 | 97.666 | 492.587 | 1.280 |
| | 18-Oct-13 | 97.633 | 492.554 | 0.887 |
| | 30-Mar-14 | 97.948 | 492.869 | 1.203 |
| SA-2 | 12-May-11 | 98.37 | 496.727 | 1.649 |
| | 30-Jul-11 | 98.341 | 496.698 | 1.387 |
| | 27-Oct-11 | 98.31 | 496.667 | 0.809 |
| | 8-May-12 | 98.391 | 496.748 | 2.008 |
| | 8-Aug-12 | *98.332* | *496.689* | 1.305 |
| | 24-Oct-12 | 98.377 | 496.734 | 2.030 |
| | 21-May-13 | 98.37 | 496.727 | 1.842 |
| | 14-Aug-13 | 98.303 | 496.66 | 0.863 |
| | 16-Oct-13 | 98.284 | 496.641 | 0.741 |
| | 24-Mar-14 | 98.448 | 496.805 | 1.180 |
| SA-3 | 13-May-11 | 98.745 | 494.459 | 0.476 |
| | 29-Jul-11 | 98.678 | 494.392 | 0.370 |
| | 28-Oct-11 | 98.608 | 494.322 | 0.239 |
| | 4-May-12 | 98.759 | 494.473 | 0.528 |
| | 5-Aug-12 | 98.729 | 494.443 | 0.478 |
| | 23-Oct-12 | 98.773 | 494.487 | 0.578 |
| | 20-May-13 | 98.768 | 494.482 | 0.564 |
| | 14-Aug-13 | 98.63 | 494.344 | 0.255 |
| | 16-Oct-13 | 98.529 | 494.243 | 0.051 |
| | 24-Mar-14 | 98.534 | 494.248 | 0.362 |



**Table B2: Stream Stage and Discharge Measurements (continued)**

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (m) (Geodetic) | Discharge ($m^3/s$) |
|---|---|---|---|---|
| SA-4 | 11-May-11 | 98.577 | 506.357 | 0.483 |
| | 30-Jul-11 | 98.534 | 506.314 | 0.335 |
| | 31-Oct-11 | 98.53 | 506.31 | 0.199 |
| | 4-May-12 | 98.568 | 506.348 | 0.466 |
| | 5-Aug-12 | 98.549 | 506.329 | 0.361 |
| | 22-Oct-12 | 98.587 | 506.367 | 0.497 |
| | 19-May-13 | 98.589 | 506.369 | 0.519 |
| | 13-Aug-13 | 98.497 | 506.277 | 0.276 |
| | 17-Oct-13 | 98.469 | 506.249 | 0.206 |
| | 23-Mar-13 | 98.601 | 506.381 | 0.330 |
| SA-5 | 12-May-11 | 98.129 | 500.708 | 1.100 |
| | 30-Jul-11 | 98.089 | 500.668 | 0.858 |
| | 29-Oct-11 | 98.03 | 500.609 | 0.476 |
| | 4-May-12 | 98.138 | 500.717 | 1.111 |
| | 5-Aug-12 | 98.105 | 500.684 | 1.026 |
| | 22-Oct-12 | 98.139 | 500.718 | 1.269 |
| | 19-May-13 | 98.147 | 500.726 | 1.381 |
| | 13-Aug-13 | 98.05 | 500.629 | 0.616 |
| | 17-Oct-13 | 98.043 | 500.622 | 0.507 |
| | 23-Mar-14 | 98.219 | 500.798 | 0.886 |
| SA-6 | 13-May-11 | 96.753 | 500.084 | 1.631 |
| | 30-Jul-11 | 96.703 | 500.034 | 1.303 |
| | 27-Oct-11 | 96.625 | 499.956 | 0.717 |
| | 6-May-12 | 96.767 | 500.098 | 1.957 |
| | 5-Aug-12 | 96.73 | 500.061 | 1.476 |
| | 22-Oct-12 | 96.771 | 500.102 | 1.851 |
| | 19-May-13 | 96.746 | 500.077 | 1.540 |
| | 13-Aug-13 | 96.661 | 499.992 | 0.842 |
| | 17-Oct-13 | 96.638 | 499.969 | 0.798 |
| | 23-Mar-14 | 96.75 | 500.081 | 1.173 |

**Table B2: Stream Stage and Discharge Measurements (continued)**

| Location | Date | Elevation (m) (Arbitrary Datum) | Elevation (m) (Geodetic) | Discharge ($m^3/s$) |
|---|---|---|---|---|
| SB-1 | 14-May-11 | 98.884 | 488.486 | 0.517 |
| | 31-Jul-11 | 99.425 | 489.027 | 0.186 |
| | 30-Oct-11 | 98.816 | 488.418 | 0.217 |
| | 3-May-12 | 98.922 | 488.524 | 0.644 |
| | 6-Aug-12 | 98.92 | 488.522 | 0.358 |
| | 23-Oct-12 | 98.997 | 488.599 | 0.578 |
| | 18-May-13 | 98.882 | 488.484 | 0.547 |
| | 12-Aug-13 | 98.733 | 488.335 | 0.158 |
| | 19-Oct-13 | 99.248 | 488.85 | 0.277 |
| | 27-Mar-14 | 99.221 | 488.823 | 0.289 |
| SB-3 | 11-May-11 | 98.964 | 510.465 | 0.187 |
| | 31-Jul-11 | 98.905 | 510.406 | 0.109 |
| | 30-Oct-11 | 98.888 | 510.389 | 0.082 |
| | 5-May-12 | 99.005 | 510.506 | 0.235 |
| | 8-Aug-12 | 98.955 | 510.456 | 0.136 |
| | 21-Oct-12 | 99.016 | 510.517 | 0.255 |
| | 20-May-13 | 98.976 | 510.476 | 0.209 |
| | 14-Aug-13 | 98.921 | 510.421 | 0.107 |
| | 17-Oct-13 | 98.914 | 510.414 | 0.080 |
| | 25-Mar-14 | 98.923 | 510.423 | 0.090 |
| SB-4 | 15-May-11 | 98.827 | 519.134 | 0.074 |
| | 1-Aug-11 | 98.657 | 518.964 | 0.008 |
| | 30-Oct-11 | 98.763 | 519.07 | 0.018 |
| | 5-May-12 | 98.912 | 519.219 | 0.109 |
| | 6-Aug-12 | 98.837 | 519.144 | 0.032 |
| | 21-Oct-12 | 98.938 | 519.245 | 0.099 |
| | 21-May-13 | 98.875 | 519.185 | 0.114 |
| | 15-Aug-13 | 98.764 | 519.074 | 0.007 |
| | 17-Oct-13 | 98.805 | 519.115 | 0.036 |

# APPENDIX C

## Open Water Stage-Discharge Curves for Lake Level and Streamflow Monitoring Stations

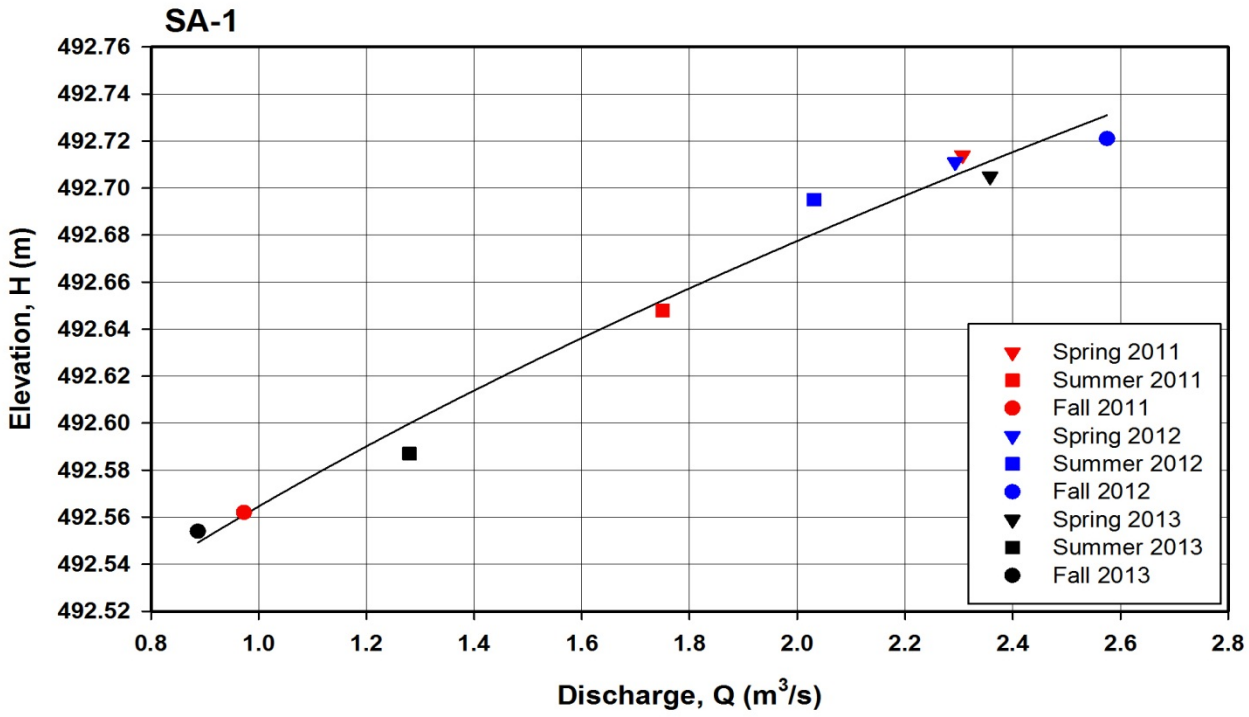



*Figure C1: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SA-1.*

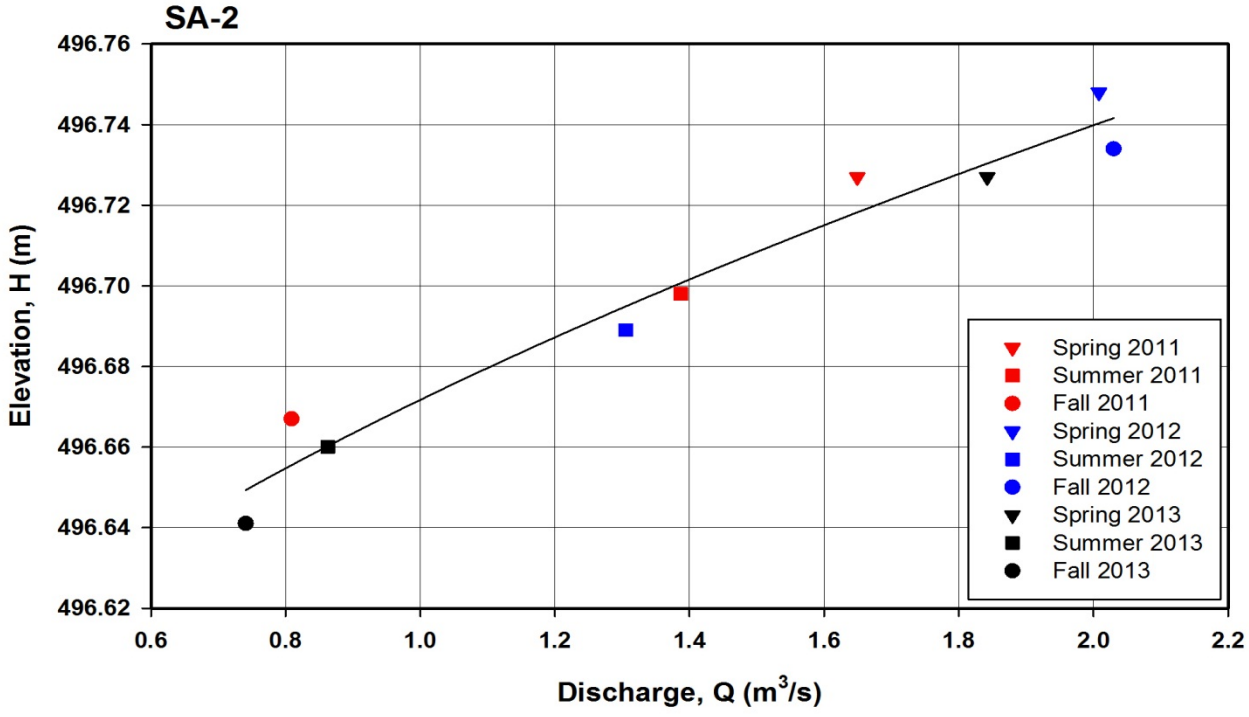



*Figure C2: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SA-2.*

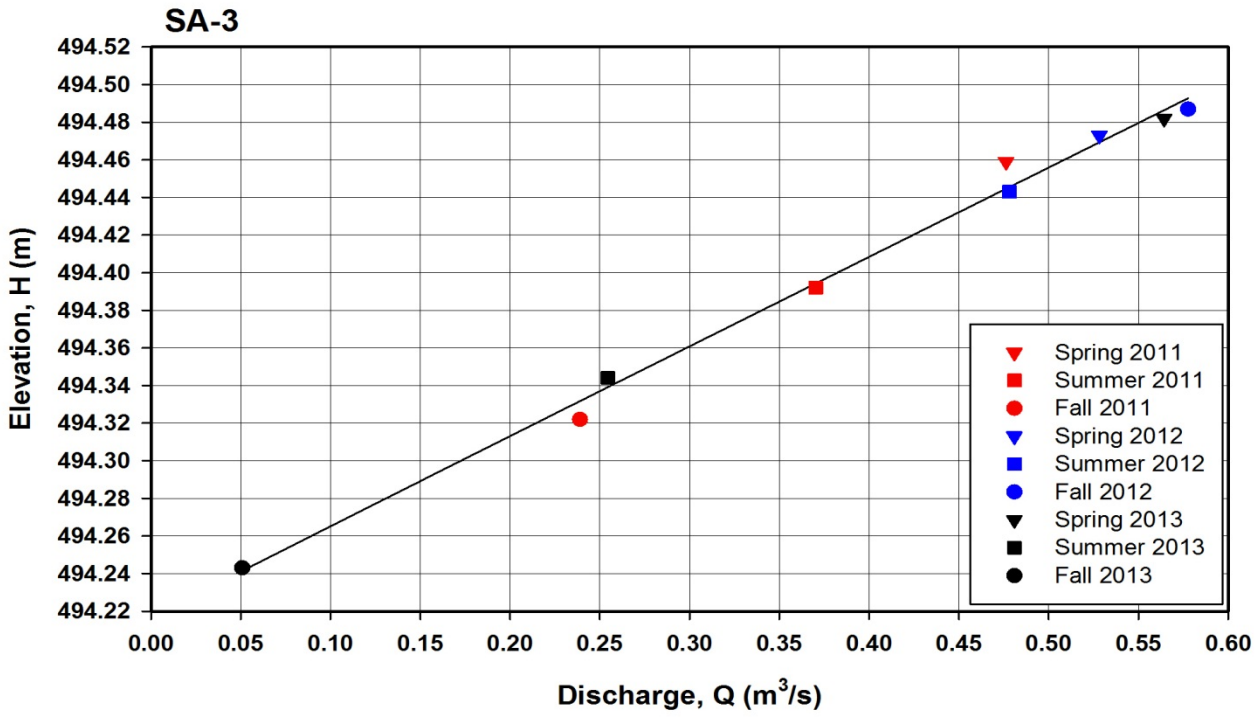



*Figure C3: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SA-3.*

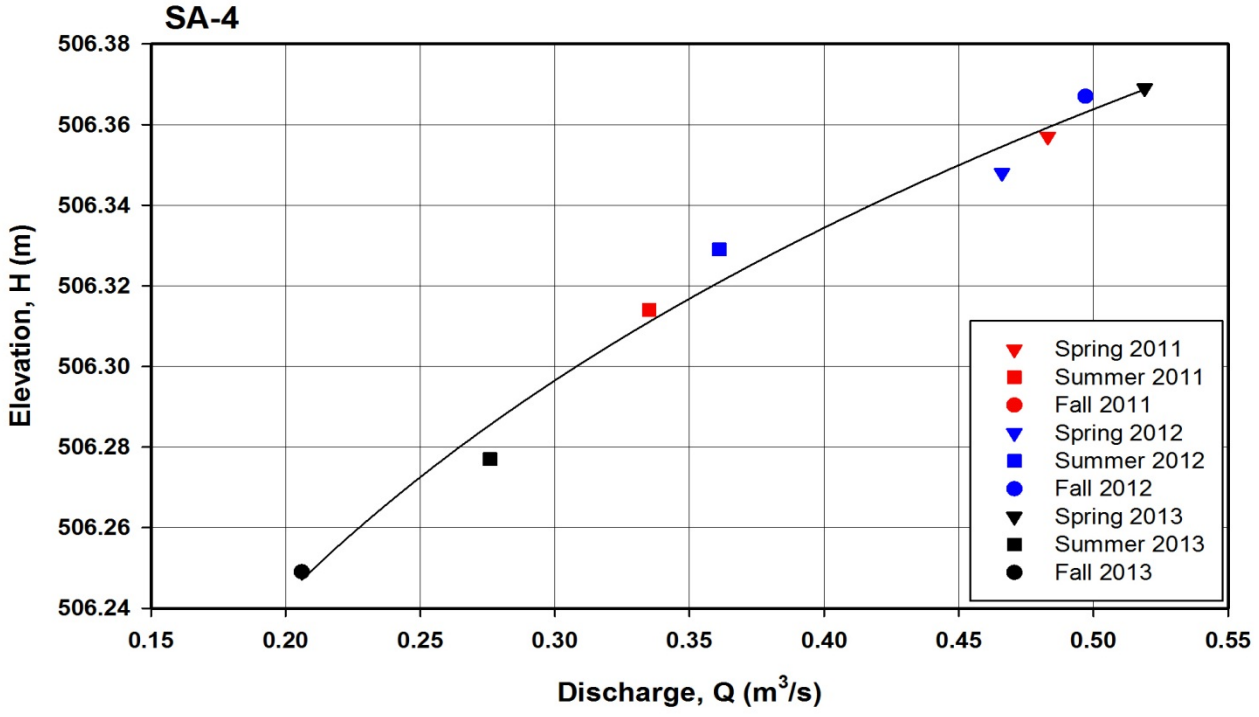



*Figure C4: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SA-4.*

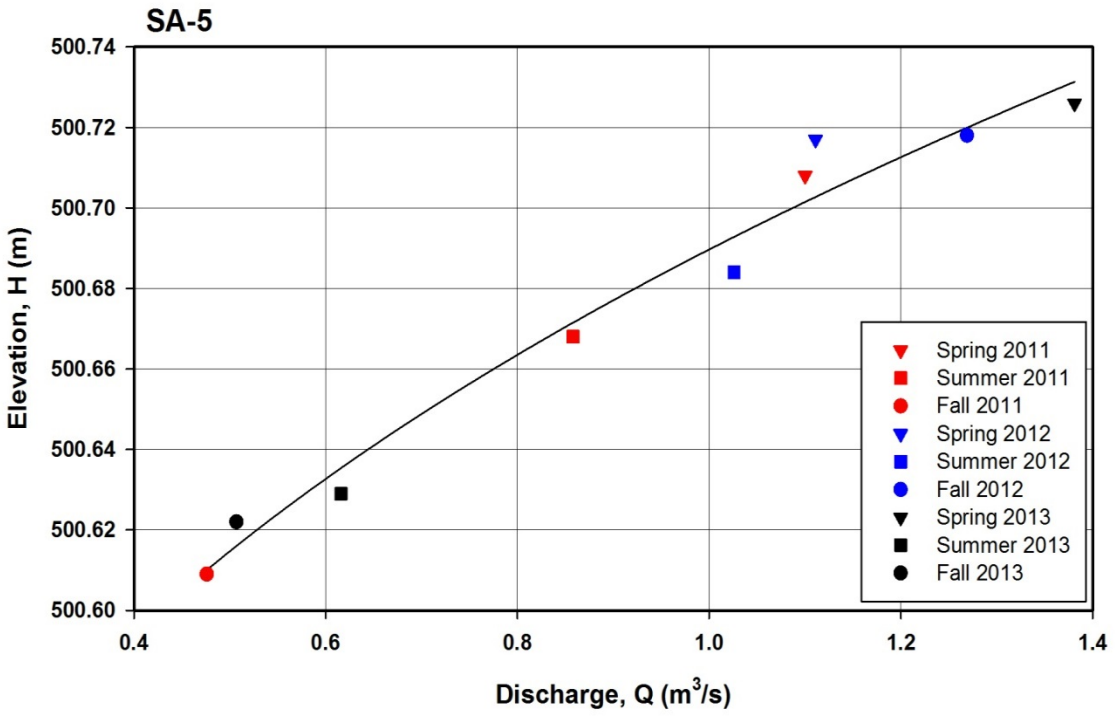



*Figure C5: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SA-5.*

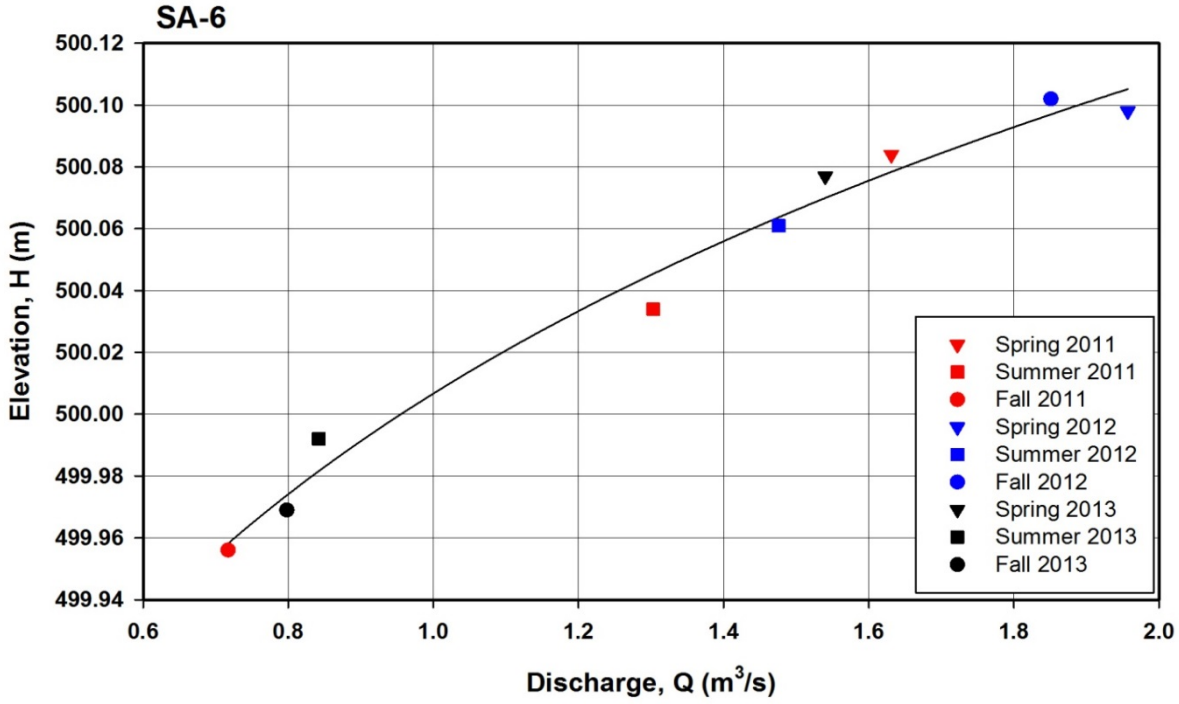



*Figure C6: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SA-6.*

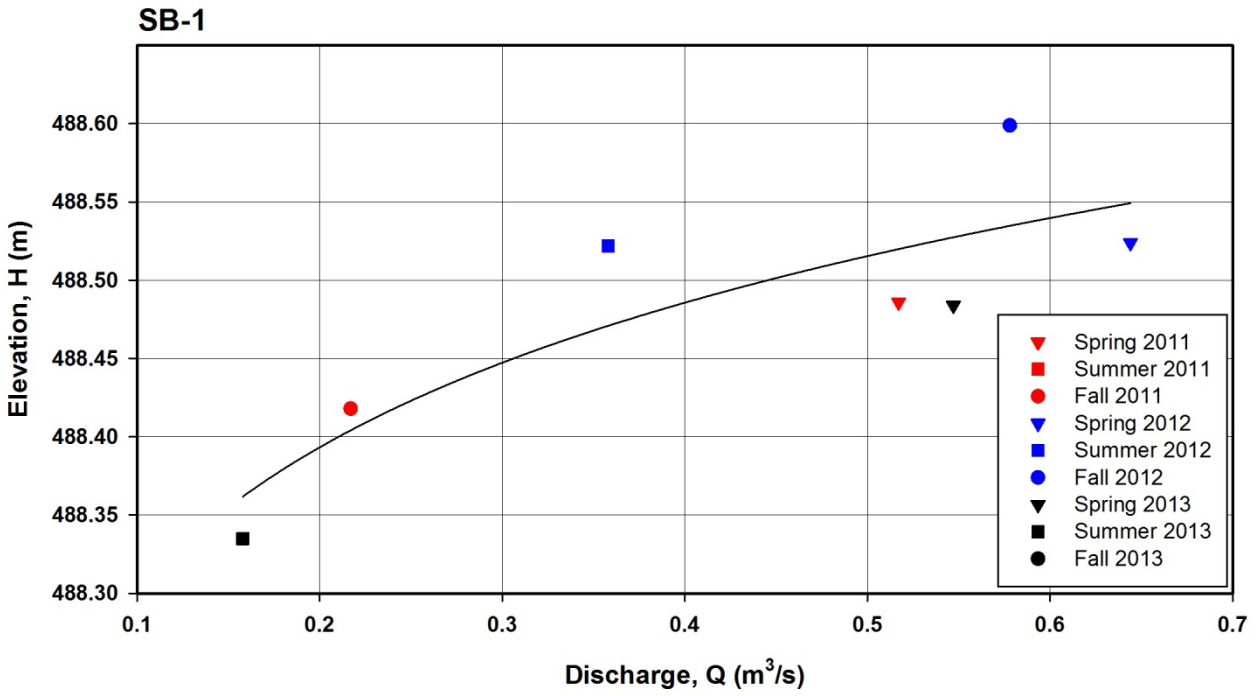



*Figure C7: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SB-1.*

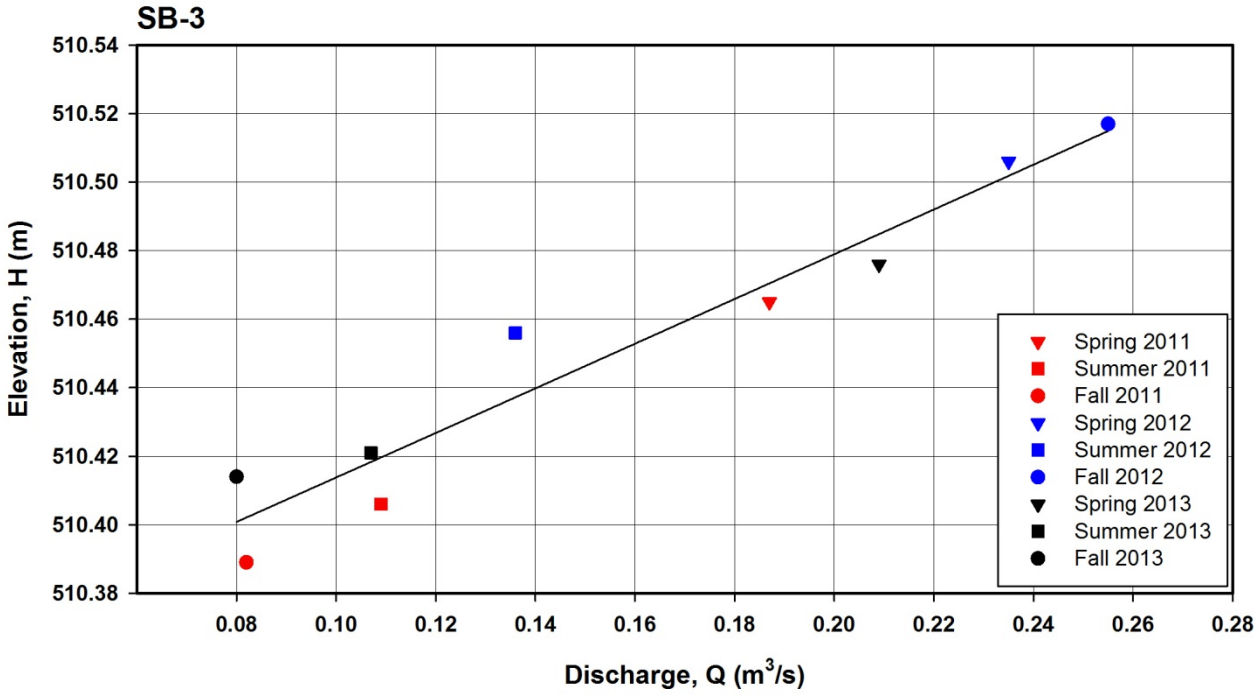



*Figure C8: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SB-3.*

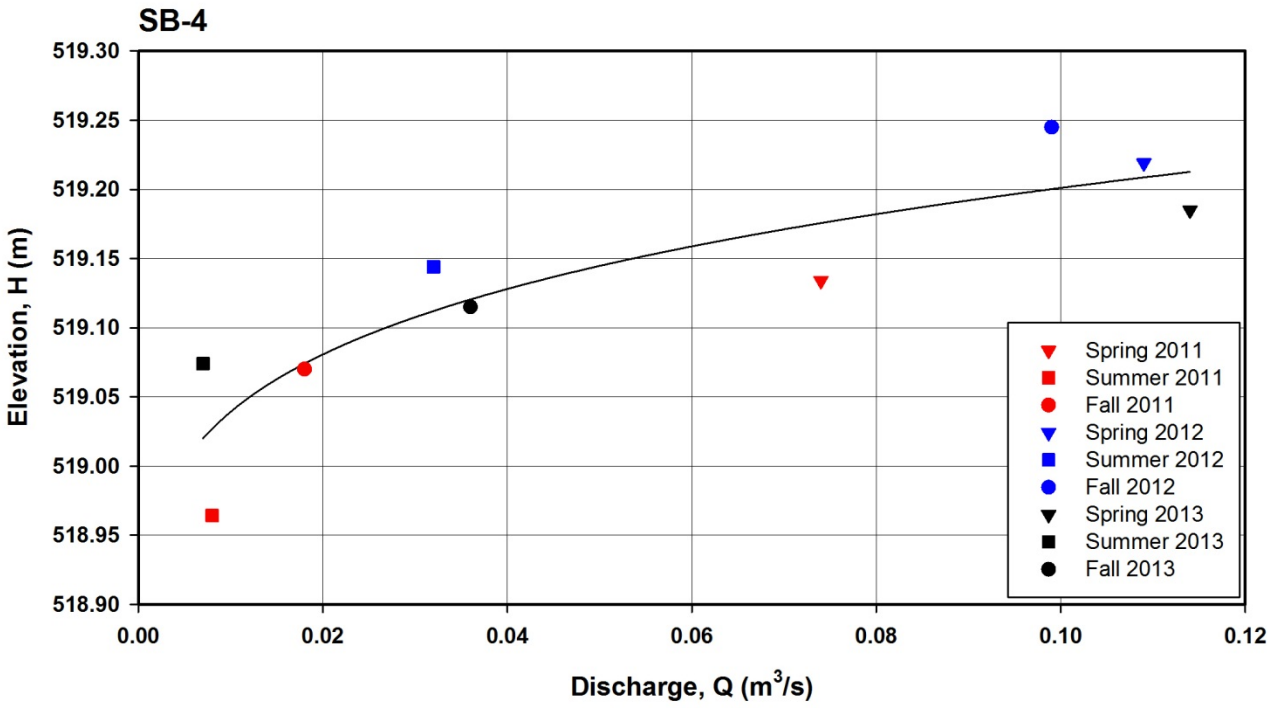



*Figure C9: Relationship between Water Surface Elevation, H (m), and Discharge, Q ($m^3/s$), at Streamflow Station SB-4.*

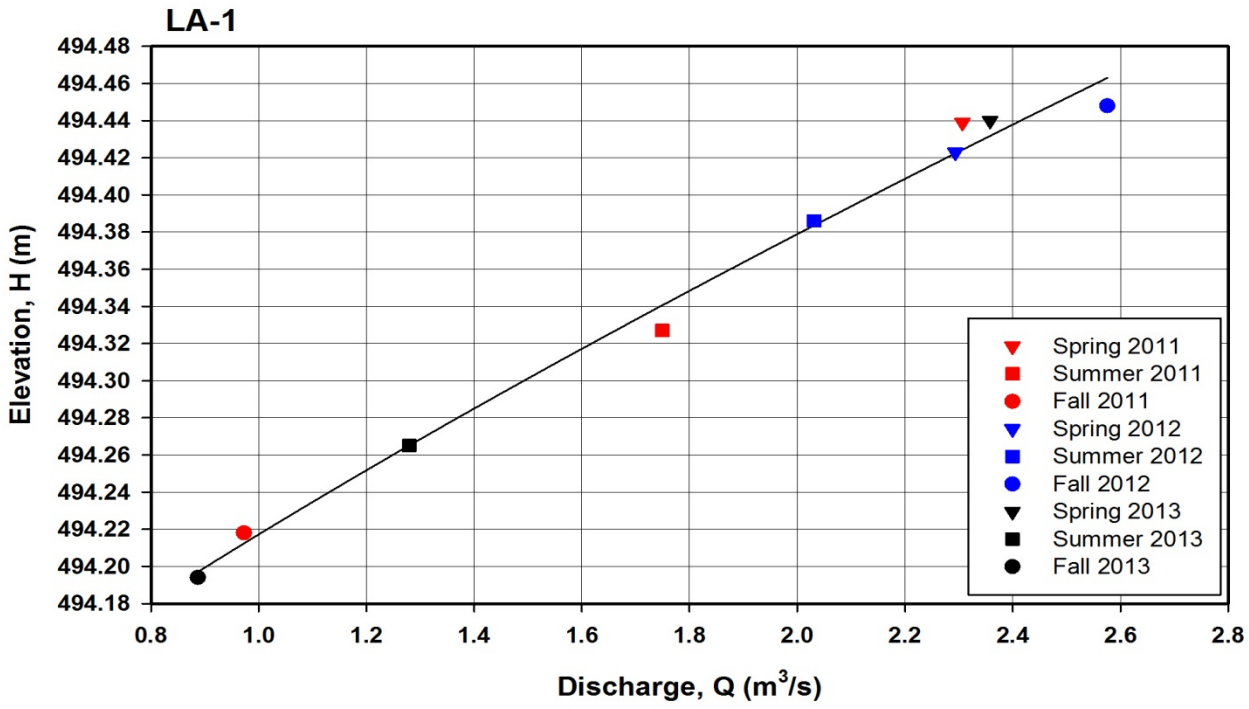



*Figure C10: Relationship between Water Surface Elevation, H (m), and Outflow Discharge, Q ($m^3/s$), at Lake Level Station LA-1.*

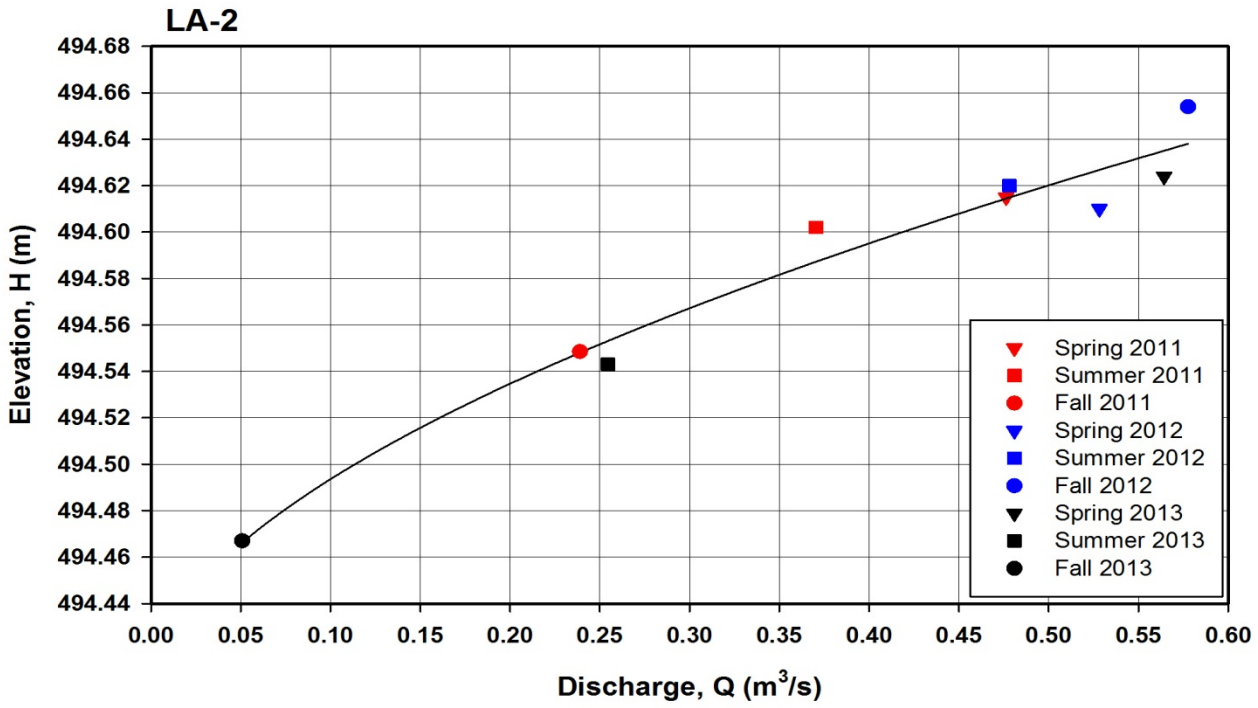



*Figure C11: Relationship between Water Surface Elevation, H (m), and Outflow Discharge, Q ($m^3$/s), at Lake Level Station LA-2.*

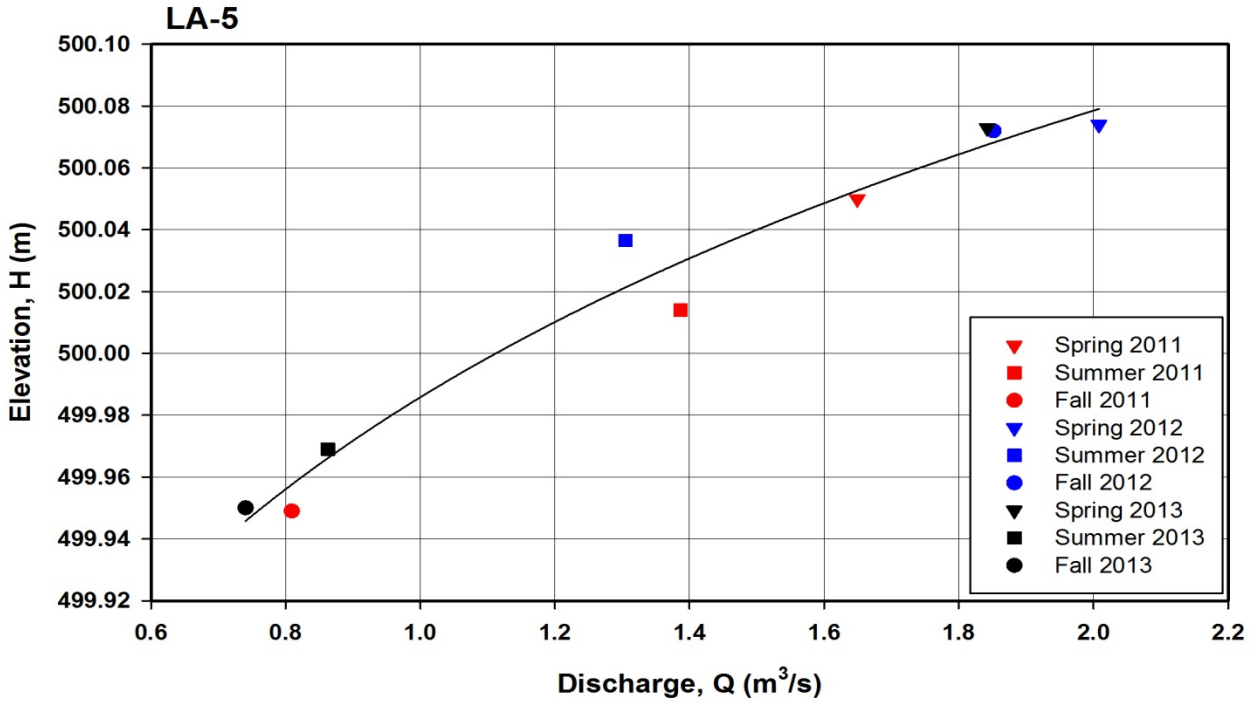



*Figure C12: Relationship between Water Surface Elevation, H (m), and Outflow Discharge, Q ($m^3$/s), at Lake Level Station LA-5.*

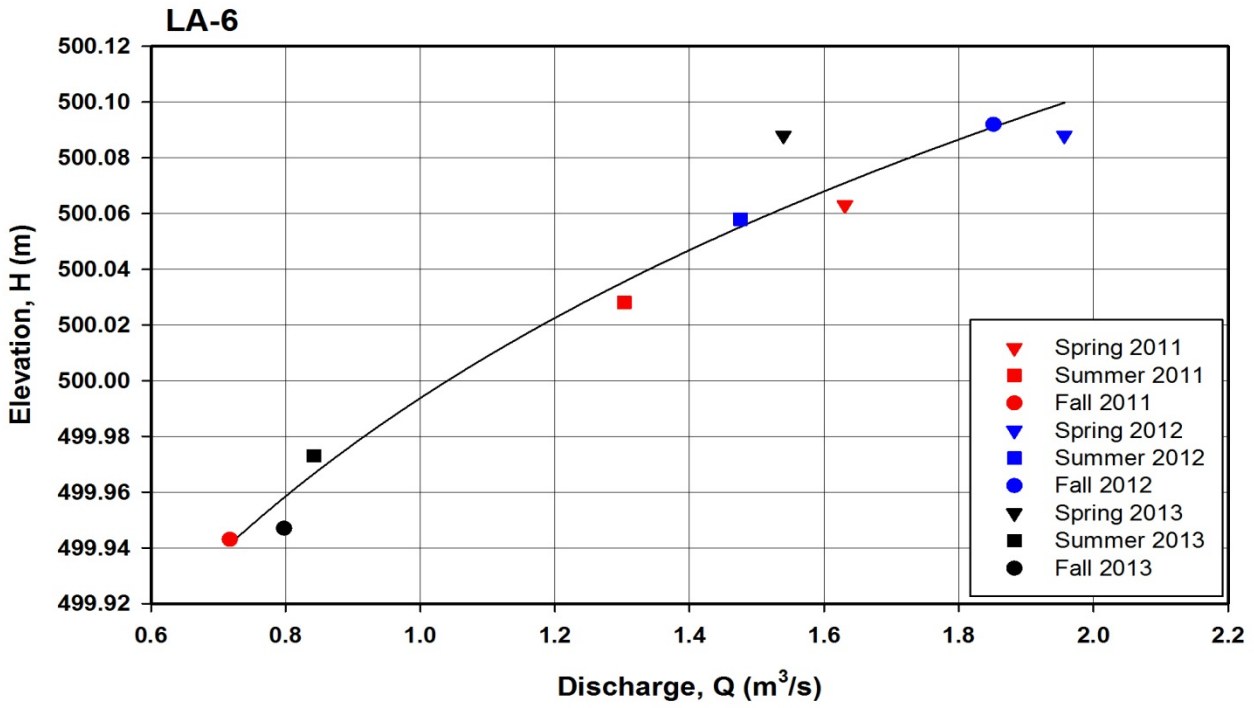



*Figure C13: Relationship between Water Surface Elevation, H (m), and Outflow Discharge, Q ($m^3/s$), at Lake Level Station LA-6.*

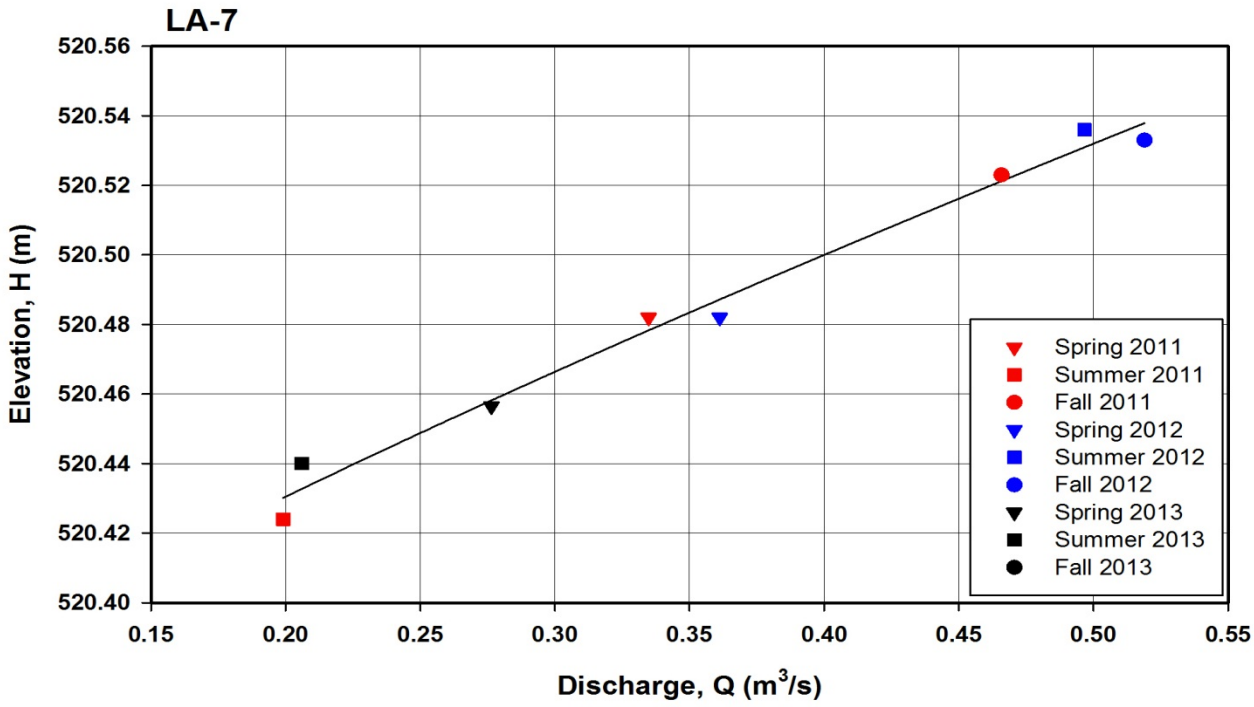



*Figure C14: Relationship between Water Surface Elevation, H (m), and Outflow Discharge, Q ($m^3/s$), at Lake Level Station LA-7.*

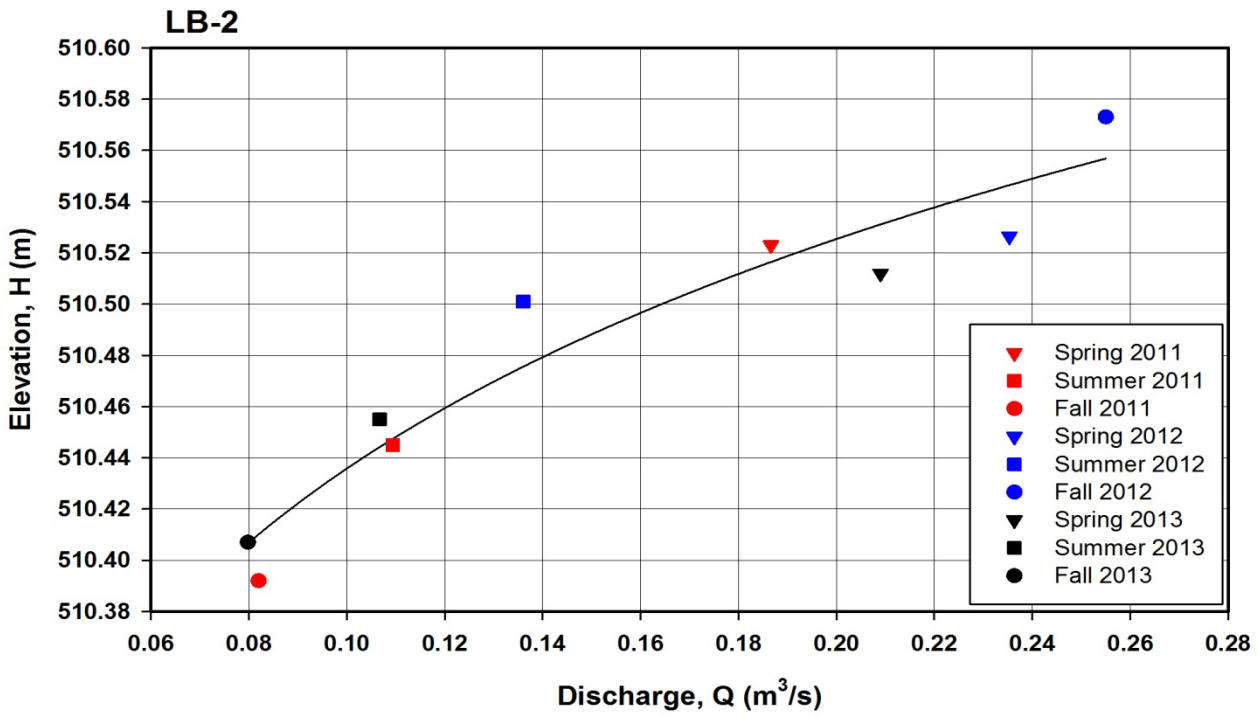



*Figure C15: Relationship between Water Surface Elevation, H (m), and Outflow Discharge, Q ($m^3/s$), at Lake Level Station LB-2.*

**Table C1: Open Water Stage-Discharge Equations**

| Site | Equation | $R^2$ | Maximum Q | Minimum Q |
|---|---|---|---|---|
| SA-1 | $H_{SFA1} = 492.3288 + 0.2358\ Q_{SA-1}^{0..5647}$ | 0.98 | 2.575 | 0.887 |
| SA-2 | $H_{SFA2} = 496.5236 + 0.1481 Q_{SA-2}^{0.5463}$ | 0.96 | 2.030 | 0.741 |
| SA-3 | $H_{SFA3} = 494.2166 + 0.4758\ Q_{SA-3}^{0.9914}$ | 0.99 | 0.578 | 0.051 |
| SA-4 | $H_{SFA4} = 463.0674 + 43.3880\ Q_{SA-4}^{0.0030}$ | 0.98 | 0.519 | 0.206 |
| SA-5 | $H_{SFA5} = 500.3430 + 0.3466\ Q_{SA-5}^{0.3517}$ | 0.97 | 1.381 | 0.476 |
| SA-6 | $H_{SFA6} = 487.0848 + 12.9219\ Q_{SA-6}^{0.0113}$ | 0.98 | 1.957 | 0.717 |
| SB-1 | $H_{SFB1} = 200.2805 + 288.3274\ Q_{SB-1}^{0.0005}$ | 0.74 | 0.644 | 0.158 |
| SB-3 | $H_{SFB3} = 510.3495 + 0.6573\ Q_{SB-3}^{1.0096}$ | 0.94 | 0.255 | 0.080 |
| SB-4 | $H_{SFB4} = 518.7461 + 0.7063\ Q_{SB-4}^{0.1911}$ | 0.79 | 0.114 | 0.007 |
| LA-1 | $H_{LLA1} = 493.9888 + 0.2284\ Q_{SA-1}^{0.7723}$ | 0.99 | 2.575 | 0.887 |
| LA-2 | $H_{LLA2} = 494.4063 + 0.3146\ Q_{SA-3}^{0.5570}$ | 0.96 | 0.578 | 0.051 |
| LA-5 | $H_{LLA5} = 483.1565 + 16.8293\ Q_{SA-2}^{0.0079}$ | 0.97 | 2.008 | 0.741 |
| LA-6 | $H_{LLA6} = 239.5643 + 260.4294\ Q_{SA-6}^{0.0006}$ | 0.98 | 1.957 | 0.717 |
| LA-7 | $H_{LLA7} = 520.3372 + 0.3401\ Q_{SA-4}^{0.0309}$ | 0.99 | 0.519 | 0.199 |
| LB-2 | $H_{LLB2} = 233.8270 + 276.9066\ Q_{SB-3}^{0.0005}$ | 0.93 | 0.255 | 0.080 |

* Where Q is discharge in $m^3/s$ and H is water level in metres above mean sea level.

# APPENDIX D

## Hydrographs for Streamflow Monitoring Stations

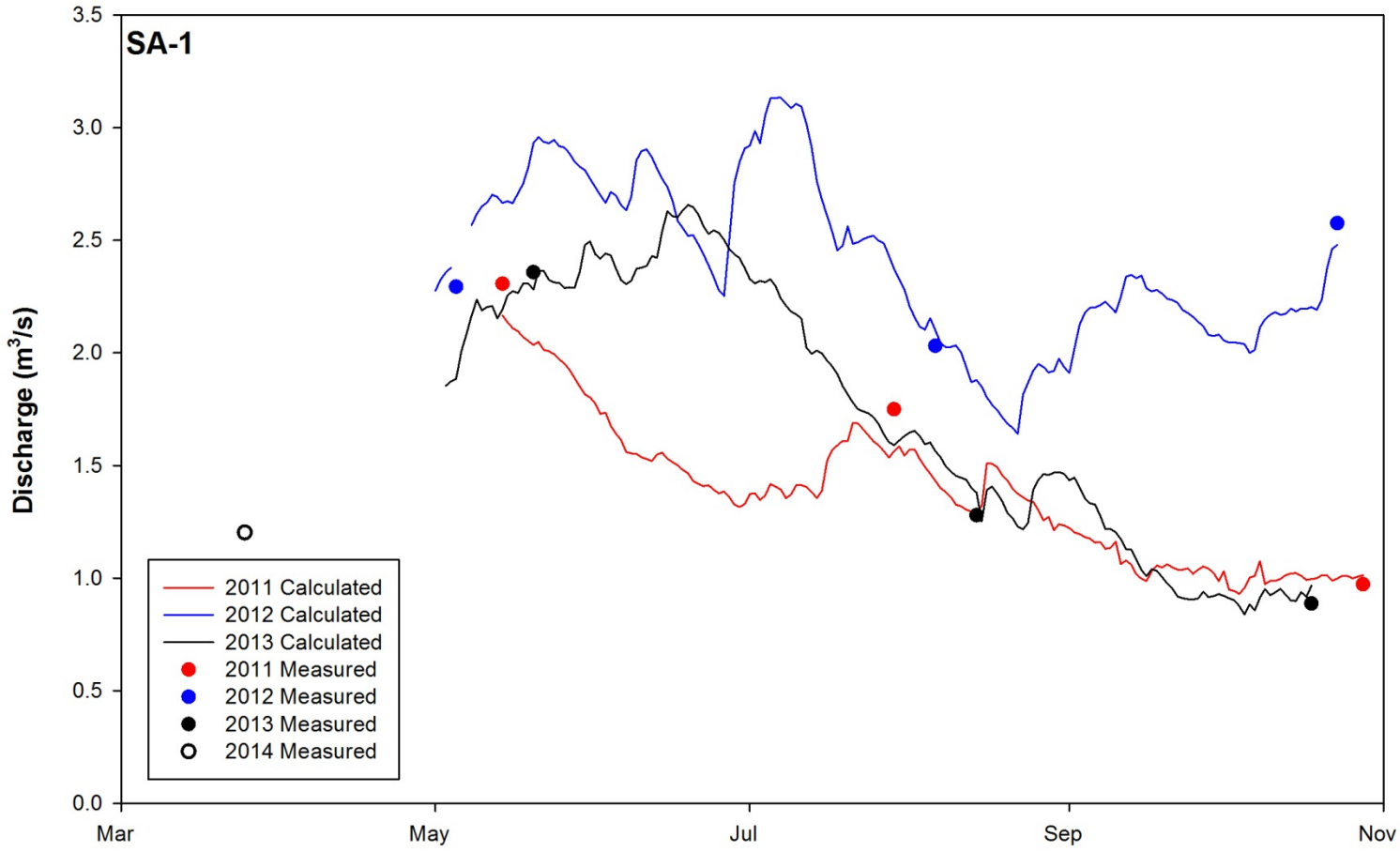



*Figure D1: Measured and Calculated Discharge, Q ($m^3/s$), for Stream Monitoring Station SA-1.*

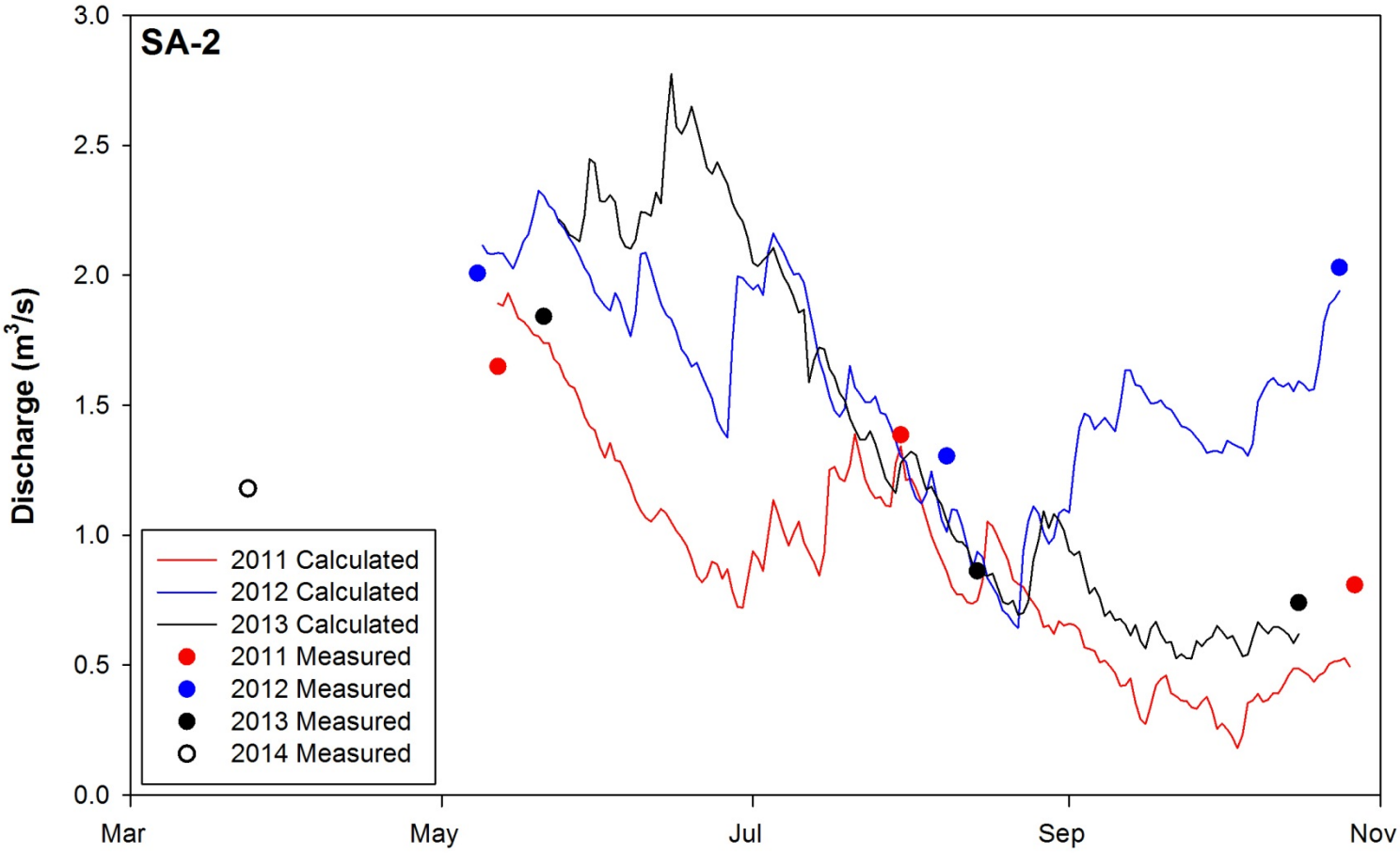



*Figure D2: Measured and Calculated Discharge, Q ($m^3$/s), for Stream Monitoring Station SA-2.*

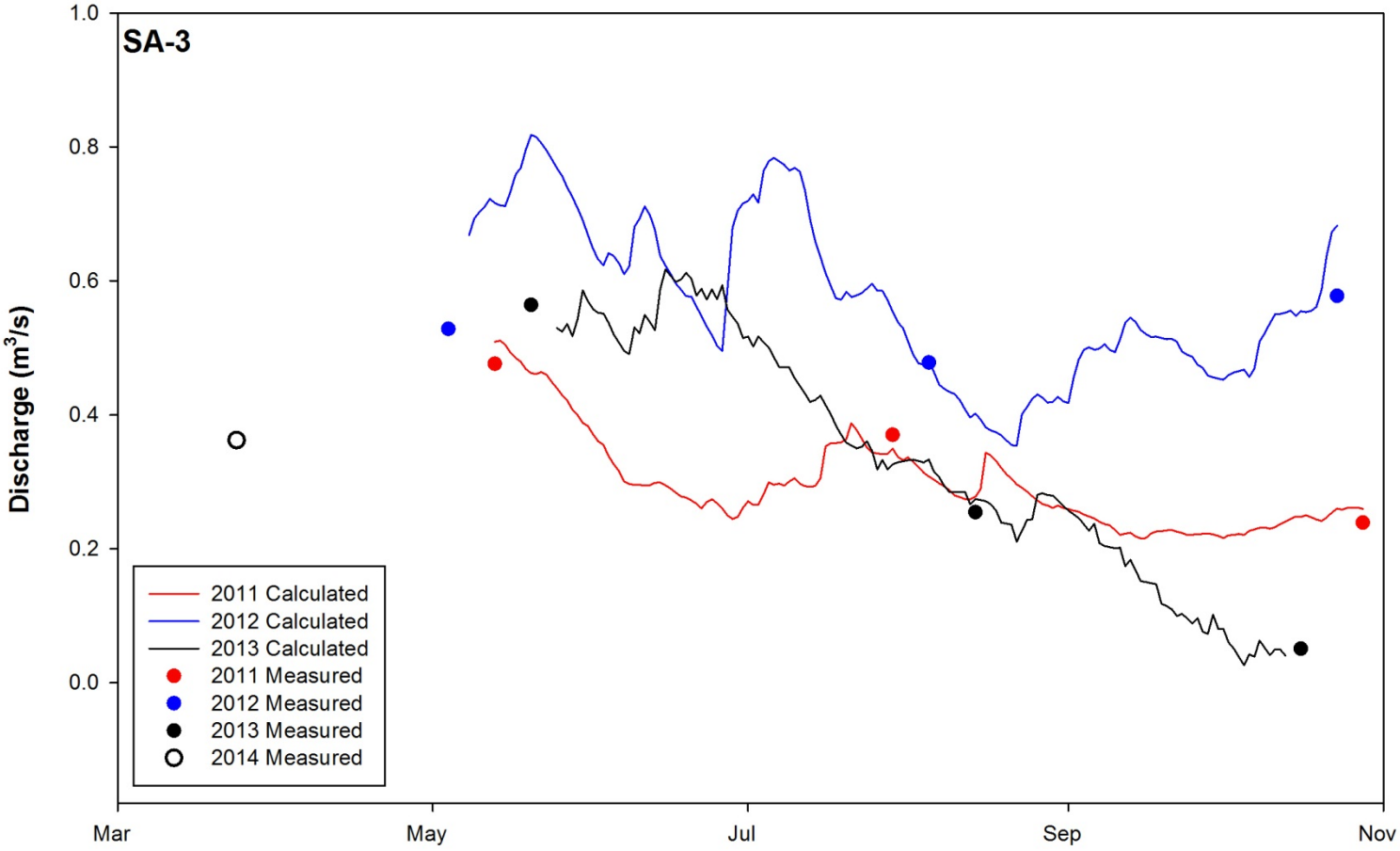



*Figure D3: Measured and Calculated Discharge, Q ($m^3$/s), for Stream Monitoring Station SA-3.*

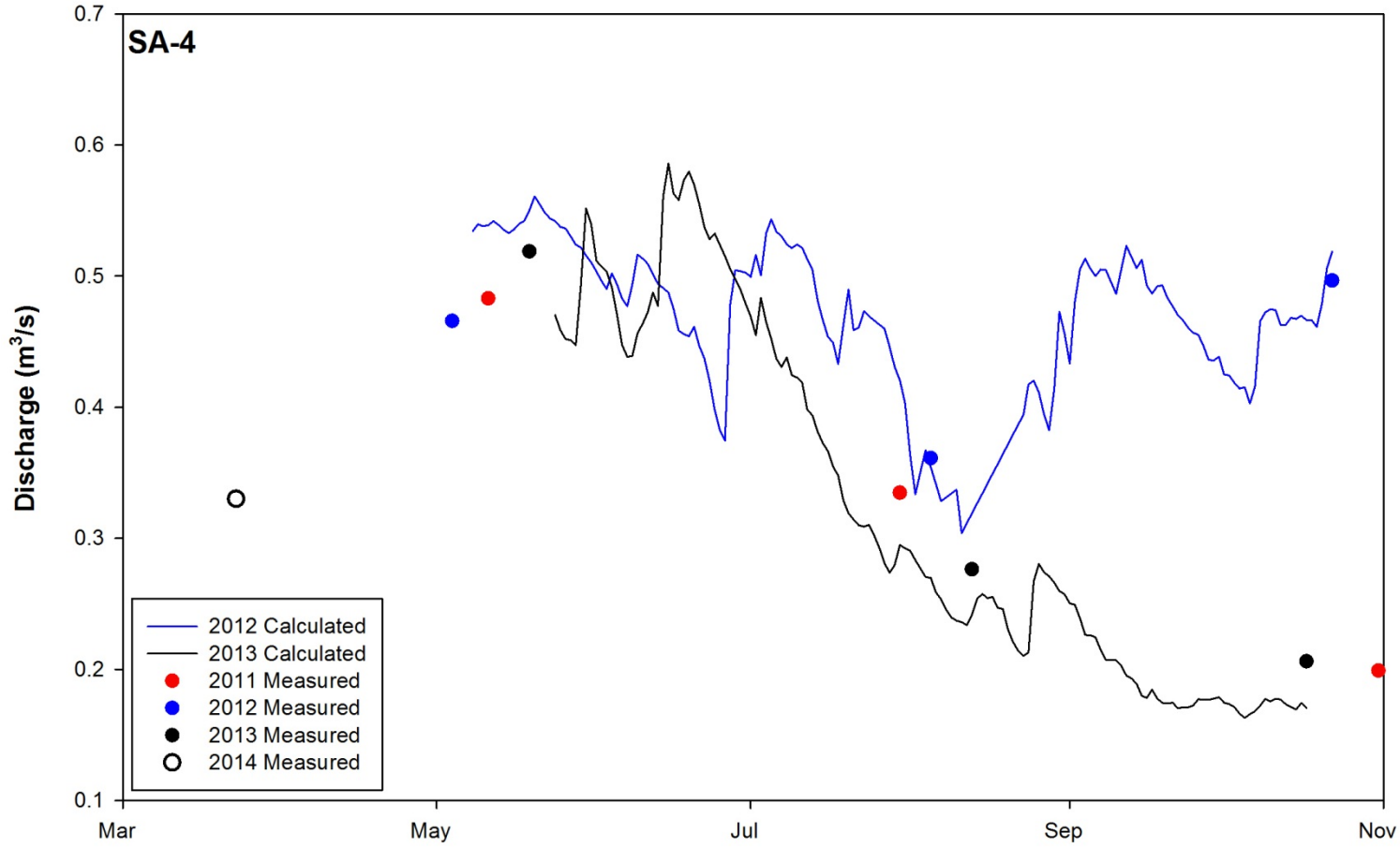



*Figure D4: Measured and Calculated Discharge, Q ($m^3$/s), for Stream Monitoring Station SA-4.*

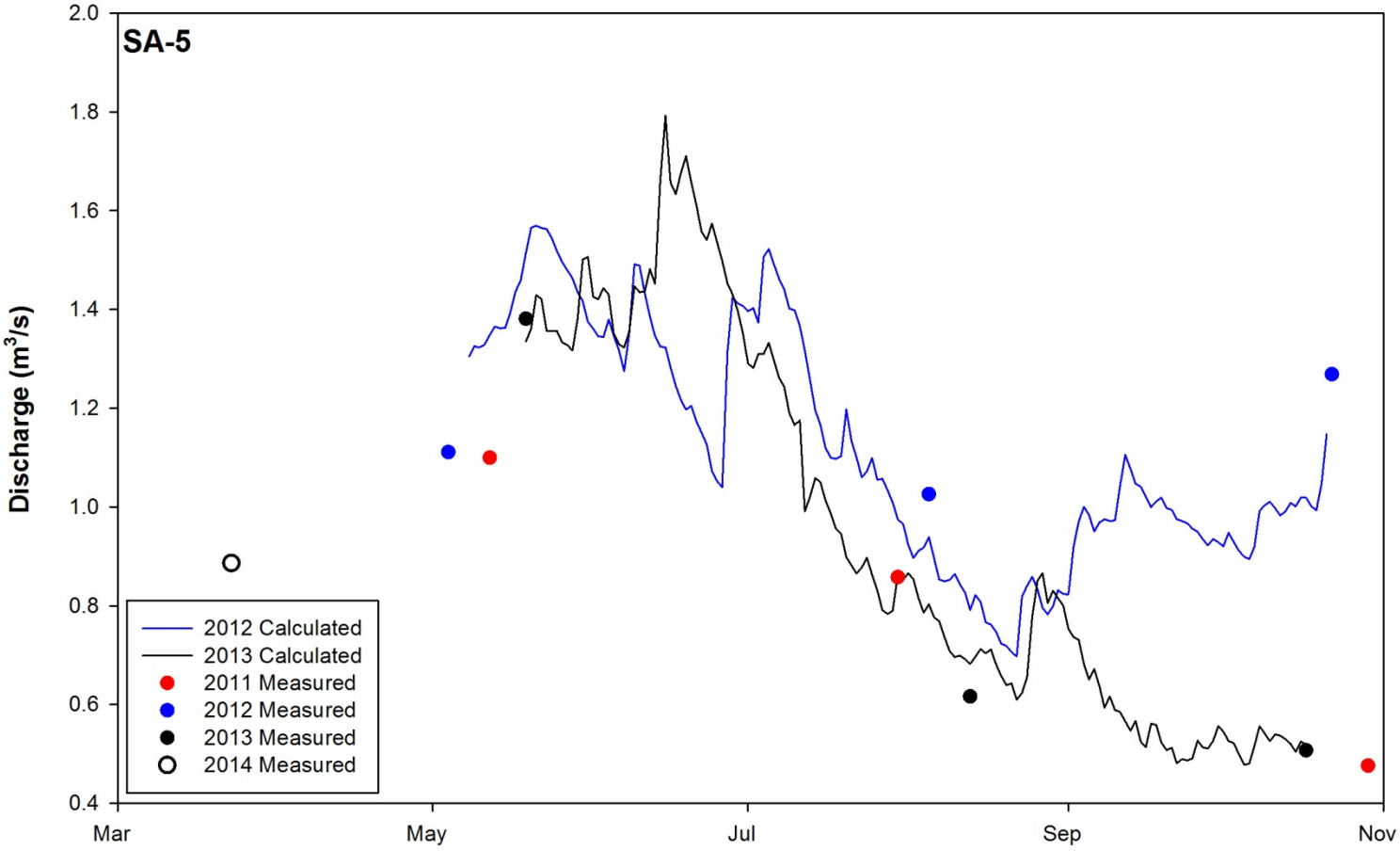



*Figure D5: Measured and Calculated Discharge, Q ($m^3$/s), for Stream Monitoring Station SA-5.*

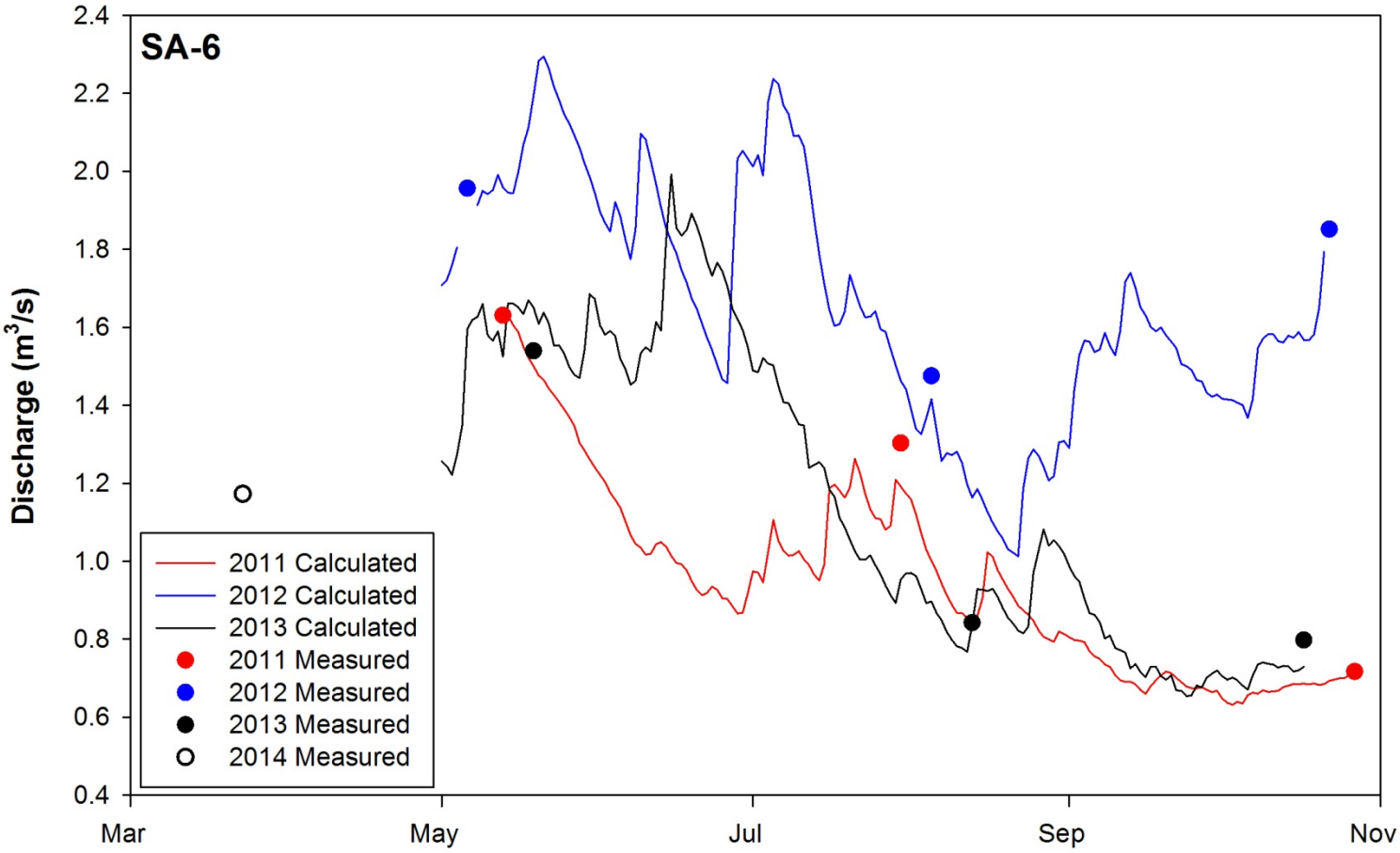



*Figure D6: Measured and Calculated Discharge, Q ($m^3$/s), for Stream Monitoring Station SA-6.*

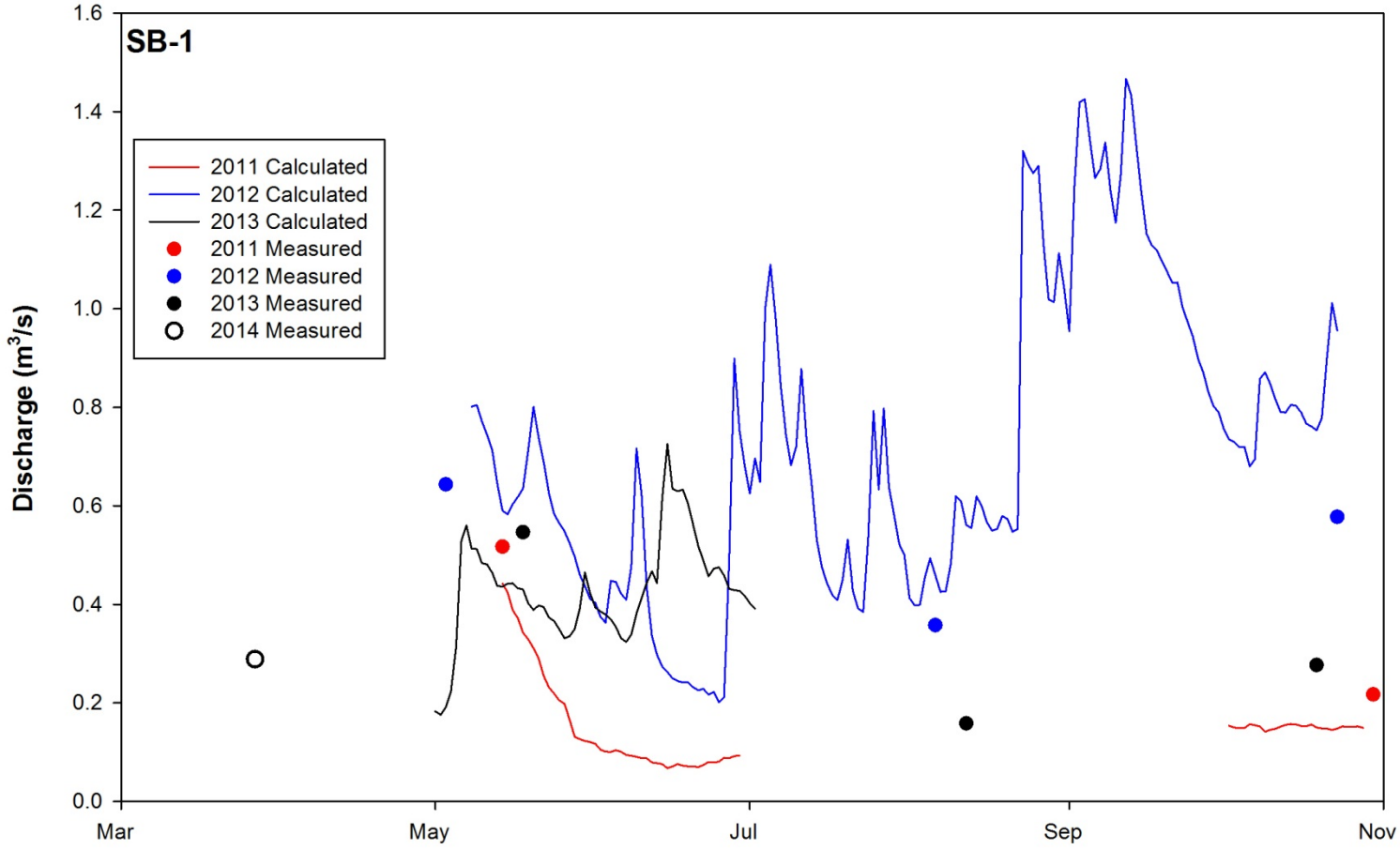



*Figure D7: Measured and Calculated Discharge, Q ($m^3$/s), for Stream Monitoring Station SB-1.*

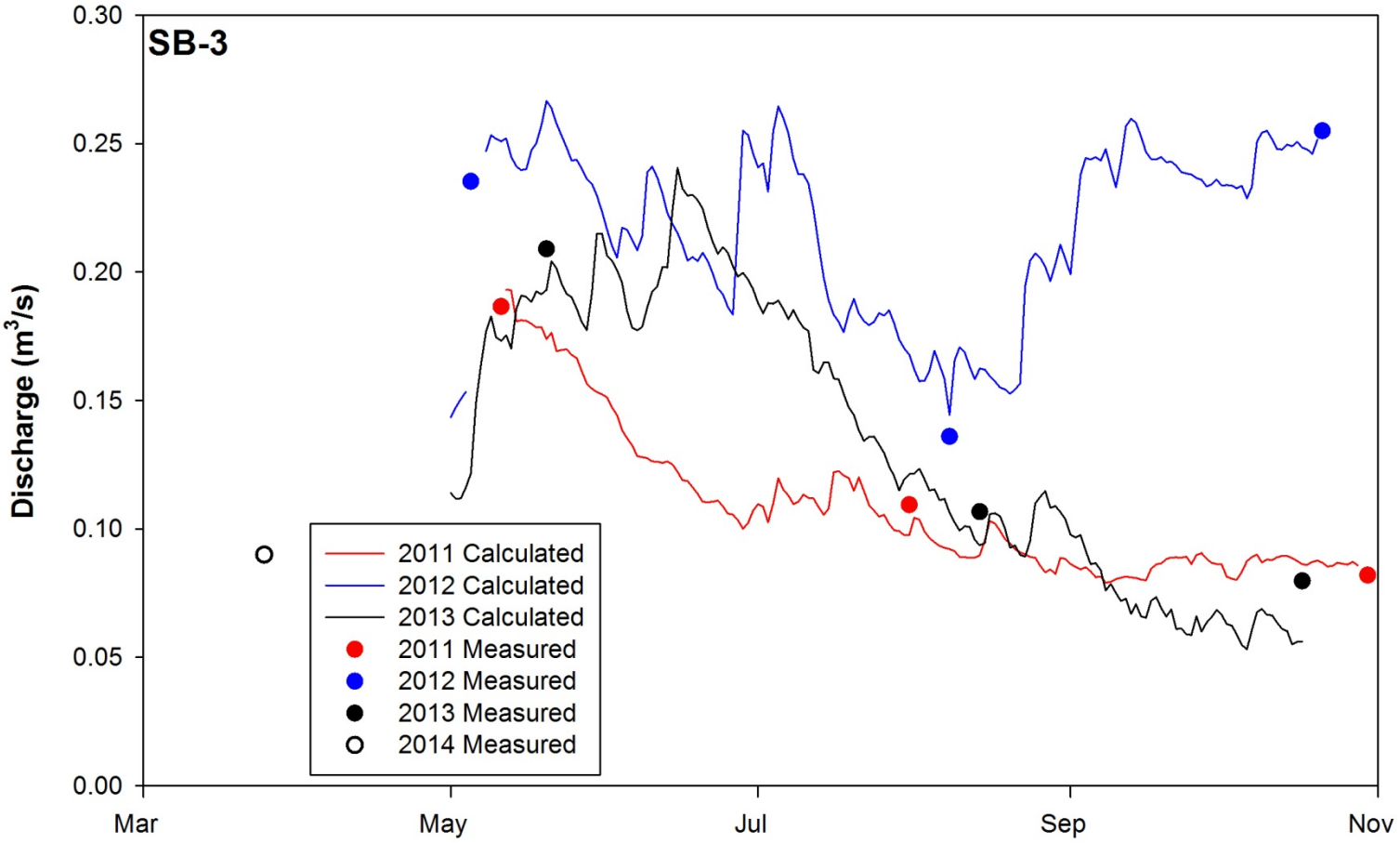



*Figure D8: Measured and Calculated Discharge, Q ($m^3$/s), for Stream Monitoring Station SB-3.*

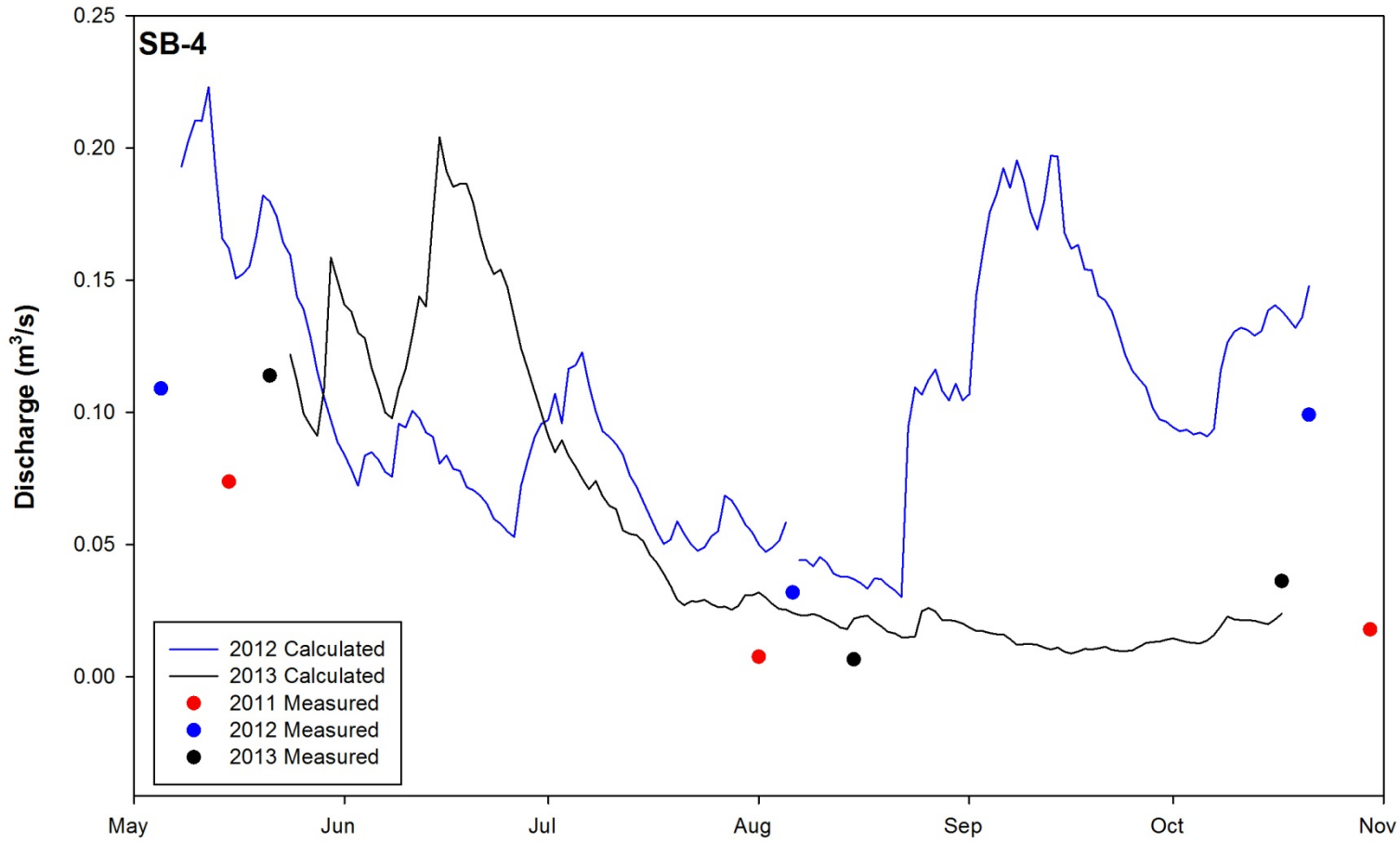



*Figure D9: Measured and Calculated Discharge, Q ($m^3$/s),for Stream Monitoring Station SB-4.*

# APPENDIX E

## Photos



Photo 1: SA-1 looking downstream. Photo taken May 14, 2011.



Photo 2: SA-2 looking downstream. Photo taken July 30, 2011.



Photo 3: SA-3 looking downstream. Photo taken May 13, 2011.



Photo 4: SA-4 looking downstream. Photo taken July 30, 2011.



Photo 5: SA-5 looking downstream. Photo taken July 31, 2011.



Photo 6: SA-6 looking upstream. Photo taken May 13, 2011.



Photo 7: SB-1 looking upstream. Photo taken May 14, 2011.



Photo 8: SB-3 looking upstream. Photo taken July 28, 2011.



Photo 9: SB-4 looking downstream. Photo taken July 31, 2011.



Photo 10: LA-1 looking west. Photo taken July 29, 2011.



Photo 11: LA-2 looking south. Photo taken July 29, 2011.



Photo 12: LA-3 looking northwest. Photo taken May 13, 2011.



Photo 13: LA-4 looking west. Photo taken July 29, 2011.



Photo 14: LA-5 looking south. Photo taken July 20, 2011.



Photo 15: LA-6 looking east. Photo taken July 30, 2011.



Photo 16: LA-7 looking north. Photo taken July 28. 2011.



Photo 17: LB-1 looking west. Photo taken July 31, 2011.



Photo 18: LB-2 looking southwest. Photo taken July 28, 2011.



Photo 19: LAB-1 looking east. Photo taken July 31, 2011.

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.


| | |
|---|---|
| Africa | + 27 11 254 4800 |
| Asia | + 86 21 6258 5522 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 55 21 3095 9500 |

solutions@golder.com
www.golder.com

**Golder Associates Ltd.**
**1721 8th Street East**
**Saskatoon, Saskatchewan, Canada S7H 0T4**
**Canada**
**T: +1 (306) 665 7989**


Golder Associates

# Appendix E Wheeler River Lake Level Survey and 2016/2017 Streamflow Monitoring. Calder Engineering Ltd.

# TECHNICAL MEMORANDUM

**Project:** **Wheeler River Lake Level Survey and 2016/2017 Streamflow Monitoring**
**Wheeler Rive Mining Exploration, Key Lake, Saskatchewan**
**Calder Engineering Ltd. Project #16-190**

**To:** **Janeen Tang**
**EcoMetrix Incorporated**

**Date:** **July 7th, 2017 revised August 2017**

---

## INTRODUCTION

Provided in this Technical Memorandum is a summary of a lake level survey and streamflow monitoring program implemented in 2016/2017 at the Wheeler River Mine Exploration. The mine exploration is located in the Key Lake area of Saskatchewan. Surface water level elevations were surveyed at a number of lakes (13) and ponds (2) at the Wheeler River Mine Exploration Site. In addition, manual streamflow measurements were taken on 16 watercourses, continuous streamflow monitoring equipment was installed at 8 locations, and streamflow monitoring equipment was retrieved from 2 locations.

The respective pond/lake and streamflow locations are shown on **Figure 1(a and b)**.

## LAKE AND POND LEVEL SURVEY

Surface water level elevations were surveyed for thirteen lakes and two ponds associated with the Wheeler River Mine Exploration near Key Lake, Saskatchewan. The water level elevation survey was performed by staff of Calder Engineering Ltd. and Ecometrix Incorporated between September 11 and September 22, 2016. Where possible, surface water elevations were referenced to geodetic benchmarks established by Golder Associates. New locations (LA8, LA9, PA2 and PA3) were initially referenced to temporary benchmarks. Geodetic elevations were assigned to the temporary benchmarks in June 2017 in conjunction with establishment of benchmarks by Webb Survey. An iron bar was installed at each of LA8, LA9, PA2 and PA3, and corrected static positions of each bar were determined from NRCAN. A copy of the report from Webb Survey is included as Attachment D.

A description of how the geodetic elevations of the Golder benchmarks were established is available in the 2012 – 2014 Baseline Hydrology Summary Report prepared by Golder Associates.

Summarized in Table 1 are surveyed pond and lake surface water level elevations. The pond and lake locations are shown on **Figure 1(a and b)**.

DRAFT

Calder Engineering Ltd.

**TABLE 1**
**LAKE AND POND SURFACE WATER LEVEL ELEVATIONS**

| Lake/Pond | Date | Water Level Elevation (m) |
|---|---|---|
| LB1 | September 11, 2016 | 503.66 |
| LB2 | September 11, 2016 | 510.54 |
| LB3 (Williams Lake) | September 11, 2016 | 518.57 |
| LAB1 (Russel Lake) | September 22, 2016 | 488.26 |
| LA1 | September 16, 2016 | 494.39 |
| LA2 | September 13, 2016 | 494.58 |
| LA3 | September 18, 2016 | 494.57 |
| LA4 | September 13, 2016 | 498.62 |
| LA5 | September 12, 2016 | 500.06 |
| LA6 | September 12, 2016 | 500.07 |
| LA7 (Kratchowsky Lake) | September 12, 2016 | 520.53 |
| | May 30, 2017 | 520.53 |
| LA8 | September 13, 2016 | 520.86 |
| | June 1, 2017 | 520.80 |
| LA9 | September 13, 2016 | 514.25 |
| | May 31, 2017 | 514.28 |
| PA2 | September 15, 2016 | 510.46 |
| PA3 | September 15, 2016 | 517.36 |

Note:
1. Units: m – metres.
2. Water level elevations are referenced to benchmarks with geodetic elevations established by Golder Associates, except for LA8, LA9, PA2 and PA3 which are referenced to geodetic elevations established as part of this report.
3. Water level elevations based on survey conducted by Calder Engineering Ltd. and Ecometrix Incorporated

DRAFT

**STREAMFLOW MONITORING**

**Stream Descriptions**

Provided below are descriptions of each stream. Photographs are provided in **Attachment A**.

SA1

SA1 is located close to the outlet of Drainage Area A at Russel Lake. The stream bottom is comprised of boulders, cobble, gravel and sand. It is our understanding that a logger was left at this location; however, this logger was not located during the site visit and is presumed to be lost. The logger retrieved from SB1 was installed in a low gradient section immediately upstream of a high gradient section. SA1 is accessible by road.

SA2

SA2 flows into the northwest end of LA1. The stream at SA2 is generally steep with vertical banks and high velocities. No logger was installed at this location. SA2 is accessible by boat.

SA3

SA3 is shallow wide sandy bottom stream with vertical banks that connects LA2 to LA1. No logger was installed at this location. SA3 is accessible by boat.

SA4

SA4 is located upstream of LA6. The channel bottom is composed primarily of cobbles and boulders. A logger was installed at this location and was located in a pool upstream of a fast high gradient section. The barometric logger was located on the bank at this station. SA4 is accessible by road.

SA5

SA5 is located upstream of LA6. The channel bottom is primarily small boulders and cobbles overlain sand. A logger was installed on a straight run downstream of the removed bridge crossing. SA5 is accessible by road.

SA6

SA6 is a wide sandy bottom stream with vertical banks connecting lakes LA5 and LA6. Flow in the stream is deep and slow. The logger installed by Golder Associates was retrieved and reinstalled at the same location. The stream gauging equipment was located approximately halfway between the two lakes. SA6 is accessible by road.

SA7

SA7 is a narrow marshy stream with vertical banks. SA7 was identified for continuous water level monitoring, however no logger was installed at this location. While the water levels at this stream

DRAFT

could be monitored, it is unlikely that a reliable rating curve could be developed for this location to convert levels to flows due to the site conditions. Flow in the stream is slow and deep, with significant undercut banks. The gradient from LA7 is shallow, allowing backwater from the lake to influence stream water levels. SA7 is accessible by boat.

SA8

SA8 is a meandering narrow sandy bottom stream with deep banks. Some areas of the bank were undercut. The monitoring station was installed in a relatively straight faster section immediately upstream of the lake. SA8 is accessible by boat.

SA9

SA9 was initially located at the outlet a small lake downstream of LA8. For access purposes, this station was relocated to the outlet of LA8 which is accessible by an existing ATV road. The stream in this section is shallow and relatively narrow. The stream bottom is comprised mainly of sand, gravel, cobbles. The monitoring station was located in a pool upstream of the road crossing. Stream banks are shallow and the surrounding land is relatively flat. The area has recently been impacted by a forest fire, so this station is at greater risk of trees/debris falling into the flow and impacting water levels. SA9 is accessible by road.

SA10

SA10 is a wide sandy bottom stream with vertical banks flowing into the northwest part of LA9. The water is deep and slow moving. The monitoring station was located in a relatively straight section with wadeable depths at the time of installation. The water depths downstream closer to the lake were too deep to wade at the time of installation. SA10 is accessible by boat.

SA11

SA11 is an additional station added to replace SA7. SA11 is located at the northern most inlet of LA7. The stream bottom is comprised primarily of gravel and cobbles. The stream channel is braided. The monitoring station was located in an unbraided section immediately upstream of the lake. SA11 is accessible by boat.

SB1

SB1 is located close to the outlet of Drainage Area B at Russel Lake. The monitoring station was located immediately upstream of the culverts at the McArthur River haul road. The stream in this area is marshy with a thick organic base. The stream base in the immediate vicinity of the monitoring station has been altered as result of the road crossing and consists sand, gravel and boulders. Signs of beaver activity were observed both upstream and downstream of the monitoring location. The logger installed by Golder Associates was retrieved from this location and redeployed at another station. SB1 is accessible by road.

DRAFT

SB2

SB2 is located in a second channel immediately west of SB1. The characteristics of SB2 are similar to SB1 – marshy with a thick organic base impacted by the road construction with signs of beaver activity. At the time of the field visit, no flow was observed at this location. It is suspected that it either flows laterally towards SB1 or seeps under the road embankment. SB2 is accessible by road.

SB3

SB3 is located downstream of LB2. The stream bottom is comprised of organics, sand, cobbles and boulders. The banks are nearly vertical. No monitoring equipment was installed or retrieved from this location. SB3 is accessible by road.

SB4

SB4 is located at the southwest inlet of LB3. The stream banks are shallow and poorly defined. It is our understanding that monitoring equipment was left at this location; however the logger was not found and is assumed to be lost. The stream bottom is primarily boulders and large cobbles. SB4 is accessible by boat.

SB5

SB5 is located at the outlet of LB3. Gauging was conducted in a relatively straight section downstream of the camp road crossing and upstream of a low gradient pool and braid. The stream bottom was composed of sand, gravel and cobbles. SB5 is accessible by road.

**Streamflow Monitoring Stations**

Eight temporary streamflow monitoring stations were installed by Calder at the Wheeler River Mine Exploration. The streamflow monitoring stations were established to obtain information on local watercourse flow characteristics. Summarized in Table 2 and shown on Figure 1 are locations of the eight streamflow monitoring stations.

DRAFT

**TABLE 2**
**SUMMARY OF STREAMFLOW MONITORING STATION LOCATIONS**

| Station | Installation Date | Easting | Northing |
|---|---|---|---|
| SA1 | September 22, 2016 | 480368 | 6371123 |
| SA4 | September 10, 2016 | 476926 | 6375868 |
| SA5 | September 9, 2016 | 477822 | 6375737 |
| SA6 | September 12, 2016 | 477863 | 6374742 |
| SA8 | September 15, 2016 | 471579 | 6378303 |
| SA9 | September 18, 2016 | 478226 | 6381589 |
| SA10 | September 18, 2016 | 479003 | 6380421 |
| SA11 | September 19, 2016 | 473026 | 6379260 |

Note:
1. Refer to Figure 1 for location of streamflow monitoring stations.
2. Eastings and northings referenced to the UTM Zone 17 grid and NAD83 datum.

The streamflow monitoring installations each comprised a Solinst Model 3001 LT F15/M5 Levelogger programmed to record water level at 15 minute intervals on a continuous basis. The Solinst Leveloggers were installed at the dates listed in Table 2. Leveloggers were programmed in June 2017 to collect data until the memory is full – around June 2018.

The Solinst Levelogger instrumentation measures absolute pressure and therefore compensation is required for atmospheric pressure fluctuations. Barometric pressure compensation is achieved using an additional device (e.g., Barologger) to measure barometric pressure. A barologger was installed and deployed adjacent the SA4 site. The data collected from the barologger will be used to apply barometric pressure compensation to data collected from the Solinst Levelogger instrumentation.

**Streamflow Measurements**

Streamflow measurements were conducted at 16 watercourses within the study area. For the sites with streamflow monitoring equipment installed, with enough manual flow measurements they can be used to develop site specific rating curves for each station. Results are shown in Table 3, detailed calculations sheets are provided in **Attachment B**.

Streamflow measurements were undertaken by wading using a portable velocity meter (Marsh-McBirney Model 2000 Flow-mate) and 1 metre staff gauge graduated in 2 millimetre increments. Streamflow measurements were conducted in accordance with ASTM Standard D 3868 – Standard Test Method for Open-Channel Flow Measurement of Water by Velocity-Area Method, whereby flow velocity is measured at the 20% and 80% depth increments when water depths are greater than 1.0 meter, and at the 60% depth increment if water depth is less than 1.0 meter.

DRAFT

With respect to streamflow measurements, typically, a minimum of 10 segments across the stream were used to measure flow depth and flow velocity. Flow velocity was measured at each segment and applicable depth increment four times. Flow was computed by multiplication of measured mean flow velocities by the determined cross-sectional flow area (for each segment) and summing the respective values.

Water elevation was determined by referencing the water surface elevation to benchmarks at each location. Benchmarks for streams SA1, SA2, SA3, SA4, SA5, SA6, SB1, SB3, and SB4 were established by Golder Associates as part of the 2012 – 2014 Baseline Hydrology Summary Report. Elevations at SA8, SA9, SA10, SA11, Kratchowsky Creek were transferred across the lake surface from the lake benchmarks established by Golder Associates. The benchmark elevation at SB5 was established by Webb Survey and Calder Engineering in June 2017. An iron bar was installed at SB5 and the corrected static positions of the bar determined from NRCAN. A copy of the report from Webb Survey is included as Attachment D.

**TABLE 3**
**SUMMARY OF MANUAL STREAMFLOW MEASUREMENTS**

| Station | Date | Water Elevation (mASL) | Flow (cms) |
|---|---|---|---|
| SA1* | September 17, 2016 | 492.71 | 2.34 |
| | May 31, 2017 | 492.72 | 2.43 |
| SA2 | September 16, 2016 | 496.46 | 2.24 |
| SA3 | September 16, 2016 | 494.43 | 0.44 |
| Kratchowsky Creek Outlet | September 14, 2016 | 520.30 | 0.58 |
| SA4* | September 10, 2016 | 506.35 | 0.49 |
| | May 30, 2017 | 506.37 | 0.58 |
| SA5* | September 9, 2016 | 500.90 | 1.27 |
| | September 21, 2016 | 500.91 | 1.58 |
| | May 30, 2017 | 500.92 | 1.95 |
| SA6* | September 11, 2016 | 500.07 | 1.98 |
| | May 31, 2017 | 500.08 | 1.77 |
| SA7 | September 15, 2016 | No BM set | 0.04 |
| SA8* | September 15, 2016 | 520.60 | 0.01 |
| | September 19, 2016 | 520.62 | 0.04 |
| | May 30, 2017 | 520.54 | 0.04 |

DRAFT

| | | | |
|---|---|---|---|
| SA9* | September 18, 2016 | 520.52 | 0.18 |
| | June 1, 2017 | 520.49 | 0.16 |
| SA10* | September 18, 2016 | 514.35 | 1.55 |
| | May 31, 2017 | 514.31 | 1.22 |
| SA11* | September 19, 2016 | 520.73 | 0.42 |
| | May 30, 2017 | 520.71 | 0.31 |
| SB1 | September 17, 2016 | 488.55 | 0.64 |
| SB2 | September 17, 2016 | No measurement taken | |
| SB3 | September 11, 2016 | 510.47 | 0.20 |
| SB4 | September 11, 2016 | 519.21 | 0.12 |
| SB5 | September 14, 2016 | 518.33 | 0.14 |

Note:
1. Units: mASL = metres above sea leavel; cms = cubic metres per second
2. Refer to Figure 1 for location of streamflow monitoring stations.
3. Water level elevations are referenced to benchmarks with geodetic elevations established by Golder Associates, except for SA8, SA9, SA10, SA11, and SB5 which are referenced to geodetic elevations established as part of this report.
4. Water level elevations based on survey conducted by Calder Engineering Ltd. and Ecometrix Incorporated
5. * - indicates that continuous monitoring equipment was installed

**RATING CURVES**

Golder Associates Ltd. (2013) presented rating curves for SA1, SA4, SA5 and SA6. The manual flow measurements taken as part of the 2016-2017 field program were graphed along with the measurements and rating curves by Golder (2013) to review for suitability for use with the new installations.

Based on the data, the new station for SA5 was installed upstream of the Golder location. The stream bed in this area is of consistent width and slope. The rating curve for SA5 was shifted upstream based on the three manual flow measurements taken in 2016 and 2017.

Manual flow measurements taken at SA1, SA4, and SA6 appear to fit into the existing rating curve and the rating curve can be applied to the level data.

For streams SA8, SA9, SA10 and SA11 the manual flow measurements taken to date are not sufficient to develop a rating curve for conversion from level to flow.

Rating curves are presented in **Attachment B**.

DRAFT

## CONTINUOUS WATER LEVEL DATA

It is our understanding that loggers installed by Golder in 2013 were left in place at the following locations: SB1, SB4, SA1, and SA6. Leveloggers were located and retrieved at SB1 and SA6 in the Fall of 2016; we were unable to locate equipment at SB4 and SA1. The logger at SA6 was redeployed at SA6 and the logger at SB1 was redeployed at SA1. Available on the instruments were level and temperature data from May 18, 2013 to August 30, 2015.

Recorded data from the leveloggers deployed in the Fall of 2016 at streams SA1, SA4, SA5, SA6, SA8, SA9 and SA10 and the site barologger was retrieved in the Spring of 2017.

### Barometric Compensation

Barometric compensation for the 2016-2017 field program was completed using the site barologger with any gaps filled using transformed data from the Key Lake Climate Station (Climate ID = 4063757) at 57°15'23.000" N, 105°37'03.000" W. Barometric compensation for the retrieved 2013 to 2015 data at SB-1 and SA-6 was completed using transformed data from the Key Lake Climate Station.

The Key Lake Climate Station has an hourly barometric pressure record at 57°15'23.000" N, 105°37'03.000" W. The data was linearly interpolated to 15 minute and 30 minute intervals for use the levelogger data. A relationship between the barometric pressure at the site barologger and the Key Lake station was developed using the May 2017 data and applied to the Key Lake Climate Station data for use with the project Levelogger data.

### Elevation Data

Calculated water elevation data for each of the locations is presented in **Attachment C**.

### Calculated Flow

For stations SA1, SA4, SA6 and SB1 the water elevation data was converted to flow using rating curve relationships developed by Golder (May 2014). The modified rating curve was applied for SA5.

For streams SA8, SA9, SA10 and SA11 the manual flow measurements taken to date are not sufficient to develop a rating curve for conversion from level to flow.

Calculated flow data for each of SA1, SA4, SA5, SA6 and SB1 is presented in **Attachment C**.

### Recommendations

- Additional manual flow measurements be taken at new monitoring locations: SA8, SA9, SA10, SA11 to establish a rating curve at each location
- Rating curves established by Golder Associates Ltd. for SA1, SA4, SA5 and SA6 be reviewed for suitability for use with the reinstallations, including additional manual flow measurements.

DRAFT

Yours Sincerely,

**CALDER ENGINEERING LTD.**

DRAFT




**FIGURE 1a: LAKE AND POND LOCATIONS**

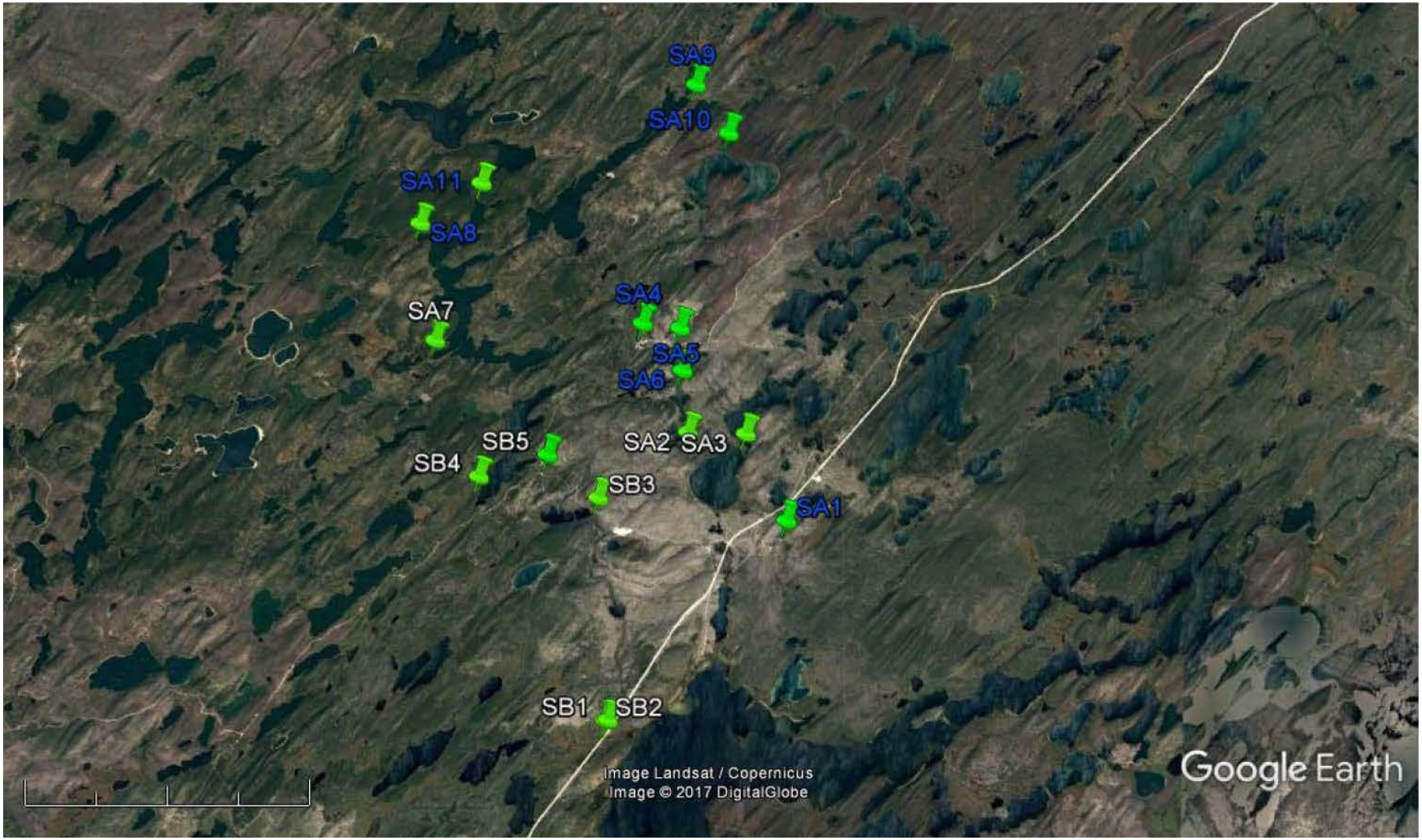



**FIGURE 1b: STREAM LOCATIONS**

# ATTACHMENT A

# PHOTOS




SA-1 facing upstream




SA-2 facing upstream




SA-1 facing downstream




SA-2 facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Engeering Ltd. | SA1 and SA2 | SEPT 2016 |
| | | | SHEET 1/9 |




SA-3 facing upstream




SA-4 facing upstream




SA-3 facing downstream




SA-4 facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Engeering Ltd. | SA3 and SA4 | SEPT 2016 |
| | | | SHEET 2/9 |




SA-5 facing upstream




SA-6 facing upstream




SA-5 facing downstream




SA-6 facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Englneering Ltd. | SA5 and SA6 | SEPT 2016<br>SHEET 3/9 |




SA-7 facing upstream




SA-8 facing upstream




SA-7 facing downstream



SA-8 facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Engineering Ltd. | SA7 and SA8 | SEPT 2016 |
| | | | SHEET 4/9 |




SA-9 facing upstream




SA-10 facing upstream




SA-9 facing downstream




SA-10 facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Englneering Ltd. | SA9 and SA10 | SEPT 2016<br>SHEET 5/9 |




SA-11 facing upstream



Kratchkowsky Lake Outlet facing upstream




SA-11 facing downstream




Kratchkowsky Lake Outlet facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Englneering Ltd. | SA11 and Kractchowsky Lake Outlet | SEPT 2016<br>SHEET 6/9 |




SB-1 facing upstream




SB-2 facing upstream




SB-1 facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Englneering Ltd. | SBl end SB2 | SEPT 2016<br>SHEET 7/9 |




SB-4 facing upstream



SB-3 facing downstream




SB-4 facing downstream

| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Engineering Ltd. | SB3 and S84 | SEPT 2016 |
| | | | SHEET 8/9 |




SB-5 facing upstream

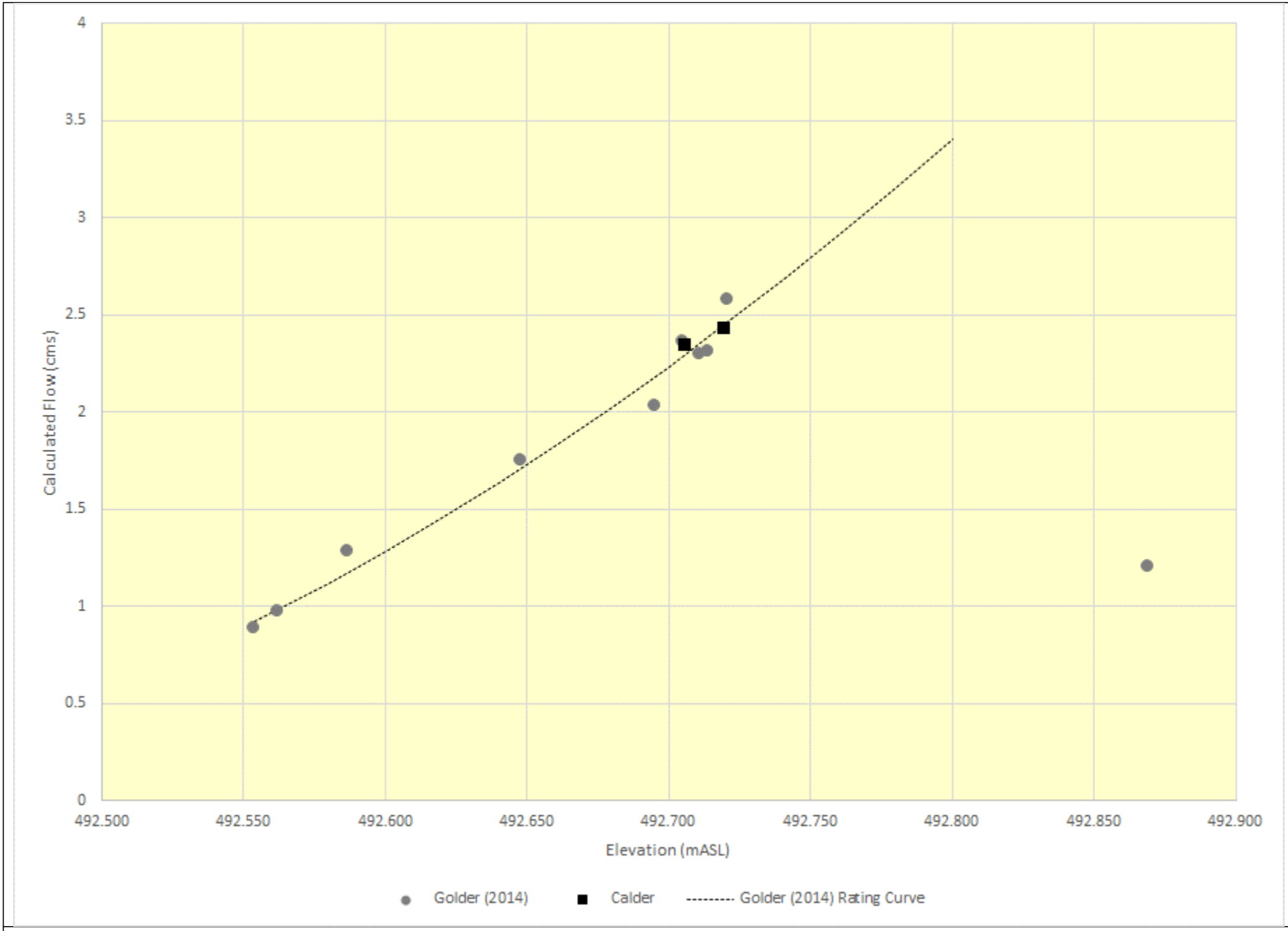


SB-5 facing downstream

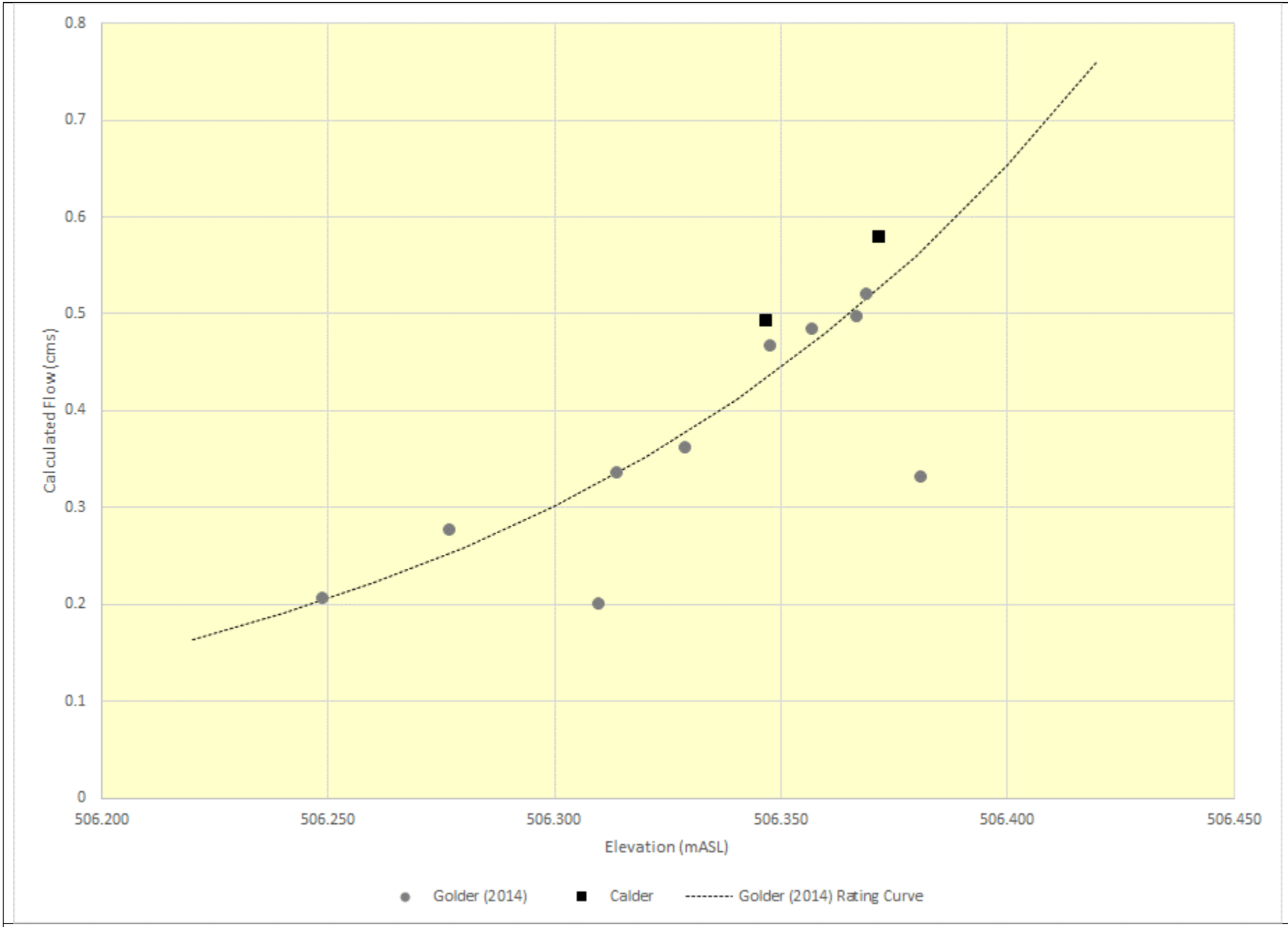
| | | | |
|---|---|---|---|
| PHOTOS<br>WHEELER RIVER | Calder Englneering Ltd. | SB5 | SEPT 2016<br>SHEET 9/9 |

# ATTACHMENT B

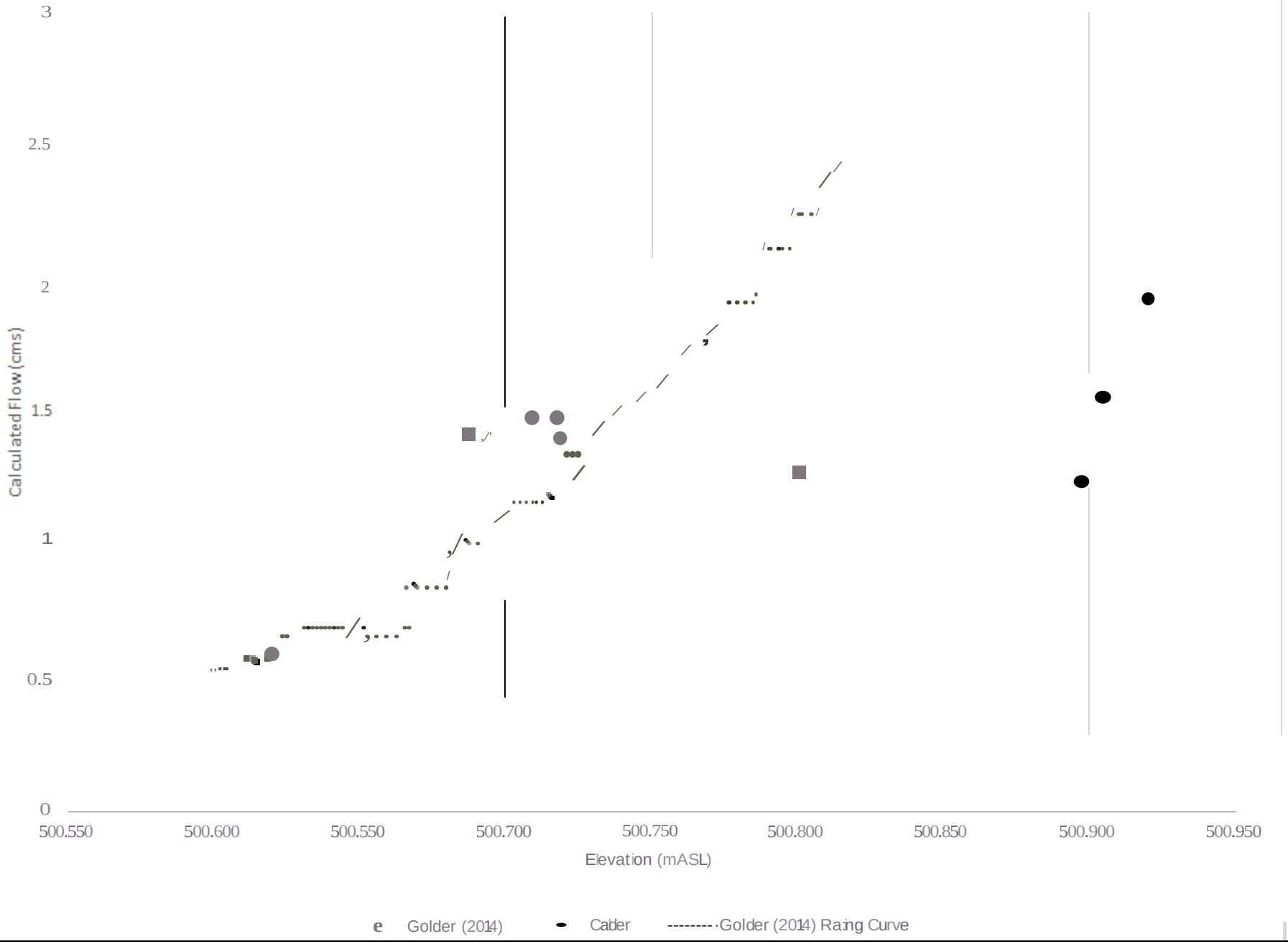
# RATING CURVES AND MANUAL FLOW MEASUREMENTS



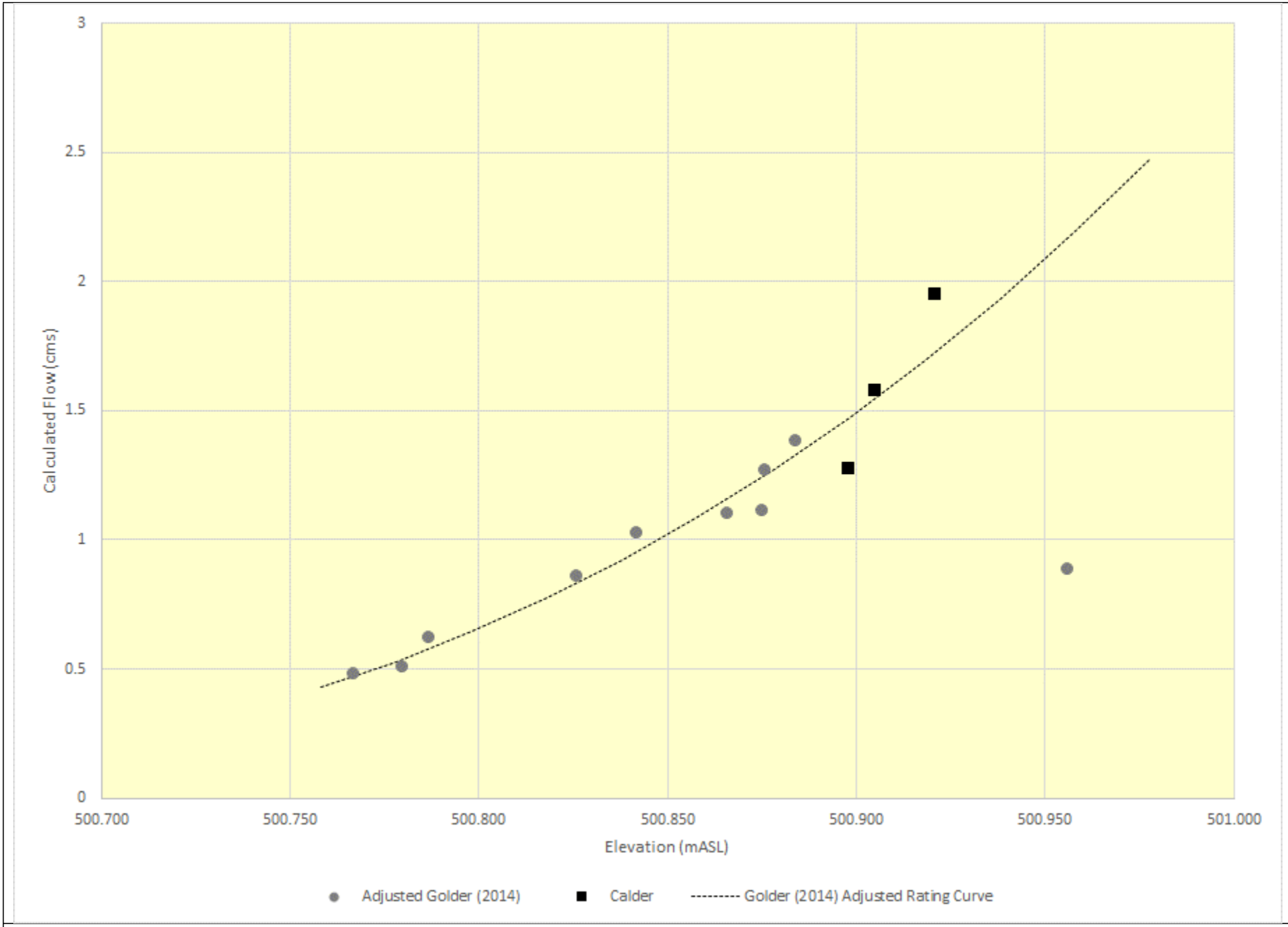

**SA1 – MANUAL FLOW MEASUREMENTS AND RATING CURVE**



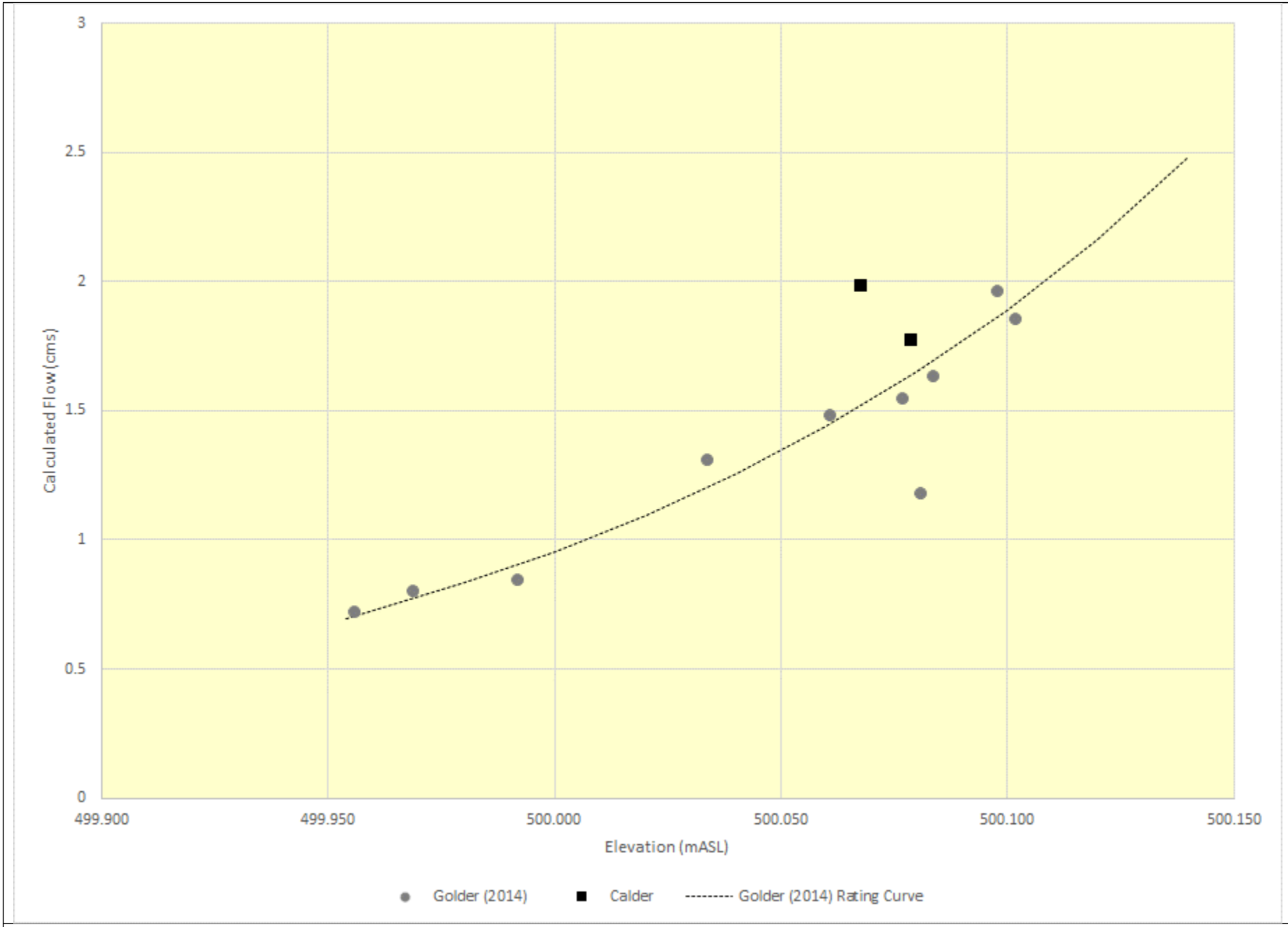

**SA4 – MANUAL FLOW MEASUREMENTS AND RATING CURVE**



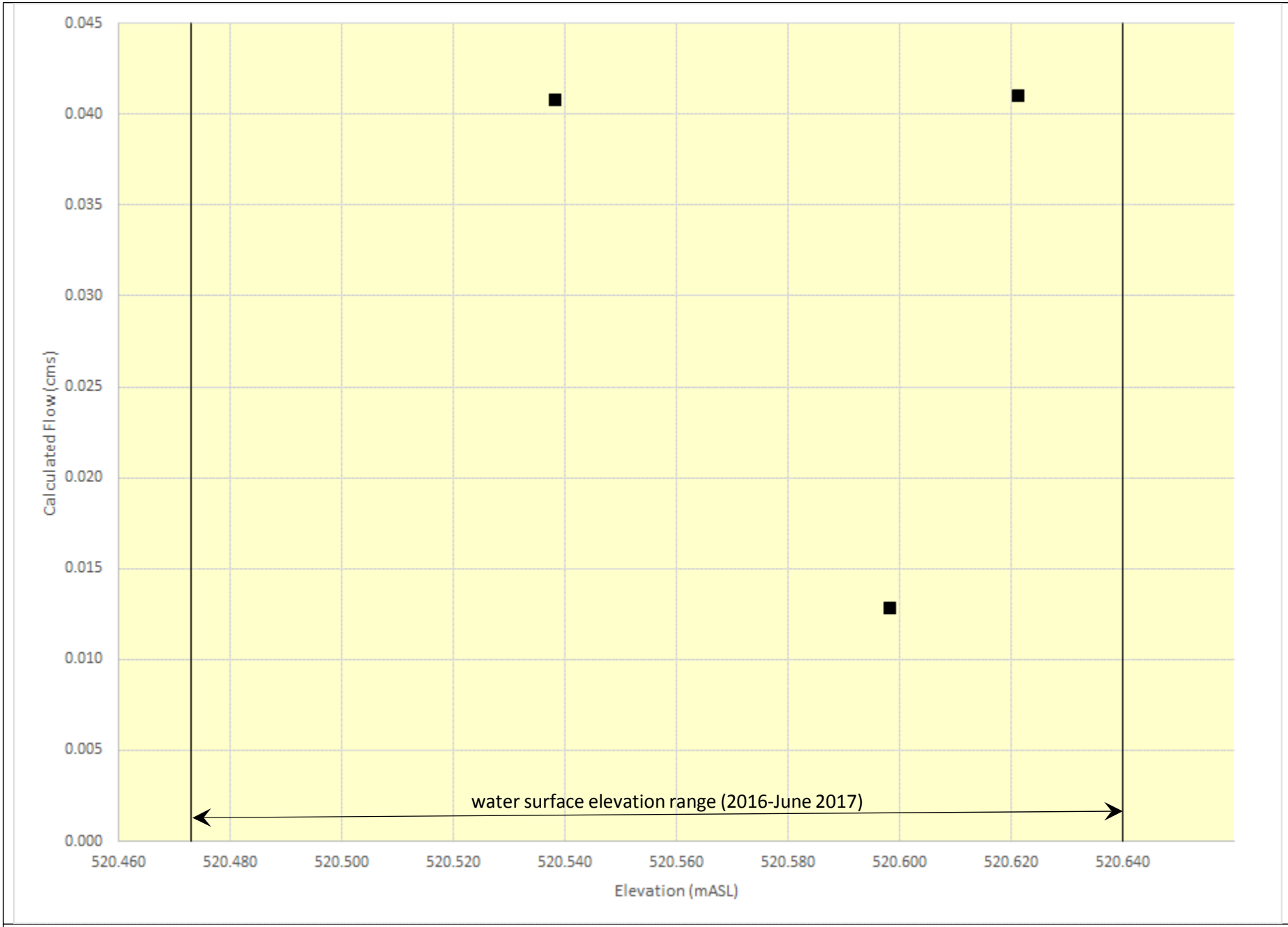

**SA5 - MANUAL FLOW MEASUREMENTS AND RATING CURVE**



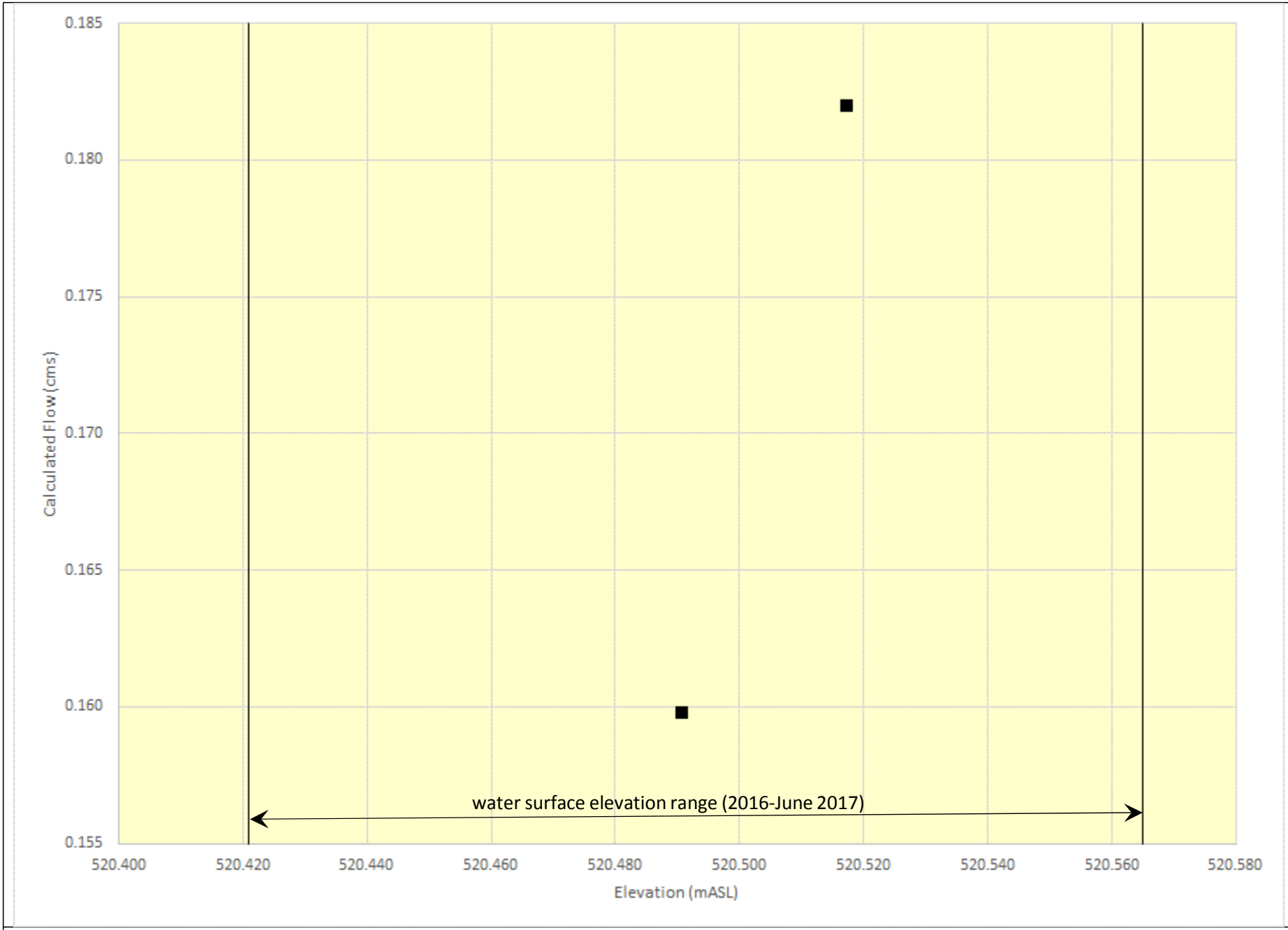

**SA5 – ADJUSTED MANUAL FLOW MEASUREMENTS AND ADJUSTED RATING CURVE**



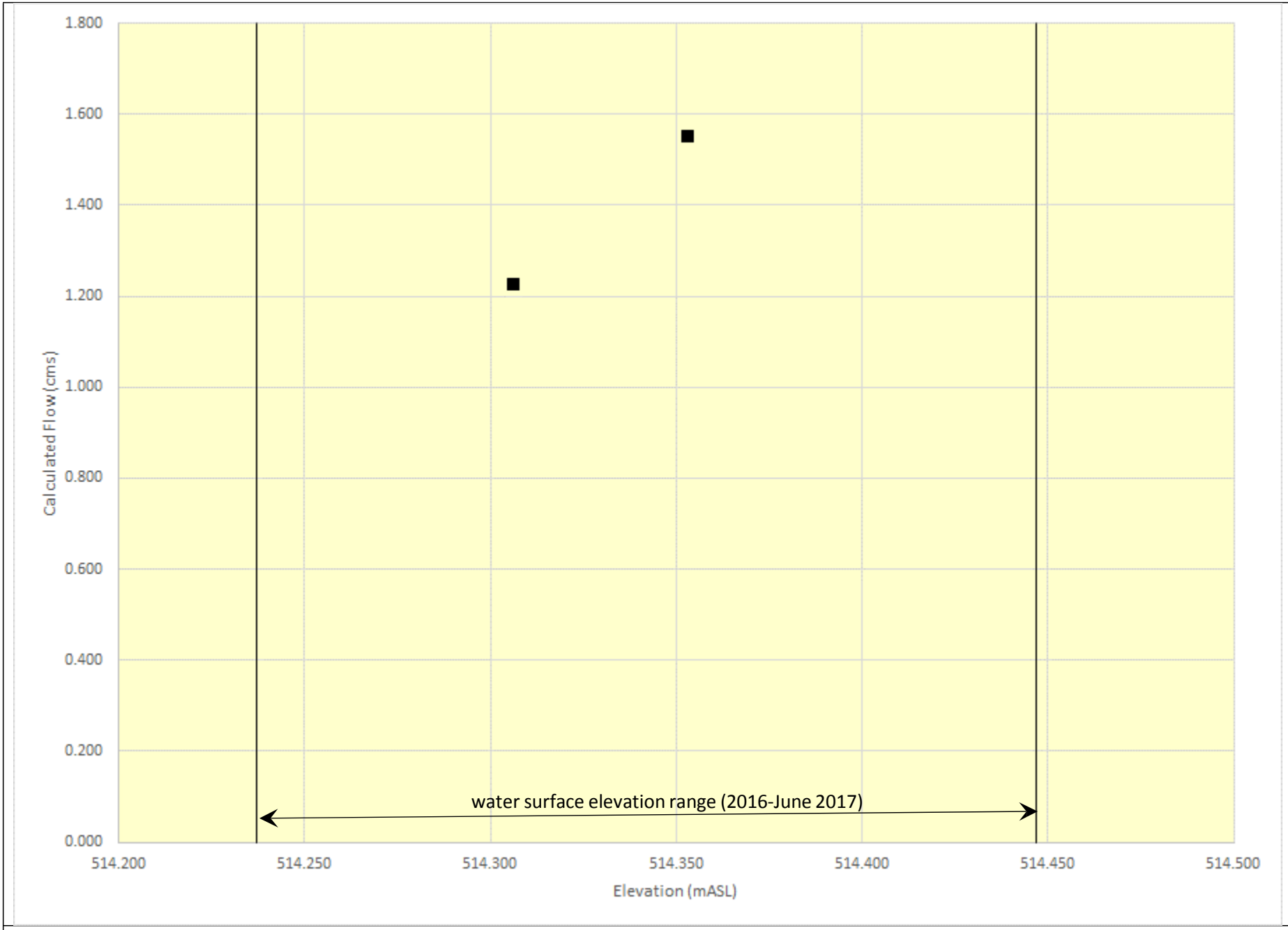

**SA6 – MANUAL FLOW MEASUREMENTS AND RATING CURVE**



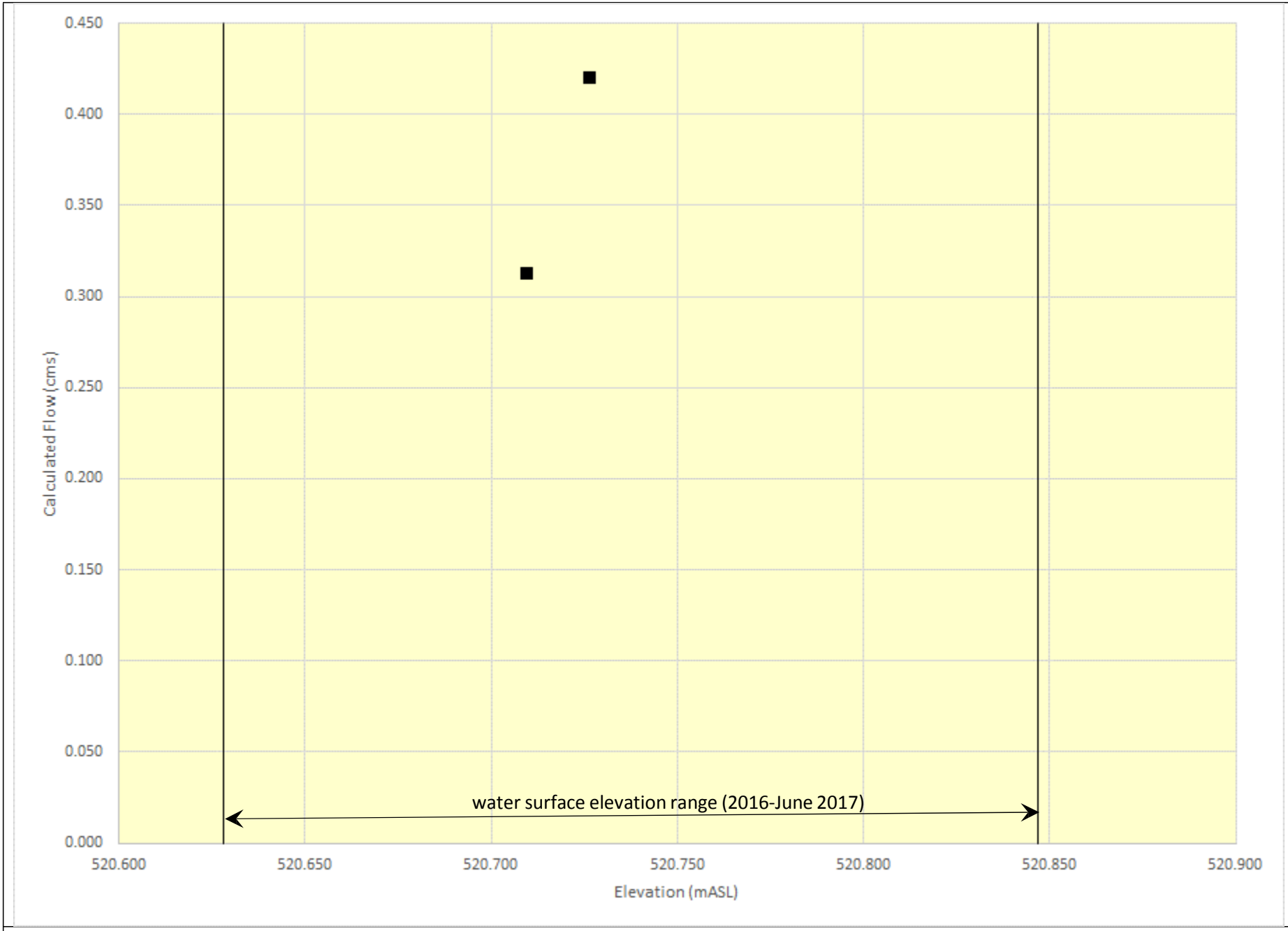

**SA8 – MANUAL FLOW MEASUREMENTS**




**SA9 – MANUAL FLOW MEASUREMENTS**




**SA10 – MANUAL FLOW MEASUREMENTS**




**SA11 – MANUAL FLOW MEASUREMENTS**

# ATTACHMENT C

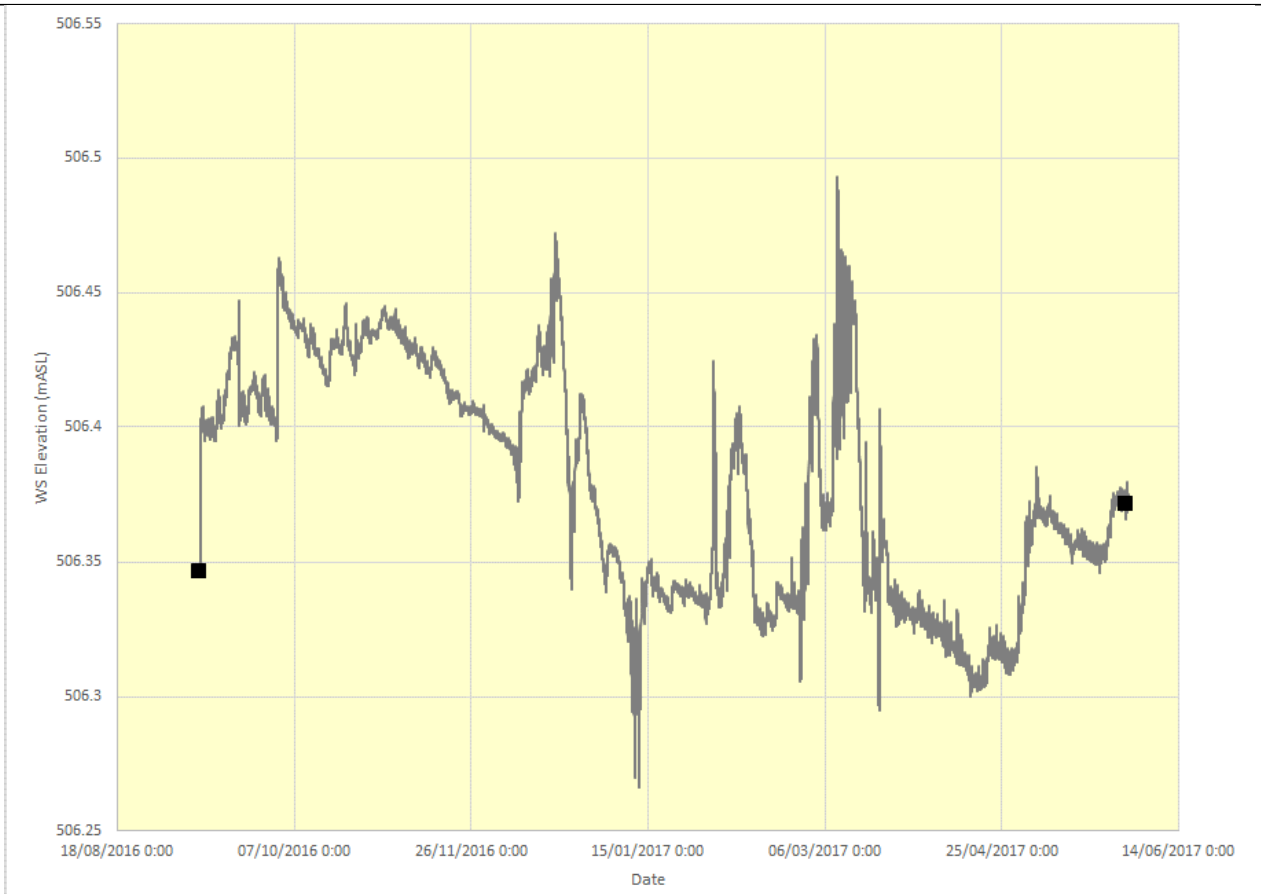
# LEVEL LOGGER DATA

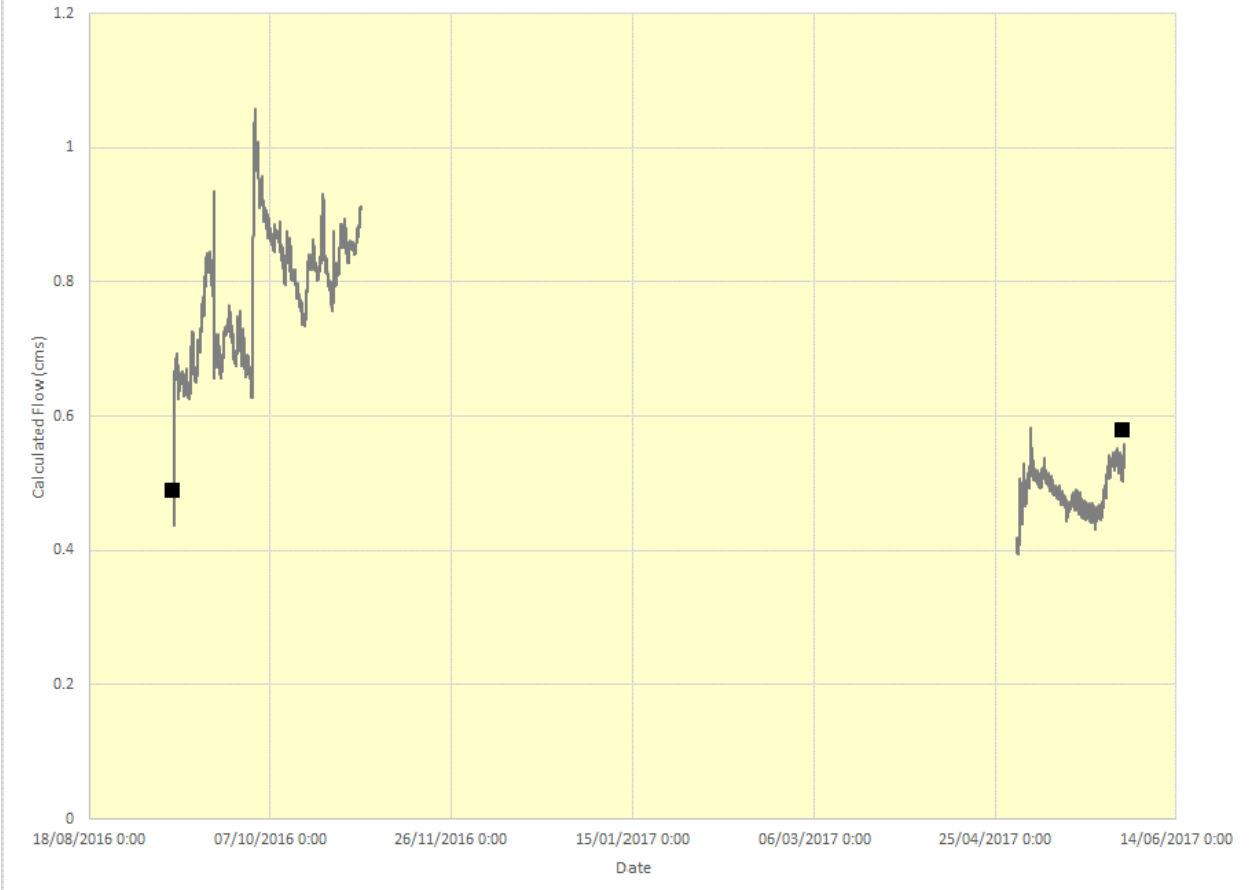




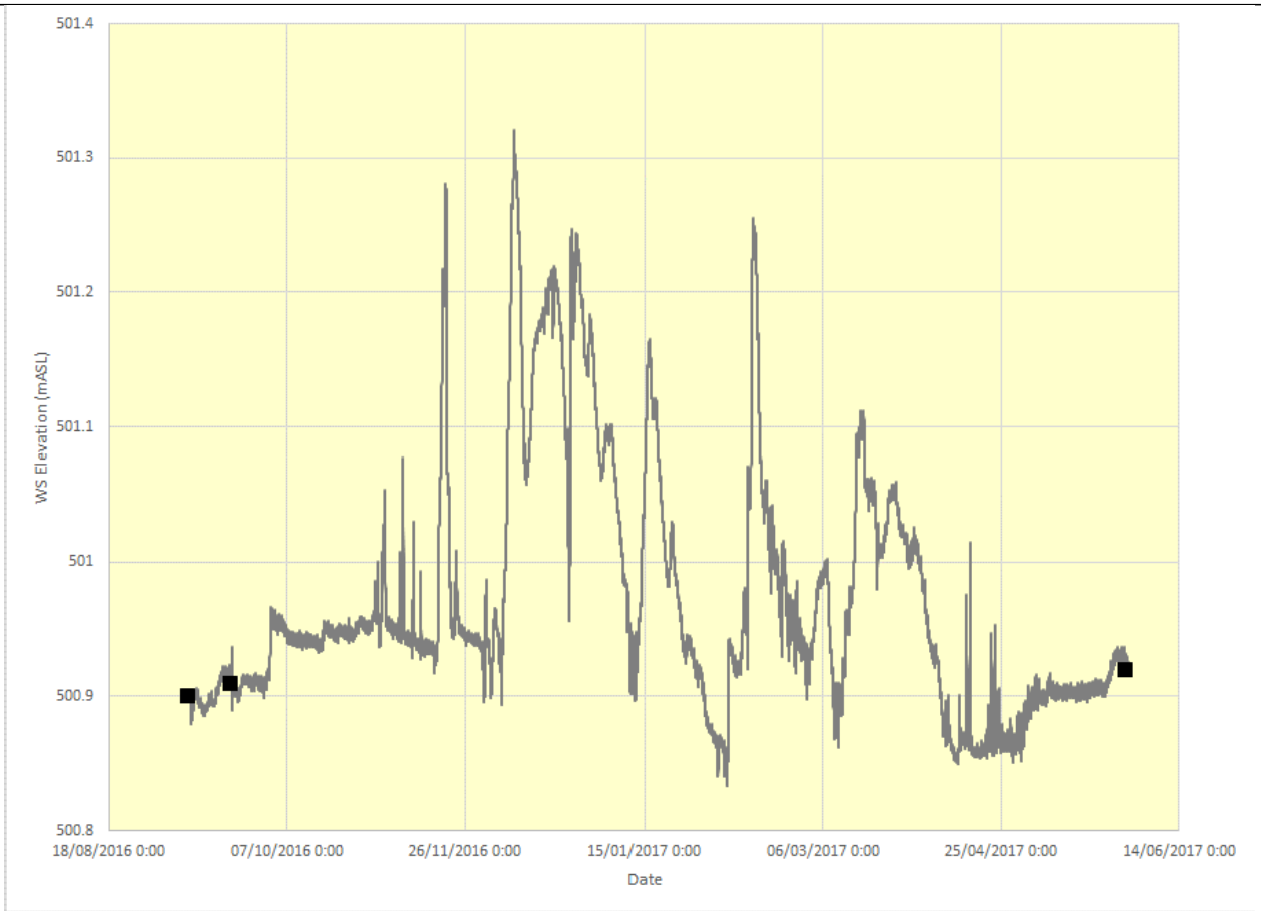


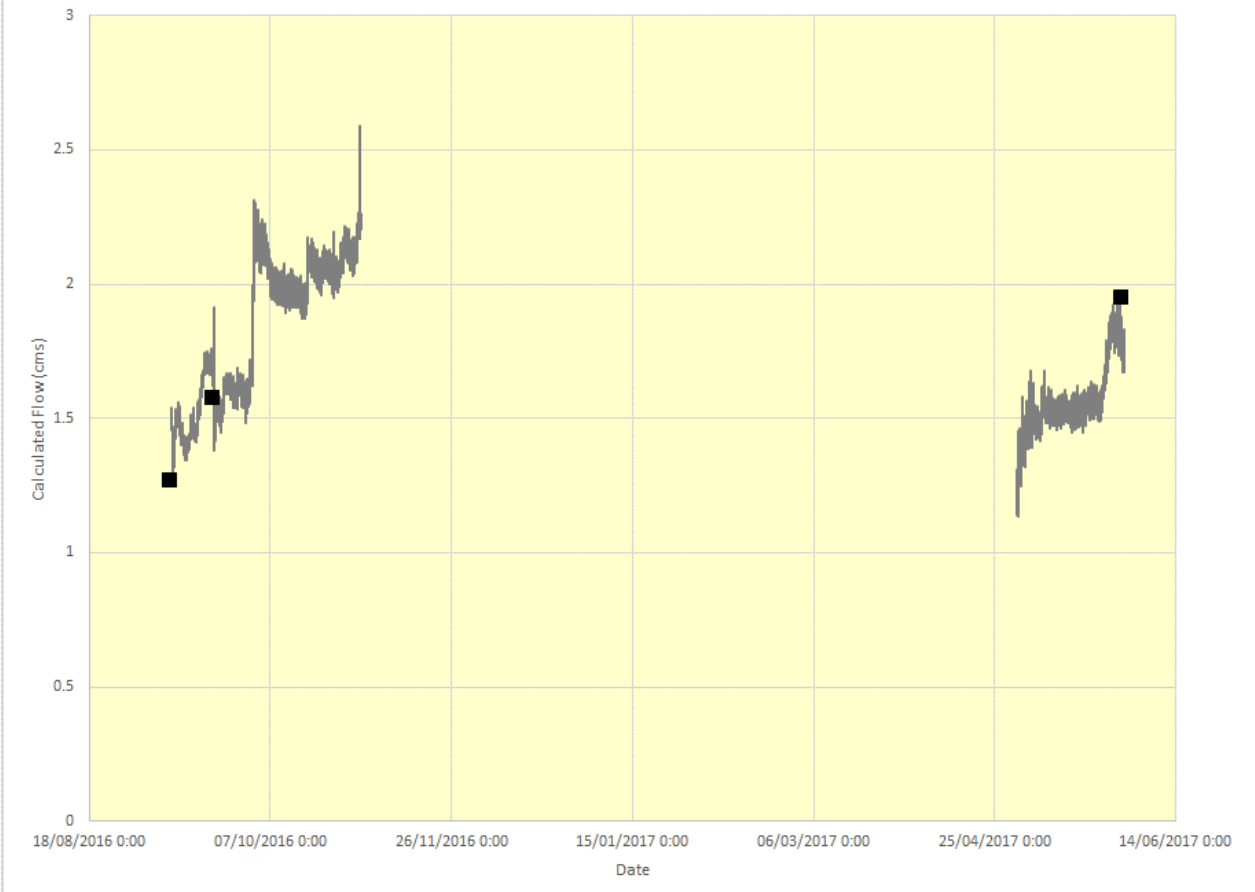
**SA1 – Elevation and Discharge (September 2016 to June 2017)**



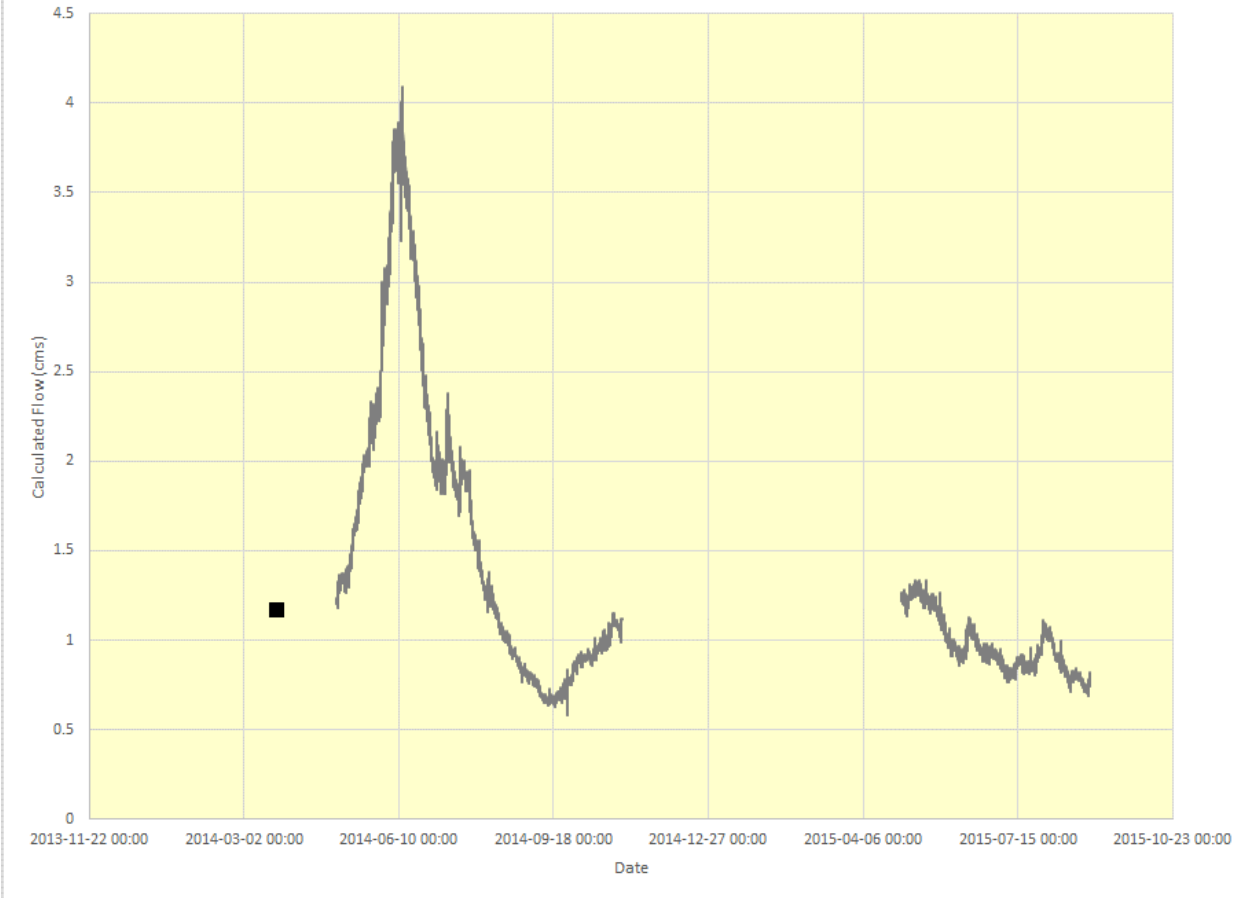

**SA4 – Elevation and Discharge (September 2016 to June 2017)**



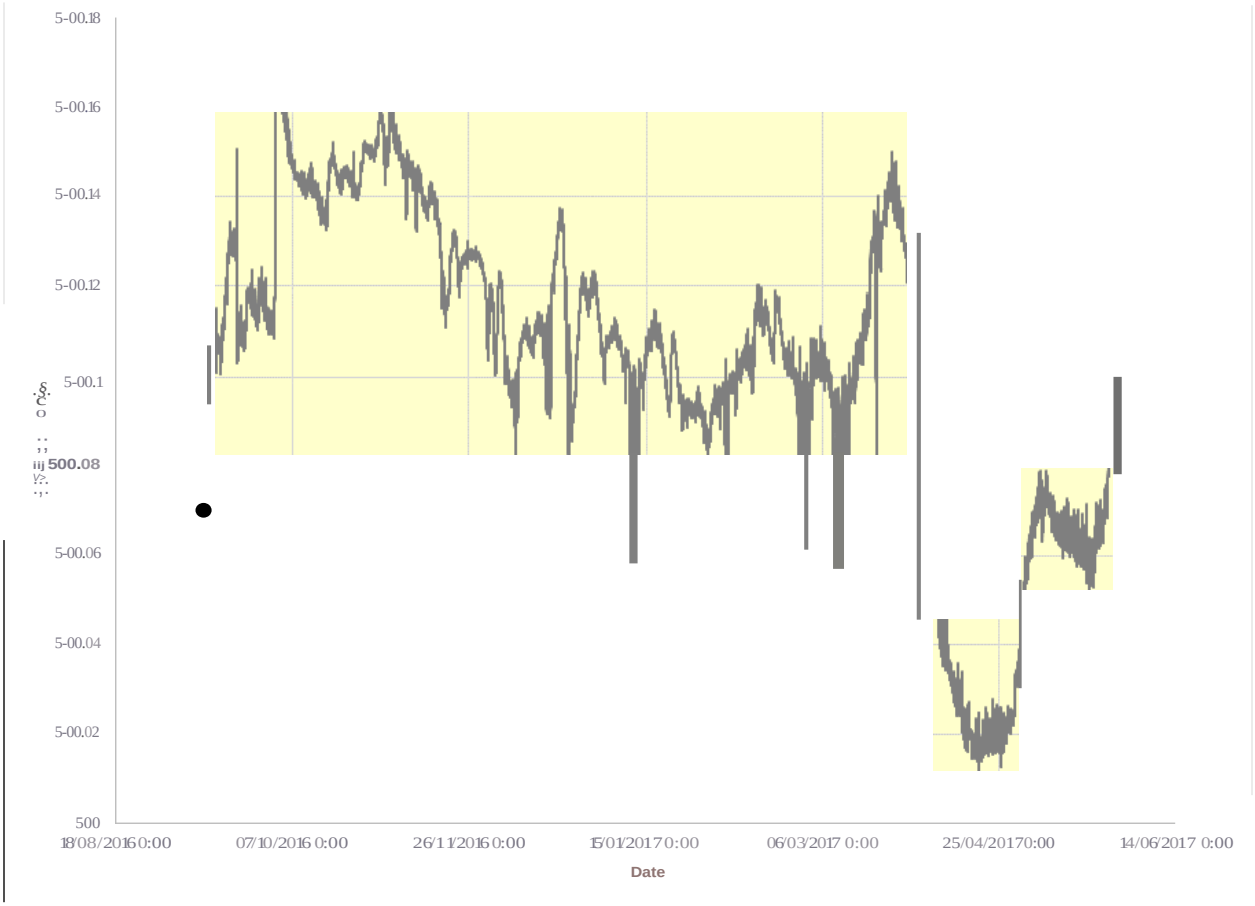




**SA5 – Elevation and Discharge (September 2016 to June 2017)**



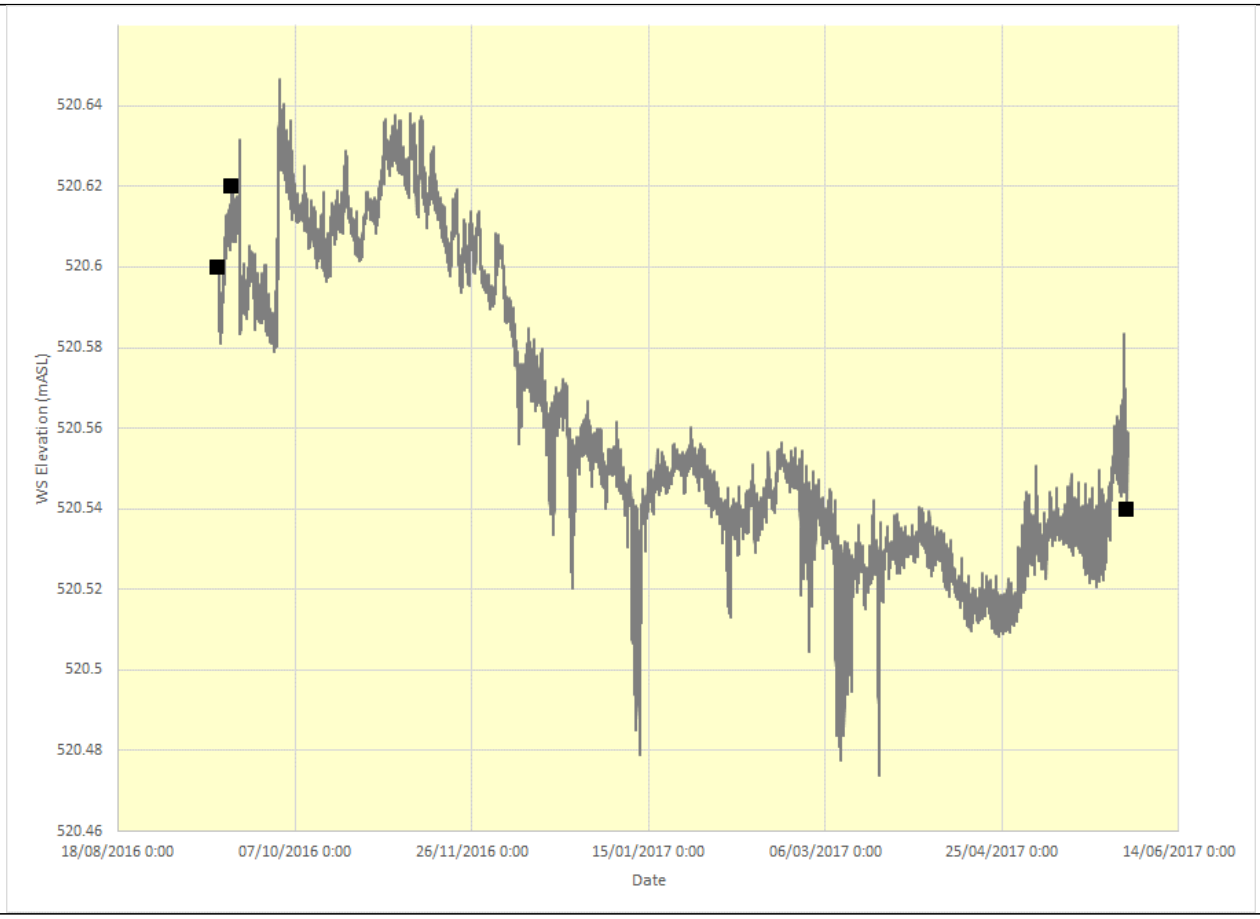

**SA6 – Elevation and Discharge (March 2014 to August 2015)**



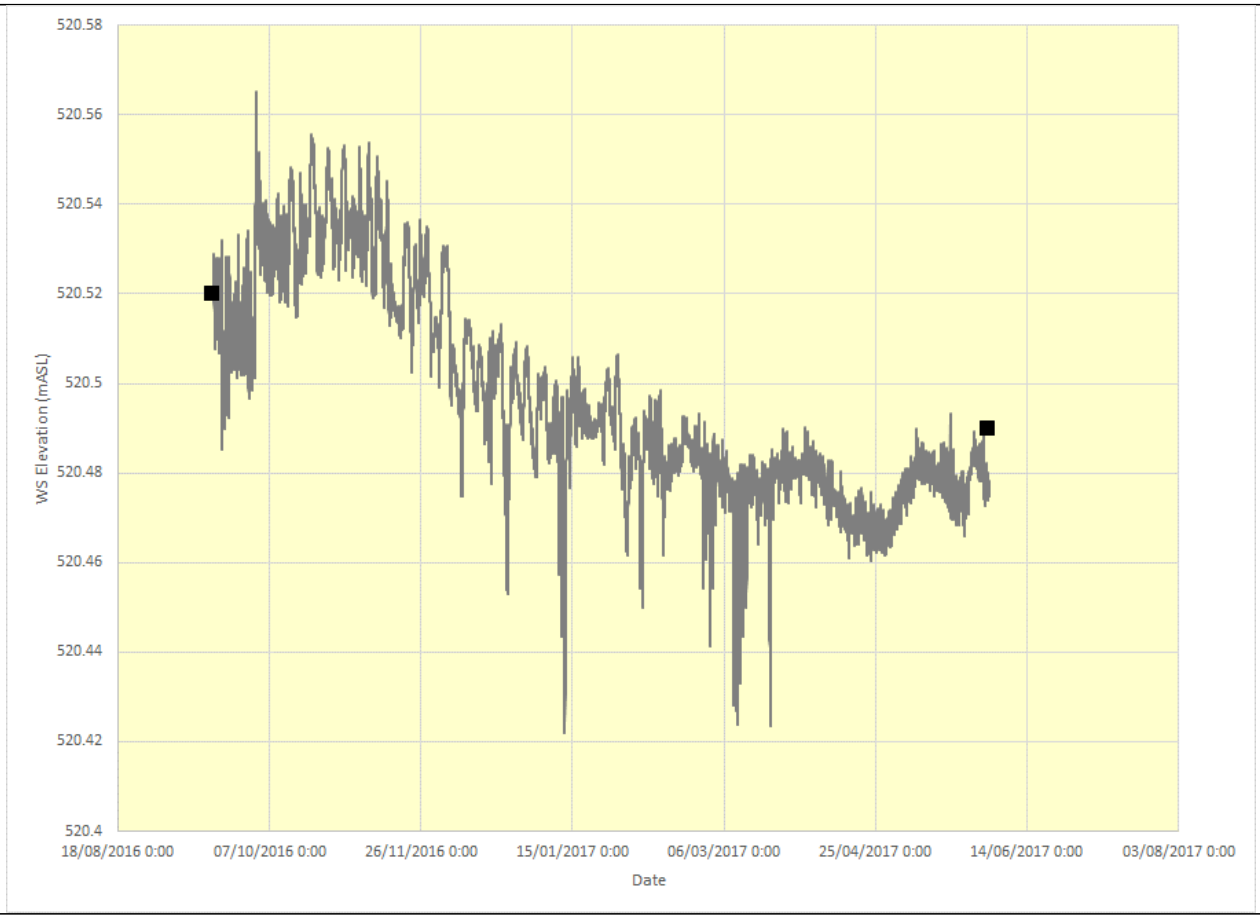




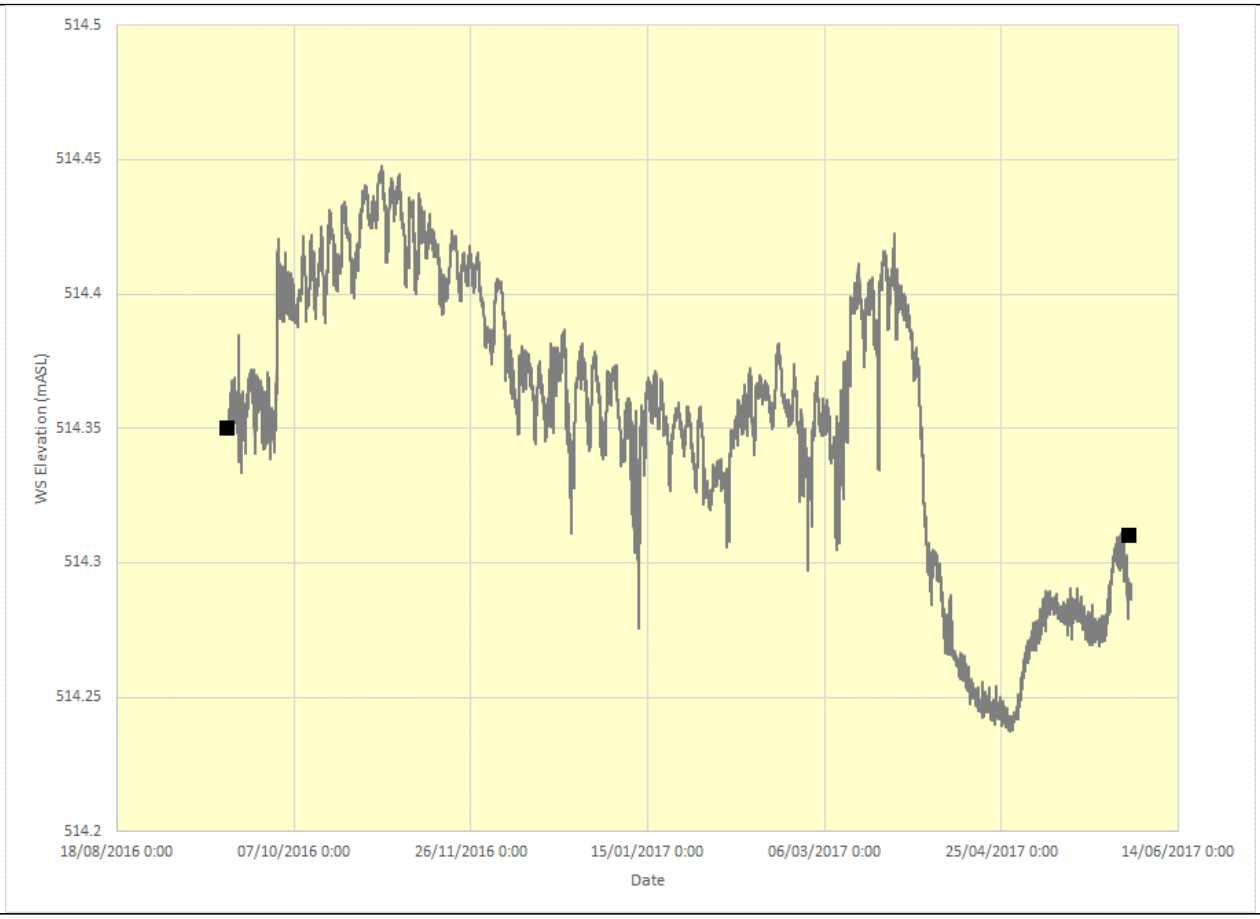
**SA6 - Elevation and Discharge (September 2016 to June 2017)**



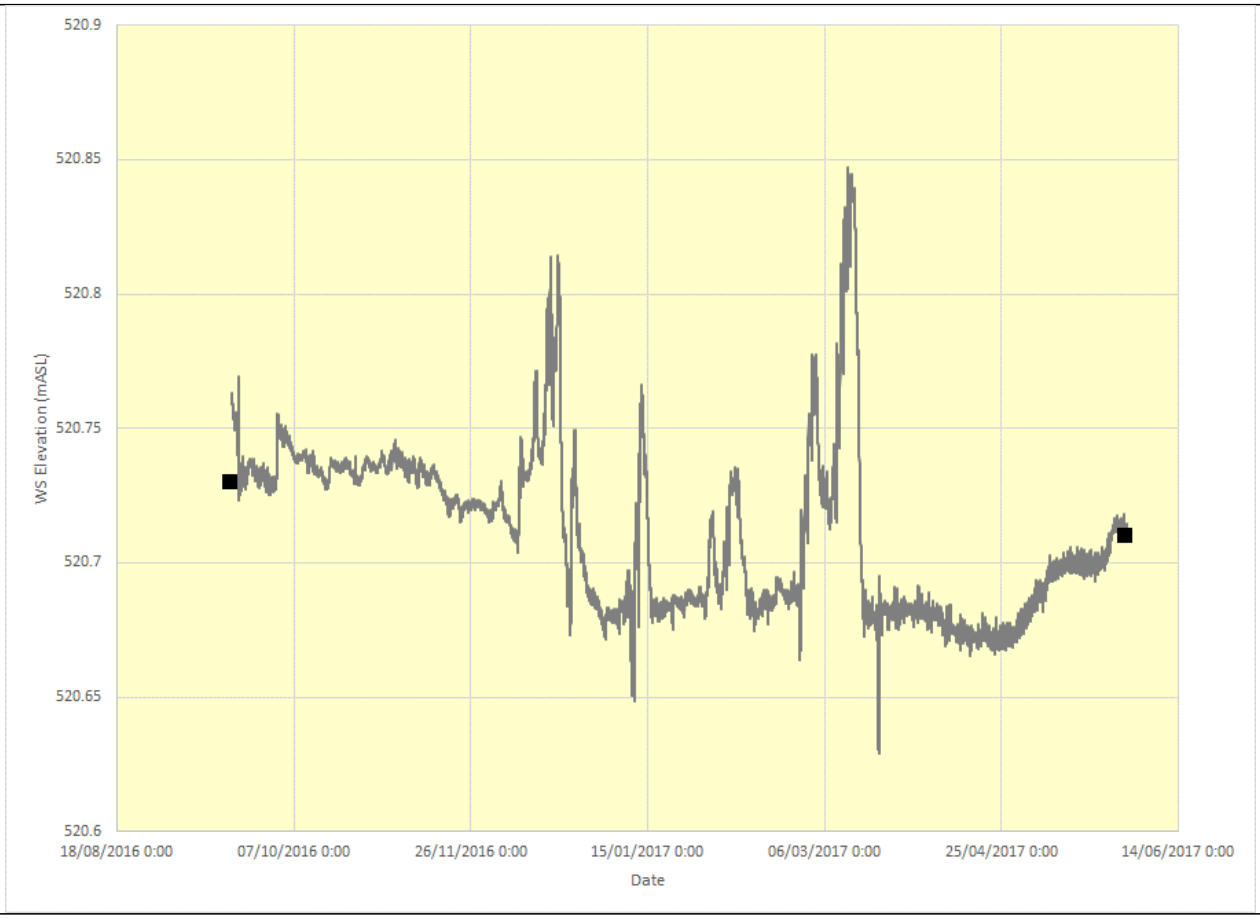

**SA8 – Elevation (September 2016 to June 2017)**



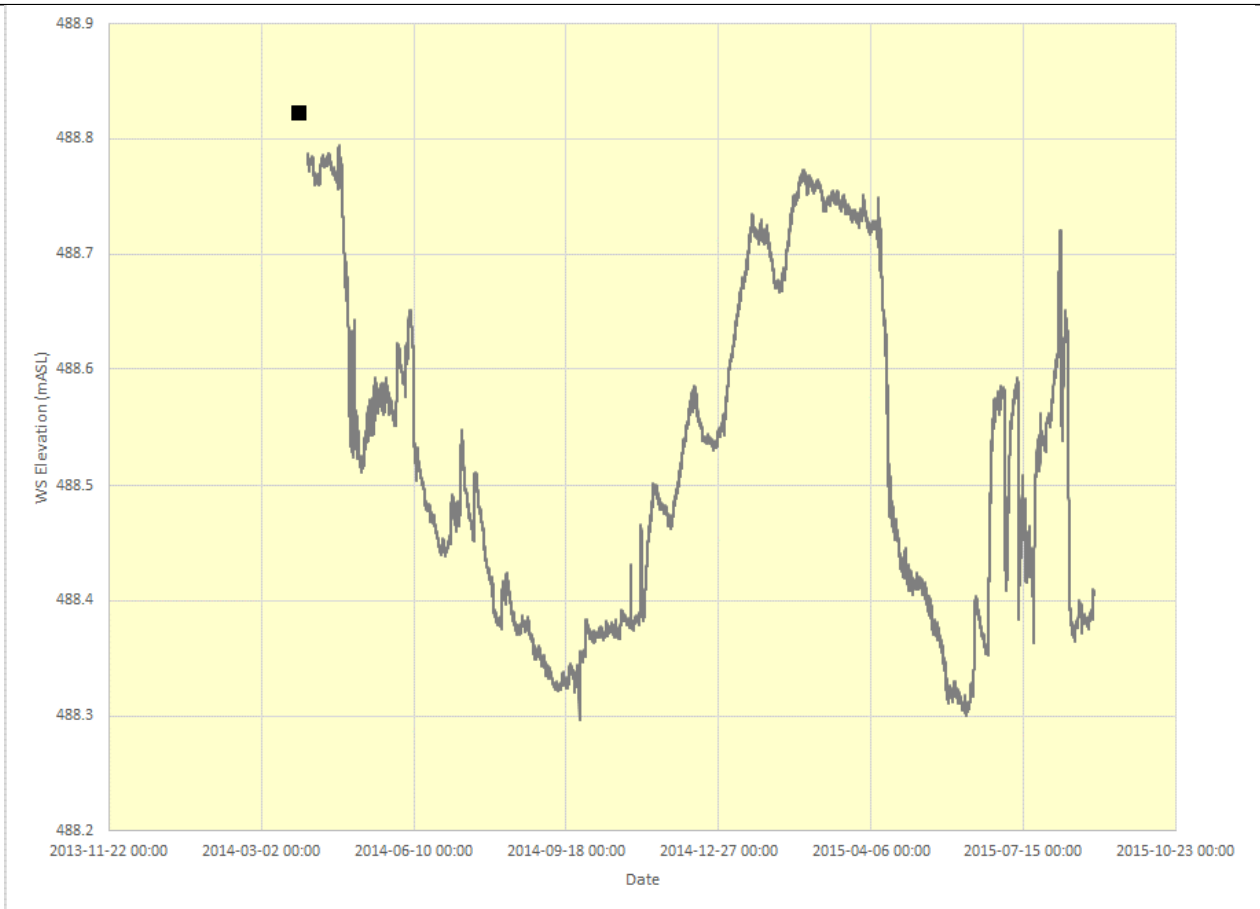

**SA9 – Elevation (September 2016 to June 2017)**

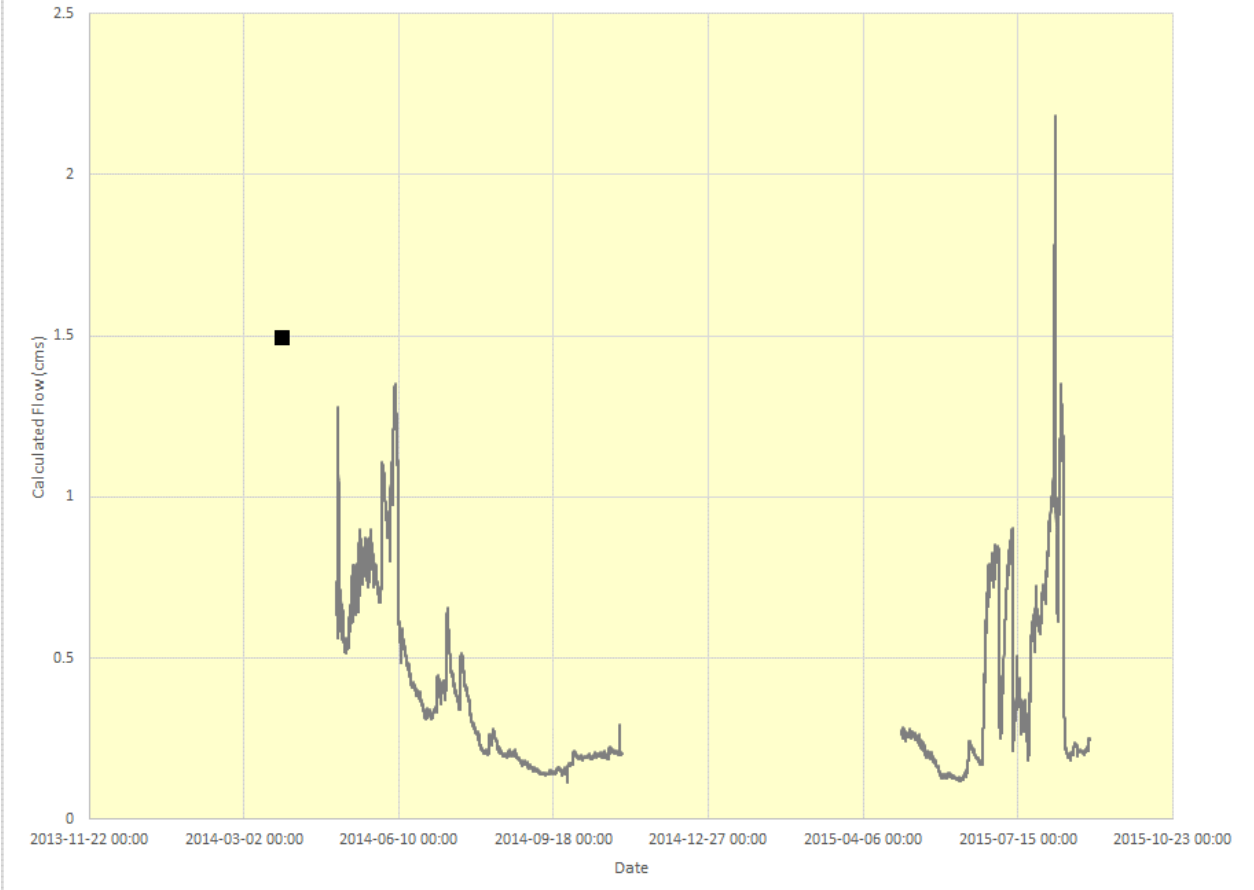



**SA10 – Elevation (September 2016 to June 2017)**




**SA11 – Elevation (September 2016 to June 2017)**




**SB1 – Elevation and Discharge (March 2014 to August 2015)**

# ATTACHMENT D

# WEBB SURVEY REPORT

Webb Surveys
REGISTERED LAND SURVEYORS
LAND DEVELOPMENT CONSULTANTS

June 6, 2017 WO# 17-246

Calder Engineering Ltd.
6440 King Street
Caledon, ON
L7C 0S1

Attn: Robert Whyte

Robert,

Please find attached the static reports from NRCAN showing the corrected static positions of the points that I surveyed between May 29 and June 1, 2017.

As a brief summary here is a list of the points and elevations:

| | |
|---|---|
| LA8 | 523.991 |
| LA9 | 515.312 |
| PA2 | 511.303 |
| PA3 | 517.851 |
| SB5 | 518.673 |

Feel free to contact me if you have any questions.

Thank you,

D.L. (Dan) Codling, SLS, P.Surv

222 Jessop Avenue • Saskatoon SK • S7N 1Y4 • Phone: (306) 955-5330 • Fax: (306) 955-0292 • Email: admin@webbsurveys.ca

# CSRS-PPP (V 1.05 11216 )

**LA8**

| Data Start | Data End | Duration of Observations |
|---|---|---|
| 2017-06-01 15:47:00.000 | 2017-06-01 21:11:30.000 | 5h 24m 30.00s |
| **Apri / Aposteriori Phase Std** | | **Apri / Aposteriori Code Std** |
| 0.015m / 0.010m | | 2.0m / 2.092m |
| **Observations** | **Frequency** | **Mode** |
| Phase and Code | L1 and L2 | Static |
| **Elevation Cut-Off** | **Rejected Epochs** | **Observation & Estimation Steps** |
| 10.000 degrees | 0.00 % | 15.00 sec / 15.00 sec |
| **Antenna Model** | **APC to ARP** | **ARP to Marker** |
| TPSGR5 NONE | L1= 0.221 m L2= 0.218 m | 1.459 m |

(APC = antenna phase center; ARP = antenna reference point)

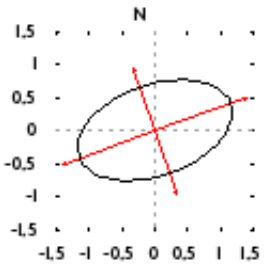
## Estimated Position for LA8152p.17O

| | Latitude (+n) | Longitude (+e) | Ell. Height |
|---|---|---|---|
| **NAD83(CSRS) (1997)** | 57º 33’ 39.2611’’ | -105º 23’ 48.9852’’ | 492.933 m |
| **Sigmas(95%)** | 0.006 m | 0.009 m | 0.021 m |
| **Apriori** | 57º 33’ 39.262’’ | -105º 23’ 49.066’’ | 494.022 m |
| **Estimated - Apriori** | -0.042 m | 1.352 m | -1.089 m |

**Orthometric Height CGVD28 (HTv2.0)**

523.991 m
(click for height reference information)

**95% Error Ellipse (cm)**
**semi-major: 1.219cm**
**semi-minor: 0.688cm**
**semi-major azimuth: 71º 1’ 7.79’’**




**UTM (North) Zone 13**

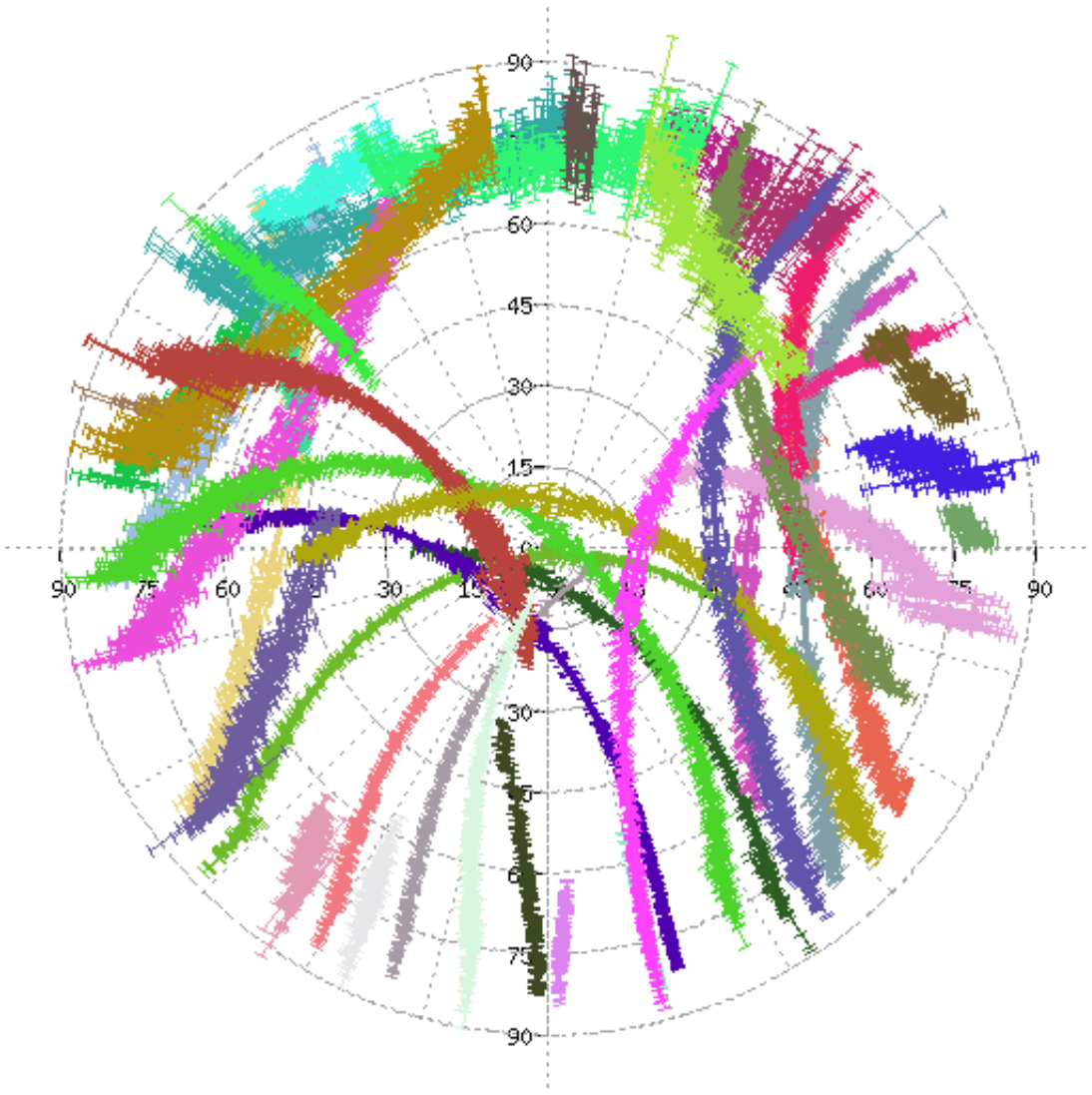
6379895.581m (N) 476250.738m (E)

Scale Factors
0.99960692 (point)
0.99952959 (combined)

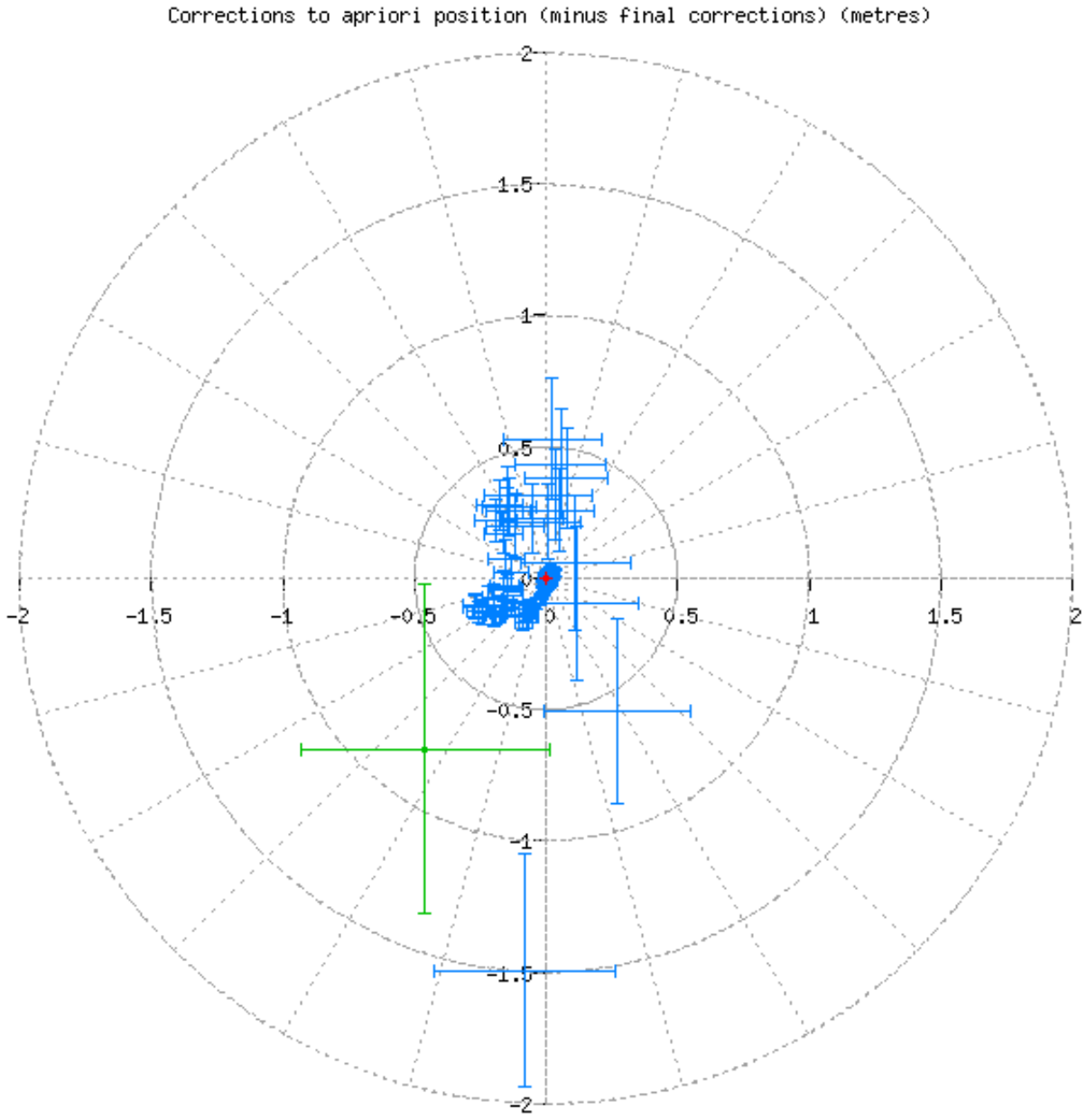
(Coordinates from RINEX file used as apriori position)

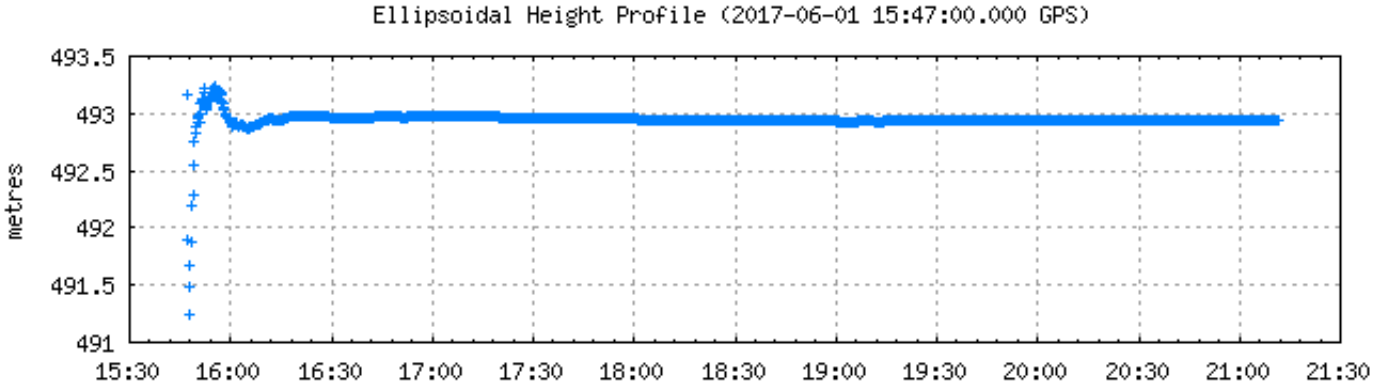
# Estimated Parameters & Observations Statistics

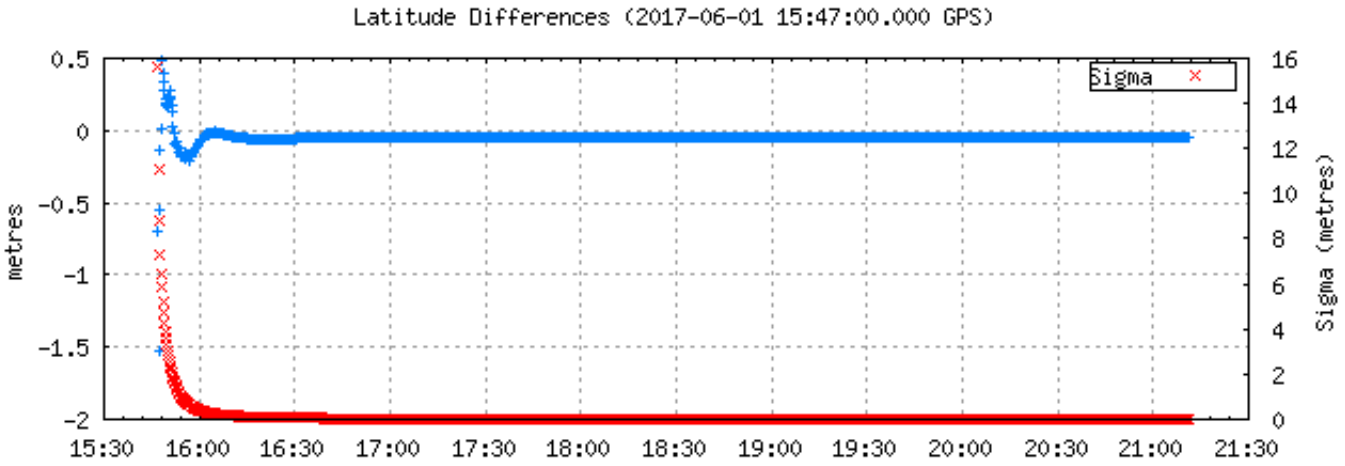
Pseudo-Range Residuals Sky Distribution

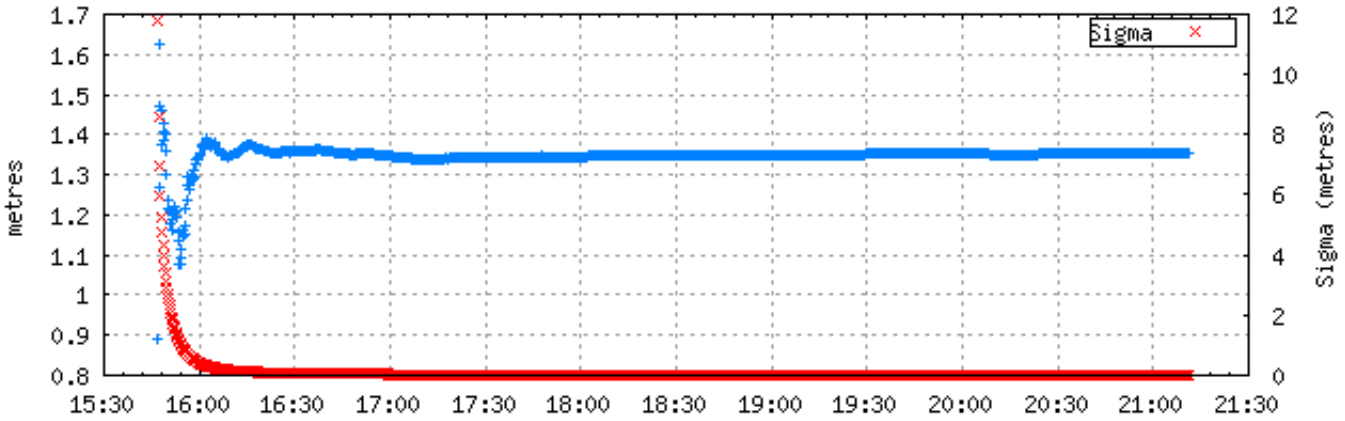


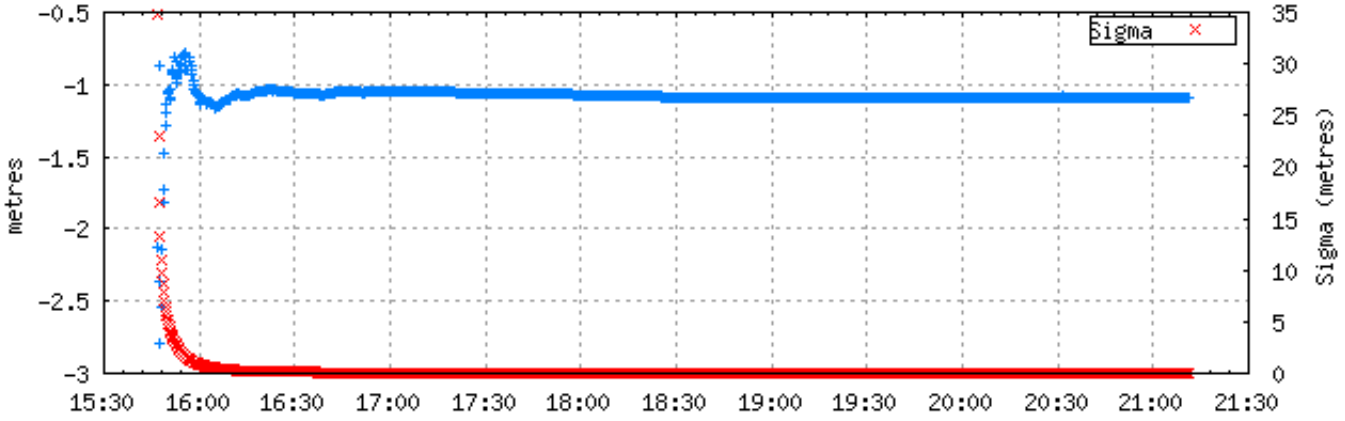

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PRN01 | PRN09 | PRN17 | PRN24 | R__03 | R__10 | R__18 | |
| PRN03 | PRN11 | PRN19 | PRN27 | R__05 | R__11 | R__19 | |
| PRN05 | PRN12 | PRN20 | PRN28 | R__06 | R__14 | R__20 | |
| PRN06 | PRN13 | PRN21 | PRN30 | R__07 | R__15 | R__21 | |
| PRN07 | PRN15 | PRN22 | R__01 | R__08 | R__16 | R__23 | |
| PRN08 | PRN16 | PRN23 | R__02 | R__09 | R__17 | R__24 | |

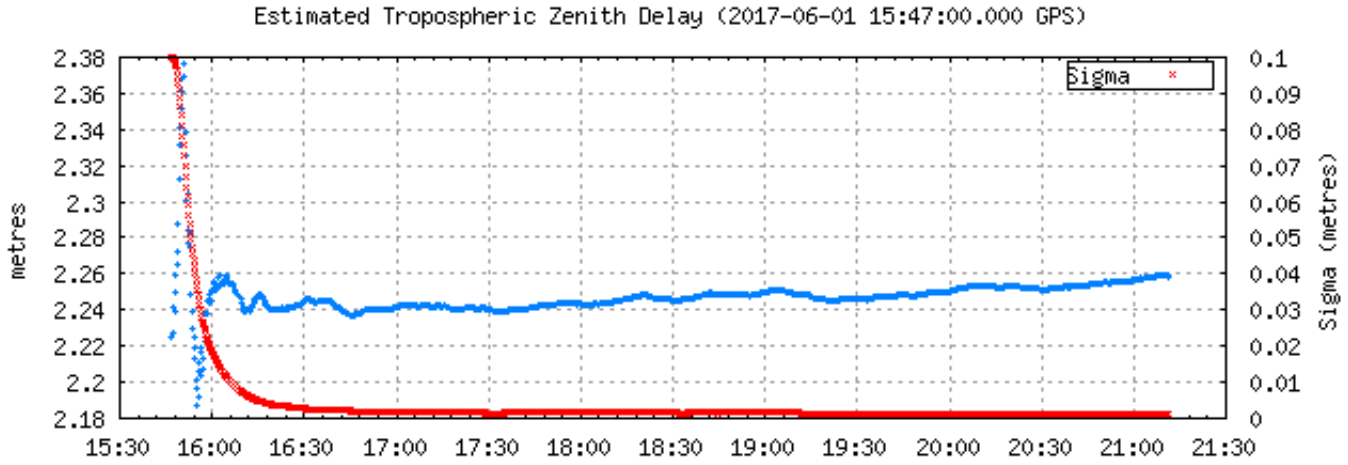

Corrections to apriori position (minus final corrections) (metres)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
(1 sigma std of position corrections) / 25
(1 sigma std of initial position correction) / 25
(1 sigma std of final position correction) / 25

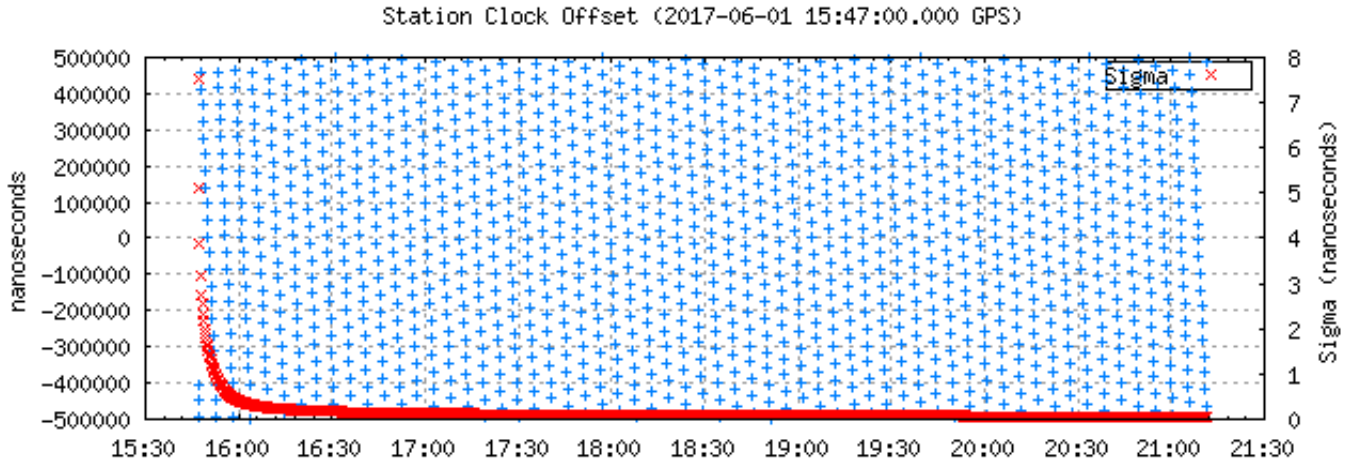

Ellipsoidal Height Profile (2017-06-01 15:47:00.000 GPS)
metres
493.5
493
492.5
492
491.5
491
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30

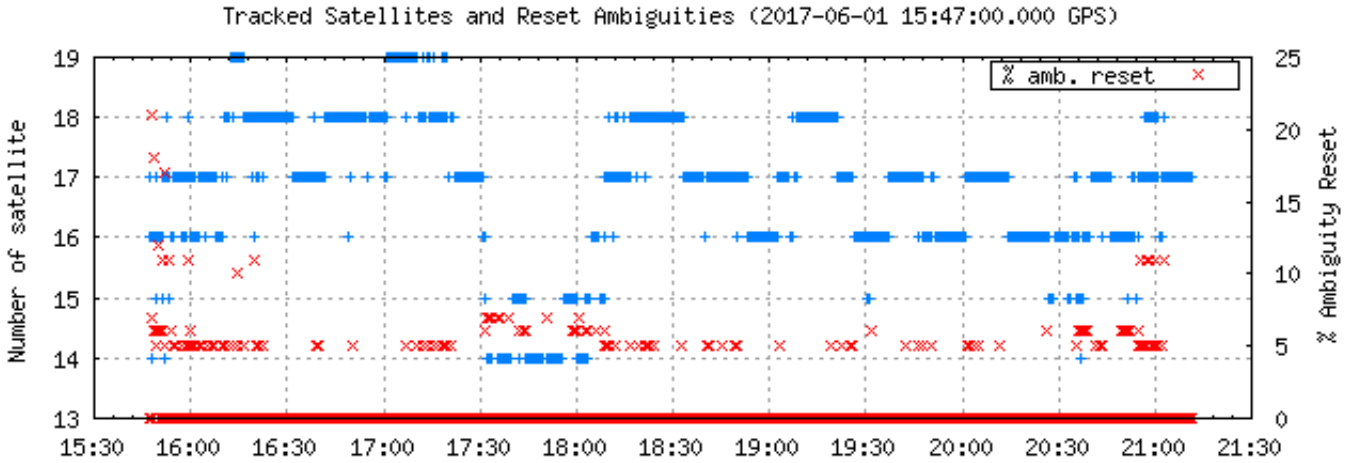

Latitude Differences (2017-06-01 15:47:00.000 GPS)
Sigma
metres
Sigma (metres)
0.5
0
-0.5
-1
-1.5
-2
16
14
12
10
8
6
4
2
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30


Longitude Differences (2017-06-01 15:47:00.000 GPS)
Sigma
metres
Sigma (metres)
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
12
10
8
6
4
2
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30

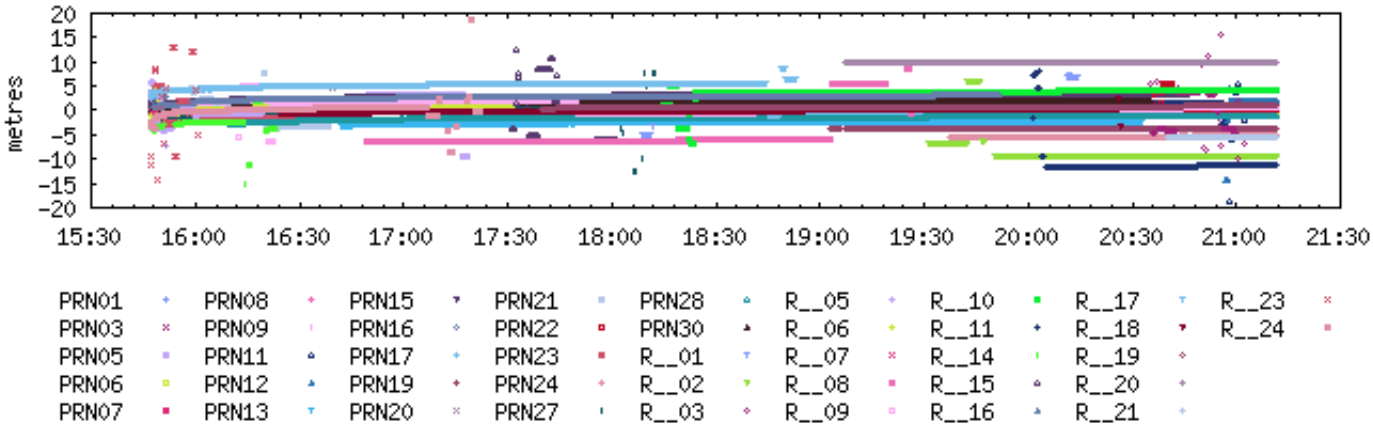

Height Differences (2017-06-01 15:47:00.000 GPS)
Sigma
metres
Sigma (metres)
-0.5
-1
-1.5
-2
-2.5
-3
35
30
25
20
15
10
5
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30


Estimated Tropospheric Zenith Delay (2017-06-01 15:47:00.000 GPS)
metres
Sigma (metres)
Sigma
2.38
2.36
2.34
2.32
2.3
2.28
2.26
2.24
2.22
2.2
2.18
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30


Station Clock Offset (2017-06-01 15:47:00.000 GPS)
nanoseconds
Sigma (nanoseconds)
Sigma
500000
400000
300000
200000
100000
0
-100000
-200000
-300000
-400000
-500000
8
7
6
5
4
3
2
1
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30

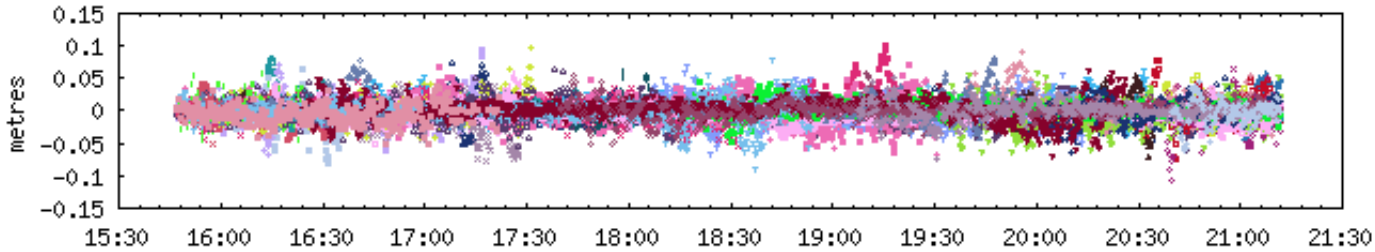

Tracked Satellites and Reset Ambiguities (2017-06-01 15:47:00.000 GPS)
Number of satellite
% Ambiguity Reset
% amb. reset
19
18
17
16
15
14
13
25
20
15
10
5
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30

Ambiguities (2017-06-01 15:47:00.000 GPS)



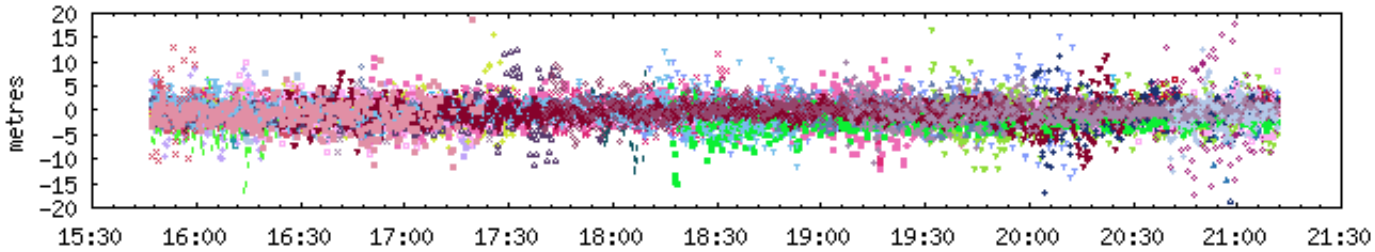

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PRN01 | PRN08 | PRN15 | PRN21 | PRN28 | R__05 | R__10 | R__17 | R__23 | |
| PRN03 | PRN09 | PRN16 | PRN22 | PRN30 | R__06 | R__11 | R__18 | R__24 | |
| PRN05 | PRN11 | PRN17 | PRN23 | R__01 | R__07 | R__14 | R__19 | | |
| PRN06 | PRN12 | PRN19 | PRN24 | R__02 | R__08 | R__15 | R__20 | | |
| PRN07 | PRN13 | PRN20 | PRN27 | R__03 | R__09 | R__16 | R__21 | | |

Carrier-Phase Residuals (2017-06-01 15:47:00.000 GPS)




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PRN01 | PRN08 | PRN15 | PRN21 | PRN28 | R__05 | R__10 | R__17 | R__23 | |
| PRN03 | PRN09 | PRN16 | PRN22 | PRN30 | R__06 | R__11 | R__18 | R__24 | |
| PRN05 | PRN11 | PRN17 | PRN23 | R__01 | R__07 | R__14 | R__19 | | |
| PRN06 | PRN12 | PRN19 | PRN24 | R__02 | R__08 | R__15 | R__20 | | |
| PRN07 | PRN13 | PRN20 | PRN27 | R__03 | R__09 | R__16 | R__21 | | |

Pseudo-Range Residuals (2017-06-01 15:47:00.000 GPS)




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PRN01 | PRN08 | PRN15 | PRN21 | PRN28 | R__05 | R__10 | R__17 | R__23 | |
| PRN03 | PRN09 | PRN16 | PRN22 | PRN30 | R__06 | R__11 | R__18 | R__24 | |
| PRN05 | PRN11 | PRN17 | PRN23 | R__01 | R__07 | R__14 | R__19 | | |
| PRN06 | PRN12 | PRN19 | PRN24 | R__02 | R__08 | R__15 | R__20 | | |
| PRN07 | PRN13 | PRN20 | PRN27 | R__03 | R__09 | R__16 | R__21 | | |

**~~~ Disclaimer ~~~**

**Natural Resources Canada does not assume any liability deemed to have been caused directly or indirectly by any content of its PPP-On-Line positioning service.**

**If you have any questions, please feel free to contact:**
**EMail: nrcan.geodeticinformationservices.rncan@canada.ca**
**Phone:343-292-6617**

Natural Resources Canada Ressources naturelles Canada

Canada

# CSRS-PPP (V 1.05 11216 )

**LA9**

| Data Start | Data End | Duration of Observations |
|---|---|---|
| 2017-05-31 15:37:30.000 | 2017-05-31 20:08:15.000 | 4h 30m 45.00s |
| **Apri / Aposteriori Phase Std** | | **Apri / Aposteriori Code Std** |
| 0.015m / 0.010m | | 2.0m / 1.435m |
| **Observations** | **Frequency** | **Mode** |
| Phase and Code | L1 and L2 | Static |
| **Elevation Cut-Off** | **Rejected Epochs** | **Observation & Estimation Steps** |
| 10.000 degrees | 0.00 % | 15.00 sec / 15.00 sec |
| **Antenna Model** | **APC to ARP** | **ARP to Marker** |
| TPSGR5 NONE | L1= 0.221 m L2= 0.218 m | 1.440 m |

(APC = antenna phase center; ARP = antenna reference point)

## Estimated Position for LA9151p.17O

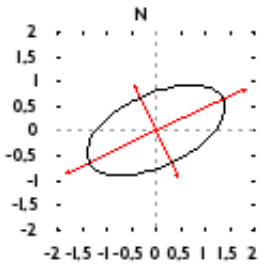
| | Latitude (+n) | Longitude (+e) | Ell. Height |
|---|---|---|---|
| **NAD83(CSRS) (1997)** | 57º 33’ 18.1971’’ | -105º 20’ 19.7196’’ | 484.198 m |
| **Sigmas(95%)** | 0.007 m | 0.011 m | 0.022 m |
| **Apriori** | 57º 33’ 18.204’’ | -105º 20’ 19.803’’ | 484.162 m |
| **Estimated - Apriori** | -0.207 m | 1.393 m | 0.036 m |

**Orthometric Height CGVD28 (HTv2.0)**

515.312 m

(click for height reference information)

**95% Error Ellipse (cm)**
**semi-major: 1.502cm**
**semi-minor: 0.730cm**
**semi-major azimuth: 65º 23’ 47.07’’**




**UTM (North) Zone 13**

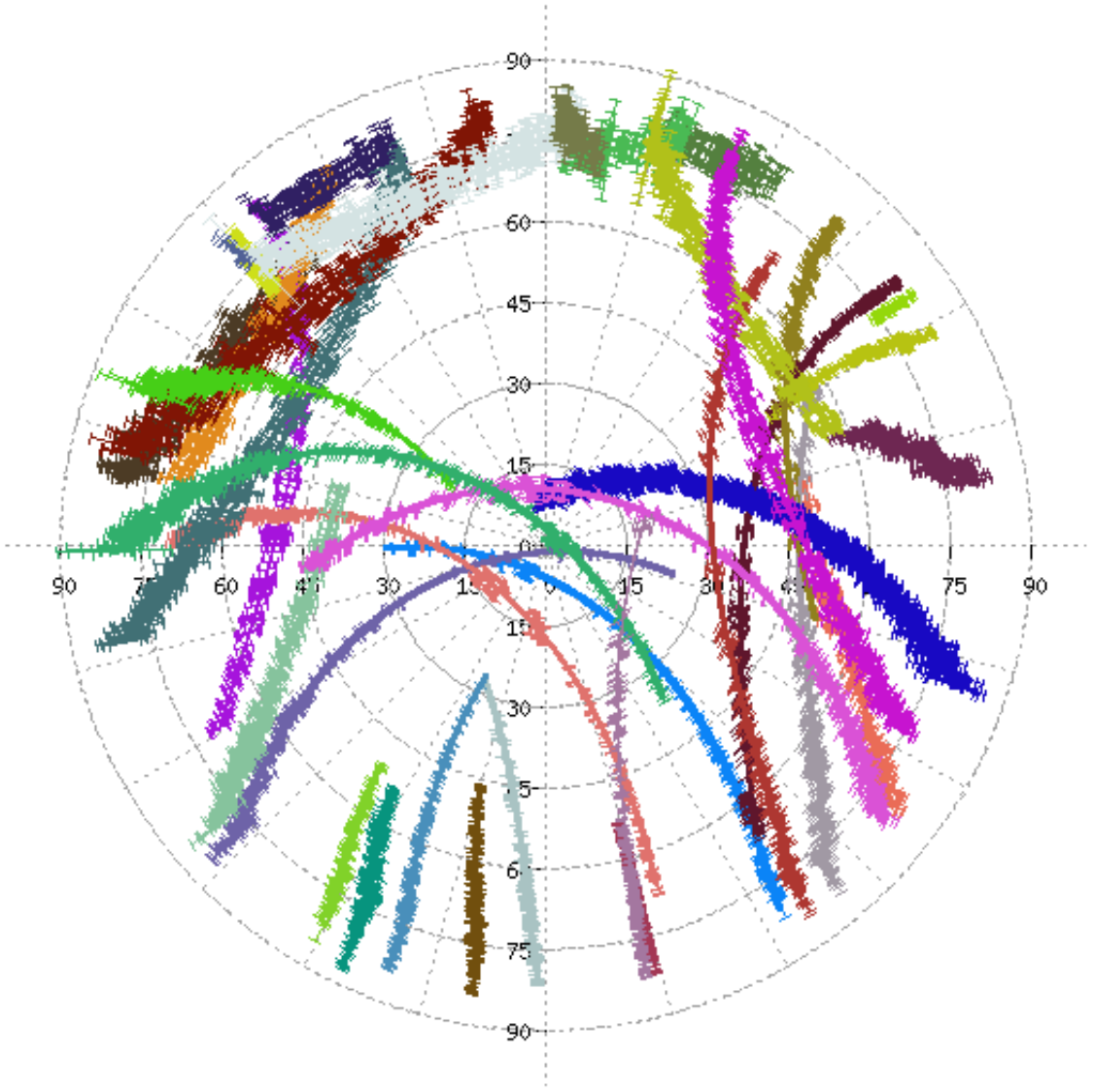
6379225.363m (N) 479725.394m (E)

Scale Factors
0.99960504 (point)
0.99952908 (combined)

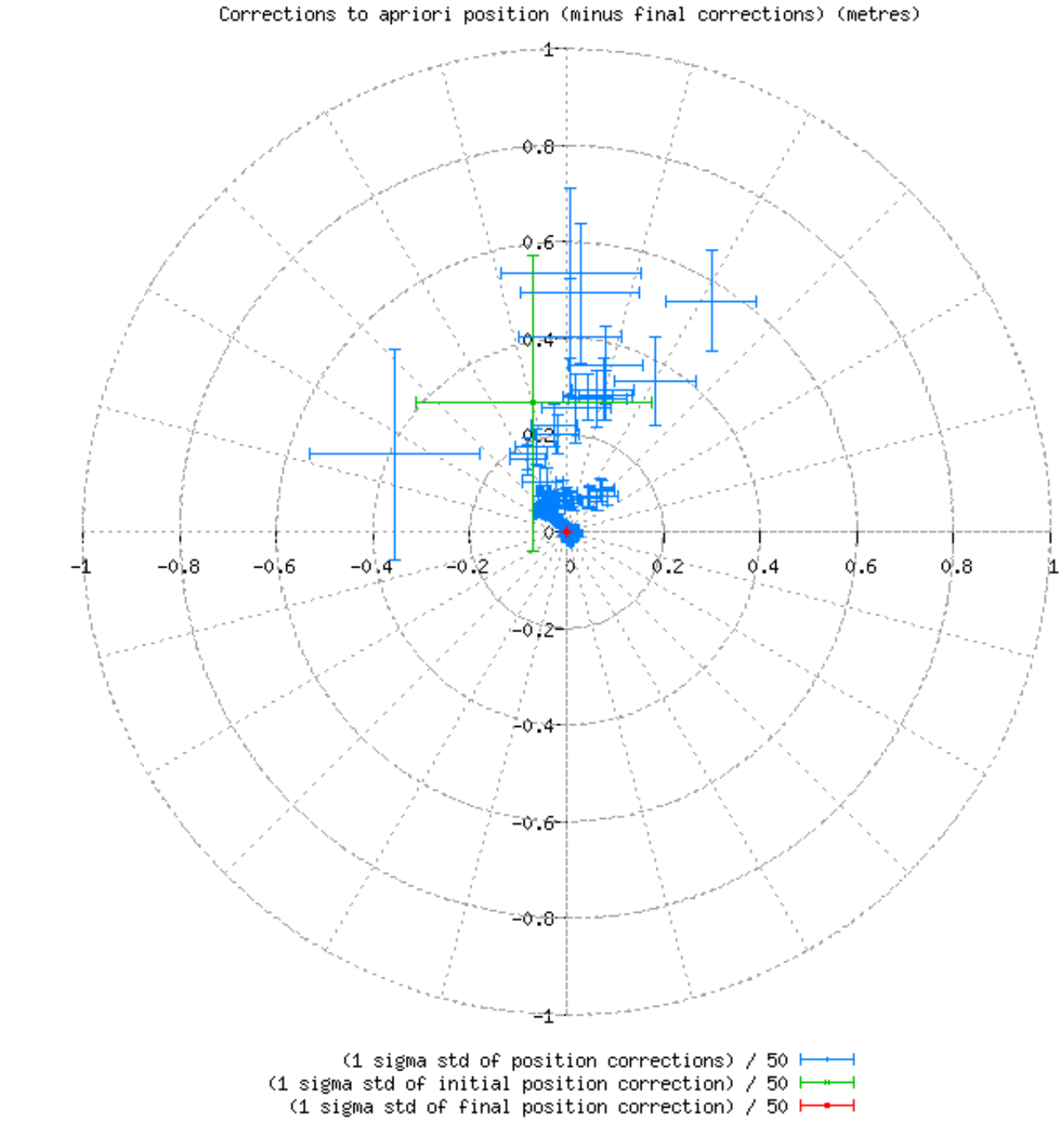
(Coordinates from RINEX file used as apriori position)

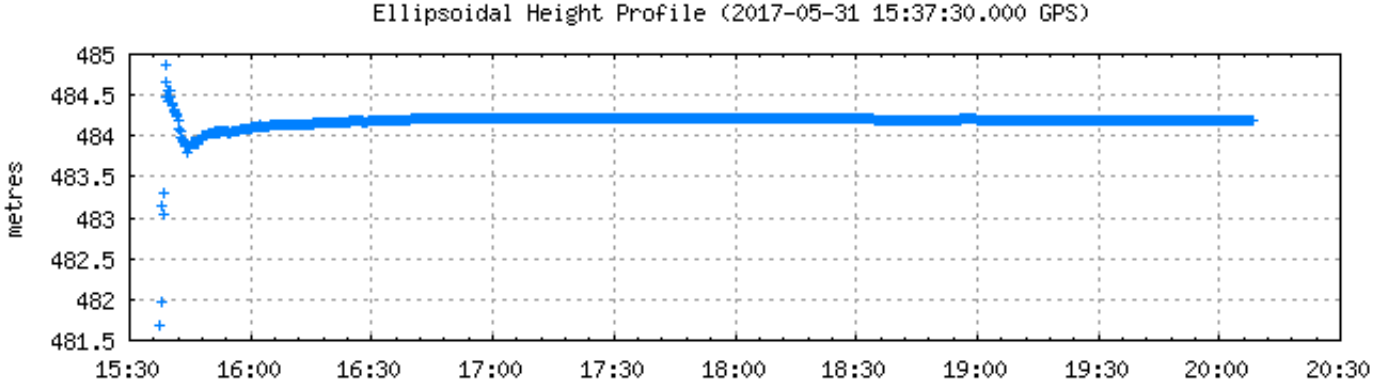
# Estimated Parameters & Observations Statistics

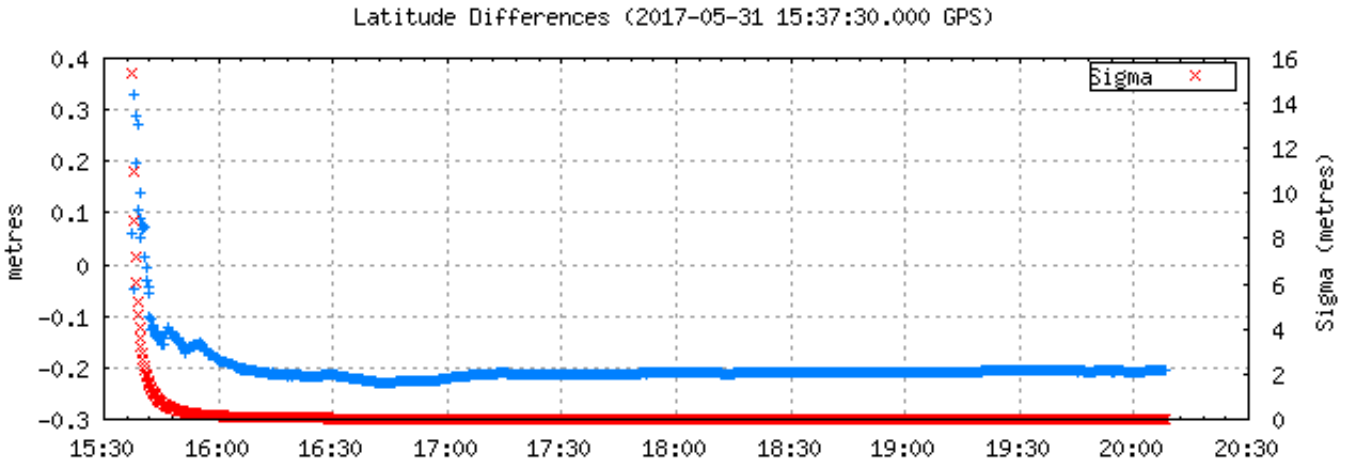
Pseudo-Range Residuals Sky Distribution



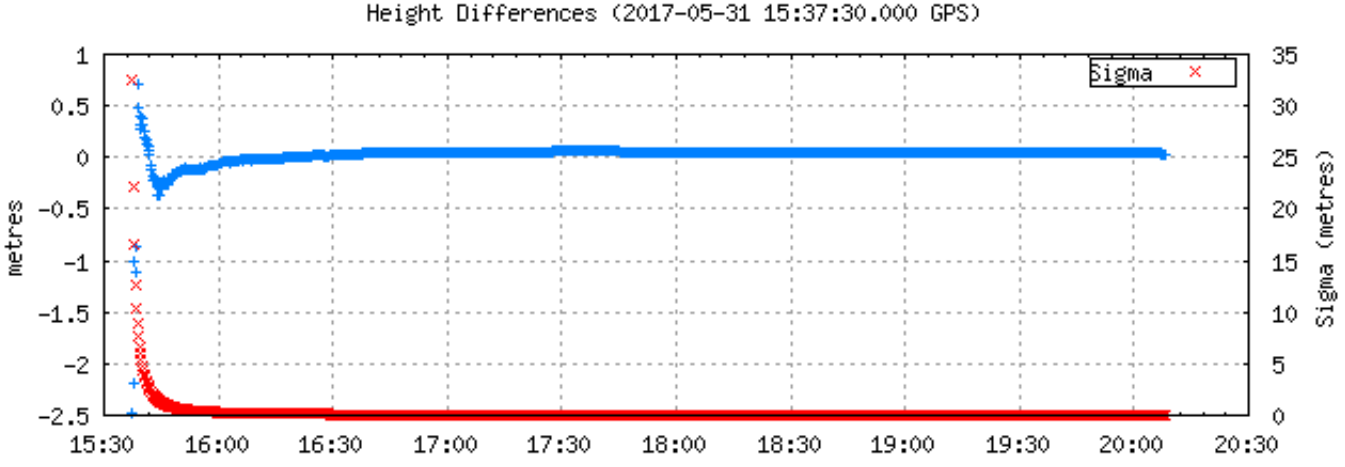

PRN01 PRN11 PRN19 PRN26 R__04 R__09 R__16 R__23
PRN05 PRN13 PRN20 PRN27 R__05 R__10 R__17 R__24
PRN07 PRN15 PRN21 PRN28 R__06 R__13 R__18
PRN08 PRN16 PRN23 PRN30 R__07 R__14 R__19
PRN09 PRN17 PRN24 R__01 R__08 R__15 R__22

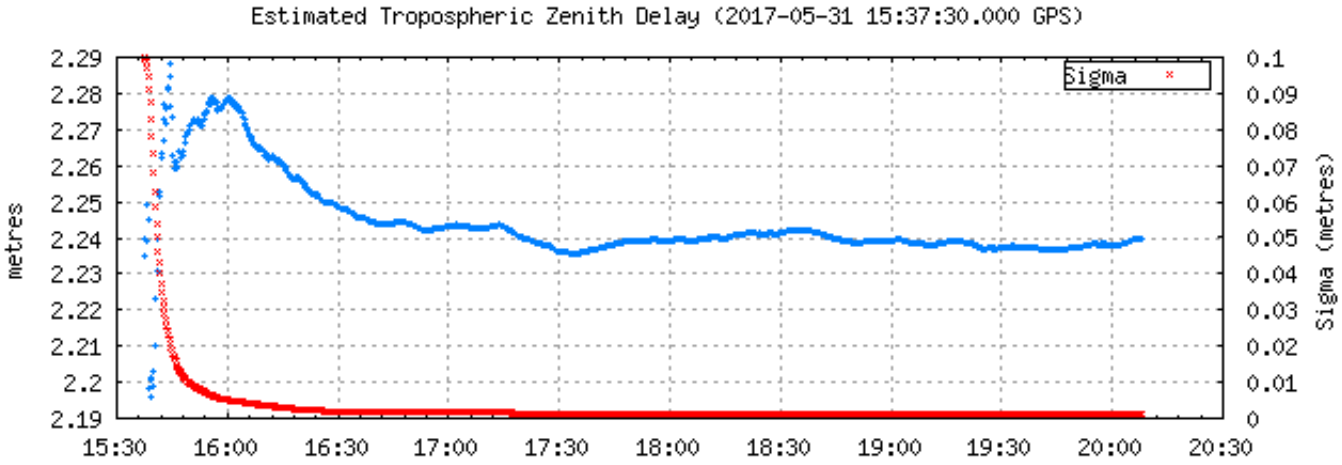

Corrections to apriori position (minus final corrections) (metres)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
(1 sigma std of position corrections) / 50
(1 sigma std of initial position correction) / 50
(1 sigma std of final position correction) / 50

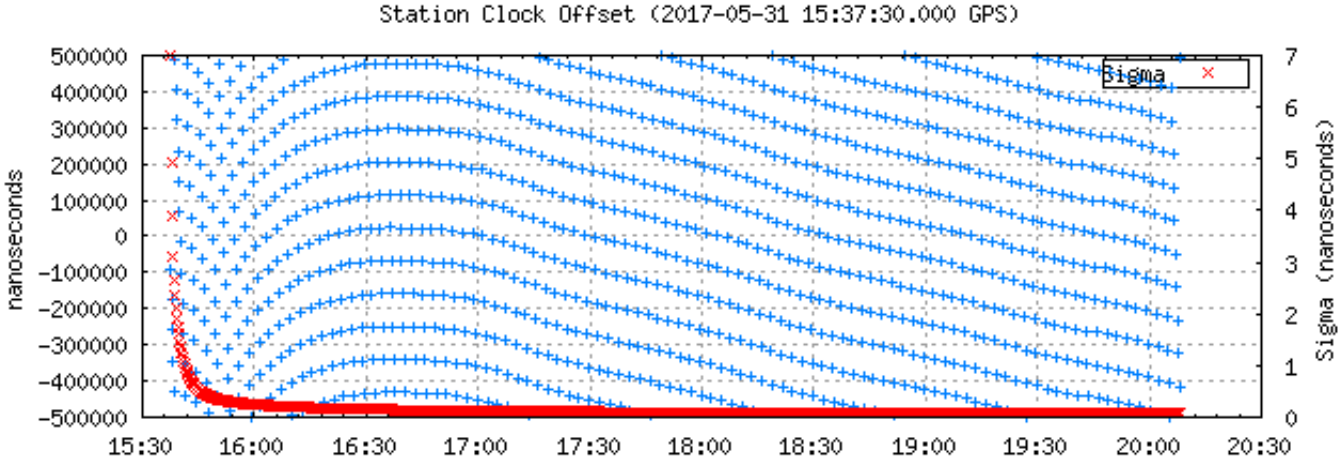

Ellipsoidal Height Profile (2017-05-31 15:37:30.000 GPS)
metres
485
484.5
484
483.5
483
482.5
482
481.5
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30

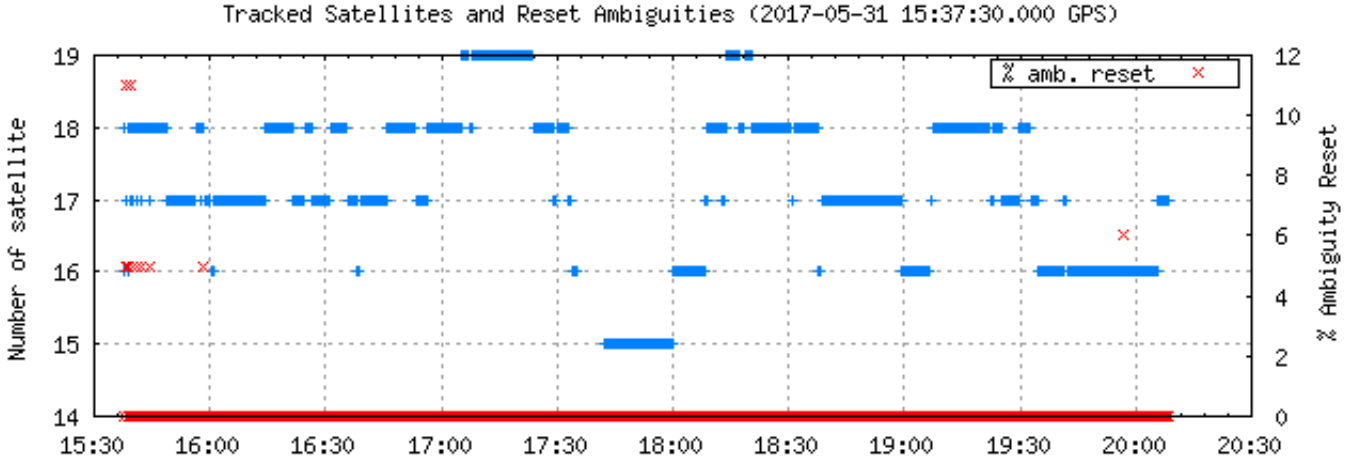

Latitude Differences (2017-05-31 15:37:30.000 GPS)
Sigma
metres
Sigma (metres)
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
16
14
12
10
8
6
4
2
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30

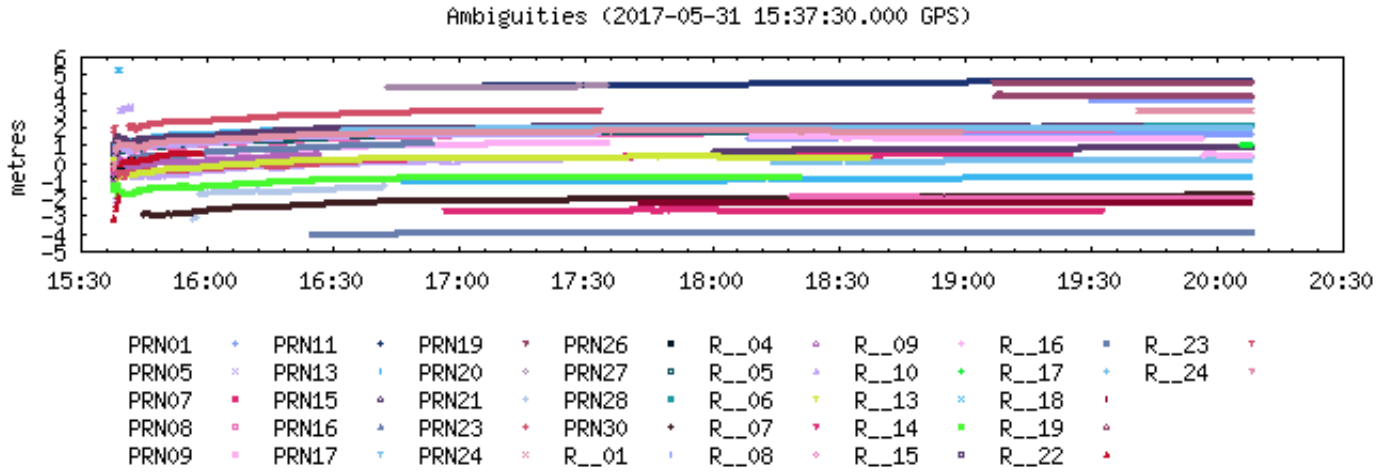

Longitude Differences (2017-05-31 15:37:30.000 GPS)
Sigma
metres
Sigma (metres)
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
14
12
10
8
6
4
2
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30

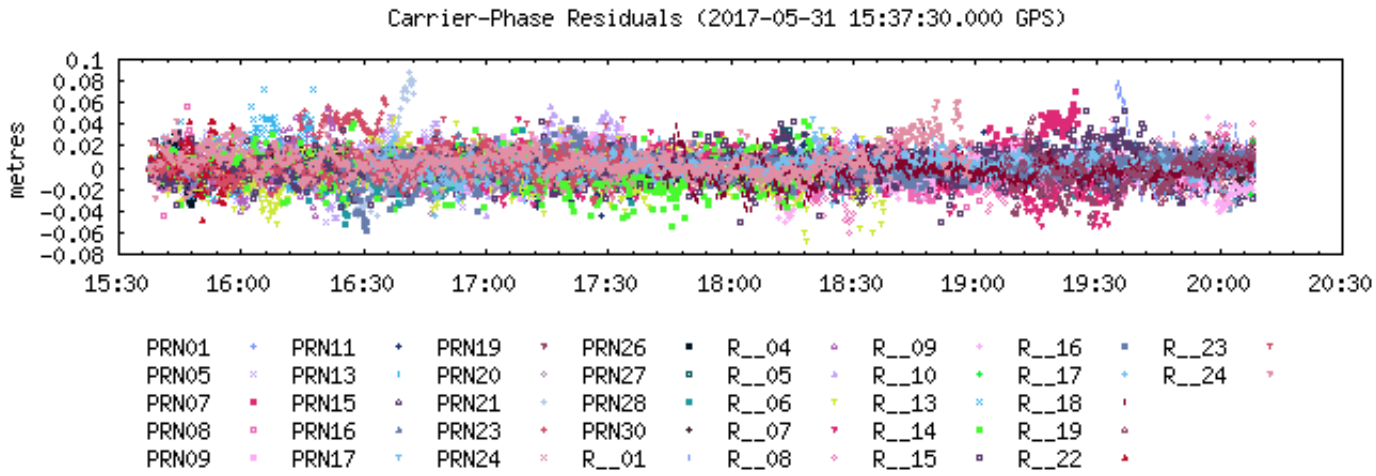

Height Differences (2017-05-31 15:37:30.000 GPS)
Sigma
metres
Sigma (metres)
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
35
30
25
20
15
10
5
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30

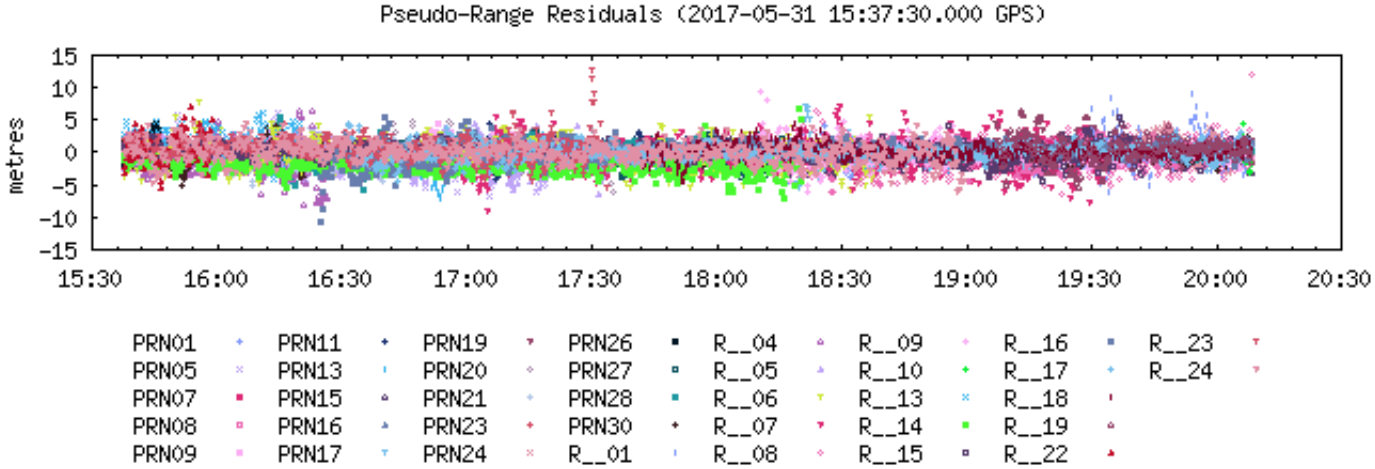

Estimated Tropospheric Zenith Delay (2017-05-31 15:37:30.000 GPS)
metres
Sigma (metres)
Sigma
2.29
2.28
2.27
2.26
2.25
2.24
2.23
2.22
2.21
2.2
2.19
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30


Station Clock Offset (2017-05-31 15:37:30.000 GPS)
nanoseconds
Sigma (nanoseconds)
Sigma
500000
400000
300000
200000
100000
0
-100000
-200000
-300000
-400000
-500000
7
6
5
4
3
2
1
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30


Tracked Satellites and Reset Ambiguities (2017-05-31 15:37:30.000 GPS)
Number of satellite
% Ambiguity Reset
% amb. reset
19
18
17
16
15
14
12
10
8
6
4
2
0
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30


Ambiguities (2017-05-31 15:37:30.000 GPS)
metres
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
PRN01 PRN11 PRN19 PRN26 R__04 R__09 R__16 R__23
PRN05 PRN13 PRN20 PRN27 R__05 R__10 R__17 R__24
PRN07 PRN15 PRN21 PRN28 R__06 R__13 R__18
PRN08 PRN16 PRN23 PRN30 R__07 R__14 R__19
PRN09 PRN17 PRN24 R__01 R__08 R__15 R__22


Carrier-Phase Residuals (2017-05-31 15:37:30.000 GPS)
metres
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
PRN01 PRN11 PRN19 PRN26 R__04 R__09 R__16 R__23
PRN05 PRN13 PRN20 PRN27 R__05 R__10 R__17 R__24
PRN07 PRN15 PRN21 PRN28 R__06 R__13 R__18
PRN08 PRN16 PRN23 PRN30 R__07 R__14 R__19
PRN09 PRN17 PRN24 R__01 R__08 R__15 R__22


Pseudo-Range Residuals (2017-05-31 15:37:30.000 GPS)
metres
15
10
5
0
-5
-10
-15
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
PRN01 PRN11 PRN19 PRN26 R__04 R__09 R__16 R__23
PRN05 PRN13 PRN20 PRN27 R__05 R__10 R__17 R__24
PRN07 PRN15 PRN21 PRN28 R__06 R__13 R__18
PRN08 PRN16 PRN23 PRN30 R__07 R__14 R__19
PRN09 PRN17 PRN24 R__01 R__08 R__15 R__22

**~~~ Disclaimer ~~~**

**Natural Resources Canada does not assume any liability deemed to have been caused directly or indirectly by any content of its PPP-On-Line positioning service.**

**If you have any questions, please feel free to contact:**
**EMail: nrcan.geodeticinformationservices.rncan@canada.ca**
**Phone:343-292-6617**

Natural Resources Canada Ressources naturelles Canada

Canada

# CSRS-PPP (V 1.05 11216 )

**PA2**

| Data Start | Data End | Duration of Observations |
|---|---|---|
| 2017-05-30 15:19:45.000 | 2017-05-30 23:52:00.000 | 8h 32m 15.00s |
| **Apri / Aposteriori Phase Std** | | **Apri / Aposteriori Code Std** |
| 0.015m / 0.014m | | 2.0m / 2.594m |
| **Observations** | **Frequency** | **Mode** |
| Phase and Code | L1 and L2 | Static |
| **Elevation Cut-Off** | **Rejected Epochs** | **Observation & Estimation Steps** |
| 10.000 degrees | 0.00 % | 15.00 sec / 15.00 sec |
| **Antenna Model** | **APC to ARP** | **ARP to Marker** |
| TPSGR5 NONE | L1= 0.221 m L2= 0.218 m | 1.303 m |

(APC = antenna phase center; ARP = antenna reference point)

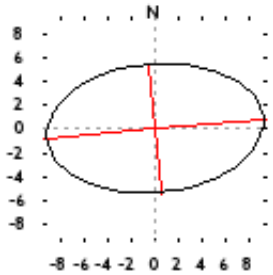
## Estimated Position for PA2150p.17O

| | Latitude (+n) | Longitude (+e) | Ell. Height |
|---|---|---|---|
| **NAD83(CSRS) (1997)** | 57º 32’ 12.2526’’ | -105º 22’ 56.6452’’ | 480.270 m |
| **Sigmas(95%)** | 0.004 m | 0.007 m | 0.017 m |
| **Apriori** | 57º 32’ 12.253’’ | -105º 22’ 56.731’’ | 480.126 m |
| **Estimated - Apriori** | -0.019 m | 1.422 m | 0.144 m |

**Orthometric Height CGVD28 (HTv2.0)**

511.303 m
(click for height reference information)

**95% Error Ellipse (mm)**
**semi-major: 9.266mm**
**semi-minor: 5.453mm**
**semi-major azimuth: 84º 48’ 31.47’’**




**UTM (North) Zone 13**

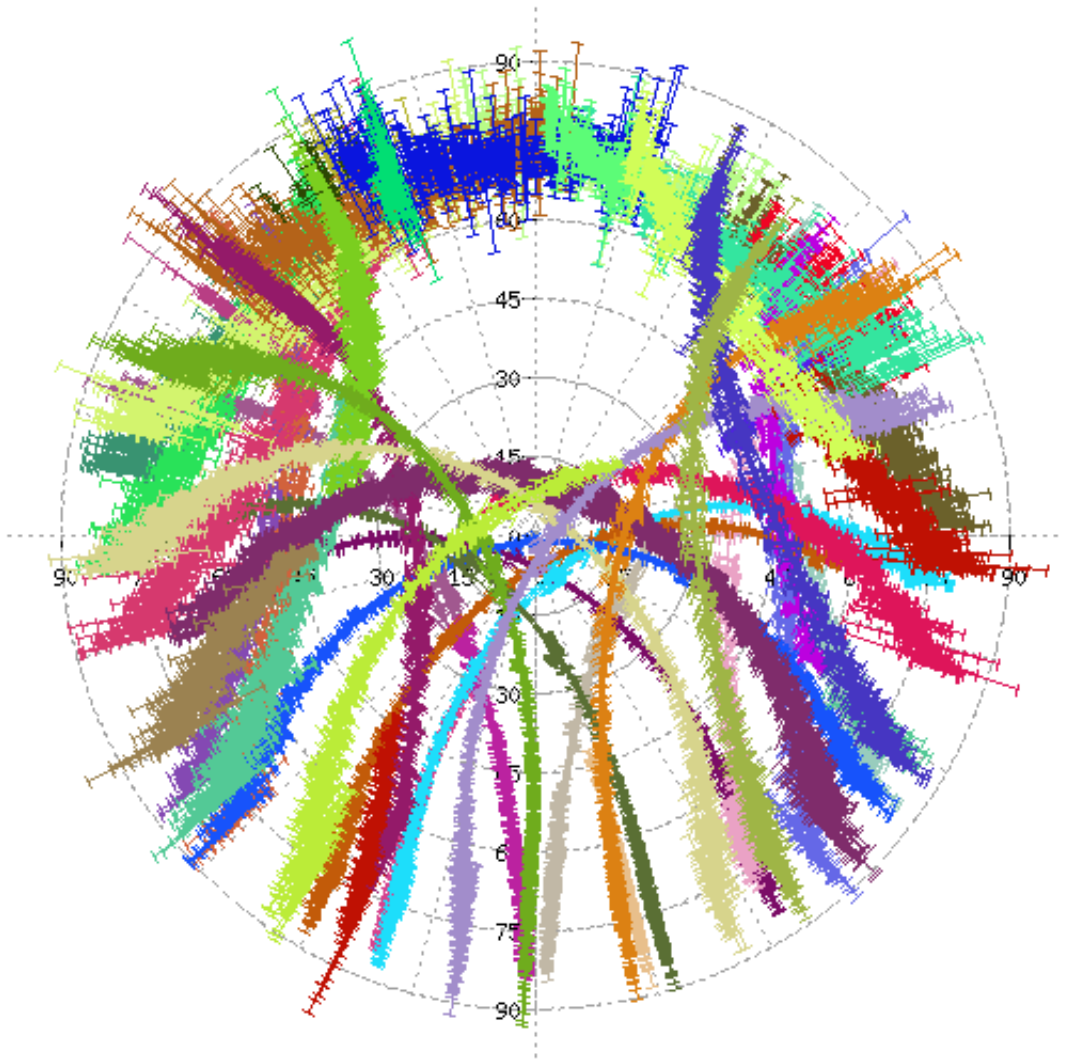
6377199.994m (N) 477105.453m (E)

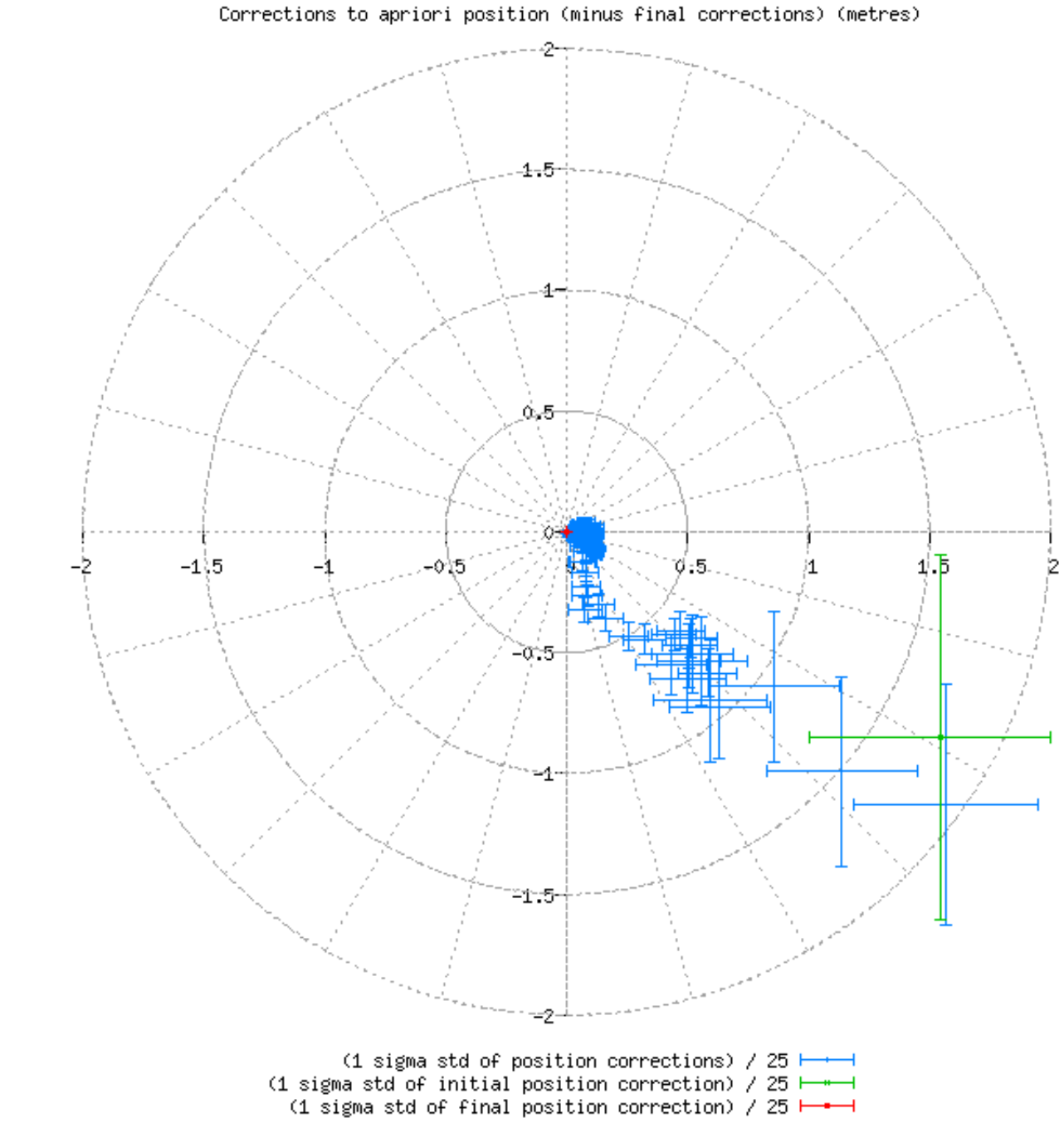
Scale Factors
0.99960643 (point)
0.99953108 (combined)

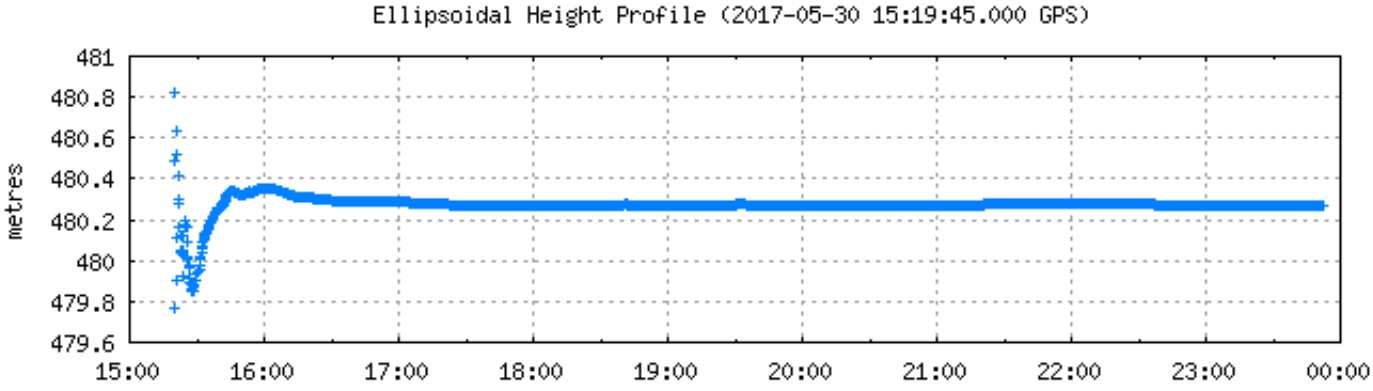
(Coordinates from RINEX file used as apriori position)

# Estimated Parameters & Observations Statistics

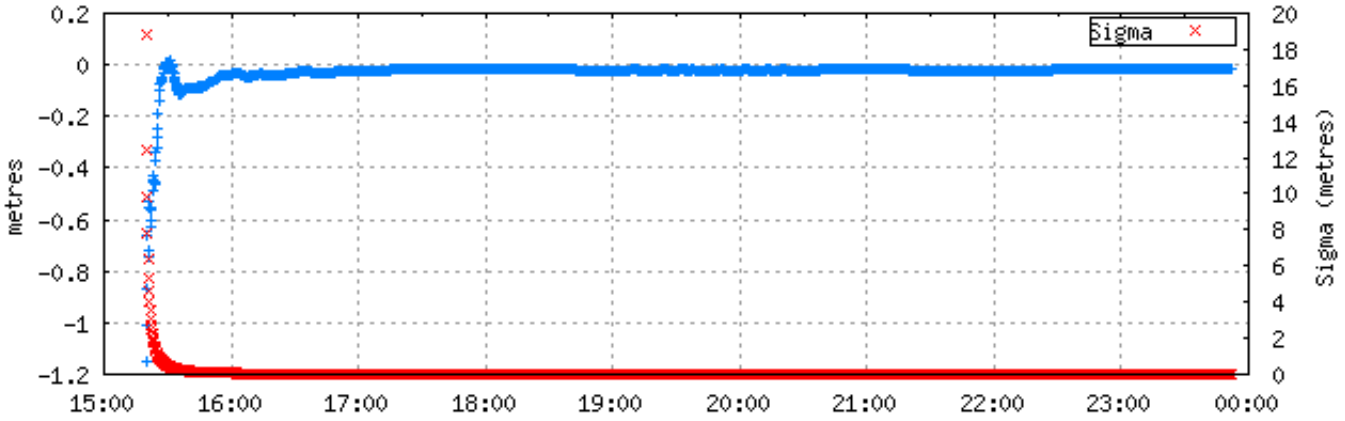
Pseudo-Range Residuals Sky Distribution



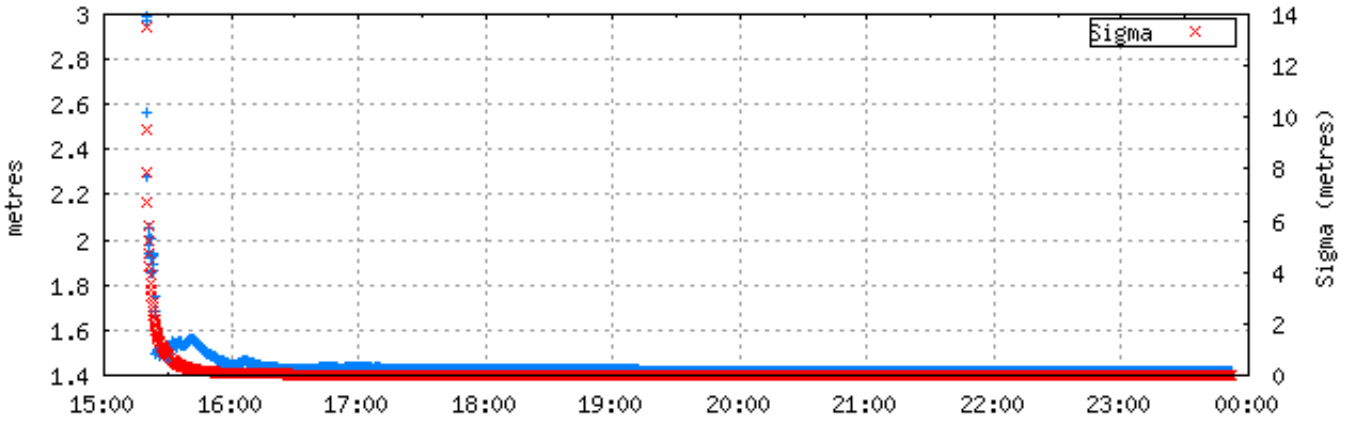

Corrections to apriori position (minus final corrections) (metres)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2
-1.5
-1
-0.5
0.5
1
1.5
2
(1 sigma std of position corrections) / 25
(1 sigma std of initial position correction) / 25
(1 sigma std of final position correction) / 25


Ellipsoidal Height Profile (2017-05-30 15:19:45.000 GPS)
metres
481
480.8
480.6
480.4
480.2
480
479.8
479.6
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

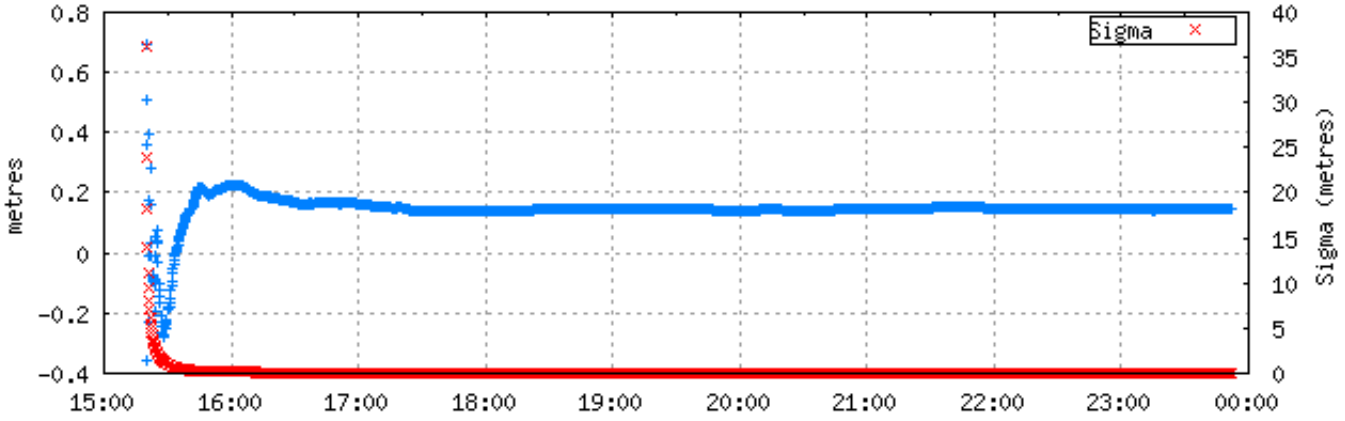
Latitude Differences (2017-05-30 15:19:45.000 GPS)

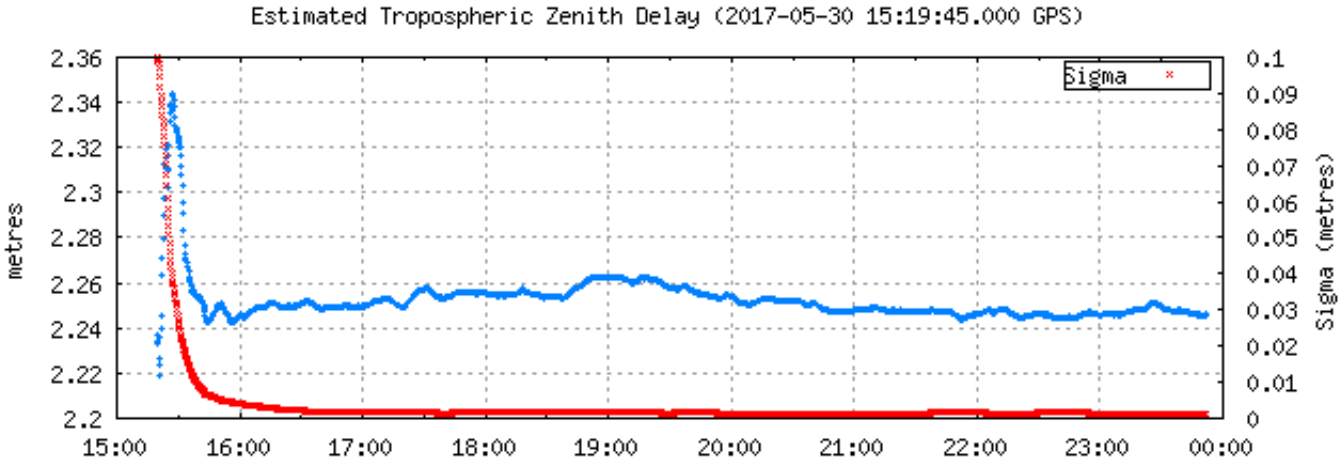


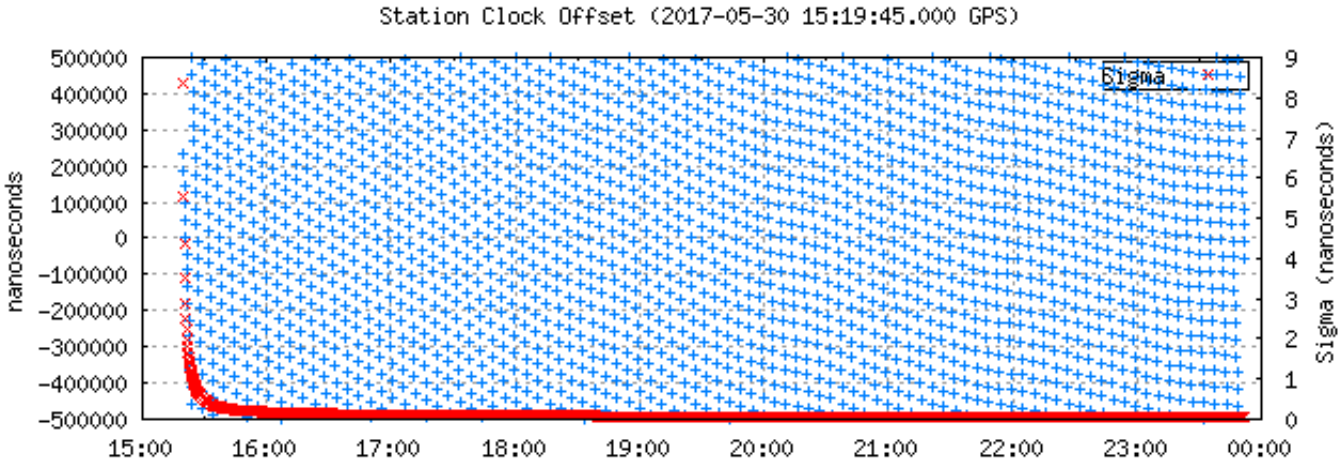

Longitude Differences (2017-05-30 15:19:45.000 GPS)

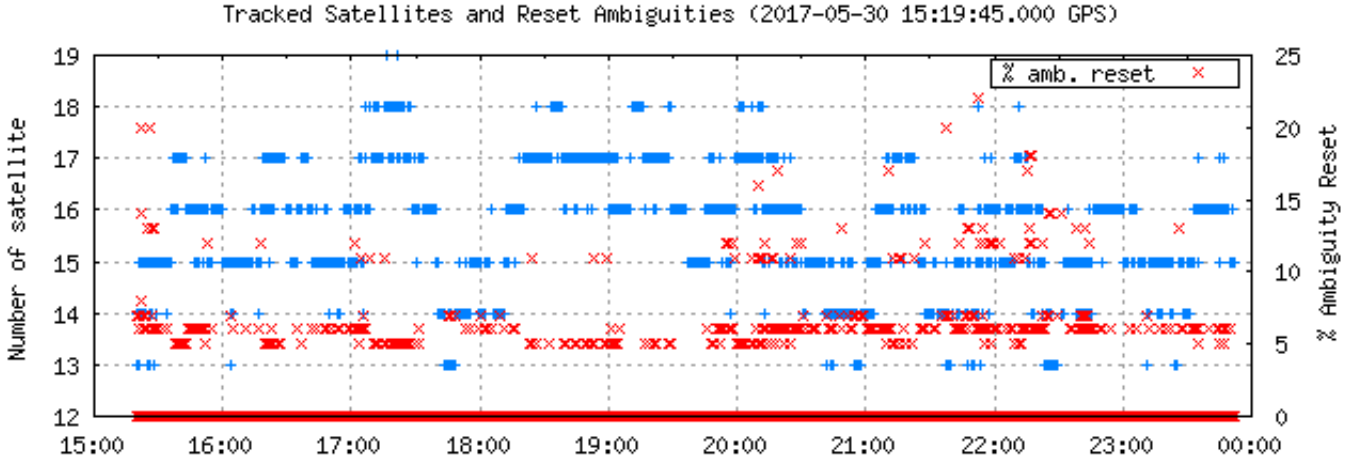



Height Differences (2017-05-30 15:19:45.000 GPS)

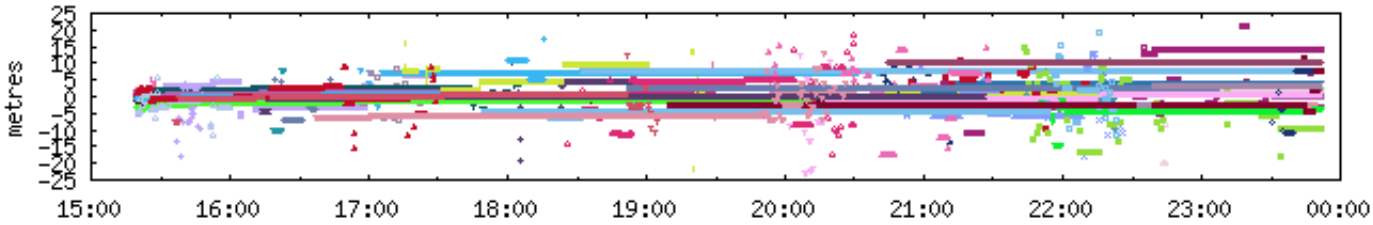



Estimated Tropospheric Zenith Delay (2017-05-30 15:19:45.000 GPS)
Sigma
metres
Sigma (metres)
2.36
2.34
2.32
2.3
2.28
2.26
2.24
2.22
2.2
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Station Clock Offset (2017-05-30 15:19:45.000 GPS)
Sigma
nanoseconds
Sigma (nanoseconds)
500000
400000
300000
200000
100000
0
-100000
-200000
-300000
-400000
-500000
9
8
7
6
5
4
3
2
1
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

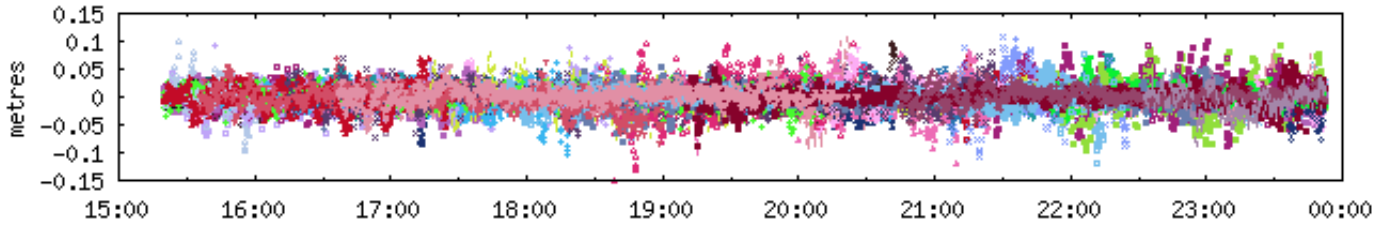

Tracked Satellites and Reset Ambiguities (2017-05-30 15:19:45.000 GPS)
% amb. reset
Number of satellite
% Ambiguity Reset
19
18
17
16
15
14
13
12
25
20
15
10
5
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

Ambiguities (2017-05-30 15:19:45.000 GPS)



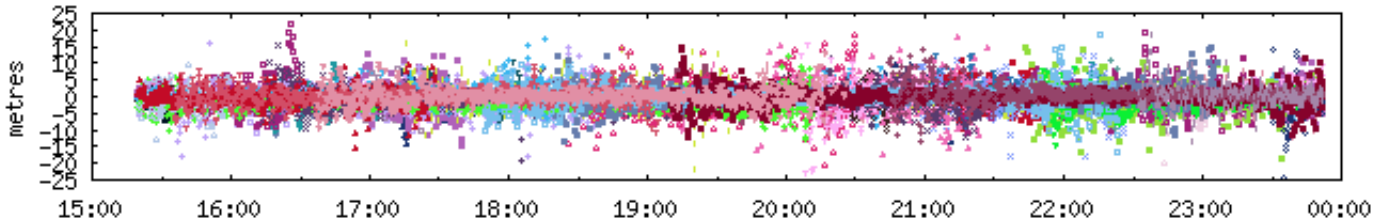

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PRN01 | PRN08 | PRN15 | PRN23 | PRN30 | R__04 | R__10 | R__17 | R__23 | |
| PRN02 | PRN09 | PRN16 | PRN24 | PRN31 | R__05 | R__11 | R__18 | R__24 | |
| PRN03 | PRN11 | PRN17 | PRN25 | PRN32 | R__06 | R__13 | R__19 | | |
| PRN05 | PRN12 | PRN19 | PRN26 | R__01 | R__07 | R__14 | R__20 | | |
| PRN06 | PRN13 | PRN20 | PRN27 | R__02 | R__08 | R__15 | R__21 | | |
| PRN07 | PRN14 | PRN22 | PRN28 | R__03 | R__09 | R__16 | R__22 | | |

Carrier-Phase Residuals (2017-05-30 15:19:45.000 GPS)




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PRN01 | PRN08 | PRN15 | PRN23 | PRN30 | R__04 | R__10 | R__17 | R__23 | |
| PRN02 | PRN09 | PRN16 | PRN24 | PRN31 | R__05 | R__11 | R__18 | R__24 | |
| PRN03 | PRN11 | PRN17 | PRN25 | PRN32 | R__06 | R__13 | R__19 | | |
| PRN05 | PRN12 | PRN19 | PRN26 | R__01 | R__07 | R__14 | R__20 | | |
| PRN06 | PRN13 | PRN20 | PRN27 | R__02 | R__08 | R__15 | R__21 | | |
| PRN07 | PRN14 | PRN22 | PRN28 | R__03 | R__09 | R__16 | R__22 | | |

Pseudo-Range Residuals (2017-05-30 15:19:45.000 GPS)




| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PRN01 | PRN08 | PRN15 | PRN23 | PRN30 | R__04 | R__10 | R__17 | R__23 | |
| PRN02 | PRN09 | PRN16 | PRN24 | PRN31 | R__05 | R__11 | R__18 | R__24 | |
| PRN03 | PRN11 | PRN17 | PRN25 | PRN32 | R__06 | R__13 | R__19 | | |
| PRN05 | PRN12 | PRN19 | PRN26 | R__01 | R__07 | R__14 | R__20 | | |
| PRN06 | PRN13 | PRN20 | PRN27 | R__02 | R__08 | R__15 | R__21 | | |
| PRN07 | PRN14 | PRN22 | PRN28 | R__03 | R__09 | R__16 | R__22 | | |

**~~~ Disclaimer ~~~**

**Natural Resources Canada does not assume any liability deemed to have been caused directly or indirectly by any content of its PPP-On-Line positioning service.**

**If you have any questions, please feel free to contact:**
**EMail: nrcan.geodeticinformationservices.rncan@canada.ca**
**Phone:343-292-6617**

Natural Resources Canada Ressources naturelles Canada

Canada

# CSRS-PPP (V 1.05 11216 )

**PA3**

| Data Start | Data End | Duration of Observations |
|---|---|---|
| 2017-05-30 15:57:00.000 | 2017-05-30 23:34:00.000 | 7h 36m 60.00s |
| **Apri / Aposteriori Phase Std** | | **Apri / Aposteriori Code Std** |
| 0.015m / 0.012m | | 2.0m / 2.020m |
| **Observations** | **Frequency** | **Mode** |
| Phase and Code | L1 and L2 | Static |
| **Elevation Cut-Off** | **Rejected Epochs** | **Observation & Estimation Steps** |
| 10.000 degrees | 0.00 % | 15.00 sec / 15.00 sec |
| **Antenna Model** | **APC to ARP** | **ARP to Marker** |
| TPSGR5 NONE | L1= 0.221 m L2= 0.218 m | 1.327 m |

(APC = antenna phase center; ARP = antenna reference point)

## Estimated Position for PA3150p.17O

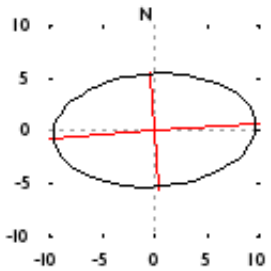
| | Latitude (+n) | Longitude (+e) | Ell. Height |
|---|---|---|---|
| **NAD83(CSRS) (1997)** | 57º 32’ 26.9749’’ | -105º 23’ 36.1688’’ | 486.823 m |
| **Sigmas(95%)** | 0.004 m | 0.008 m | 0.016 m |
| **Apriori** | 57º 32’ 26.976’’ | -105º 23’ 36.263’’ | 486.523 m |
| **Estimated - Apriori** | -0.039 m | 1.567 m | 0.299 m |

**Orthometric Height CGVD28 (HTv2.0)**

517.851 m

(click for height reference information)

**95% Error Ellipse (mm)**
**semi-major: 9.630mm**
**semi-minor: 5.345mm**
**semi-major azimuth: 86º 16’ 41.17’’**




**UTM (North) Zone 13**

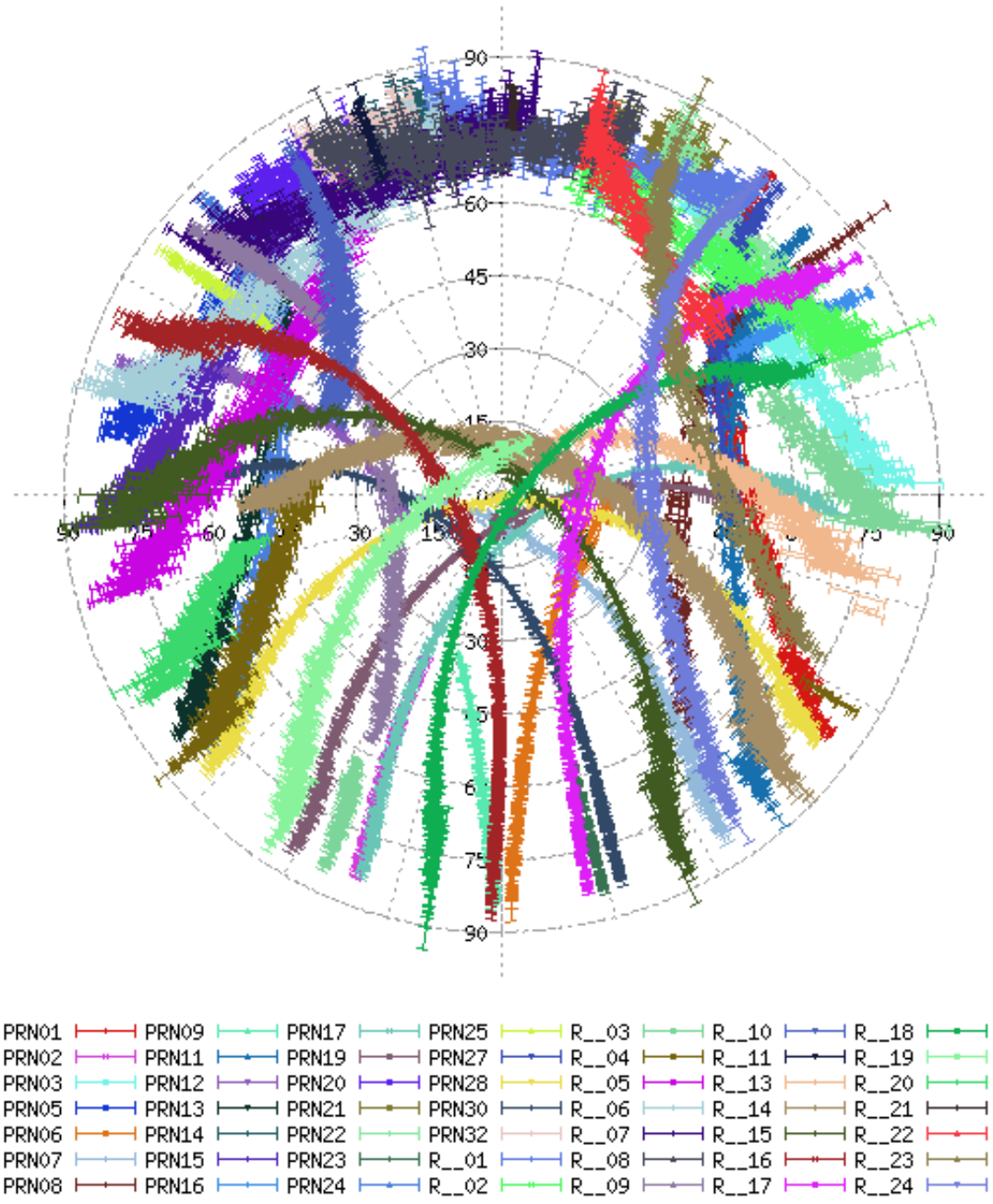
6377659.010m (N) 476450.790m (E)

Scale Factors
0.99960680 (point)
0.99953042 (combined)

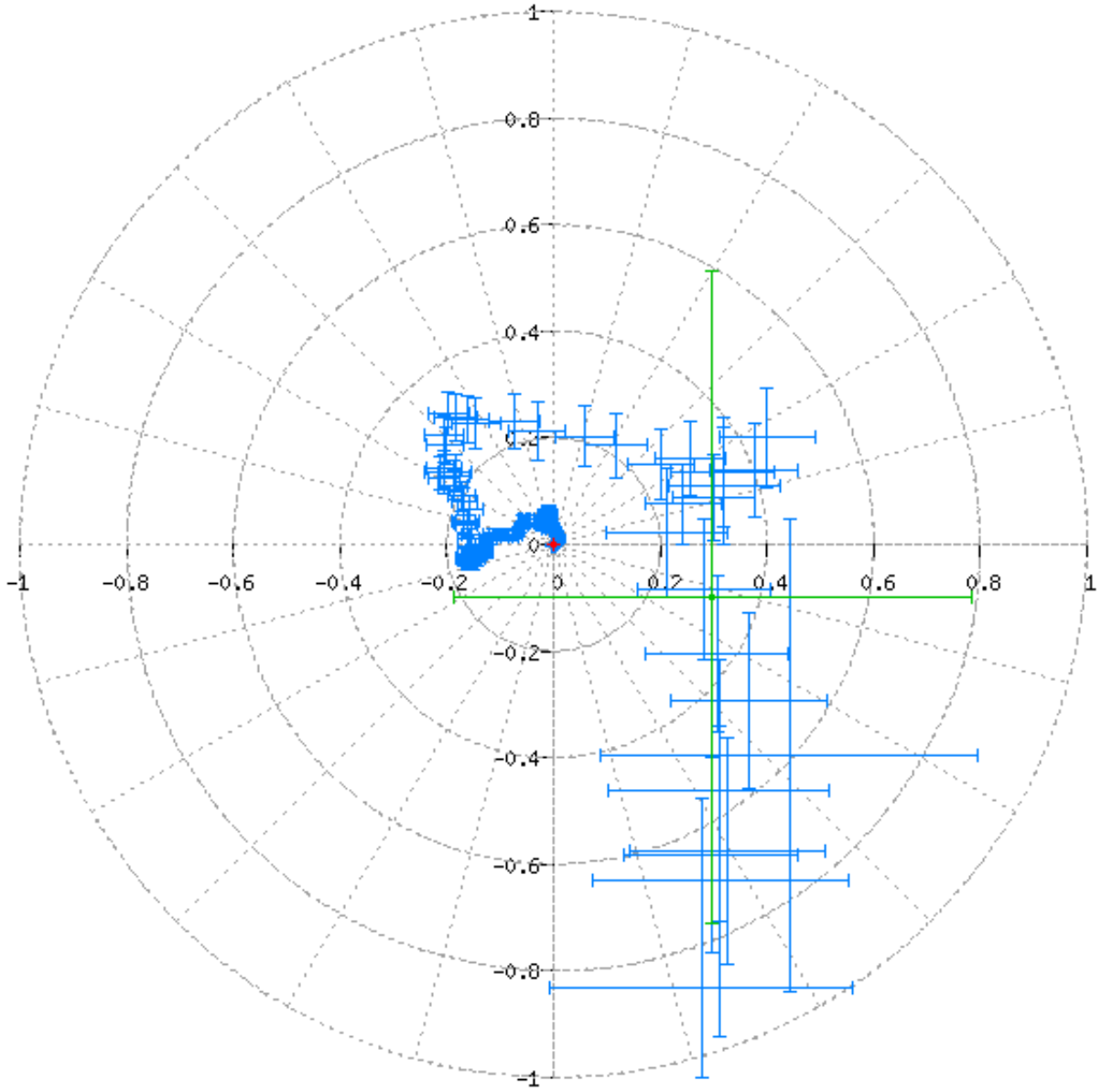
(Coordinates from RINEX file used as apriori position)

# Estimated Parameters & Observations Statistics

Pseudo-Range Residuals Sky Distribution

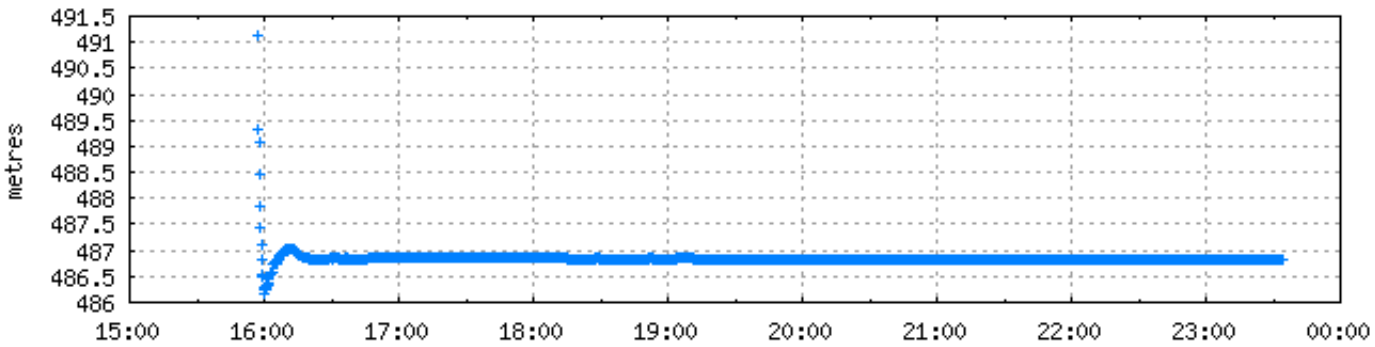


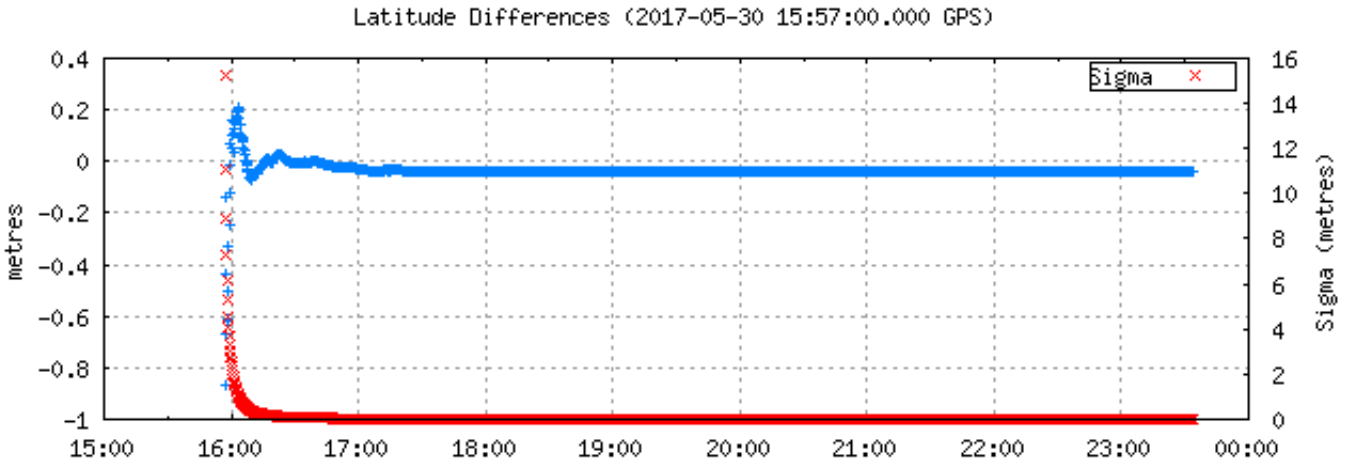
Corrections to apriori position (minus final corrections) (metres)

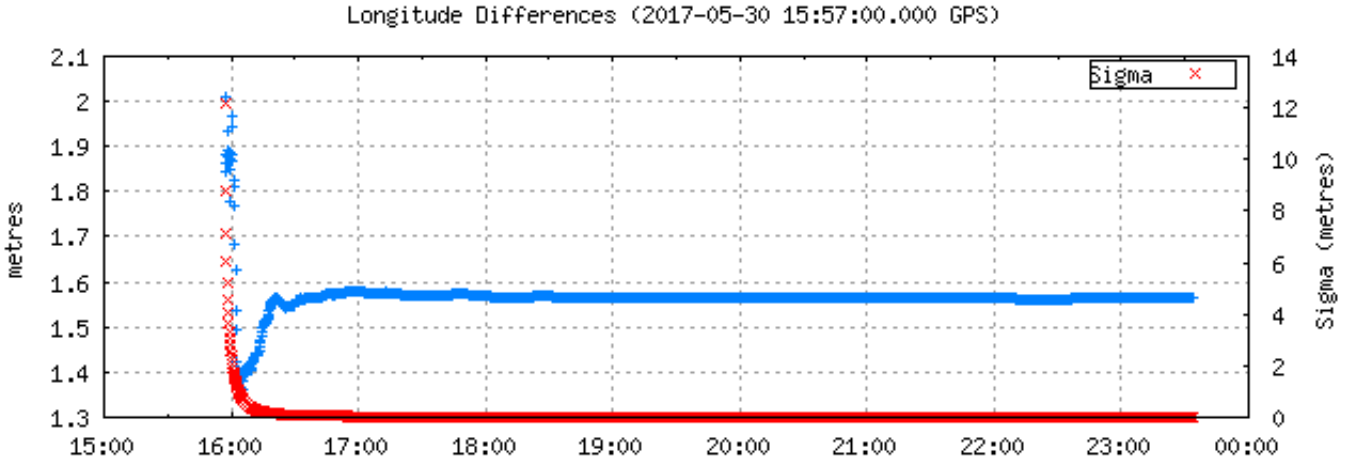


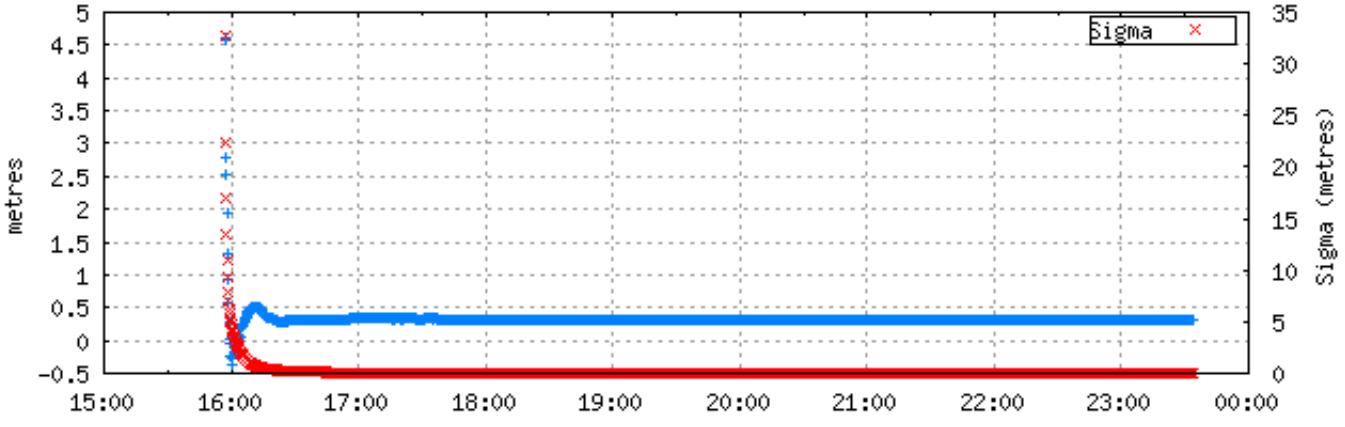

(1 sigma std of position corrections) / 25
(1 sigma std of initial position correction) / 25
(1 sigma std of final position correction) / 25

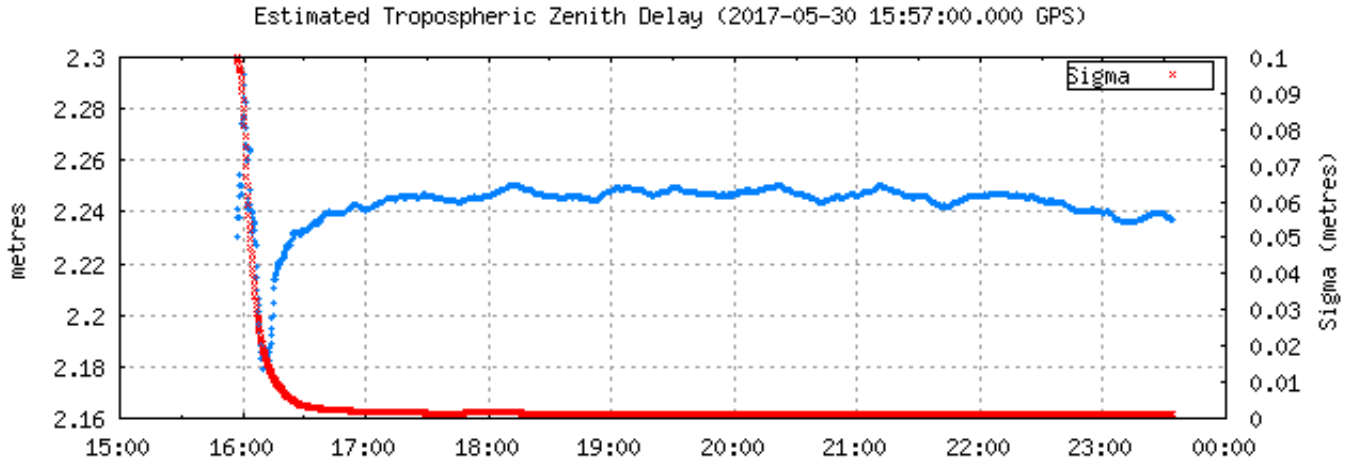
Ellipsoidal Height Profile (2017-05-30 15:57:00.000 GPS)

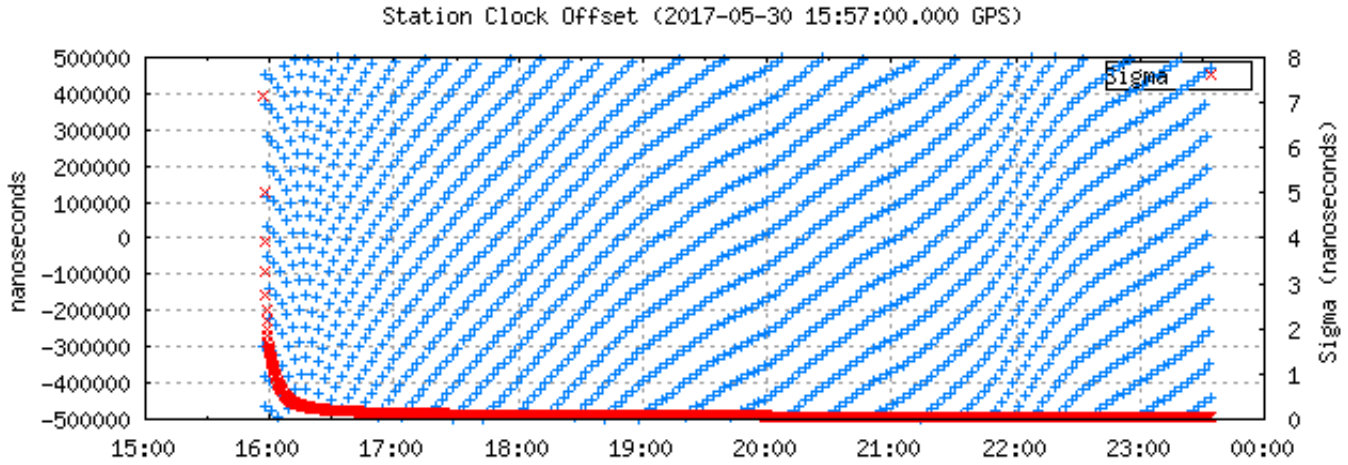


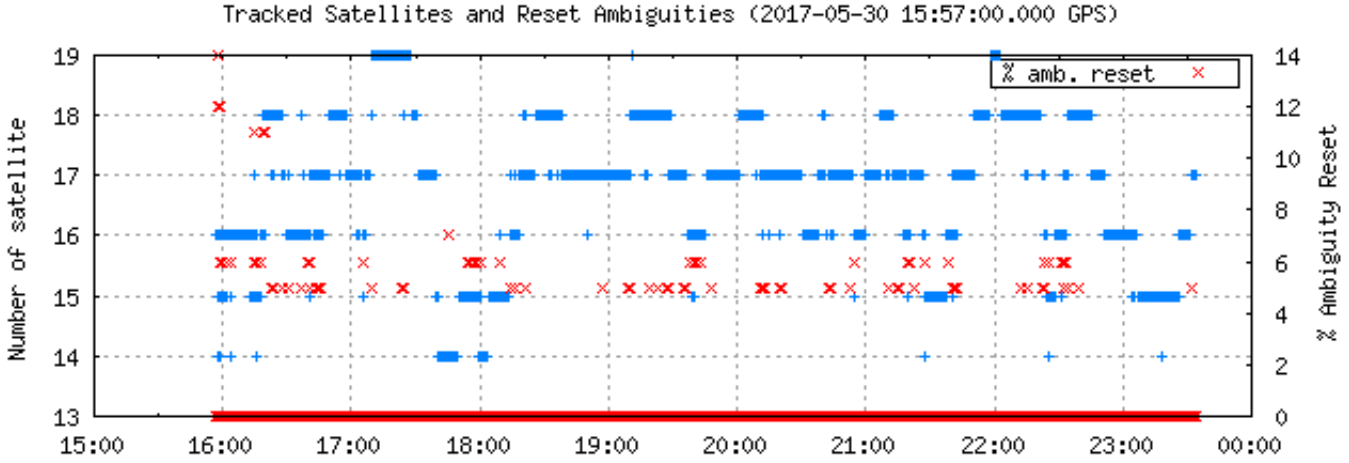

Latitude Differences (2017-05-30 15:57:00.000 GPS)
Sigma
metres
Sigma (metres)
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
16
14
12
10
8
6
4
2
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

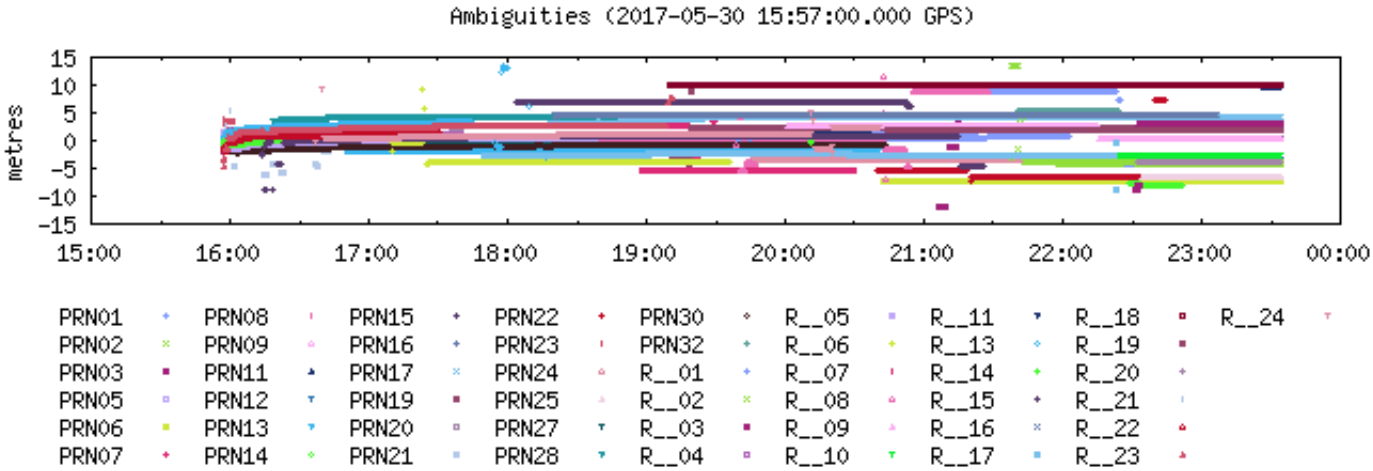

Longitude Differences (2017-05-30 15:57:00.000 GPS)
Sigma
metres
Sigma (metres)
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
14
12
10
8
6
4
2
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

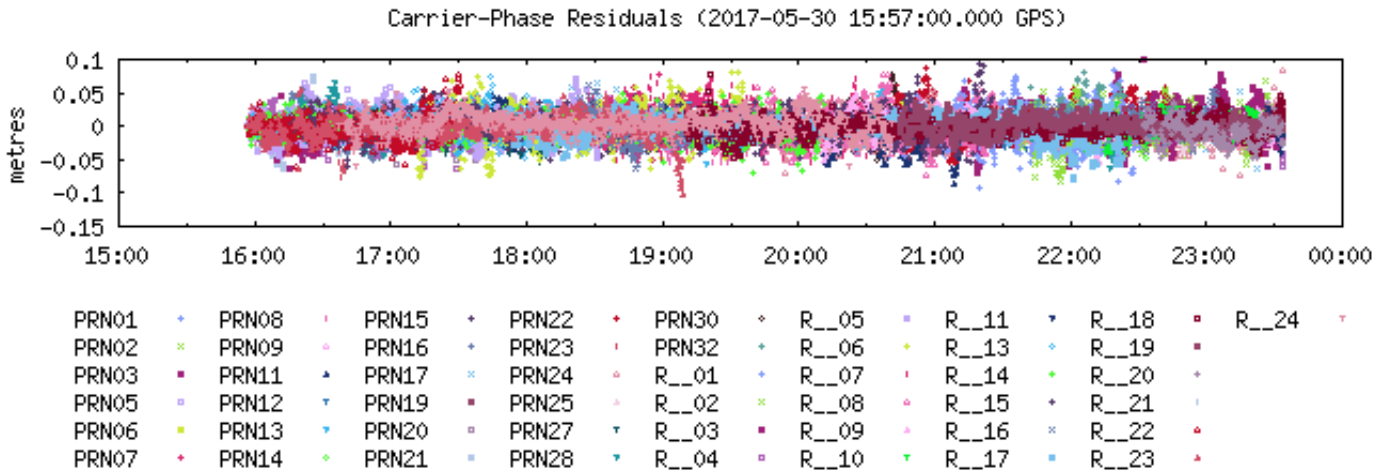

Height Differences (2017-05-30 15:57:00.000 GPS)
Sigma
metres
Sigma (metres)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
35
30
25
20
15
10
5
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

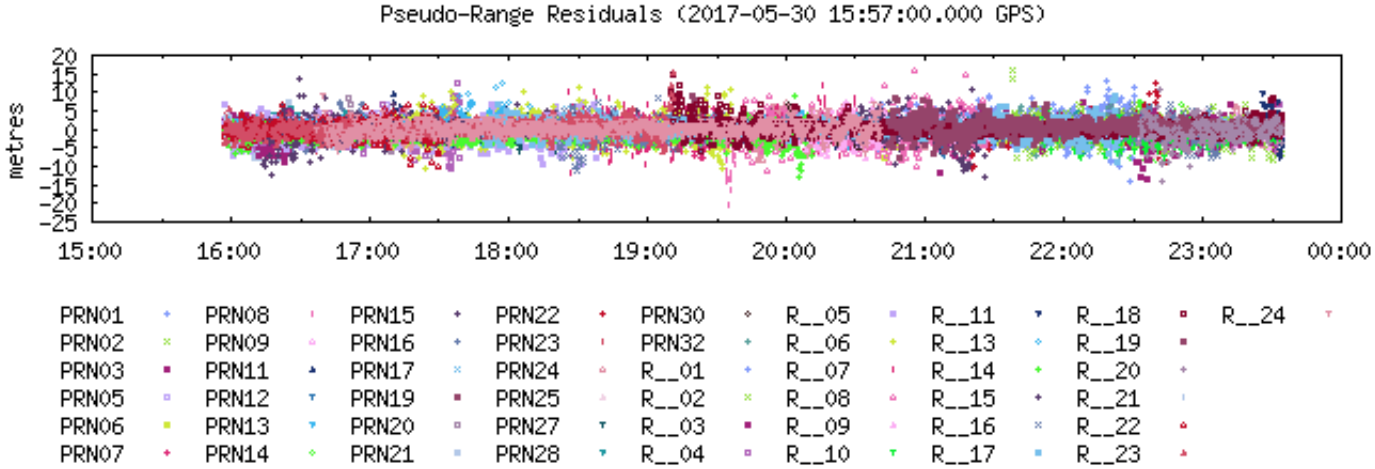

Estimated Tropospheric Zenith Delay (2017-05-30 15:57:00.000 GPS)
Sigma
metres
Sigma (metres)
2.3
2.28
2.26
2.24
2.22
2.2
2.18
2.16
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Station Clock Offset (2017-05-30 15:57:00.000 GPS)
Sigma
nanoseconds
Sigma (nanoseconds)
500000
400000
300000
200000
100000
0
-100000
-200000
-300000
-400000
-500000
8
7
6
5
4
3
2
1
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Tracked Satellites and Reset Ambiguities (2017-05-30 15:57:00.000 GPS)
% amb. reset
Number of satellite
% Ambiguity Reset
19
18
17
16
15
14
13
14
12
10
8
6
4
2
0
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Ambiguities (2017-05-30 15:57:00.000 GPS)
metres
15
10
5
0
-5
-10
-15
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
PRN01 PRN02 PRN03 PRN05 PRN06 PRN07
PRN08 PRN09 PRN11 PRN12 PRN13 PRN14
PRN15 PRN16 PRN17 PRN19 PRN20 PRN21
PRN22 PRN23 PRN24 PRN25 PRN27 PRN28
PRN30 PRN32
R__01 R__02 R__03 R__04
R__05 R__06 R__07 R__08 R__09 R__10
R__11 R__13 R__14 R__15 R__16 R__17
R__18 R__19 R__20 R__21 R__22 R__23
R__24


Carrier-Phase Residuals (2017-05-30 15:57:00.000 GPS)
metres
0.1
0.05
0
-0.05
-0.1
-0.15
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
PRN01 PRN02 PRN03 PRN05 PRN06 PRN07
PRN08 PRN09 PRN11 PRN12 PRN13 PRN14
PRN15 PRN16 PRN17 PRN19 PRN20 PRN21
PRN22 PRN23 PRN24 PRN25 PRN27 PRN28
PRN30 PRN32
R__01 R__02 R__03 R__04
R__05 R__06 R__07 R__08 R__09 R__10
R__11 R__13 R__14 R__15 R__16 R__17
R__18 R__19 R__20 R__21 R__22 R__23
R__24


Pseudo-Range Residuals (2017-05-30 15:57:00.000 GPS)
metres
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
PRN01 PRN02 PRN03 PRN05 PRN06 PRN07
PRN08 PRN09 PRN11 PRN12 PRN13 PRN14
PRN15 PRN16 PRN17 PRN19 PRN20 PRN21
PRN22 PRN23 PRN24 PRN25 PRN27 PRN28
PRN30 PRN32
R__01 R__02 R__03 R__04
R__05 R__06 R__07 R__08 R__09 R__10
R__11 R__13 R__14 R__15 R__16 R__17
R__18 R__19 R__20 R__21 R__22 R__23
R__24

**~~~ Disclaimer ~~~**

**Natural Resources Canada does not assume any liability deemed to have been caused directly or indirectly by any content of its PPP-On-Line positioning service.**

**If you have any questions, please feel free to contact:**
**EMail: nrcan.geodeticinformationservices.rncan@canada.ca**
**Phone:343-292-6617**

Natural Resources Canada Ressources naturelles Canada

Canada

# CSRS-PPP (V 1.05 11216 )

**SB5**

| Data Start | Data End | Duration of Observations |
|---|---|---|
| 2017-05-29 23:07:00.000 | 2017-05-30 01:49:00.000 | 2h 42m 0.00s |
| **Apri / Aposteriori Phase Std** | | **Apri / Aposteriori Code Std** |
| 0.015m / 0.010m | | 2.0m / 1.887m |
| **Observations** | **Frequency** | **Mode** |
| Phase and Code | L1 and L2 | Static |
| **Elevation Cut-Off** | **Rejected Epochs** | **Observation & Estimation Steps** |
| 10.000 degrees | 0.00 % | 10.00 sec / 10.00 sec |
| **Antenna Model** | **APC to ARP** | **ARP to Marker** |
| TPSGR5 NONE | L1= 0.221 m L2= 0.218 m | 1.242 m |

(APC = antenna phase center; ARP = antenna reference point)

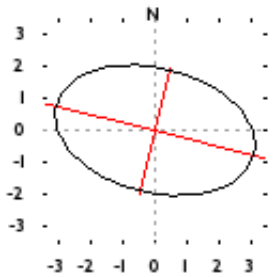
## Estimated Position for SB5149x.17O

| | Latitude (+n) | Longitude (+e) | Ell. Height |
|---|---|---|---|
| **NAD83(CSRS) (1997)** | 57º 29’ 47.4940’’ | -105º 25’ 23.7269’’ | 487.757 m |
| **Sigmas(95%)** | 0.016 m | 0.025 m | 0.044 m |
| **Apriori** | 57º 29’ 47.490’’ | -105º 25’ 23.821’’ | 487.571 m |
| **Estimated - Apriori** | 0.126 m | 1.575 m | 0.186 m |

**Orthometric Height CGVD28 (HTv2.0)**

518.673 m
(click for height reference information)

**95% Error Ellipse (cm)**
**semi-major: 3.203cm**
**semi-minor: 1.946cm**
**semi-major azimuth: 103º 35’ 31.03’’**




**UTM (North) Zone 13**

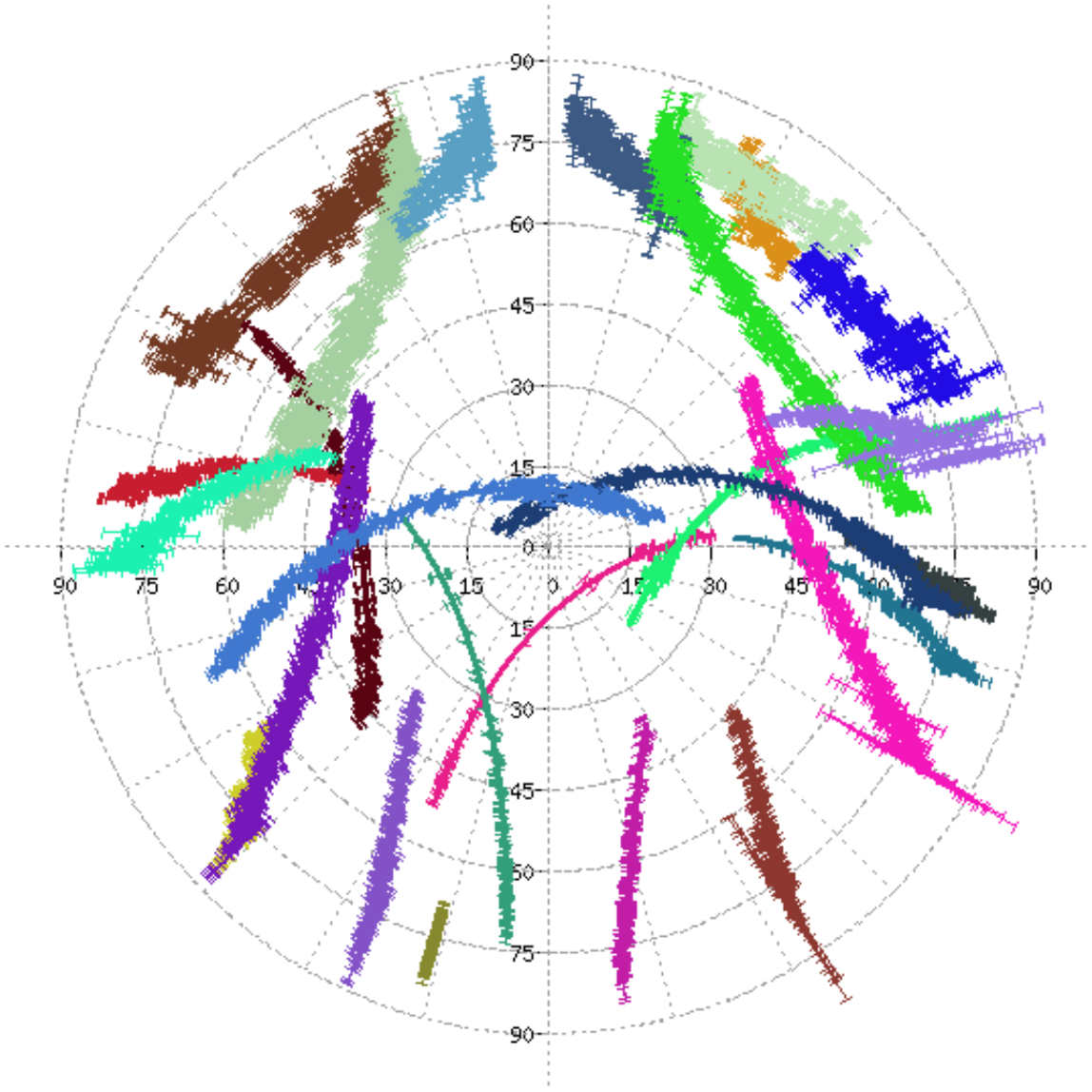
6372738.116m (N) 474631.507m (E)

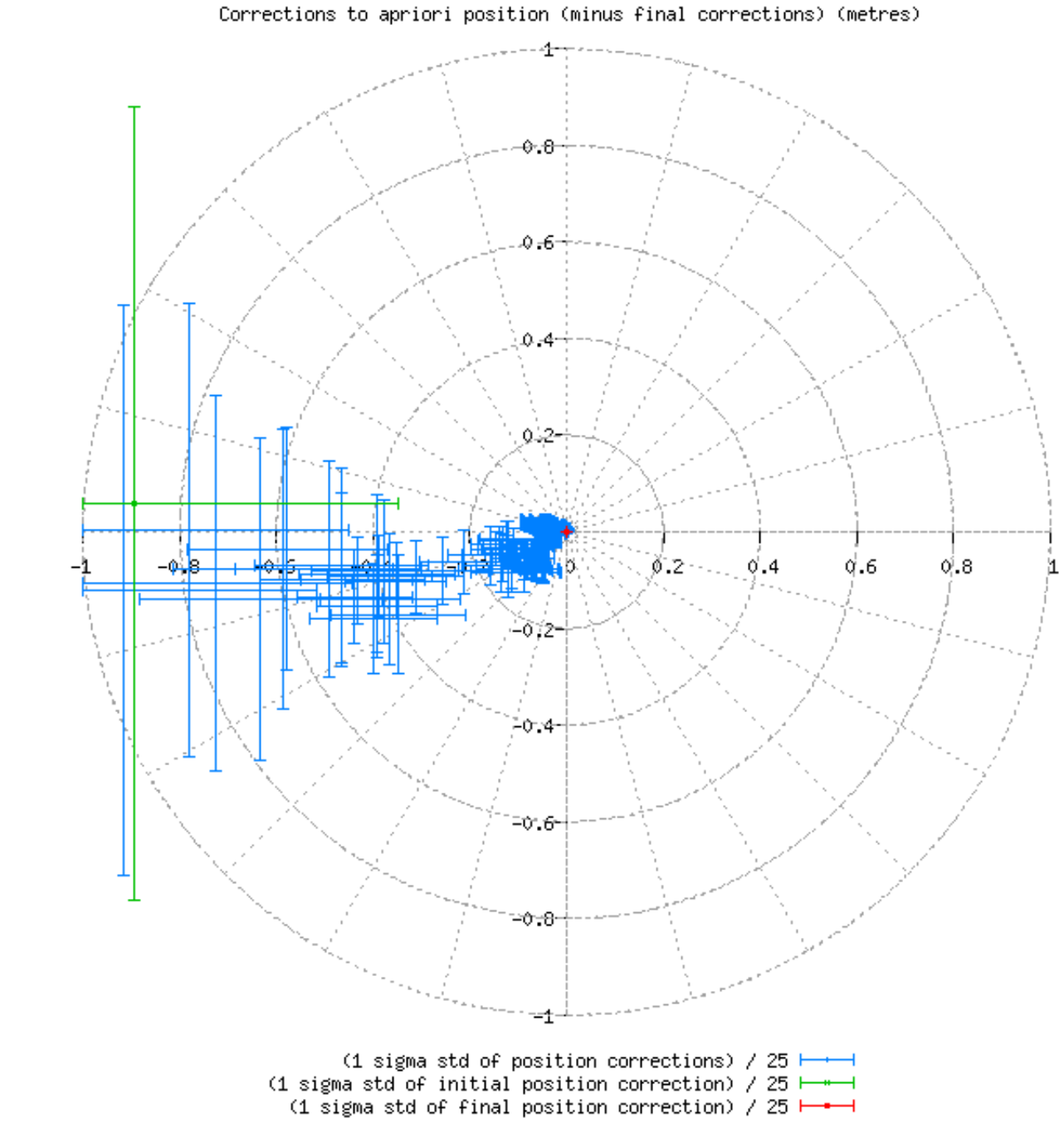
Scale Factors
0.99960789 (point)
0.99953137 (combined)

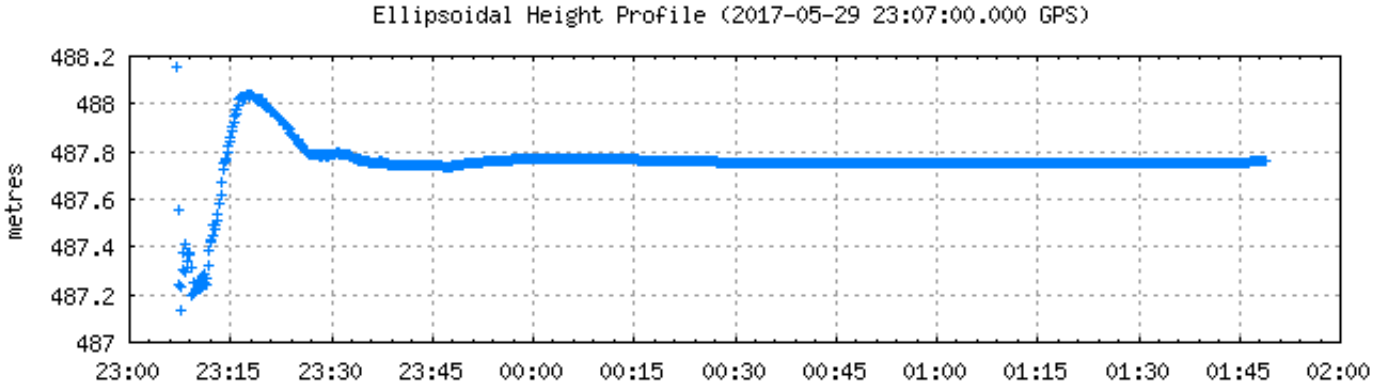
(Coordinates from RINEX file used as apriori position)

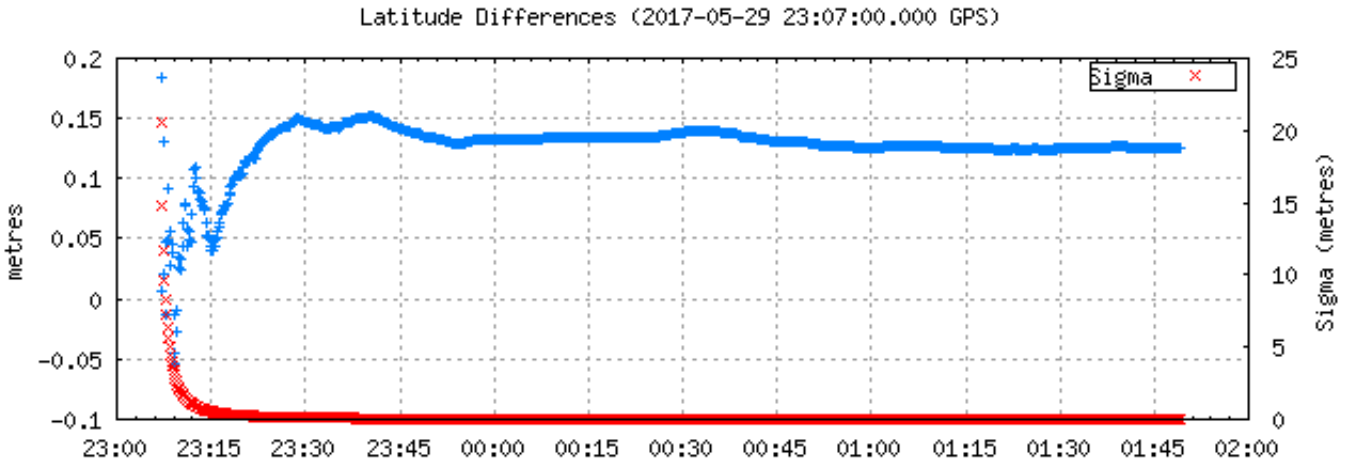
# Estimated Parameters & Observations Statistics

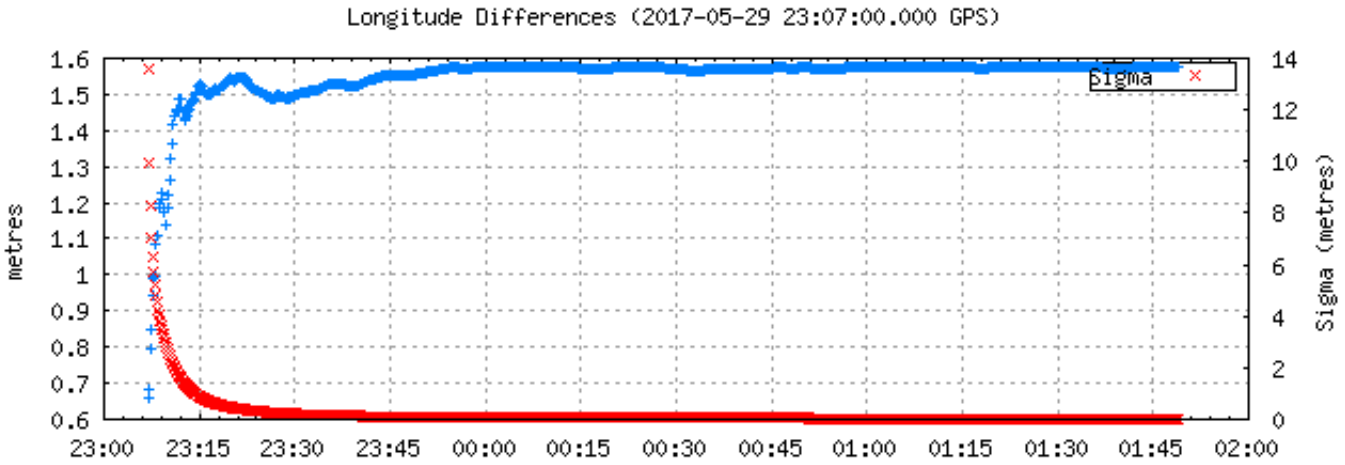
Pseudo-Range Residuals Sky Distribution

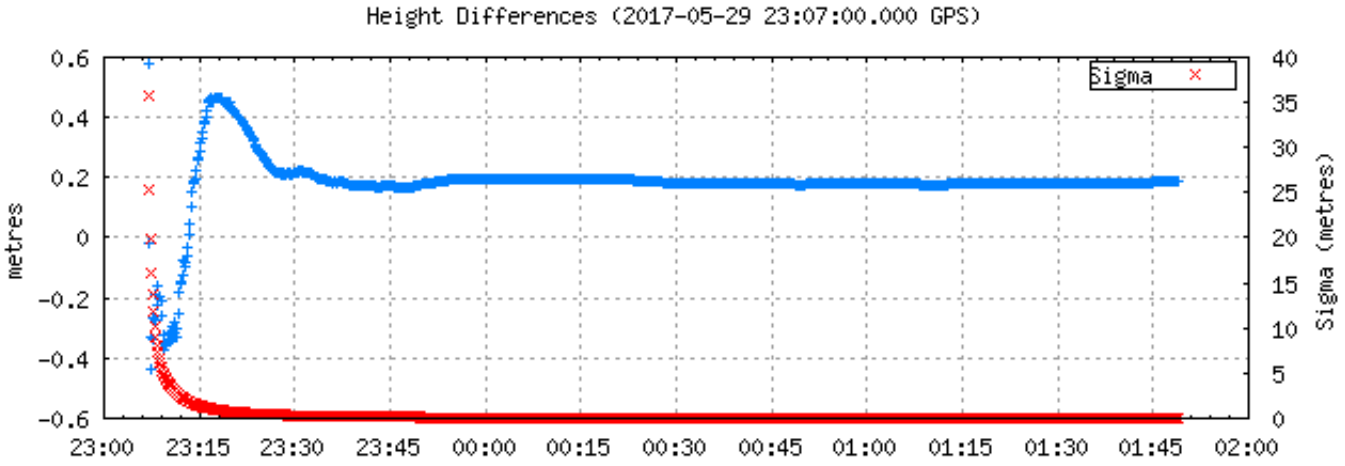


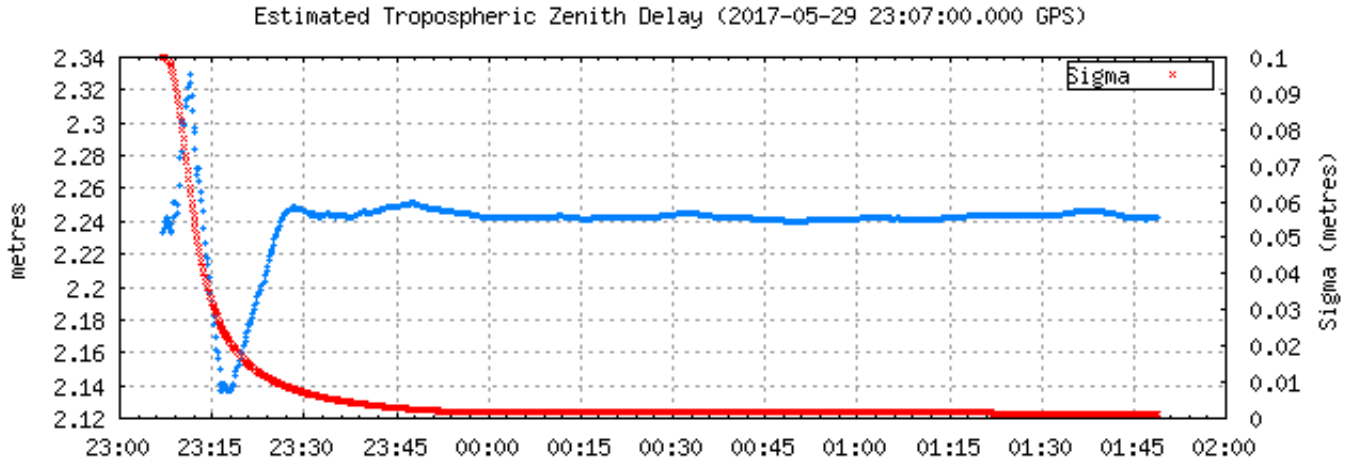

Corrections to apriori position (minus final corrections) (metres)
1
0.8
0.6
0.4
0.2
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.8
0.2
0.4
0.6
0.8
1
(1 sigma std of position corrections) / 25
(1 sigma std of initial position correction) / 25
(1 sigma std of final position correction) / 25

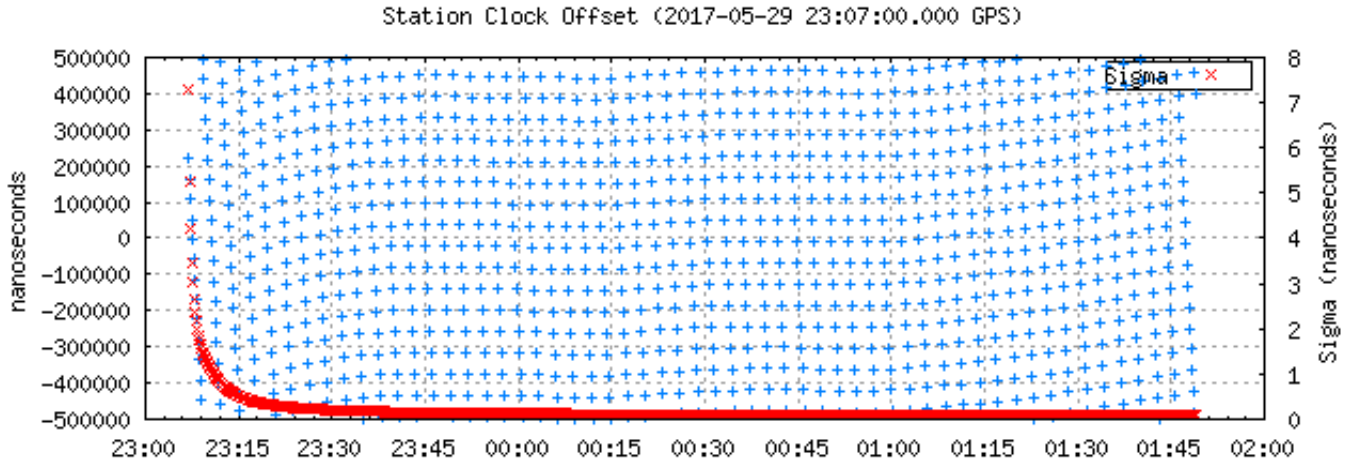

Ellipsoidal Height Profile (2017-05-29 23:07:00.000 GPS)
metres
488.2
488
487.8
487.6
487.4
487.2
487
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00

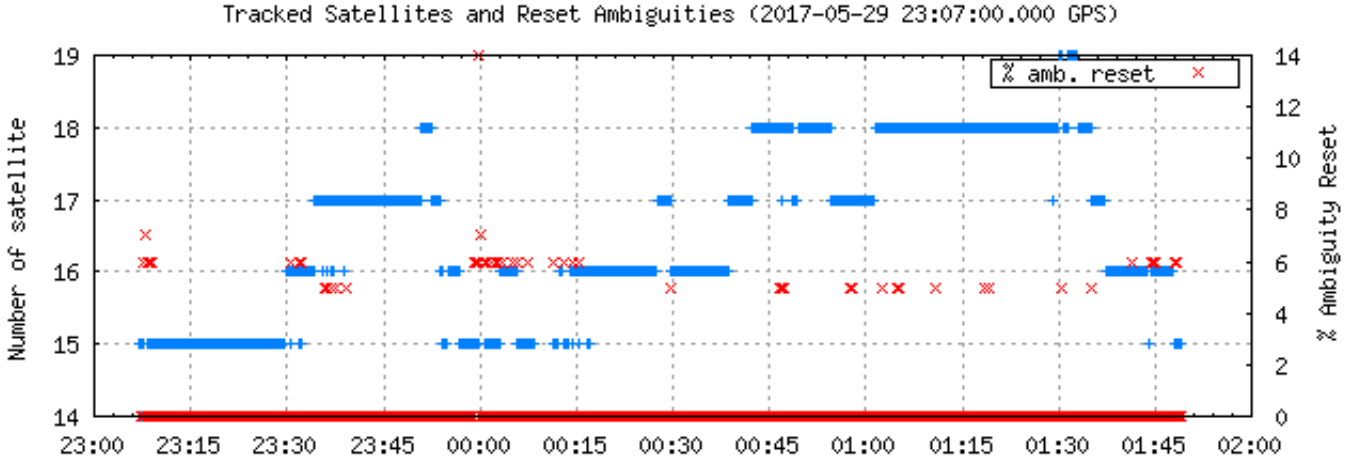

Latitude Differences (2017-05-29 23:07:00.000 GPS)
Sigma
metres
Sigma (metres)
0.2
0.15
0.1
0.05
0
-0.05
-0.1
25
20
15
10
5
0
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00

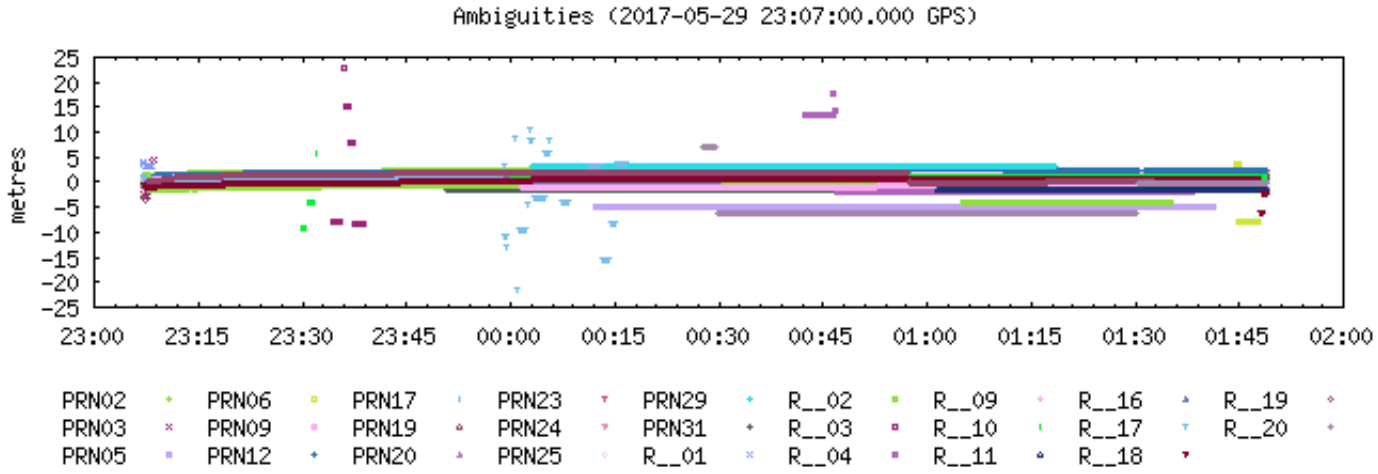

Longitude Differences (2017-05-29 23:07:00.000 GPS)
Sigma
metres
Sigma (metres)
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
14
12
10
8
6
4
2
0
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00

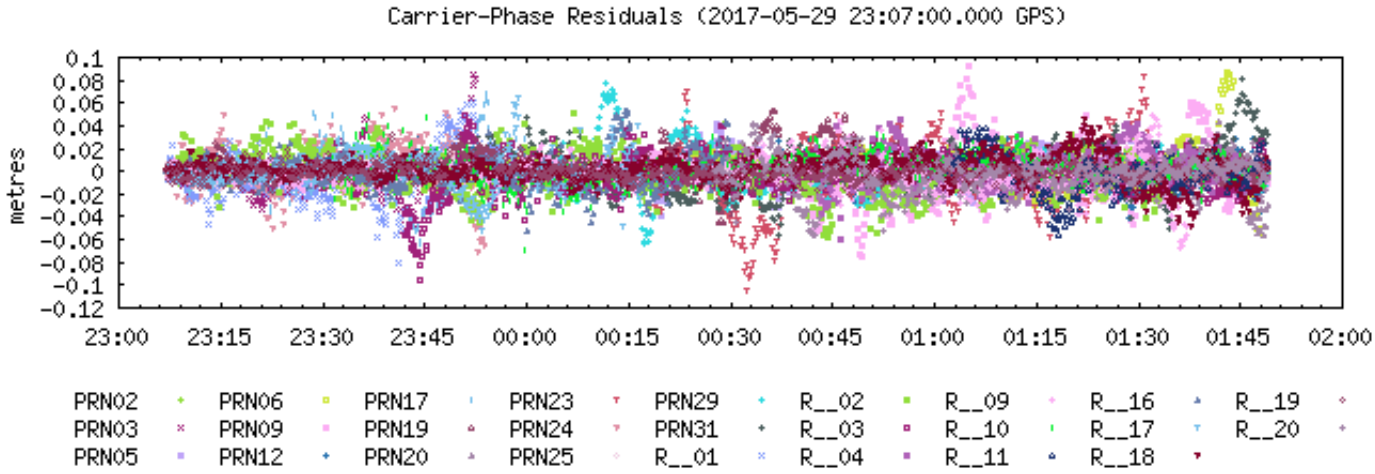

Height Differences (2017-05-29 23:07:00.000 GPS)
Sigma
metres
Sigma (metres)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
40
35
30
25
20
15
10
5
0
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00

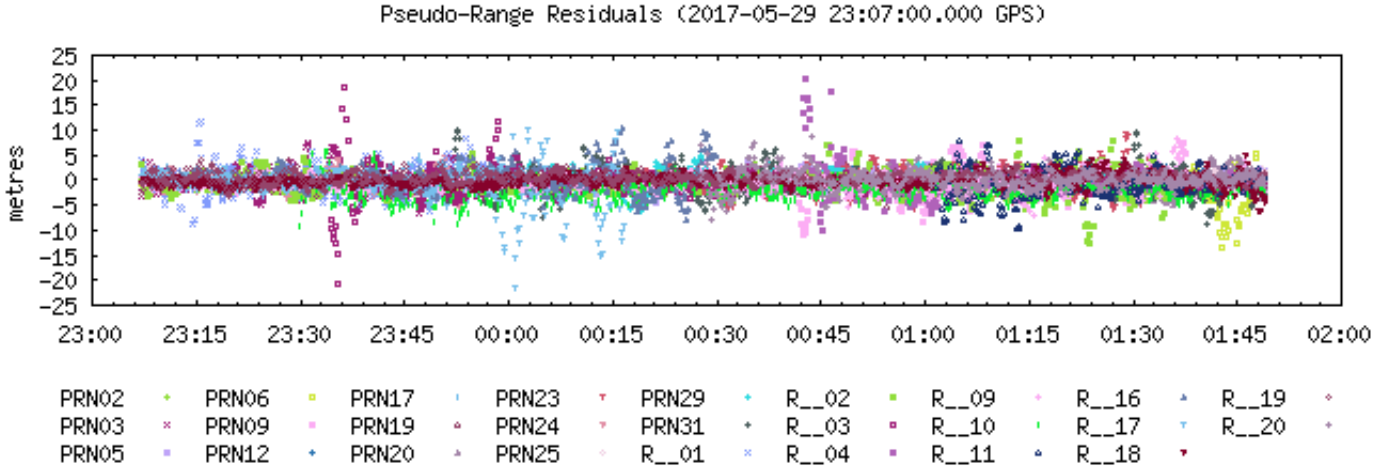

Estimated Tropospheric Zenith Delay (2017-05-29 23:07:00.000 GPS)
metres
Sigma (metres)
Sigma
2.34
2.32
2.3
2.28
2.26
2.24
2.22
2.2
2.18
2.16
2.14
2.12
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00


Station Clock Offset (2017-05-29 23:07:00.000 GPS)
nanoseconds
Sigma (nanoseconds)
Sigma
500000
400000
300000
200000
100000
0
-100000
-200000
-300000
-400000
-500000
8
7
6
5
4
3
2
1
0
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00


Tracked Satellites and Reset Ambiguities (2017-05-29 23:07:00.000 GPS)
Number of satellite
% Ambiguity Reset
% amb. reset
19
18
17
16
15
14
14
12
10
8
6
4
2
0
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00


Ambiguities (2017-05-29 23:07:00.000 GPS)
metres
25
20
15
10
5
0
-5
-10
-15
-20
-25
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00
PRN02 PRN06 PRN17 PRN23 PRN29 R__02 R__09 R__16 R__19
PRN03 PRN09 PRN19 PRN24 PRN31 R__03 R__10 R__17 R__20
PRN05 PRN12 PRN20 PRN25 R__01 R__04 R__11 R__18


Carrier-Phase Residuals (2017-05-29 23:07:00.000 GPS)
metres
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00
PRN02 PRN06 PRN17 PRN23 PRN29 R__02 R__09 R__16 R__19
PRN03 PRN09 PRN19 PRN24 PRN31 R__03 R__10 R__17 R__20
PRN05 PRN12 PRN20 PRN25 R__01 R__04 R__11 R__18


Pseudo-Range Residuals (2017-05-29 23:07:00.000 GPS)
metres
25
20
15
10
5
0
-5
-10
-15
-20
-25
23:00
23:15
23:30
23:45
00:00
00:15
00:30
00:45
01:00
01:15
01:30
01:45
02:00
PRN02 PRN06 PRN17 PRN23 PRN29 R__02 R__09 R__16 R__19
PRN03 PRN09 PRN19 PRN24 PRN31 R__03 R__10 R__17 R__20
PRN05 PRN12 PRN20 PRN25 R__01 R__04 R__11 R__18

**~~~ Disclaimer ~~~**

**Natural Resources Canada does not assume any liability deemed to have been caused directly or indirectly by any content of its PPP-On-Line positioning service.**

**If you have any questions, please feel free to contact:**
**EMail: nrcan.geodeticinformationservices.rncan@canada.ca**
**Phone:343-292-6617**

Natural Resources Canada Ressources naturelles Canada

Canada

# Appendix F Wheeler River Hydrometric Monitoring Activity Summary 2019. Missinipi Water Solutions.

November 6, 2019 File Number: MWS-19-013

Dr. Fei Luo
Environmental Engineer
EcoMetrix Incorporated
6800 Campobello Road
Mississauga, ON L5N 2L8

RE: 2019 Wheeler River Hydrometric Monitoring Activity Summary

Dear Dr. Luo,

This letter is provided to you as a summary of field hydrometric monitoring activities during 2019 at Denison Mine's (Denison) Wheeler River Project (the Project). EcoMetrix Incorporated (EcoMetrix) is completing baseline monitoring for the Project on behalf of Denison and has retained Missinipi Water Solutions Inc. (MWSI) to provide hydrometric monitoring and water sampling at the Project.

## Introduction

The Project is located approximately 750 km north of Saskatoon within Saskatchewan's Athabasca Basin. The Project is considered to be Denison's flagship project and Denison is currently proceeding with development of an Environmental Impact Statement (EIS) for the property. Data recorded during baseline monitoring are important to the development of an EIS in context of existing conditions and predicted impacts.

In coordination with EcoMetrix, MWSI completed two field programs at the project in 2019 from July 3 to 7 and August 28 to September 1. The purpose of each field program was as follows:

July Field Program

- Project introduction with EcoMetrix including guided access to all stations and identification of survey benchmarks;
- Discharge measurement and water level survey at SA-1, SA-2, SA-3, SA-4, SA-5, SA-6 and RC-1;
- Water level survey at LA-1; and,
- Water sampling at SA-1, SA-2, SA-3, SA-4, SA-5, SA-6 and RC-1.

August Field Program

- Discharge measurement and water level survey at SA-1, SA-2, SA-3, SA-4, SA-5, SA-6, SA-8, SA-9, SA-10, SA-11 and RC-1;
- Water level survey at LA-1 and LA-6; and,
- Water sampling at SA-1, SA-2, SA-3, SA-4, SA-5, SA-6 and RC-1.

Some stations are equipped with water level dataloggers which were downloaded in 2019. Each station is discussed in detail below and notes any observations or changes to instrumentation. Discharge and water level data developed from installed dataloggers are being provided electronically to EcoMetrix as a part of, but not attached/appended to, this letter.

## Methodology and Equipment

This monitoring program is a continuation of work completed by others and all relevant background data and previous measurements for each station are discussed by EcoMetrix (2019) in *Baseline Hydrology Summary Report – Wheeler River Project, Denison Mines*. Work completed by MWSI in 2019 included extension of the stage-discharge rating curves (rating curve) at each station and development of hydrographs.

A rating curve requires several measurements of water level (stage) and discharge measurement over a wide range of flow conditions. During 2019, discharge was measured at each station by in-stream velocity measurements via the Mid-Section Method (Terzi, 1981). A Sontek FlowTracker was used to record velocity measurements at all stations for the Project in 2019. Water levels were recorded by elevation surveys to previously installed benchmarks using an engineer's rod and level. At some locations (SA-1, SA-4, SA-5, SA-6, SA-8, SA-9, SA-10, SA-11 and LA-6) Solinst Leveloggers are installed to record water level.

The quality of the data collected and reported is directly related to the accuracy of the measurements collected in the field. MWSI regularly inspects and calibrates field equipment to provide quality data for analysis. As of the spring of 2019 there are no facilities in Canada to perform calibration of Sontek FlowTrackers; however, MWSI regularly calibrates the older mechanical flow meters and annual verification is completed to confirm that all flow meters have agreement under a range of velocities in a lab controlled hydraulic flume. Two Peg Test surveys are performed to verify the accuracy of survey equipment. During station monitoring additional survey collection and measurements are often completed to confirm and validate measurements prior to leaving the station.

Solinst Leveloggers installed in-stream record total pressure which is a combination of water level and barometric pressures. A Solinst Barologger is used to measure local barometric pressure and this data record can be confirmed and extended, if needed, using local climate station data. The barometric pressure record is subtracted from the total pressure record for all in-stream Leveloggers. This record is used to generate the hydrograph by correcting the record to the surveyed water level, referenced to local benchmarks, and applying the trendline equation from the rating curve at a given station. Any users of hydrograph data should exercise caution if a given hydrograph has data that are developed by extrapolation beyond the measured range of a rating curve.

Winter water level data records are often impacted by ice cover and encroachment of the channel by snow. All stations with dataloggers installed at the Project are similarly impacted. Winter flow data can be estimated from other regional stations, but this effort is not included as a part of this report.

During the 2019 field programs the dataloggers were observed to have a two hour time shift from Central Standard Time (CST). All dataloggers were reset to CST to ease future processing of logger data at a sampling frequency of 30 minutes.

## Stream Discharge and Lake Level Monitoring

This section provides a summary of activities for each station as well as updated tables of measured stage and discharge. When possible the current stage-discharge rating curve is plotted including the equation for the fitted trendline and the coefficient of determination ($R^2$). In some cases, a measurement may be rejected from the trendline equation and $R^2$ assessment based upon the type of measurement (i.e. winter vs. open water) or professional judgment based on the perceived fit of the data point. Rejection of data points is based upon close scrutiny of the data set, consideration for the data and conditions associated with that measurement and the potential perceived influence of site conditions such as measurement location.

As previously discussed, this monitoring is a continuation of work completed by others. The measurements discussed below are a compilation of all work at each station where MWSI completed measurements made in 2019 and all other work is discussed by EcoMetrix (2019).

### SA-1 (Icelander River)

Measurements were completed at SA-1 twice in 2019 (Table 1). A data logger is installed at this location and a new sensor housing was added during the August field program. The current data logger is an older model of the Solinst Levelogger product and will need replacement soon but was not believed to be required for 2019.

Some discrepancy was noted at this station regarding previously reported benchmark labels and elevations. For the 2019 data to fit with previously reported data in the rating curve (Figure 1) the benchmark elevation from BM3 (as previously reported by others) needed to be assigned to BM1. This is a somewhat arbitrary correction; however, it creates a proper fit to the rating curve based on the measured flow and stage data. Should other information regarding the benchmarks at SA-1 become available it could be used to provide any other correction which may be required.

Photo 1 and Photo 2 are photos of the cross-section at SA-1 taken in July and August, respectively.

*Table 1: SA-1 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge (m³/s) |
|---|---|---|
| 2011-05-14 | 492.714 | 2.3070 |
| 2011-07-29 | 492.648 | 1.7500 |
| 2011-10-28 | 492.562 | 0.9730 |
| 2012-05-05 | 492.711 | 2.2930 |
| 2012-08-06 | 492.695 | 2.0310 |
| 2012-10-23 | 492.721 | 2.5750 |
| 2013-05-20 | 492.705 | 2.3580 |
| 2013-08-14 | 492.587 | 1.2800 |
| 2013-10-18 | 492.554 | 0.8870 |
| 2014-03-30 | 492.869 | 1.2030 |
| 2016-09-17 | 492.710 | 2.3400 |
| 2017-05-31 | 492.720 | 2.4300 |
| 2018-07-02 | 494.043 | 2.4100 |
| 2019-07-05 9:00 | 492.744 | 3.0553 |
| 2019-08-30 9:30 | 492.733 | 2.7760 |

*Figure 1: SA-1 Rating Curve*

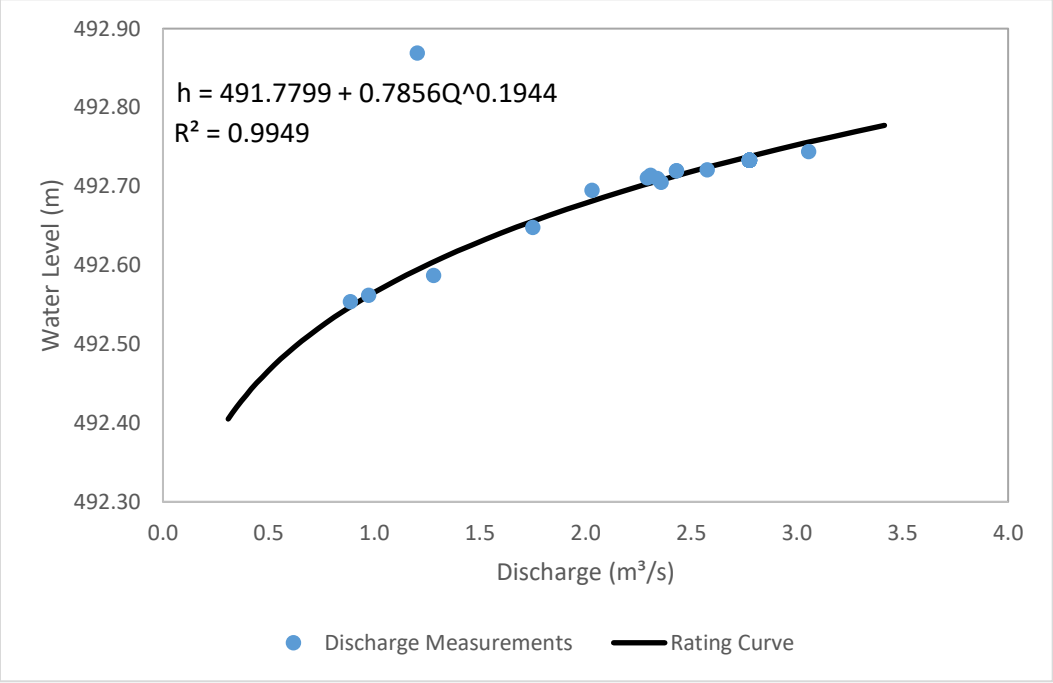


*Photo 1: SA-1 - July Field Program*



*Photo 2: SA-1 - August Field Program*



## SA-2 (Northwest Flow into McGowan Lake)

Station SA-2 is located to the northwest of McGowan Lake. A datalogger is not installed at this location. During the 2019 monitoring program it was learned that the cross-section had been moved in 2016 creating a discrepancy in water levels. The old cross-section was identified during the August field program and sufficient data are available to correct the July 2019 measurement (Table 2 and Figure 2). The original cross-section will be used for measurements in future field monitoring programs. Photo 3 is taken of the cross-section used during the July field program while Photo 4 is the original cross-section used in August.

*Table 2: SA-2 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2011-05-12 | 496.727 | 1.6490 |
| 2011-07-30 | 496.698 | 1.3870 |
| 2011-10-27 | 496.667 | 0.8090 |
| 2012-05-08 | 496.748 | 2.0080 |
| 2012-08-08 | 496.689 | 1.3050 |
| 2012-10-24 | 496.734 | 2.0300 |
| 2013-05-21 | 496.727 | 1.8420 |
| 2013-08-14 | 496.660 | 0.8630 |
| 2013-10-16 | 496.641 | 0.7410 |
| 2014-03-24 | 496.805 | 1.1800 |
| 2016-09-16 | 496.460 | 2.2400 |
| 2019-07-05 12:30 | 496.773 | 2.2095 |
| 2019-08-30 13:30 | 496.748 | 1.9537 |

*Figure 2: SA-2 Rating Curve*

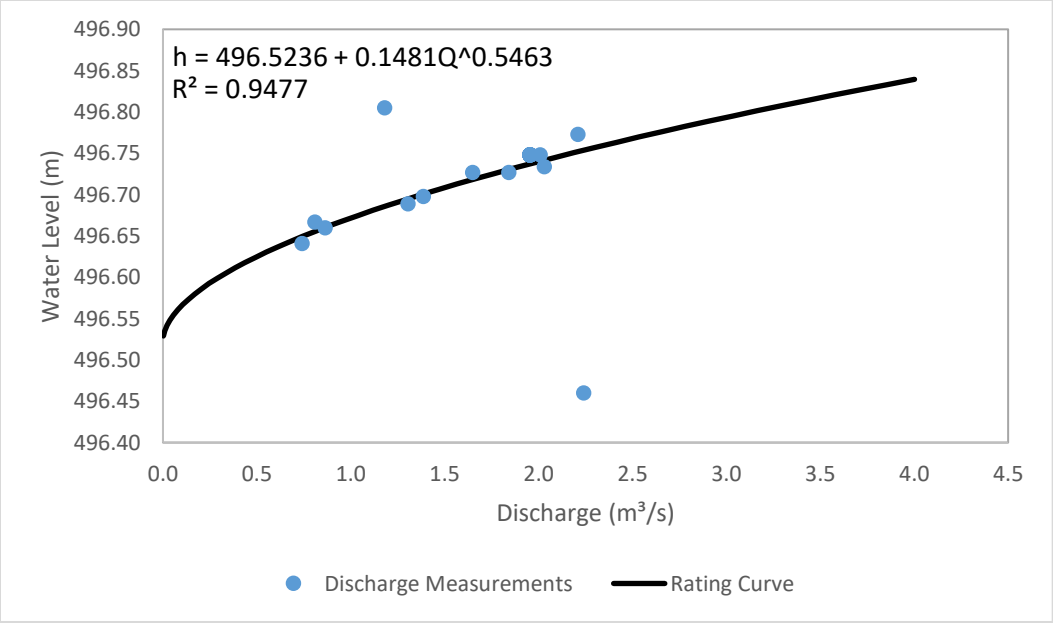


*Photo 3: SA-2 - July Field Program*



*Photo 4: SA-2 - August Field Program*



## SA-3 (LA-2 to McGowan Lake)

SA-3 is located on an inflow stream to McGowan Lake from the northeast. The station does not have a datalogger. Stage and discharge measurement data are provided in Table 3 and plotted in Figure 3. Photo 5 and Photo 6 are taken during the July and August field programs, respectively. The stream at this location has a low gradient and, due to the proximity to the lake, is believed to have been slightly backwatered by McGowan Lake during 2019.

*Table 3: SA-3 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2011-05-13 | 494.459 | 0.4760 |
| 2011-07-29 | 494.392 | 0.3700 |
| 2011-10-28 | 494.322 | 0.2390 |
| 2012-05-04 | 494.473 | 0.5280 |
| 2012-08-05 | 494.443 | 0.4780 |
| 2012-10-23 | 494.487 | 0.5780 |
| 2013-05-20 | 494.482 | 0.5640 |
| 2013-08-14 | 494.344 | 0.2550 |
| 2013-10-16 | 494.243 | 0.0510 |
| 2014-03-24 | 494.248 | 0.3620 |
| 2016-09-16 | 494.430 | 0.4400 |
| 2019-07-05 14:00 | 494.541 | 0.6219 |
| 2019-08-30 15:30 | 494.506 | 0.5474 |

*Figure 3: SA-3 Rating Curve*

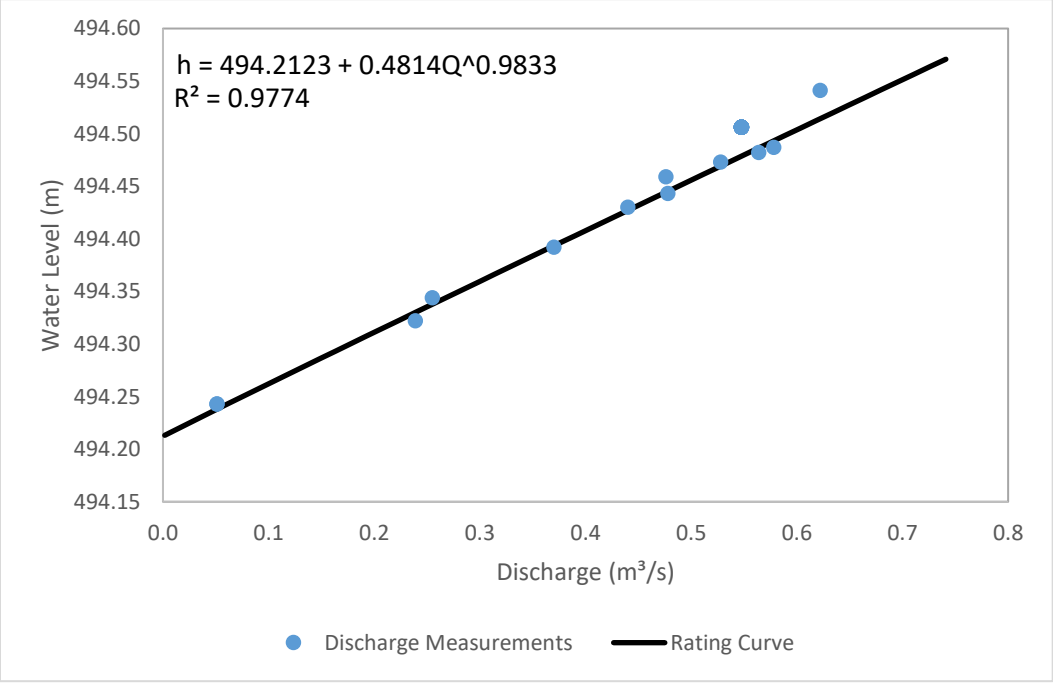


*Photo 5: SA-3 - July Field Program*



*Photo 6: SA-3 - August Field Program*



## SA-4 (Downstream of Outflow from Kratchkowsky Lake)

SA-4 is located downstream of Kratchkowsky Lake and flows into LA-6 from the northwest. This station has a datalogger. The measured stage and discharge data are presented in Table 4 and Figure 4. Photo 7 was taken during the July field program while Photo 8 is from August.

*Table 4: SA-4 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2011-05-11 | 506.357 | 0.4830 |
| 2011-07-30 | 506.314 | 0.3350 |
| 2011-10-31 | 506.310 | 0.1990 |
| 2012-05-04 | 506.348 | 0.4660 |
| 2012-08-05 | 506.329 | 0.3610 |
| 2012-10-22 | 506.367 | 0.4970 |
| 2013-05-19 | 506.369 | 0.5190 |
| 2013-08-13 | 506.277 | 0.2760 |
| 2013-10-17 | 506.249 | 0.2060 |
| 2014-03-23 | 506.381 | 0.3300 |
| 2016-09-10 | 506.350 | 0.4900 |
| 2017-05-30 | 506.370 | 0.5800 |
| 2018-06-29 | 506.357 | 0.4845 |
| 2019-07-04 12:00 | 506.387 | 0.6336 |
| 2019-08-29 13:00 | 506.374 | 0.5900 |

*Figure 4: SA-4 Rating Curve*

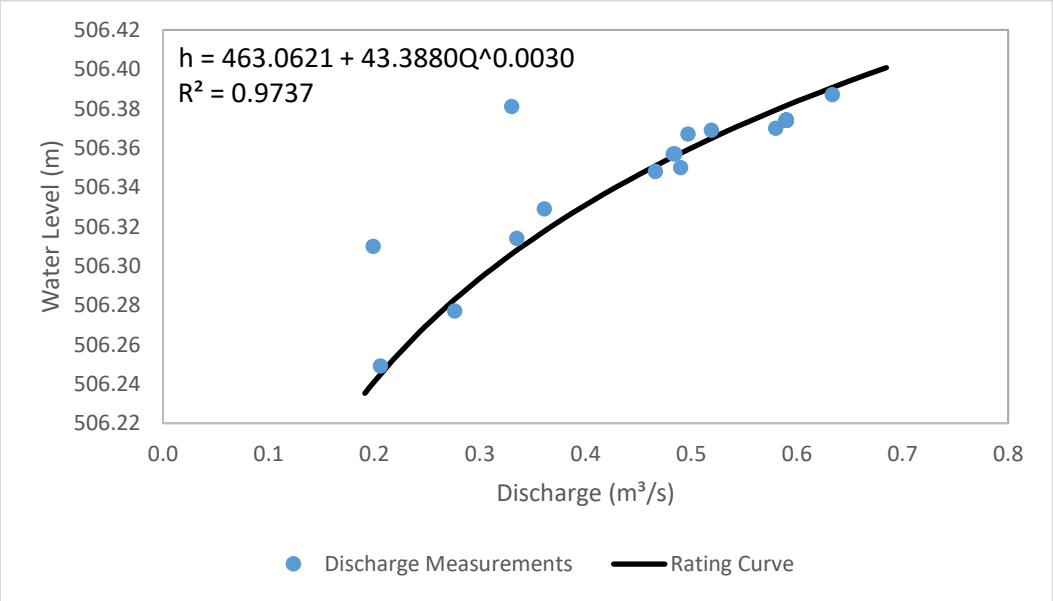


*Photo 7: SA-4 - July Field Program*



*Photo 8: SA-4 - August Field Program*



## SA-5 (Northwest Inflow to LA-6)

A second northwest inflow to LA-6 is monitored at SA-5. This station is equipped with a datalogger and a new logger housing was installed during the August field program. Stage and discharge measurements are presented in Table 5 and the rating curve is shown in Figure 5. Photo 9 and Photo 10 show the cross-section during the July and August field programs, respectively.

This station has been measured at two cross-sections approximately 30 m apart. The reason for the change in cross-section is unknown at this time; however, efforts have been undertaken both in previous reporting and this document to shift all measurements to a common datum. This may not be justifiable in consideration of hydraulic characteristics but it will be possible in future measurements to confirm the shape of the rating curve and provide any additional shifts that may be required.

*Table 5: SA-5 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2011-05-12 | 500.891 | 1.1000 |
| 2011-07-30 | 500.851 | 0.8580 |
| 2011-10-29 | 500.792 | 0.4760 |
| 2012-05-04 | 500.900 | 1.1110 |
| 2012-08-05 | 500.867 | 1.0260 |
| 2012-10-22 | 500.901 | 1.2690 |
| 2013-05-19 | 500.909 | 1.3810 |
| 2013-08-13 | 500.812 | 0.6160 |
| 2013-10-17 | 500.805 | 0.5070 |
| 2014-03-23 | 500.981 | 0.8860 |
| 2016-09-09 | 500.900 | 1.2700 |
| 2016-09-21 | 500.910 | 1.5800 |
| 2017-05-30 | 500.920 | 1.9500 |
| 2018-06-30 | 500.890 | 1.6567 |
| 2019-07-04 10:30 | 500.955 | 1.6137 |
| 2019-08-29 10:30 | 500.927 | 1.3589 |

*Figure 5: SA-5 Rating Curve*

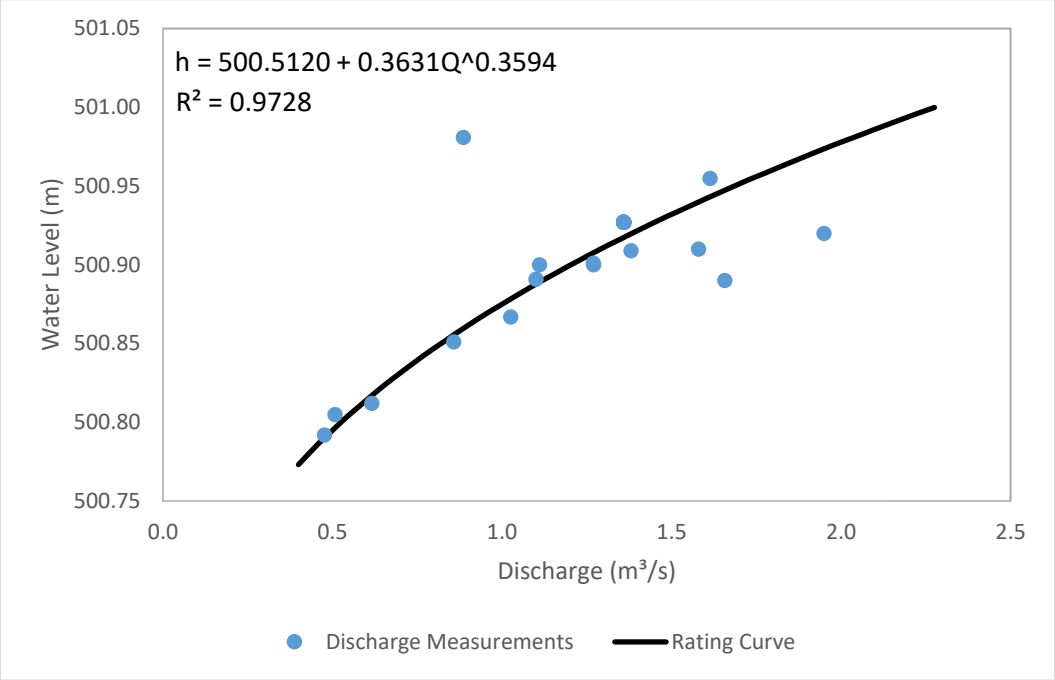



*Photo 9: SA-5 - July Field Program*



*Photo 10: SA-5 - August Field Program*



## SA-6 (Outflow from LA-6)

SA-6 is the outflow from LA-6 and is equipped with a stage recording datalogger. The sensor and sensor housing at this location were replaced in August. Stage and discharge data for SA-6 are presented in Table 6 and the rating curve is shown as Figure 6. The cross-section is shown in Photo 11 for the July field program and Photo 12 is from the August field program.

*Table 6: SA-6 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge (m³/s) |
|---|---|---|
| 2011-05-13 | 500.084 | 1.6310 |
| 2011-07-30 | 500.034 | 1.3030 |
| 2011-10-27 | 499.956 | 0.7170 |
| 2012-05-06 | 500.098 | 1.9570 |
| 2012-08-05 | 500.061 | 1.4760 |
| 2012-10-22 | 500.102 | 1.8510 |
| 2013-05-19 | 500.077 | 1.5400 |
| 2013-08-13 | 499.992 | 0.8420 |
| 2013-10-17 | 499.969 | 0.7980 |
| 2014-03-23 | 500.081 | 1.1730 |
| 2016-09-11 | 500.070 | 1.9800 |
| 2017-05-31 | 500.080 | 1.7700 |
| 2018-06-30 | 500.125 | 1.5576 |
| 2019-07-04 14:30 | 500.125 | 2.2674 |
| 2019-08-29 16:00 | 500.110 | 2.0247 |

*Figure 6: SA-6 Rating Curve*

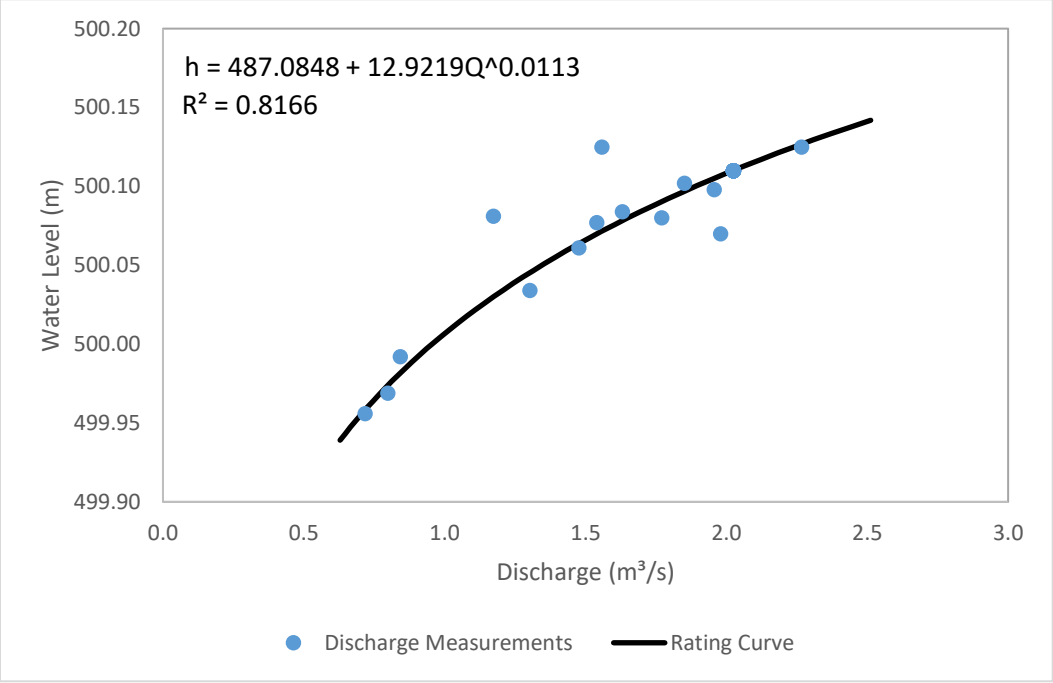


*Photo 11: SA-6 - July Field Program*



*Photo 12: SA-6 - August Field Program*



## SA-8 (Inflow to Kratchkowsky Lake)

SA-8 is an inflow to Kratchkowsky Lake and was located immediately upstream of the shoreline. It is believed that stage measurements at that location were influenced by the lake level in Kratchkowsky Lake and not representative of the hydraulics of the inflow channel. The station was moved upstream and re-installed with a new sensor housing. The station was surveyed to new local benchmarks and not referenced to the old cross-section (Table 7). Photo 13 shows the old monitoring location during the July field program while Photo 14 was taken at the new upstream location in August.

*Table 7: SA-8 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2016-09-15 | 520.600 | 0.0100 |
| 2016-09-19 | 520.620 | 0.0400 |
| 2017-05-30 | 520.540 | 0.0400 |
| 2018-07-03 | 520.570 | 0.0560 |
| 2019-08-31 10:00 | 99.455* | 0.0443 |

* Referenced to local benchmark after moving measurement location.

*Photo 13: SA-8 - July Field Program*



*Photo 14: SA-8 - August Field Program*



## SA-9 (Outflow from LA-8)

SA-9 is located downstream of LA-8 and is equipped with a datalogger. Insufficient stage and discharge measurement data (Table 8) are available to generate a rating curve at this time. Photo 15 was taken during the August field program.

*Table 8: SA-9 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2016-09-18 | 520.520 | 0.1800 |
| 2017-06-01 | 520.490 | 0.1600 |
| 2019-08-31 14:10 | 520.547 | 0.1457 |

*Photo 15: SA-9 - August Field Program*



## SA-10 (Northwest Inflow to LA-9)

SA-10 is an inflow to LA-9 and is equipped with a datalogger. Stage and discharge measurement data are presented in Table 9 but are insufficient to generate a rating curve. Photo 16 was taken during the August field program.

*Table 9: SA-10 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2016-09-18 | 514.350 | 1.5500 |
| 2017-05-31 | 514.310 | 1.2200 |
| 2019-08-31 17:30 | 514.344 | 1.3127 |

*Photo 16: SA-10 - August Field Program*



## SA-11 (North Inflow to Kratchkowsky Lake)

The north inflow to Kratchkowsky Lake is monitored at SA-11. This station is equipped with a datalogger. Stage and discharge measurement data are provided in Table 10 and the rating curve is shown in Figure 7. Due to the brevity of data, caution is advised when using this rating curve especially for extrapolation above the highest measured discharge. Photo 17 was taken of the cross-section during the August field program.

*Table 10: SA-11 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2016-09-19 | 520.730 | 0.4200 |
| 2017-05-30 | 520.710 | 0.3100 |
| 2018-07-02 | 520.561 | Not Measured |
| 2019-08-31 11:00 | 520.713 | 0.3104 |

*Figure 7: SA-11 Rating Curve*

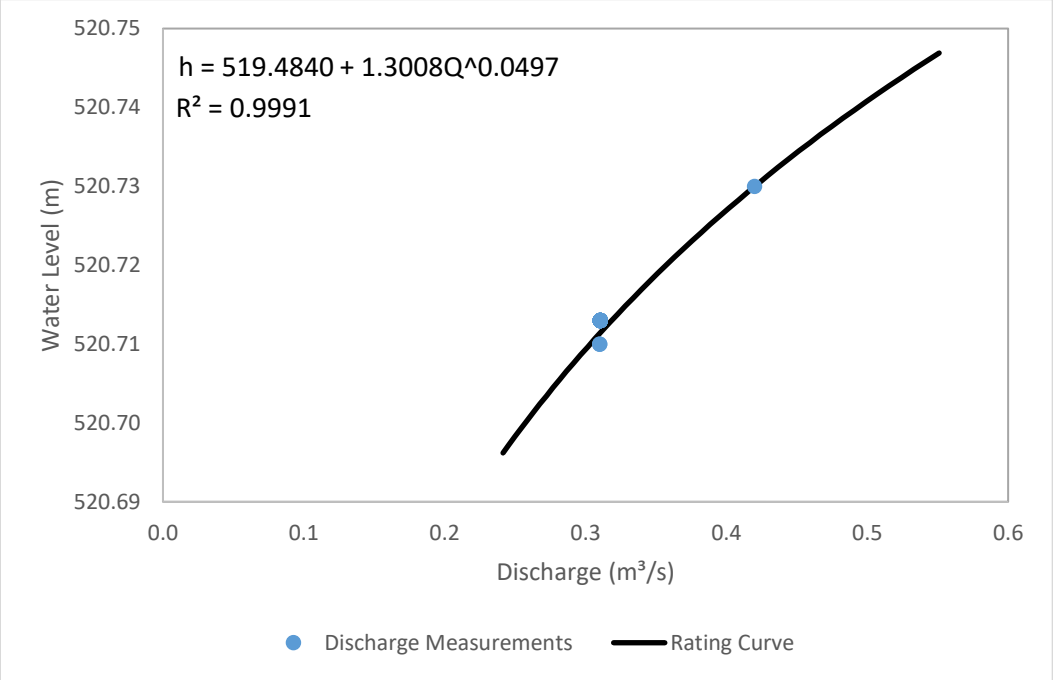



*Photo 17: SA-11 - August Field Program*



## RC-1 (Outflow from Kratchkowsky Lake Upstream of SA-4)

RC-1 is measured near the outflow from Kratchkowsky Lake and upstream of SA-4. A datalogger is not installed at this location. Water level measurements in Table 11 are referenced to the lake water level measured at a different location on Kratchkowsky Lake. There are not enough data to generate a rating curve. Photo 18 and Photo 19 show the cross-section during the July and August field programs, respectively.

*Table 11: RC-1 Stage and Discharge Measurements*

| Measurement Date & Time | Water Level (m) | Discharge ($m^3/s$) |
|---|---|---|
| 2016-09-14 | 520.300 | 0.5800 |
| 2018-03-15 | No WL Measured | 0.2303 |
| 2019-07-06 9:00 | No WL Measured | 0.6041 |
| 2019-09-01 8:30 | 520.559 | 0.5514 |

*Photo 18: RC-1 - July Field Program*



*Photo 19: RC-1 - August Field Program*



## LA-1 Water Level

Measurements of water level for LA-1 occur coincident with monitoring at SA-3. The stream and lake are separated by a long natural levy and survey benchmarks are located between the two stations and used for both water level surveys. Table 12 presents the survey data for LA-1. A new datalogger was installed at this location during the August field program.

*Table 12: LA-1 - Water Level Measurements*

| Measurement Date & Time | Water Level (m) |
|---|---|
| 2011-05-13 | 494.439 |
| 2011-07-29 | 494.327 |
| 2011-10-28 | 494.218 |
| 2012-05-04 | 494.423 |
| 2012-08-05 | 494.386 |
| 2012-10-23 | 494.448 |
| 2013-05-21 | 494.440 |
| 2013-08-14 | 494.265 |
| 2013-10-16 | 494.194 |
| 2014-03-24 | 494.298 |
| 2016-09-16 | 494.390 |
| 2018-07-02 | 494.344 |
| 2019-07-05 14:00 | 494.515 |
| 2019-08-30 15:30 | 494.476 |

## LA-6 Water Level

LA-6 is upstream of SA-6. Water level survey (Table 13) was completed once during the August field program. A datalogger for LA-6 could not be found during the August field program; however, comparison of historical measurement between LA-6 and SA-6 (Figure 8) indicate that the water levels are similar enough to use water level data from the SA-6 datalogger to represent the water level of LA-6.

*Table 13: LA-6 - Water Level Measurements*

| Measurement Date & Time | Water Level (m) |
|---|---|
| 2011-05-13 | 500.063 |
| 2011-07-31 | 500.028 |
| 2011-10-27 | 499.943 |
| 2012-05-06 | 500.088 |
| 2012-08-05 | 500.058 |
| 2012-10-22 | 500.092 |
| 2013-05-19 | 500.088 |
| 2013-08-13 | 499.973 |
| 2013-10-17 | 499.947 |
| 2014-03-23 | 500.058 |
| 2016-09-12 | 500.070 |
| 2018-06-30 | 500.106 |
| 2019-08-29 14:25 | 500.118 |

*Figure 8: Comparison of LA-6 and SA-6 Water Levels*

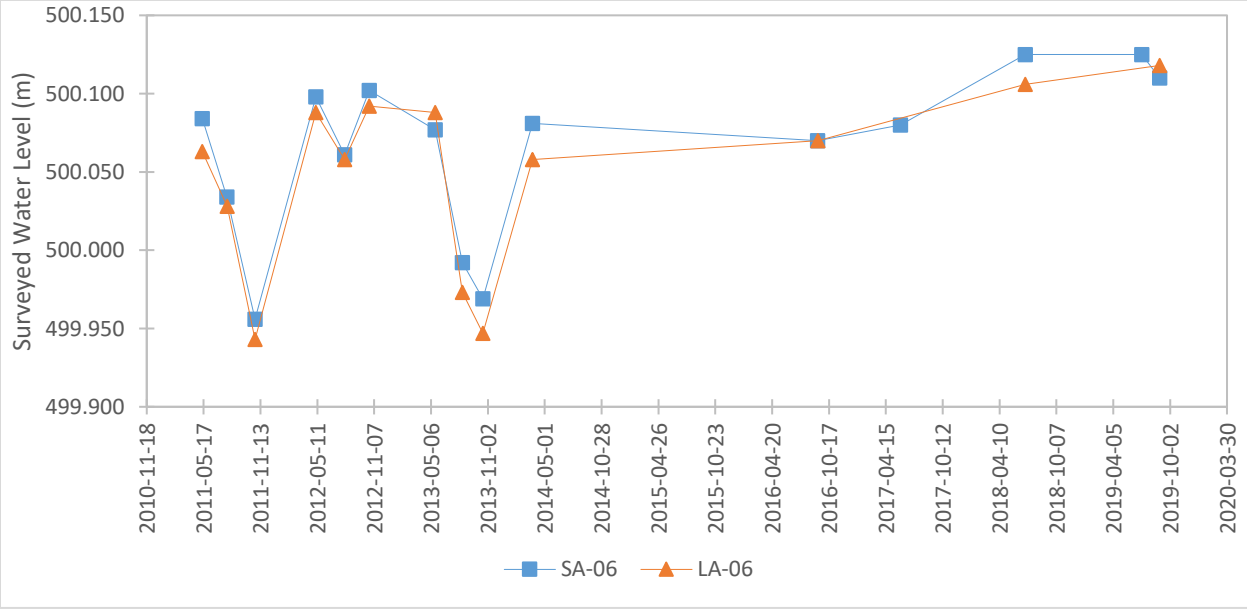


*Photo 20: LA-6 - August Field Program*



## Water Quality Parameter Measurements

Water samples were collected during both 2019 field programs. Water quality parameters recorded during the August field program are presented in Table 14.

*Table 14: August Water Quality Field Measurements*

| Station ID | SA-01 | SA-02 | SA-03 | SA-04 | SA-05 | SA-06 | RC-01 |
|---|---|---|---|---|---|---|---|
| Water Depth (m): | Surface | Surface | Surface | Surface | Surface | Surface | Surface |
| Water Temp (°C) | 12.8 | 14 | 15.2 | 14.1 | 12.4 | 13.8 | 12.8 |
| Conductivity (uS/cm): | 14 | 13.7 | 16.7 | 15.8 | 12.3 | 13.7 | 15.4 |
| Spec. Conductivity (uS/cm): | 18.3 | 17.4 | 20.6 | 19.9 | 16.2 | 17.5 | 20.1 |
| pH: | 6.82 | 6.98 | 6.76 | 6.93 | 6.75 | 6.86 | 7.04 |
| Dissolved Oxygen (mg/L): | 8.91 | 9.11 | 9.21 | 7.15 | 7.81 | 7.33 | 9.09 |
| DO Sat. (%): | 84.1 | 88.2 | 92.3 | 70.2 | 73.2 | 71.1 | 86.1 |

## Summary and Closure

On behalf of Denison, EcoMetrix has retained MWSI for monitoring and reporting of discharges in the vicinity of the Project. This reporting consists of the monitoring data and other pertinent observations recorded during two field programs in 2019.

This report has been prepared for the exclusive use of Denison and EcoMetrix. MWSI is not responsible for any unauthorized use or modification of this document. All third parties relying on information presented herein do so at their own risk.

MWSI appreciates the opportunity to work with Denison and EcoMetrix on this project. Should there be any questions regarding this document please contact the undersigned.

Respectfully submitted,

Missinipi Water Solutions Inc.



Tyrel J. Lloyd, M.Eng., P.Eng.

Senior Water Resources Engineer

## References

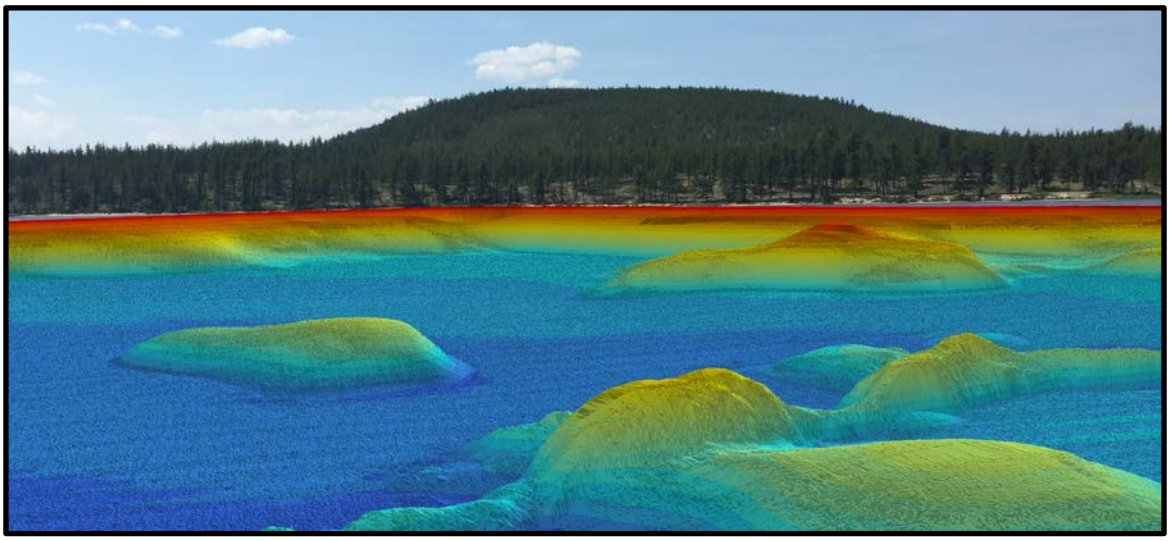
EcoMetrix Incorporated. 2019. Baseline Hydrology Summary Report – Wheeler River Project, Denison Mines. Ref. 16-2285. Mississauga, ON.

Terzi, R.A. 1981. Hydrometric Field Manual – Measurement of Streamflow. Inland Waters Directorate, Water Resources Branch, Environment Canada.

# Appendix H Milne Technologies. 2018 Denison Mines (Wheeler River Site) Multibeam Sonar Bathymetry and Habitat Mapping Report

# 2018 DENISON MINES (WHEELER RIVER SITE) MULTIBEAM SONAR BATHYMETRY AND HABITAT MAPPING REPORT:

LAKES LA1 AND LA6



Prepared for:
Elaine Mason
EcoMetrix Inc.

Scott W. Milne
September 18, 2018

91 Pinecrest Avenue, PO Box 237
Keene, Ontario, Canada K0L 2G0

# Milne Technologies

*Environmental and Aquatic Resource Consulting*

**www.milnetechnologies.ca**

91 Pinecrest Avenue, PO Box 237, Keene, Ontario, Canada K0L 2G0
Tel: (416) 848-3945  smilne@milnetechnologies.ca


September 18, 2018

**Elaine Mason**
Aquatic Scientist
EcoMetrix Inc.
6800 Campobello Road
Mississauga, ON
L5N 2L8
www.ecometrix.ca
Tel: (905) 794-2325 ext. 211
Cell: (416) 460-6494
Email: emason@ecometrix.ca

**Ms. Mason,**

On behalf of Milne Technologies, I am pleased to present to you the final report from the 2018 Denison Mines (Wheeler River Site) Multibeam Sonar Bathymetry and Habitat Mapping Project in partial fulfillment of the data products and deliverables described in the Scope of Works provided to EcoMetrix Inc. on April 27, 2018.

The following document is intended to provide a detailed record of the data collection, post-processing methods and bathymetry/habitat map products.

All post-process data, geo-databases, GIS layers and supporting electronic files are provided on a USB memory chip and accompany this report. Other maps and figures of more detailed analyses are available in the Appendices.

Thank you for the opportunity to provide you with this report and I look forward to further collaborations in the near future. Please don't hesitate to contact me if you have any further questions.

Sincerely,




Scott Milne

# TABLE OF CONTENTS

1.0 Introduction ..... 1

2.0 Data Collection and Analysis Methodologies ..... 2

2.1 Standardized Depth and Survey elevation ..... 2

2.2 Kongsberg M$^3$ Multibeam Sonar System Hardware ..... 2

2.3 Real-time Kinematic (RTK) GPS Corrections and Vessel Attitude Corrections (Heave, Pitch and Roll) ..... 6

2.4 Patch Tests (Pitch, Roll, Heading and Sensor Latency Calibrations) ..... 6

2.5 Sound Velocity ..... 6

2.6 Multibeam Sonar Bathymetry Profiling ..... 11

2.7 Bathymetry Surface Creation in ArcGIS ..... 11

2.8 MBES Habitat Mosaics (vegetation coverage, course woody debris and bottom substrate complexity) ..... 15

2.9 Relevant GIS Layers ..... 16

3.0 Results ..... 18

4.0 Acknowledgements ..... 30

5.0 References ..... 30

# INDEX OF FIGURES

Figure 1. Screen shot from the Kongsberg M$^3$ data collection software. The real-time 3D point cloud (from Lake LA1) is shown in the left panel and a frame from the M3 multibeam sonar echogram is shown in the right panel. The bottom detection points are shown as green dots. ..... 7

Figure 2. The Kongsberg M$^3$ sonar system set up on the aluminum boat..... 8

Figure 3. Shown is the Real-time Kinematic (RTK) GPS base-station and radio modem set-up on Lake LA6. A similar setup was deployed at Lake LA1..... 9

Figure 4. Observed Sontek CastAway "Conductivity-Temperature-Depth" (CTD) sonde water temperature ($^o$C) and sound velocity (m/s) profiles for Lakes LA6 and LA1 recorded on the bathymetry survey day. Profiles recorded before commencing surveys are shown as black lines and post-survey are shown as red lines. ..... 10

Figure 5a. Map of Lake LA1 showing the observed multibeam sonar bathymetry survey coverage (TIN model), the modified shoreline points (red points) and the estimated 40 cm depth contour points (yellow points)..... 13

Figure 5b. Map of Lake LA6 showing the observed multibeam sonar bathymetry survey coverage (TIN model), the modified shoreline points (red points) and the estimated 50 cm depth contour points (yellow points)..... 14

Figure 6. Observed multibeam sonar bathymetry survey coverage of Lake LA1. ..... 20

Figure 7a. Shown is the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA1. The bathymetry model includes the observed average multibeam sonar bathymetry points, the lake outline points (where z = 0 m) and the estimated 40 cm contours..... 21

Figure 7b. Same as 7a and includes 1 m depth contour lines..... 22

Figure 7c. 1m depth contours generated from the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA1. ..... 23

Figure 8. . Sonar imaging habitat mosaic for the Lake LA1 nearshore and shoals. Sand and gravel bars show up as bright patches whereas darker areas in away from shore indicate low acoustic reflection associated with mud, fines and detritus. ..... 24

Figure 9. Observed multibeam sonar bathymetry survey coverage of Lake LA6. ..... 25

Figure 10a. Shown is the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA6. The bathymetry model includes the observed average multibeam sonar bathymetry points, the lake outline points (where z = 0 m) and the estimated 50 cm contours..... 26

Figure 10b. Same as 9a and includes 1 m depth contour lines. ..... 27

Figure 10c. 1m depth contours generated from the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA6. ..... 28

Figure 11. Sonar imaging habitat mosaic for Lake LA6. The bright speckling is acoustic scattering from macrophyte stems/leaves. Sand and gravel bars show up as bright patches whereas darker areas in away from shore indicate low acoustic reflection associated with mud, fines and detritus. ..... 29

# INDEX OF TABLES

Table 1. Average observed real-time kinematic (RTK) corrected global positioning system (GPS) orthometric height (elevation msl) recorded from a survey segment where $GPGGA GPS Quality Indicator = 4 and Number of Satellites >= 10. ..... 2

Table 2a. Summary of the survey hardware and software parameter settings. ..... 4

Table 2b. Summary of the Hypack Patch test and MBMAX64 parameter settings. ..... 5

# 1.0 INTRODUCTION

In 2018, EcoMetrix Inc. requested assistance from Milne Technologies to provide multibeam sonar bathymetry data collection, post-processing, map production and reporting towards producing high resolution bathymetry models and nearshore benthic habitat mosaics for a sub-set of Denison Mine, Wheeler River Site lakes. Lakes LA1 (west side of lake only) and LA6 were surveyed over a 3 day period in June 2018. The survey sites have been identified as areas where Denison Mine has proposed to construct intake and/or discharge structures to support mining operations.

The purpose of this report is to provide a detailed description of the data collection and post-processing methodologies as well as a summary of the bathymetry models and GIS deliverables.

# 2.0 DATA COLLECTION AND ANALYSIS METHODOLOGIES

## 2.1 STANDARDIZED DEPTH AND SURVEY ELEVATION

Survey elevation (msl) benchmarks were not available for the survey lakes, however we estimated the lake surface elevation (referenced to mean sea level) from the average observed real-time kinematic (RTK) corrected global positioning system (GPS) Orthometric height (elevation msl) recorded from a survey segment on each lake where $GPGGA GPS Quality Indicator = 4 and Number of Satellites >= 10.

Table 1. Average observed real-time kinematic (RTK) corrected global positioning system (GPS) orthometric height (elevation msl) recorded from a survey segment where $GPGGA GPS Quality Indicator = 4 and Number of Satellites >= 10.

| Lake | Elevation (m) (incldes. 59 cm offset from GPS/INS to water surface) | | | | |
|---|---|---|---|---|---|
| | Average | Std. Deviation | Minimum | Maximum | Count |
| LA1 | 493.88 | 0.02 | 493.81 | 493.97 | 200123 |
| LA6 | 500.24 | 0.30 | 494.26 | 500.60 | 21650 |

## 2.2 KONGSBERG M$^3$ MULTIBEAM SONAR SYSTEM HARDWARE

Bathymetric profiling and imaging was completed using a Kongsberg-Mesotech Ltd. M$^3$ multi-mode multibeam (M$^3$) sonar system.

The M$^3$ sonar system has a nominal operating frequency of 500 kHz with 100 kHz bandwidth. The M$^3$ sonar system was operated in “profiling” mode to obtain high resolution vertical bathymetry points from the lake bottom.

In the sonar “profiling mode”, pulses are generated and received on two independent transducer elements, consisting of a single channel transmitter and a 64 element receiver. The associated signal processing software forms a 120$^o$ swath image (in the athwartship plane) of the water column formed by 256 receive beams, each with an apparent beam-width of <0.5$^o$ x 3$^o$ (figure 1). The M$^3$ host software provides a

sophisticated bottom detection algorithm to generate 256 bottom points per acoustic transmission (or ping).

Raw beamformed data, collected in “fast-profiling” mode, were recorded in the Kongsberg *.mmb file format (see "\\..\EcoMetrix\DenisonMine\Data\M3\ mmb\”). Operating at a rate of 11 to 14 pings per second, the software builds a 3-dimensional point cloud of the bottom in real-time. In post-processing, all raw *.mmb data were replayed in the M3 Host software (version M3 ver. 2.20) using the beamforming over-ride batch processing method (using standard profiling beamforming) and profiling points were exported as Kongsberg *.all type files (see “\\\..\EcoMetrix\DenisonMine\Data\M3\REPLAY_ALL\”).

The Kongsberg $M^3$ multibeam sonar transducer head was mounted on a pole affixed to the port-side gunwale of the Denison Mines supplied aluminum boat. The face of the transducer was deployed approximately 38.0 cm below the water surface. The primary GPS antenna was positioned 192 cm starboard of the sonar head (or 96.5 cm starboard of inertial navigation system (INS)) and was raised up approximately 52.2 cm from the INS (figure 2). A summary of the hardware and software parameter settings are shown in Table 2a.

**Field Note:** *Strong magnetic interference was observed to negatively affect the performance of the inertial navigation system (INS) during the LA6 surveys. This resulted in inconsistent measures of vessel heading. Therefore the INS was taken off line at 15:24 and the heading was calculated from the course-over-ground (COG) and roll was fixed at 2.5$^o$ for the remaining LA6 transects. The INS was recalibrated at camp that evening and operated as expected for the LA1 surveys the next day.*

Table 2a. Summary of the survey hardware and software parameter settings.

| Hardware and/or Software | Parameter | Units / Comments | LA6 | LA6 > 0018_20180624_152405.HS2x | LA1 |
|---|---|---|---|---|---|
| Date | | | June 24 | June 24 | June 25 |
| M3_Host_SW | CastAway M3 Max Sound Velocity | m/s | 1484.3 | 1484.3 | 1484.8 |
| | X Offset (m) athwartship | m | -0.965 | -1.917 | -0.965 |
| | Y Offset (m) alongship | m | 0 | 0 | 0 |
| | DEPTH (m) Sonar to Surface | m | 0.38 | 0.38 | 0.38 |
| | Z Offset (m) Sonar to GPS | m | -0.97 | -0.97 | -0.97 |
| | Orientation | | Inverted Downward | Inverted Downward | Inverted Downward |
| | Pitch Angle | (°) | -90 | -90 | -90 |
| | Roll Angle | (°) | 0 | 0 | 0 |
| | Yaw Angle | (°) | 180 | 180 | 180 |
| Ellipse-E INS Lever Arms to Antenna | X Offset (m) alongship | m (Aft is "-") | 0 | 0 | 0 |
| | Y Offset (m) athwartship | m (Port is "-") | 0.952 | 0.952 | 0.952 |
| | Z Offset (m) GPS Antenna to INS | m (GPS over INS "-" value) | -0.522 | -0.522 | -0.522 |
| Ellipse-E INS Main Lever Arms to Centre Point | X Offset (m) athwartship | m (Aft is "-") | 0 | 0 | 0 |
| | Y Offset (m) alongship | m (Port is "-") | 0 | 0 | 0 |
| | Z Offset (m) INS to Centre of Mass | m (CTR over INS "-" value) | 0 | 0 | 0 |

Table 2b. Summary of the Hypack Patch test and MBMAX64 parameter settings.

| Hardware and/or Software | Parameter | Units / Comments | LA6 | LA6 > 0018_20180624_ 152405.HS2x | LA1 |
|---|---|---|---|---|---|
| Hypack Patch Test | Yaw Angle (o) Offset | (°) | 1.25 | 1.25 | 1.25 |
| | Pitch Angle (o) Offset | (°) | -1.5 | 0 | -1.5 |
| | Roll Angle (o) Offset | (°) | 1.03 | 2.5 | 1.03 |
| Hypack M3 | Starboard Offset | m | 0 | -0.952 | |
| | Vertical Offset | m | -0.59 | -0.59 | -0.59 |
| MBMAX64 | Filter - Over/Under | | YES | YES | YES |
| | Filter - Beam limits per side | (°) | 57 | 57 | 57 |

| | |
|---|---|
| *Note vertical offset adjusted | |
| 0034_20180624_160149.HS2x | 0.69 |
| 0035_20180624_160544.HS2x | 0.69 |
| **Note ROLL offset adjusted | |
| 0034_20180624_160149.HS2x | -1.5 |
| 0035_20180624_160544.HS2x | -1.5 |

## 2.3 REAL-TIME KINEMATIC (RTK) GPS CORRECTIONS AND VESSEL ATTITUDE CORRECTIONS (HEAVE, PITCH AND ROLL)

Horizontal spatial accuracy was typically better than 12 cm with the deployment of the on-site Hemisphere GPS R120 DGPS receiver RTK base-station that provided real-time GPS satellite receiver phase corrections to the survey data stream. The RTK base station was positioned on shore with an unobstructed view of the sky and also provided a consistent "line-of-sight" to the survey vessel (figure 3). RTK corrections were provided to the survey vessel using a pair of Microhard VIP 2.4 GHz radios and L-Comm 8 dB antennas. The rover GPS system was a Hemisphere VS110 DGPS with true-heading capabilities. Fine-scale pitch, roll and vessel heave corrections were measured at the sonar pole mount using an SBG Systems Ellipse-E Inertial Navigation System (INS).

## 2.4 PATCH TESTS (PITCH, ROLL, HEADING AND SENSOR LATENCY CALIBRATIONS)

The "patch test" corrects for residual mounting angle errors that remain after the static calibration (physical measurements of sensor mounting locations) is defined. The method utilizes the repeatability of lakebed features when viewed from different geometries (i.e. transect offsets, opposing transect directions and varying survey speeds) in order to determine the residual mounting angles between the sonar transducer, inertial navigation system and RTK corrected Differential Global Positioning System (DGPS). Patch tests are most successful over deep water where angle measurement errors are lowest. Patch test data were collected on Lake LA1 at the end of the survey day. Post-processing of the patch-test data followed the recommendations in the Kongsberg Mesotech "Collecting and processing bathymetry data: User Manual" (Smith 2013). Patch tests data were processed in Hypack 2018 HySWEEP hydrographic processing software (HYPACK, Inc., Middletown CT.). Patch test corrections are shown in Table 2b.

## 2.5 SOUND VELOCITY

The sound velocity profile was estimated from the observed water temperature, salinity and conductivity at the beginning of each survey day. "Conductivity-Temperature-Depth" (CTD) profile data were recorded using a Sontek CastAway profiling logger (figure 4). Sound velocity profiles were exported from the CastAway software as a *.vel file and imported into the Hypack 2018 HySWEEP hydrographic processing software.

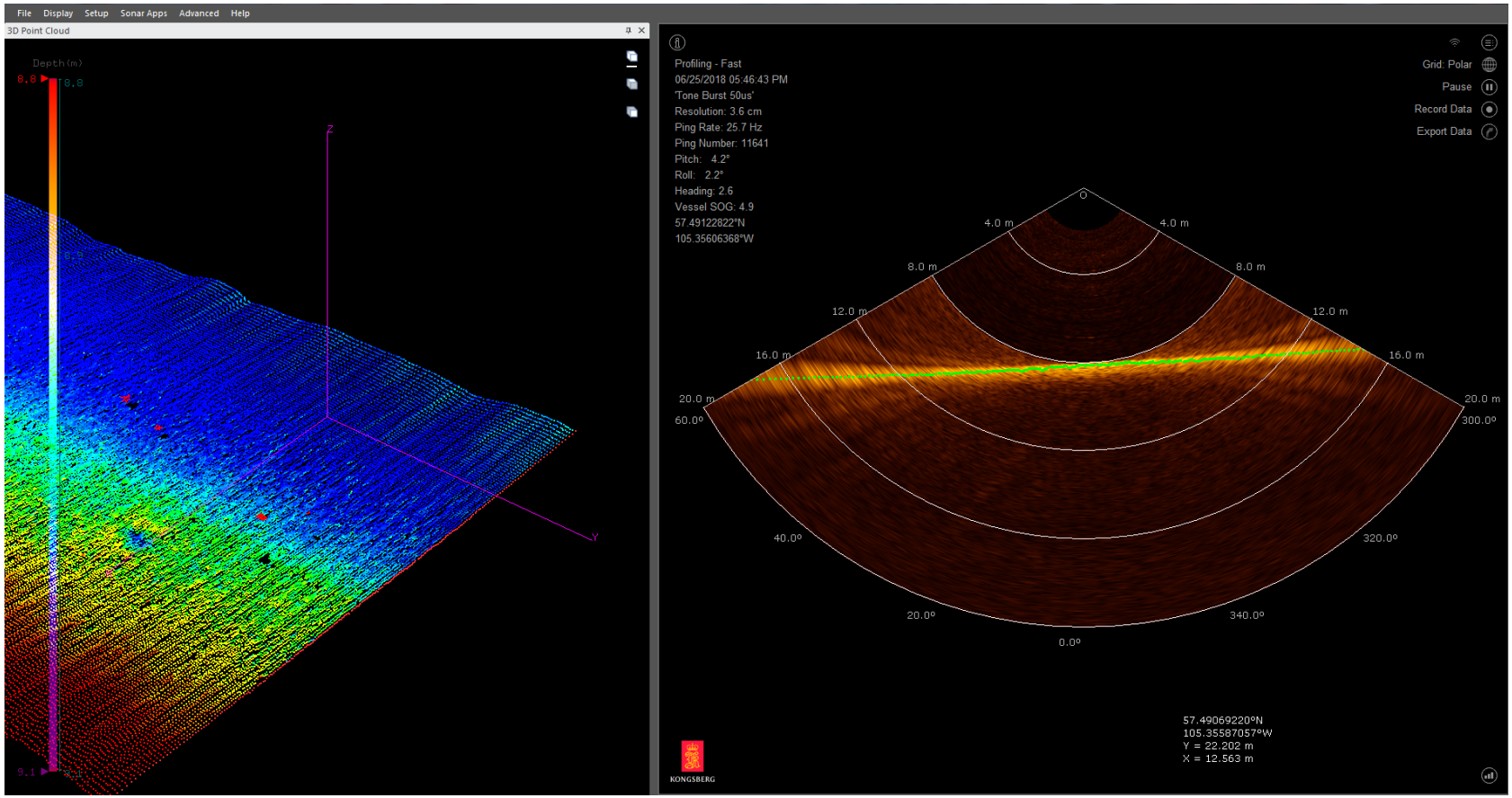



Figure 1. Screen shot from the Kongsberg M³ data collection software. The real-time 3D point cloud (from Lake LA1) is shown in the left panel and a frame from the M3 multibeam sonar echogram is shown in the right panel. The bottom detection points are shown as green dots.

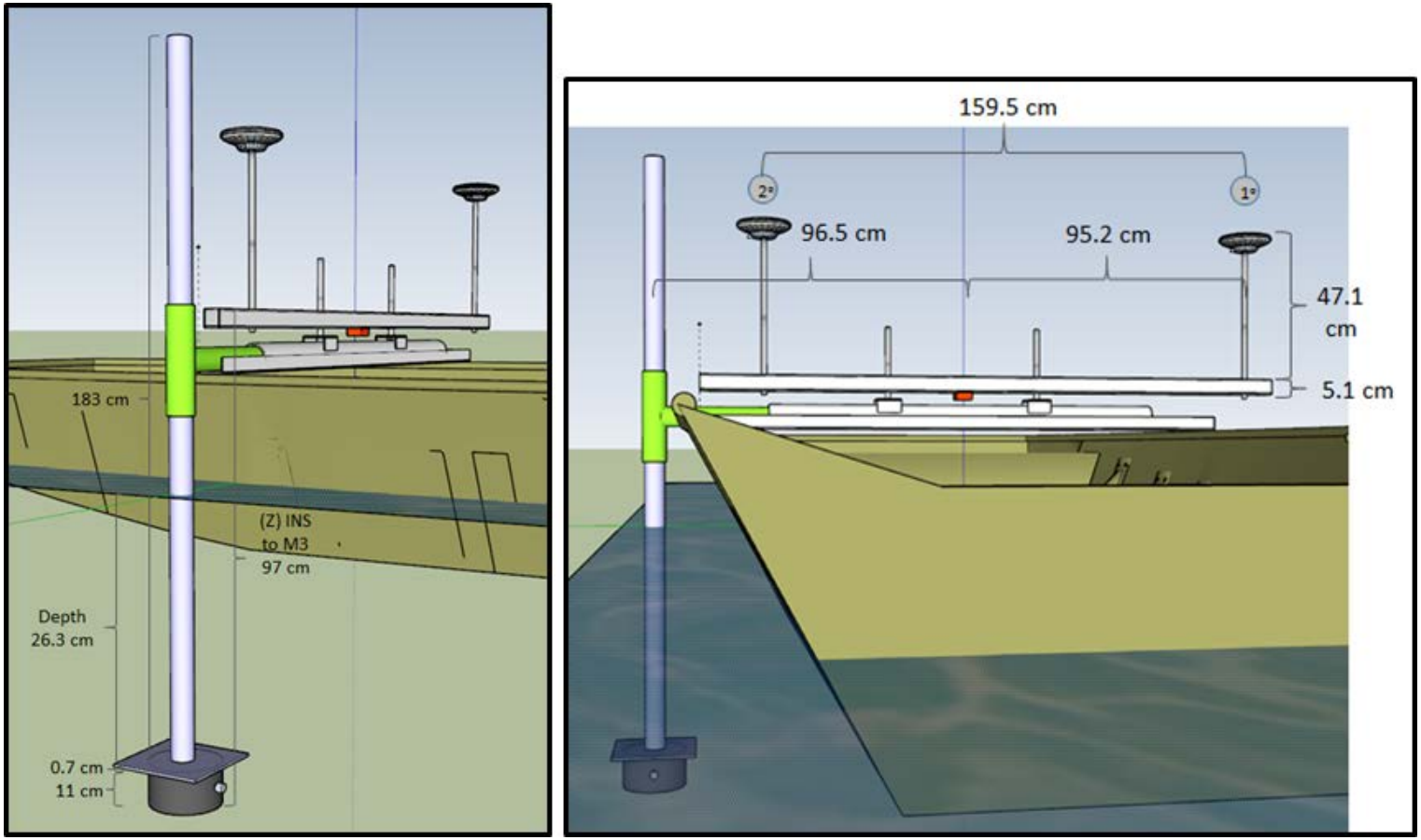



Figure 2. The Kongsberg M$^3$ sonar system set up on the aluminum boat.

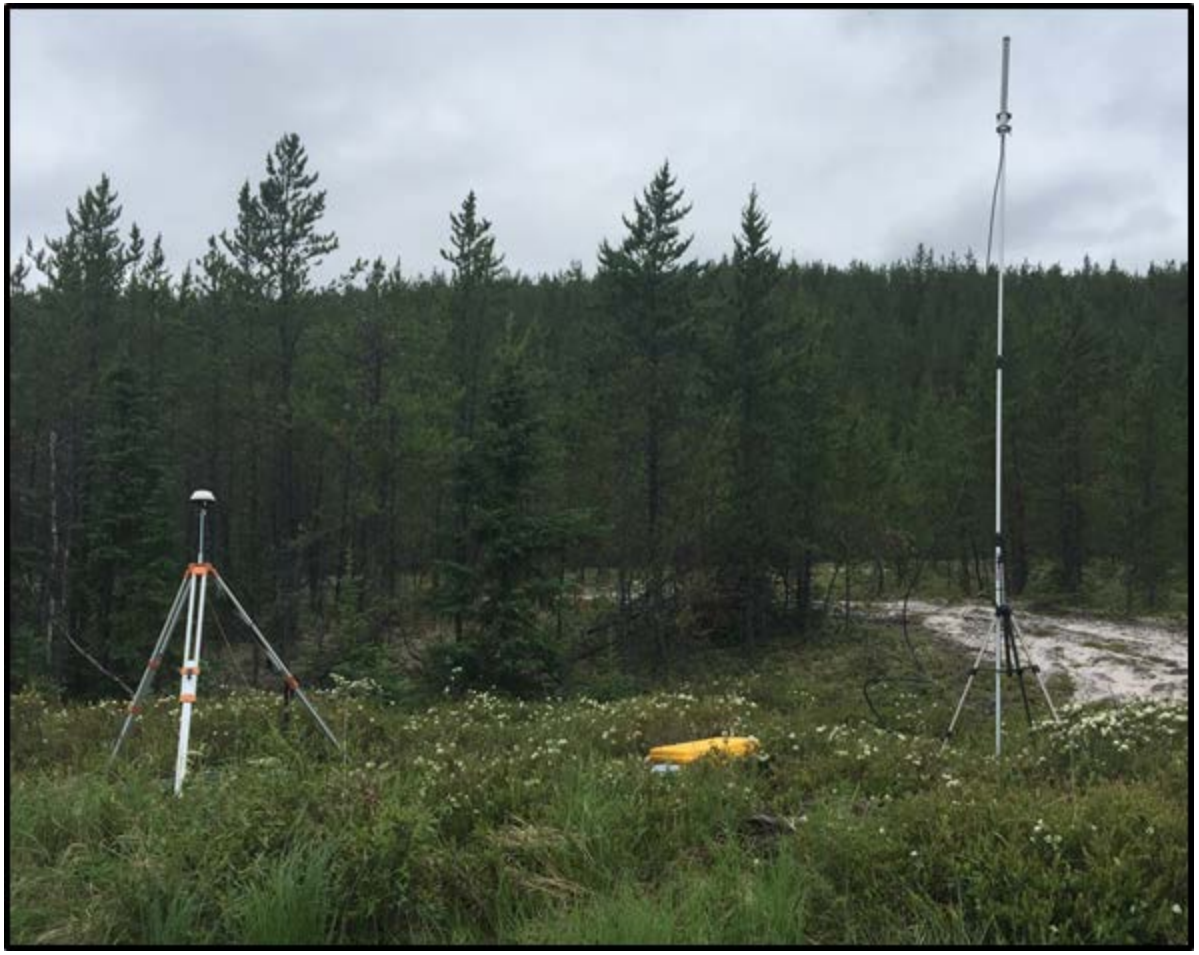


Figure 3. Shown is the Real-time Kinematic (RTK) GPS base-station and radio modem set-up on Lake LA6. A similar setup was deployed at Lake LA1.

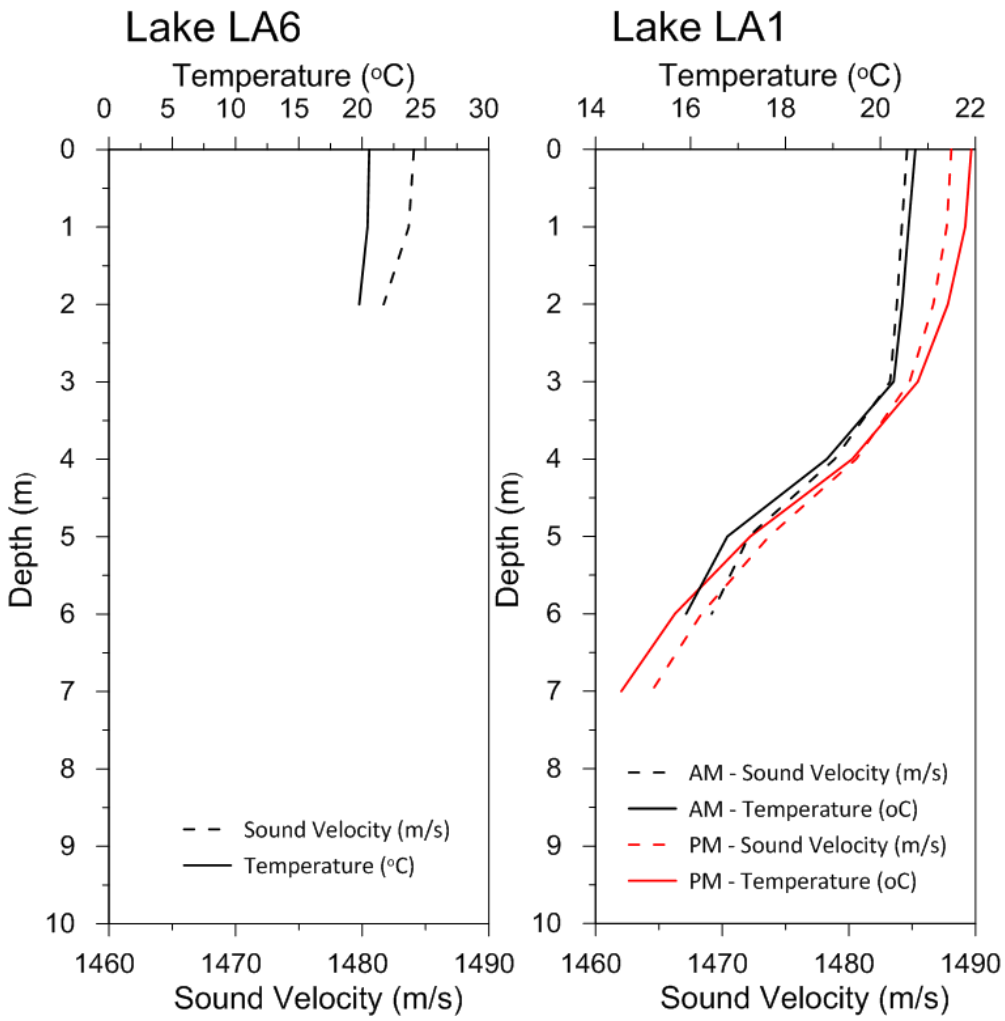



Figure 4. Observed Sontek CastAway "Conductivity-Temperature-Depth" (CTD) sonde water temperature (°C) and sound velocity (m/s) profiles for Lakes LA6 and LA1 recorded on the bathymetry survey day. Profiles recorded before commencing surveys are shown as black lines and post-survey are shown as red lines.

## 2.6 MULTIBEAM SONAR BATHYMETRY PROFILING

Kongsberg $M^3$ sonar echograms for all surveys were logged to the laptop in the native *.mmb format. All files were replayed in the $M^3$ host software and the 3D point cloud was exported to the Kongsberg *.all data format and imported into Hypack HySWEEP hydrographic software (HYPACK, Inc., Middletown CT.). Within Hypack hydrographic software, *.hsx multibeam data files were generated and imported into the HySWEEP Editor - 64 multibeam processing module within Hypack. Within HySWEEP, wiggle plots of the bathymetry files were generated to identify and remove outliers, fish detections, side-lobe and sub-bottom detections. File segments where GPS problems were observed were removed. Patch test data were processed to determine roll, pitch, yaw and sensor latency offsets. Scrubbed *.hs2x files (\\..\EcoMetrix\DenisonMine\Data\Hypack2018\Projects\DenisonMines\Edit) were then compiled onto a 0.1 m x 0.1 m grid and the average (AVG) depths were assigned to each cell from all observed bathymetry points that fell within the grid cell. To keep file sizes manageable, grid cells were then resampled to a 0.3 m x 0.3 m cell size and were exported as an *.xyz text file ("LA1_AVGZ_030cm_XYZ.txt" and "LA6_AVGZ_030cm_XYZ.txt") for importing into ESRI ArcGIS (ESRI). XYZ files are available in "\\..\EcoMetrix\DenisonMine\Data\Hypack2018\Projects\DenisonMines\Sort\".

## 2.7 BATHYMETRY SURFACE CREATION IN ARCGIS

The lake outlines (provided by EcoMetrix Inc.) for each of the survey lakes were modified and/or redigitized to contain all the observed XYZ data points. The lake outlines were split into 1 m segments and converted to XYZ points where Z = 0 m.

The multibeam sonar bathymetry survey data was limited to a minimum depth of 48 cm over the shoals. Where the shoreline was > ~25 m from the survey transect or where the area was too shallow (< 1 m) to be safely surveyed, we estimated the nearshore depth as ~40 cm (LA1) or ~50 cm (LA6) to generate a more realistic littoral area slope between the shoreline and the closest bathymetry survey point. Maps of the modified shoreline and the estimated contour lines are shown in Figures 5a-b.

Within the GIS, we used the 3D Analyst ArcGIS extension to generate a triangulated irregular network (TIN) surface from the XYZ bathymetry grid points, the modified shoreline points and the estimated ~40 cm (LA1) or ~50 cm (LA6) contour points. The

TIN surface was clipped using the “Delineate TIN Data Area” tool to remove all TIN components with an edge > 50 m. We used the Convert TIN to Raster tool to present the bathymetry model as an ArcGIS GRID with a 0.3 m x 0.3 m cell size.

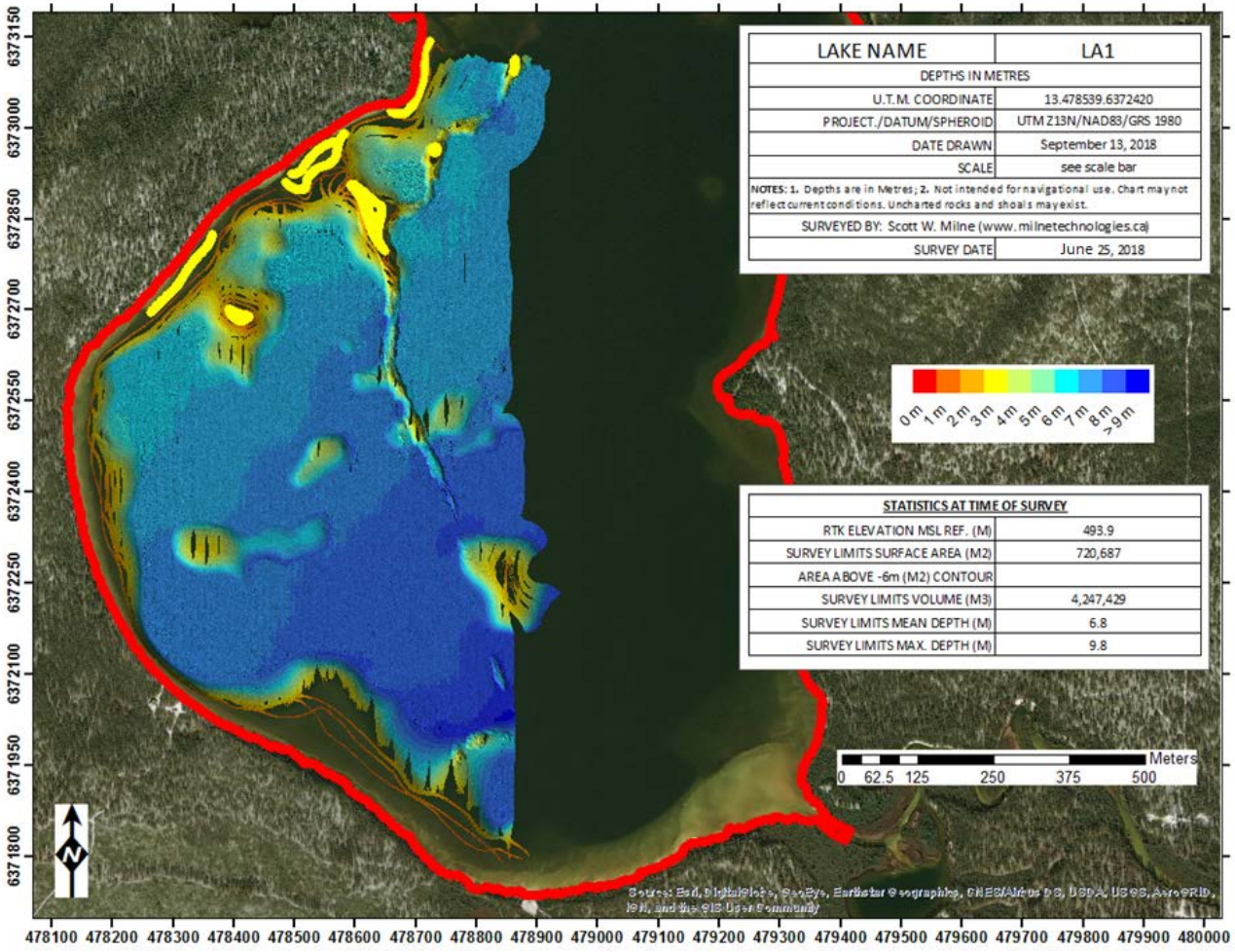



Figure 5a. Map of Lake LA1 showing the observed multibeam sonar bathymetry survey coverage (TIN model), the modified shoreline points (red points) and the estimated 40 cm depth contour points (yellow points).

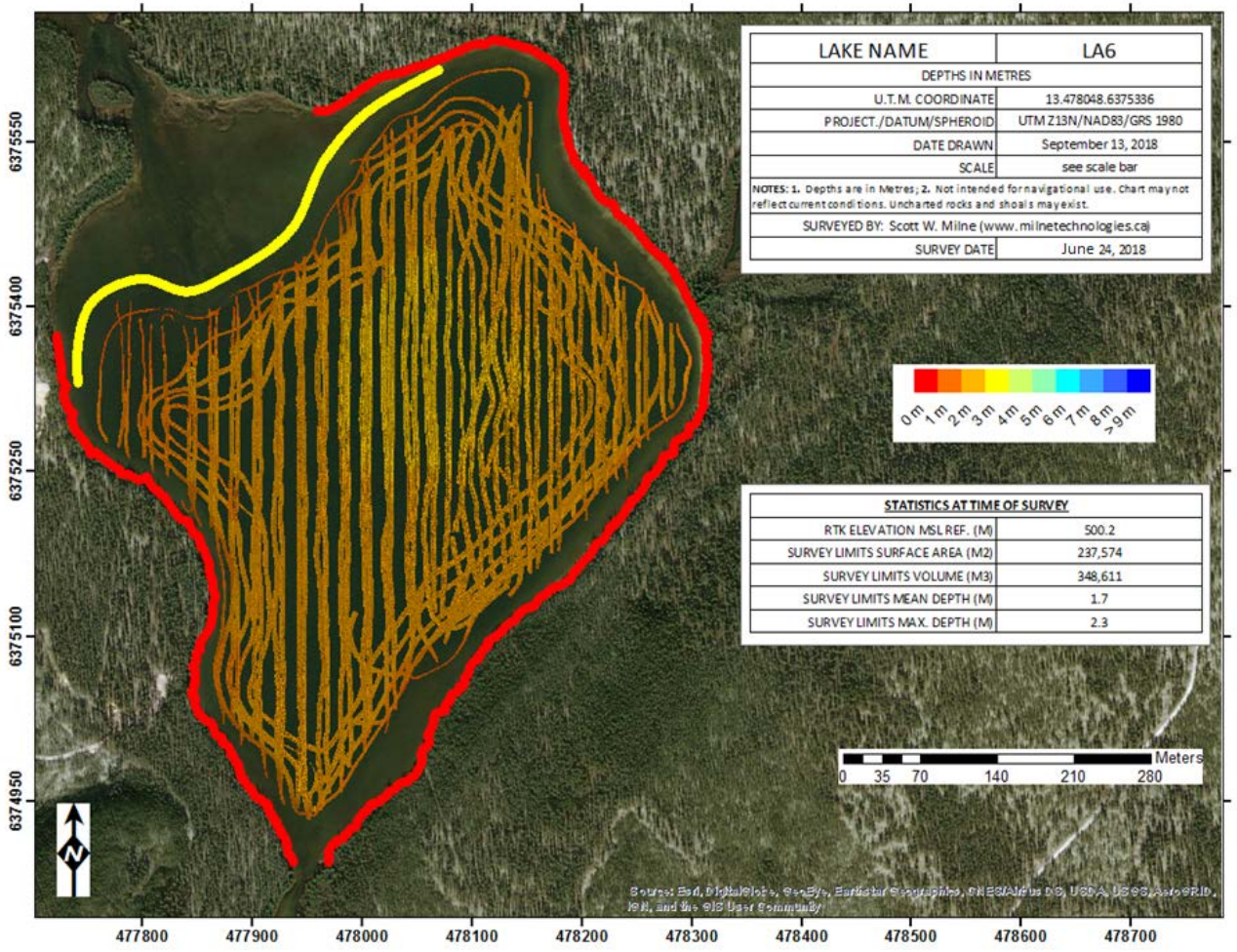



Figure 5b. Map of Lake LA6 showing the observed multibeam sonar bathymetry survey coverage (TIN model), the modified shoreline points (red points) and the estimated 50 cm depth contour points (yellow points).

## 2.8 MBES HABITAT MOSAICS (VEGETATION COVERAGE, COURSE WOODY DEBRIS AND BOTTOM SUBSTRATE COMPLEXITY)

Similar to the multibeam bathymetry surveys described above, we deployed the $M^3$ multibeam echosounder system from the Denison Mines aluminium boat. For this task the sonar head was oriented to look horizontally from the side of the survey vessel. The $M^3$ was operated in "eIQ imaging mode" to record high resolution images of the lake bottom features (course woody debris, boulders, submerged aquatic vegetation (SAV) etc.), relief (cobbles, rocks and gravel vs. mud, old tires etc.) and infrastructure (lost exploration gear, submerged pipes etc.). These images were "stitched" together on-the-fly using "Stand-Alone Mosaicking Module for Forward Looking Sonar" (SAMM-FLS, Oceanic Imaging Consultants, Honolulu, Hawaii, USA) sonar processing software. This software provided a geo-referenced "picture" (or mosaic of sonar images) of the nearshore (<8m) benthic habitat. In the sonar imaging mode, pulses were generated on 4 independent element arrays and received on a single transducer array, consisting of a 4 channel transmitter and a 64 element receiver. The associated signal processing software formed a $140^o$ swath image (in the horizontal plane), of the water column formed by 216 receive beams, each with a beam-width of $0.8^o$ x $30^o$ (at nadir).

All "Stand-Alone Mosaicking Module for Forward Looking Sonar" (SAMM-FLS) project files are available in the directory "\\..\EcoMetrix\DenisonMine\Data\SAMM_FLS\LA1\" and "..\LA6\".

## 2.9 RELEVANT GIS LAYERS

**.. \\EcoMetrix\DenisonMine\GIS\Bathy**

*Note: "LA*x*" is the lake name (**1** or **6**)

LA*x*_AVGZ_030cm_XYZ_MODEL.lyr – Observed average depth calculated from all observed multibeam sonar profiling points within each 30 cm grid cell.

LA*x*_BathyContour_1m.lyr – 1 m depth contour polylines generated from the triangulated irregular network (TIN) bathymetry surface. Note that the layer includes a definition query expression "LENGTHM" >=50.

LA*x*_BATHY_MODEL.lyr – The triangulated irregular network (TIN) surface generated from the **average** XYZ bathymetry grid (0.3 m x 0.3 m) points. This layer combines all the high resolution bathymetry data, shoreline points and the estimated 40 cm or 50 cm contour points.

LA*x*_BATHY_RAW.lyr – The triangulated irregular network (TIN) surface generated from the **average** XYZ bathymetry grid (0.3 m x 0.3 m) points. This layer includes only the observed high resolution bathymetry data (no shoreline points and no estimated contour points).

**.. \\EcoMetrix\DenisonMine\GIS**

LA-*x* Shoreline.lyr –Lake outline polygon provided by EcoMetrix Inc.

**.. \\EcoMetrix\DenisonMine\GIS\SAMM_FLS**

SAMM_LA1.tif.lyr - The SAMM-FLS habitat imaging mosaic from LA1, shoreline and shoals.

SAMM_LA6_Shoreline.tif.lyr - The SAMM-FLS habitat imaging mosaic from LA6 shoreline area.

SAMM_LA6_CentreBasin_4cm.tif.lyr – The SAMM-FLS habitat imaging mosaic from LA6 centre basin area.

SAMM_LA*x*_HABITAT.lyr – Unsupervised substrate classification polygons traced from the SAMM_FLS mosaics. Unsupervised substrate classes include sand, gravel, submergent and emergent vegetation.

## 3.0 RESULTS

All map products (standard and high-resolution) are available in the folder "**.. \\EcoMetrix\DenisonMine\GIS\Images\"**. High resolution (600 dpi) versions of the maps within this report are indicated with the "_HIRES.bmp" suffix.

Additional figures and maps are available in "**.. \\EcoMetrix\DenisonMine\Data_Summary\2018_WheelerR_L1L6_MBES_Bathymetry_Mapping_Report-AppendixI.pptx**".

The bathymetry surface for the survey area within Lake LA1 is shown in figure 7a-d. Within the survey area, the observed mean and maximum depth is 6.8 m and 9.8 m, respectively. The nearshore area of Lake LA, within the survey area, is characterized by a shallow sand beach shelf that extends 15 m to 133 m out from shore. The edge of the beach shelf is steep, falling away quickly into a broad flat basin with a bottom depth of approximately 8 m. Within the basin, a number of shoal features and ridge-lines are apparent.

Although bottom sampling was not completed (i.e. underwater video, Ekman dredge sampling, etc.), horizontal sonar imaging reveals that these shoal features are significantly more acoustically reflective (i.e. harder substrates such as gravel, cobble and sand) than the flat basin that appears to be less reflective (indicating soft substrates, mud, detritus etc.)(figure 8). Both the bathymetry and horizontal sonar imaging surveys revealed very low densities of submerged vegetation stems within the main basin and on the shallow sand beach shelf. There was also no obvious accumulation of coarse woody debris or large rocks and boulders. Although backscatter intensity was relatively high over the mid-lake shoals, the absence of acoustic shadows and low bathymetry relief indicate the substrate in these areas are likely sand, gravel and small cobble with very few large rocks.

The bathymetry surface for the survey area within Lake LA6 is shown in figure 10a-d. This very shallow lake had an observed mean and maximum depth of only 1.7 m and 2.3 m, respectively. The lake morphology can be described as a "frying pan" shape with a very shallow and flat bottom and a relatively short slope up to the shoreline. Acoustic backscatter within the mid-basin indicates the substrate is very soft and suggests the acoustic detected bottom substrate has a high water content, almost flocculent-like. Although the $M^3$ MBES bottom detection algorithm is robust, in this case, the bottom point detections within ~ $15^o$ of the beam nadir varied in range (or depth) by approximately 10 to 15 cm. This is likely why the bathymetry models shows some "striping" in the north-south orientation.

Water depth within the region of the intake delta at the north-west corner of Lake LA6 was too shallow to safely survey. The relative acoustic backscattering strength at the outer edge of the intake delta and near the outflow was much higher than that of the main basin and may indicate harder substrate types such as sand (at outflow) and sand gravel mix (at edge of inflow delta).

Physical bottom sampling was not completed on Lake LA6, however the horizontal sonar imaging reveals some relevant habitat features such as stands of emergent and submergent vegetation, sand bars, probable gravel patches and some unknown features that may be lost exploration gear, tires and culverts (figure 11).

Dense patches of long-stemmed submergent vegetation were observed near the intake delta edge on the west side of the lake. Elsewhere, although sparse, some submergent vegetation stems were observed in the mid-basin, however the stem heights were only approximately 10 to 20 cm. Emergent vegetation was limited to the nearshore and shoreline areas.

A large nearshore horse-shoe shaped patch at the southern end of Lake LA6 showed a relatively strong acoustic reflection consistent with sand. Other small patches of relatively strong reflective material are consistent with gravel as these areas showed fine shadowing indicating substrate roughness. Overall, the dark colour of the sonar mosaics within the main basin indicates a relatively low acoustic backscattering strength that is consistent with a mud or detritus bottom with high water content.

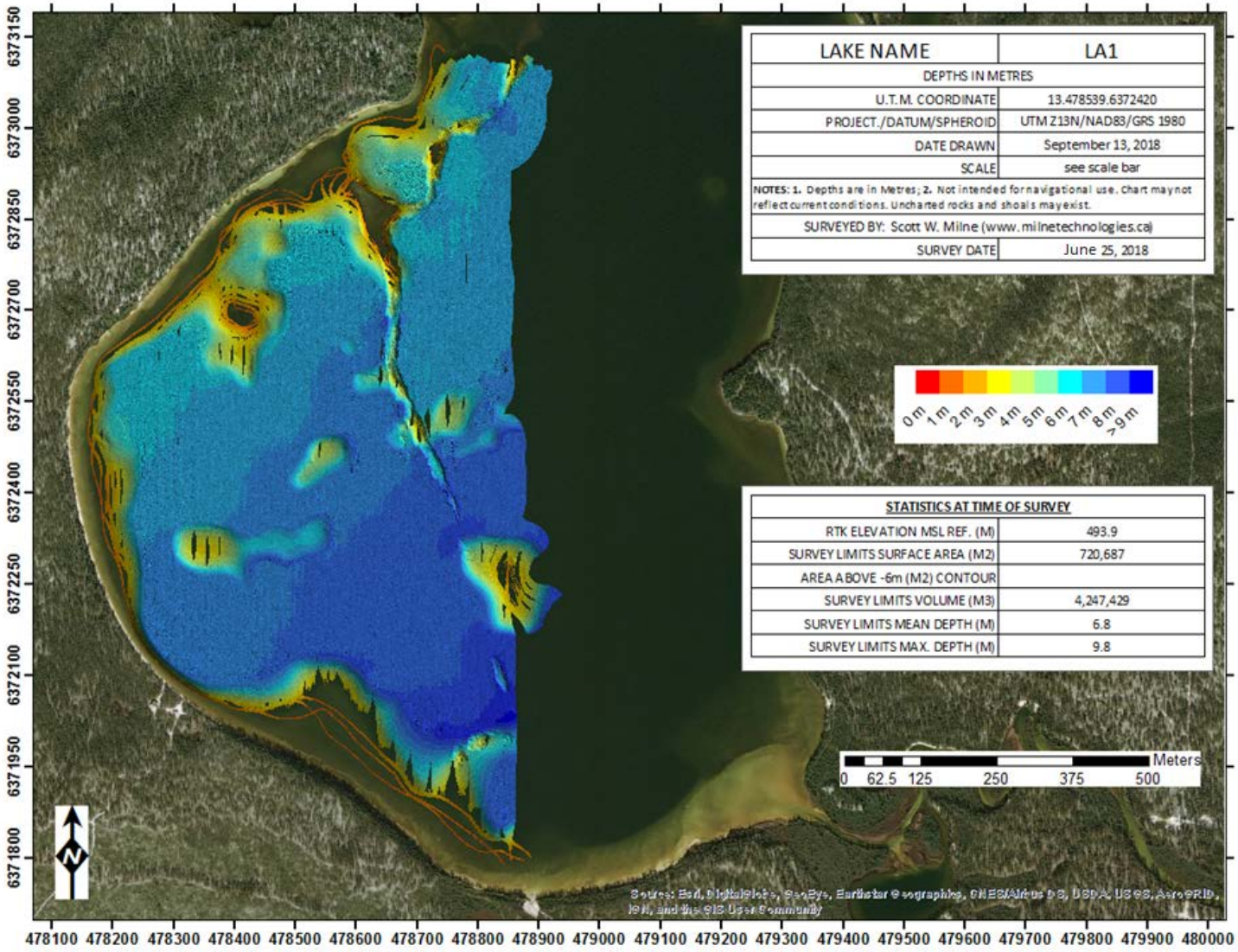



Figure 6. Observed multibeam sonar bathymetry survey coverage of Lake LA1.

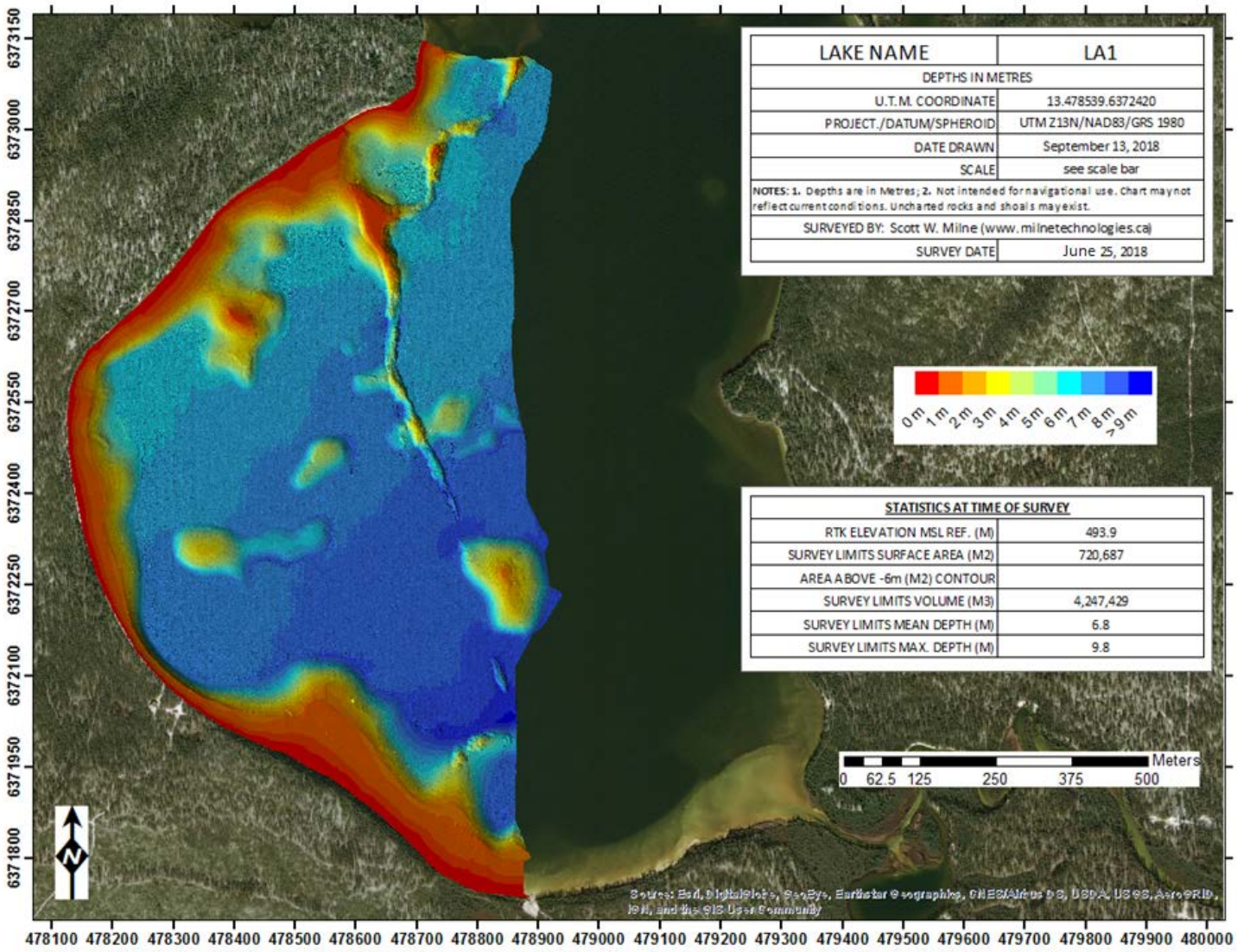



Figure 7a. Shown is the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA1. The bathymetry model includes the observed average multibeam sonar bathymetry points, the lake outline points (where z = 0 m) and the estimated 40 cm contours.

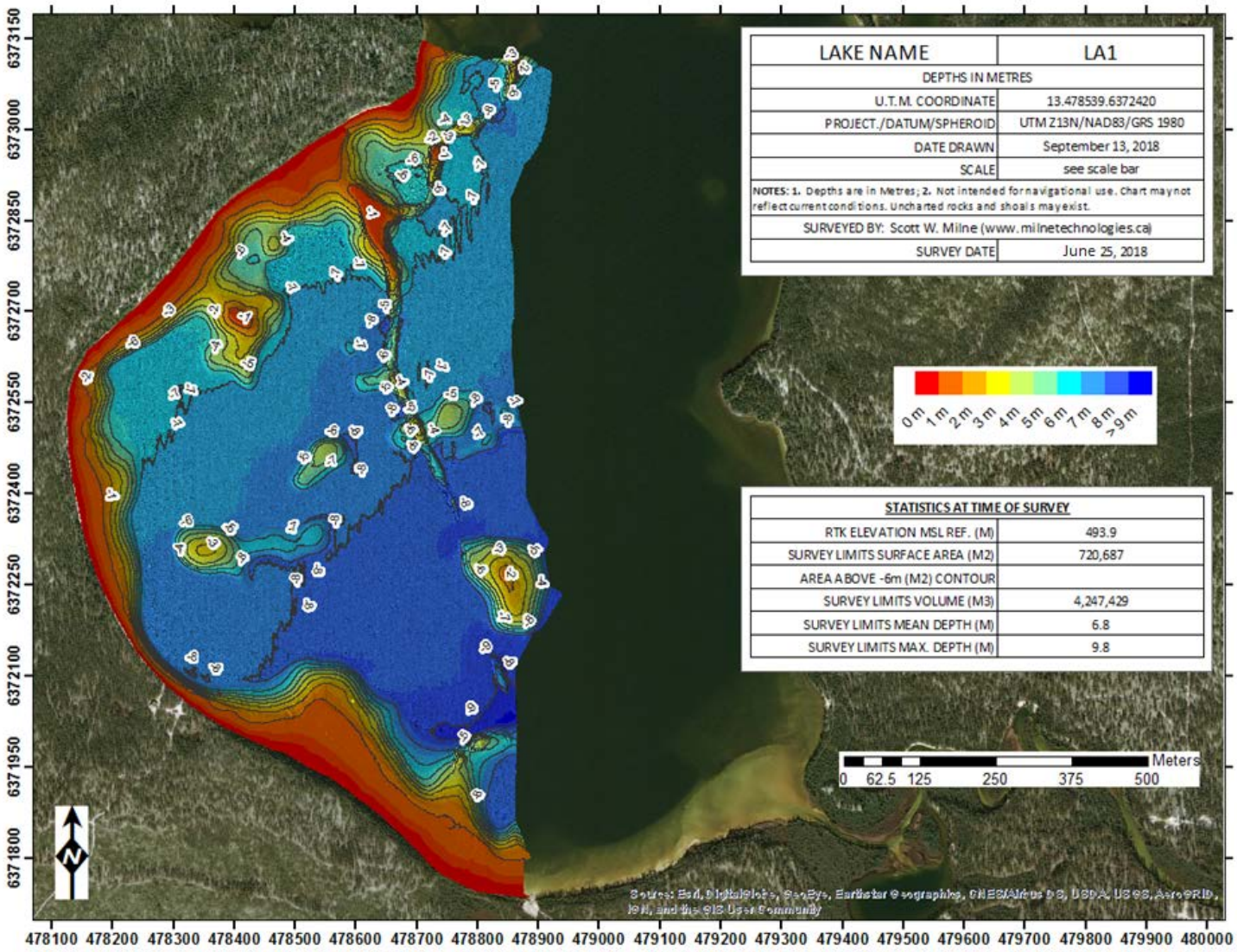



Figure 7b. Same as 7a and includes 1 m depth contour lines.

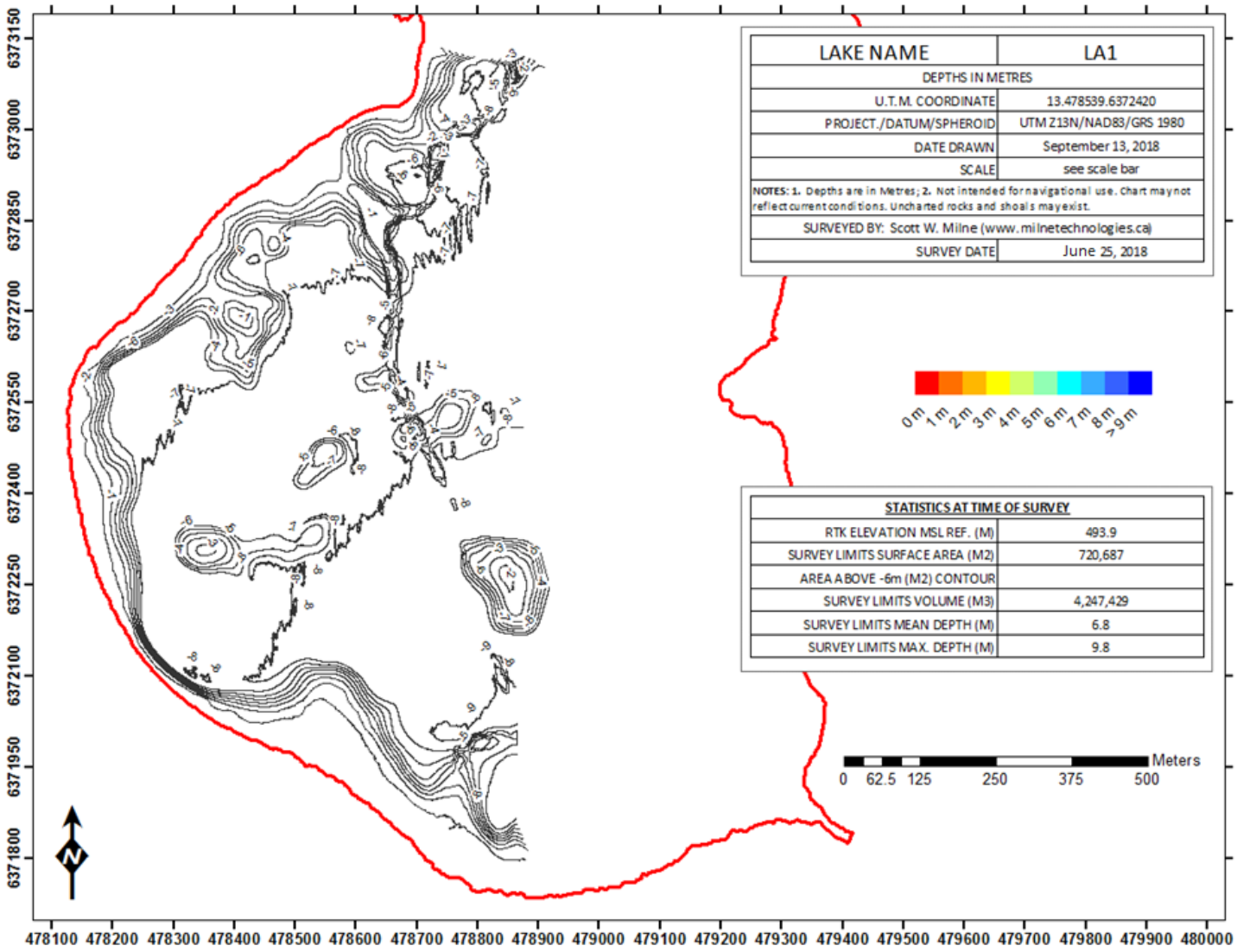



Figure 7c. 1m depth contours generated from the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA1.

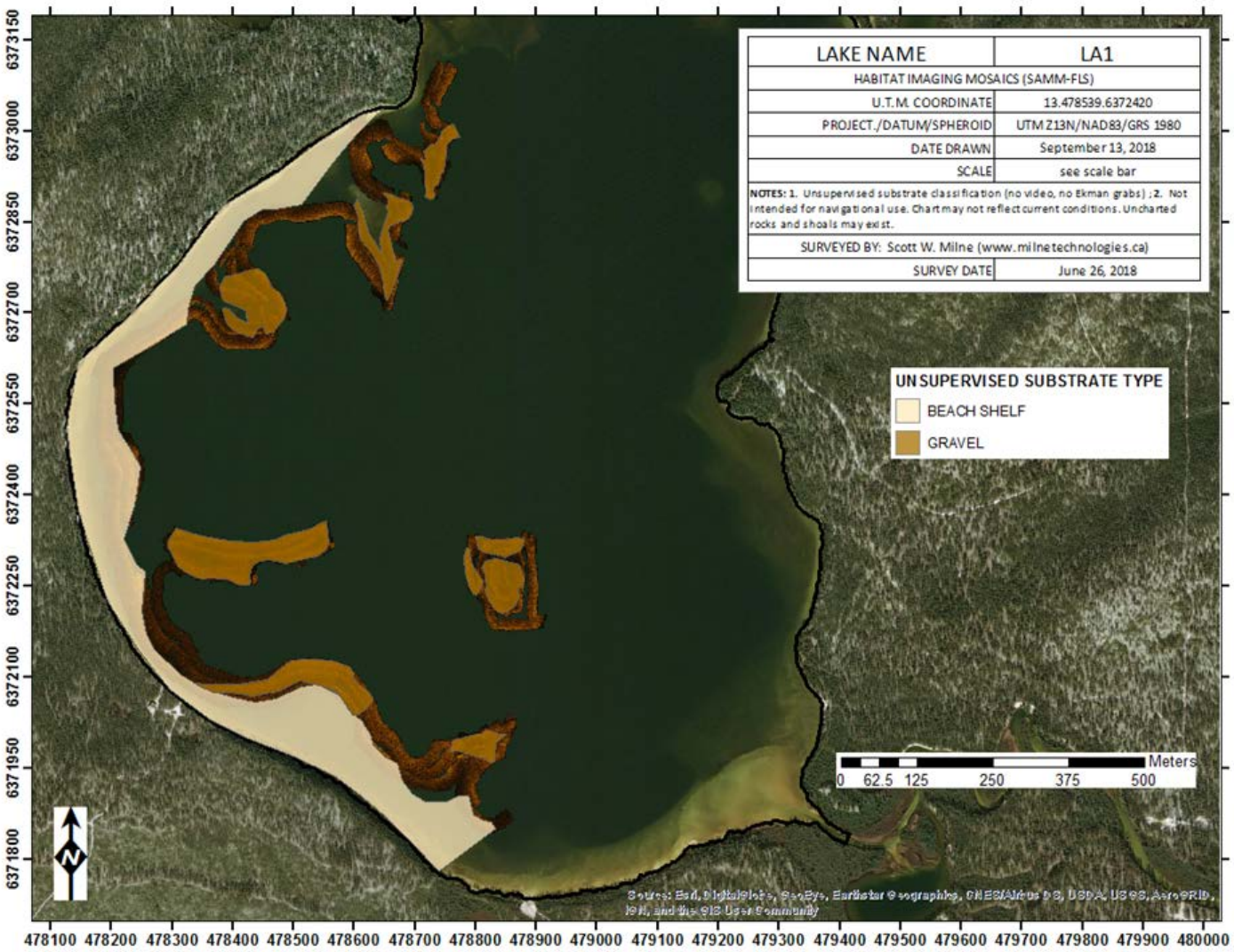



Figure 8. . Sonar imaging habitat mosaic for the Lake LA1 nearshore and shoals. Sand and gravel bars show up as bright patches whereas darker areas in away from shore indicate low acoustic reflection associated with mud, fines and detritus.

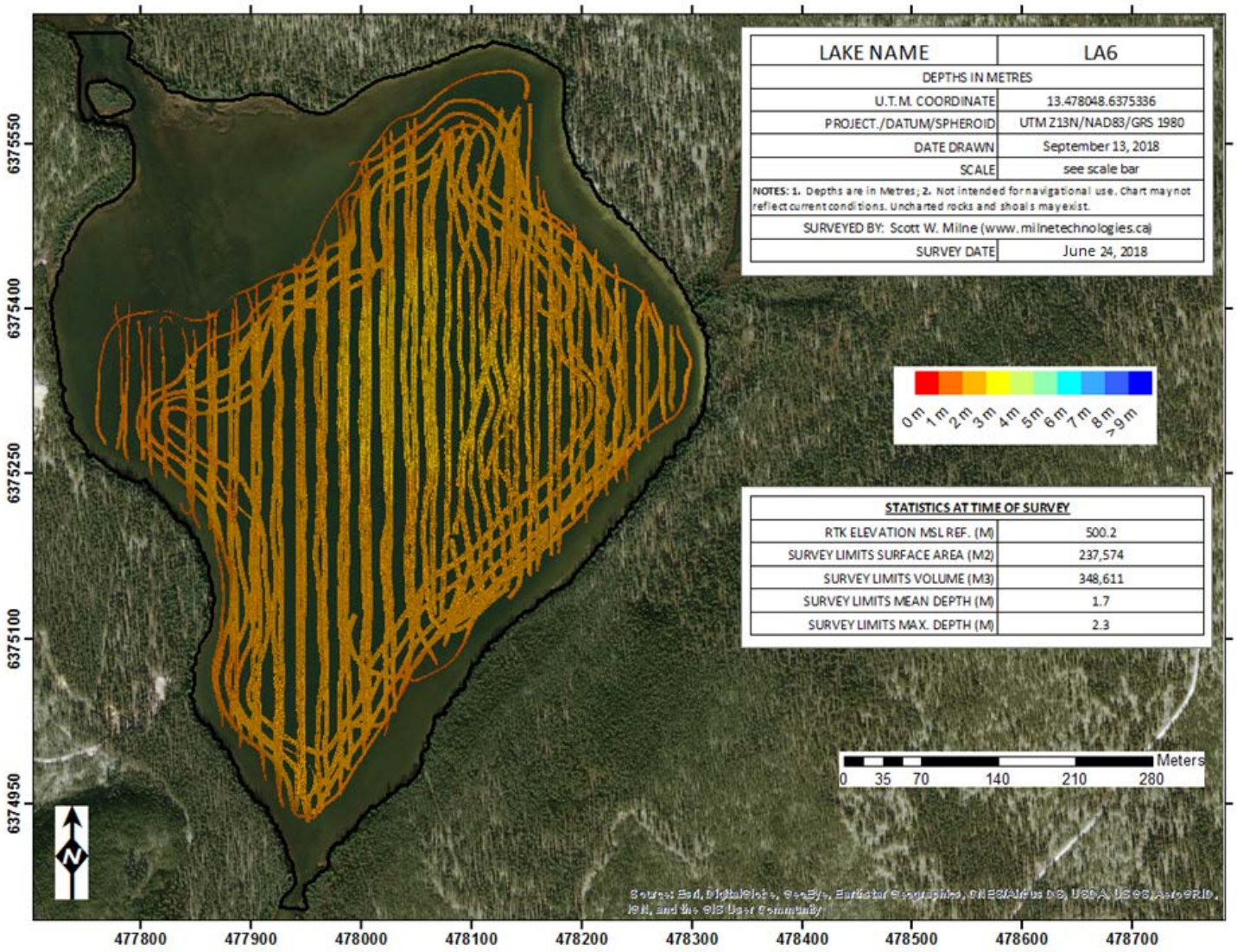



Figure 9. Observed multibeam sonar bathymetry survey coverage of Lake LA6.

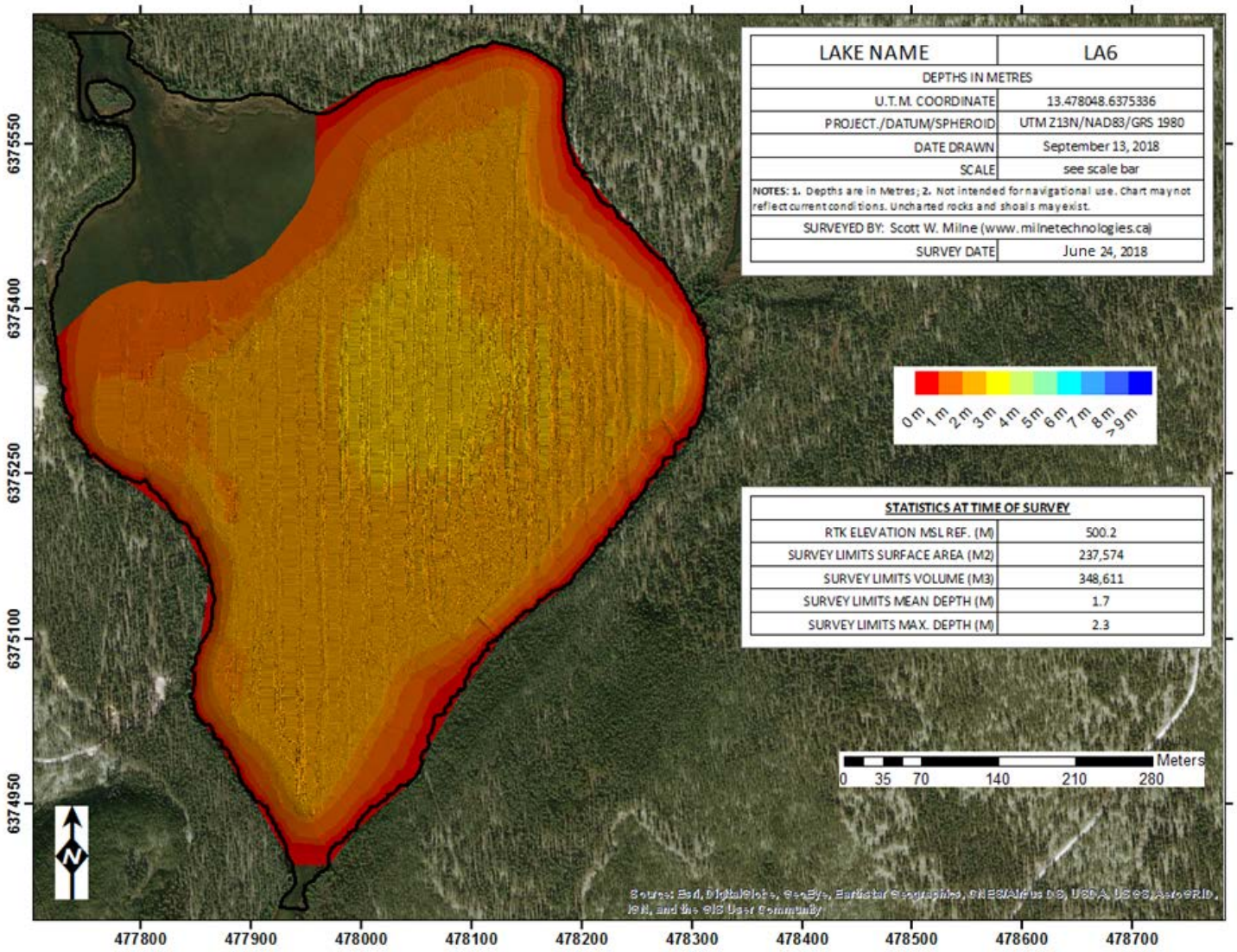



Figure 10a. Shown is the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA6. The bathymetry model includes the observed average multibeam sonar bathymetry points, the lake outline points (where z = 0 m) and the estimated 50 cm contours.

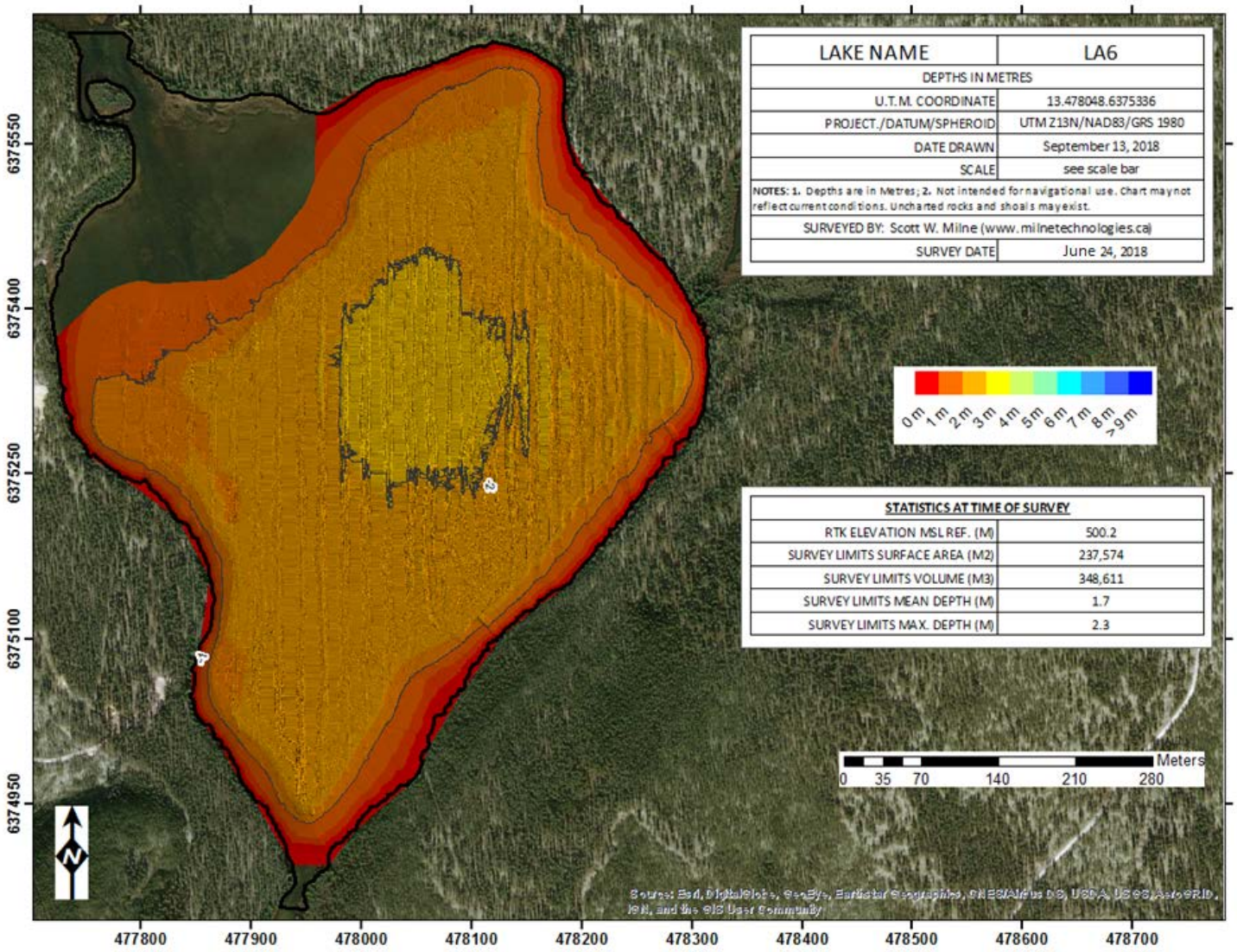



Figure 10b. Same as 9a and includes 1 m depth contour lines.

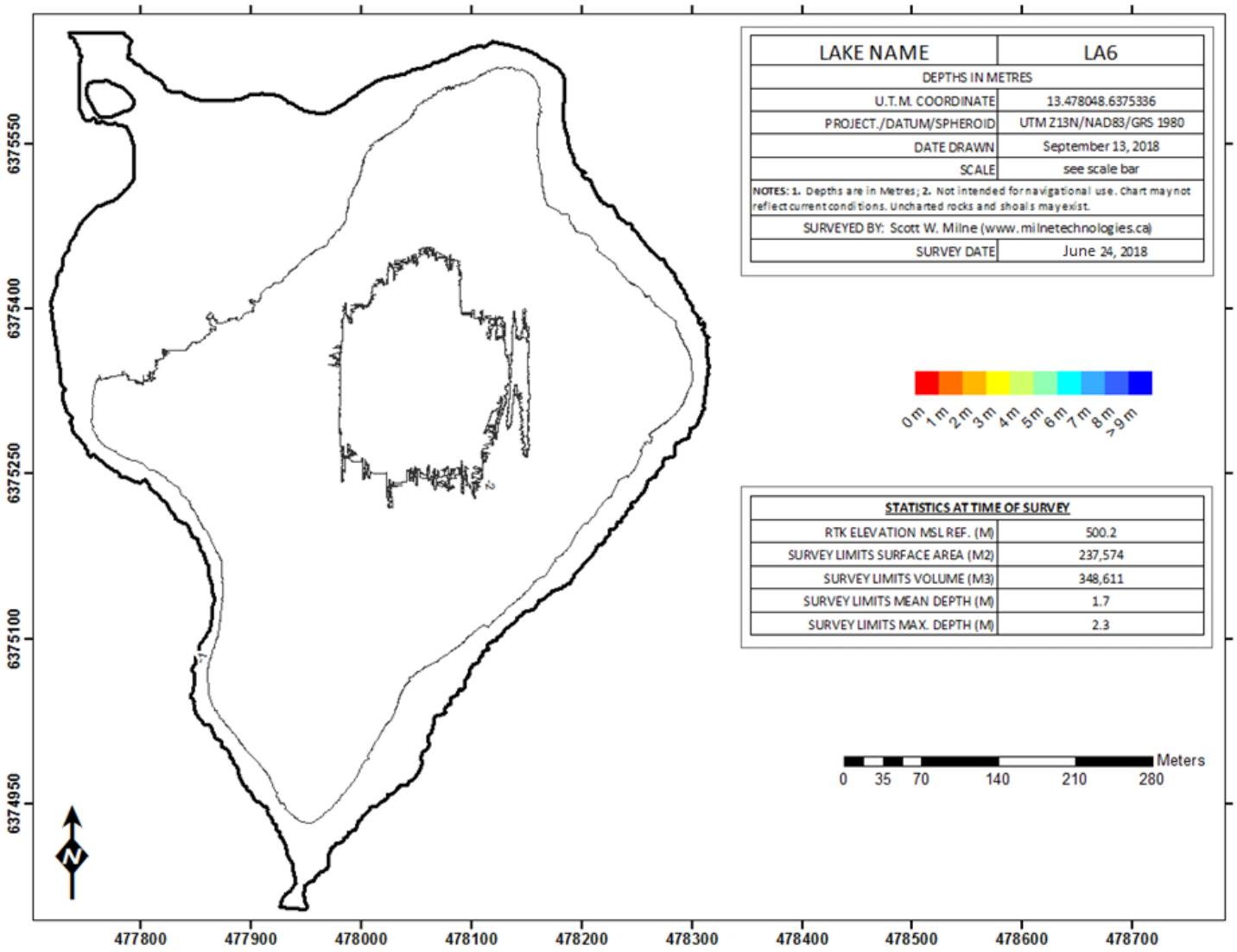



Figure 10c. 1m depth contours generated from the acoustic detected bottom bathymetry TIN (30 cm x 30 cm) model for Lake LA6.

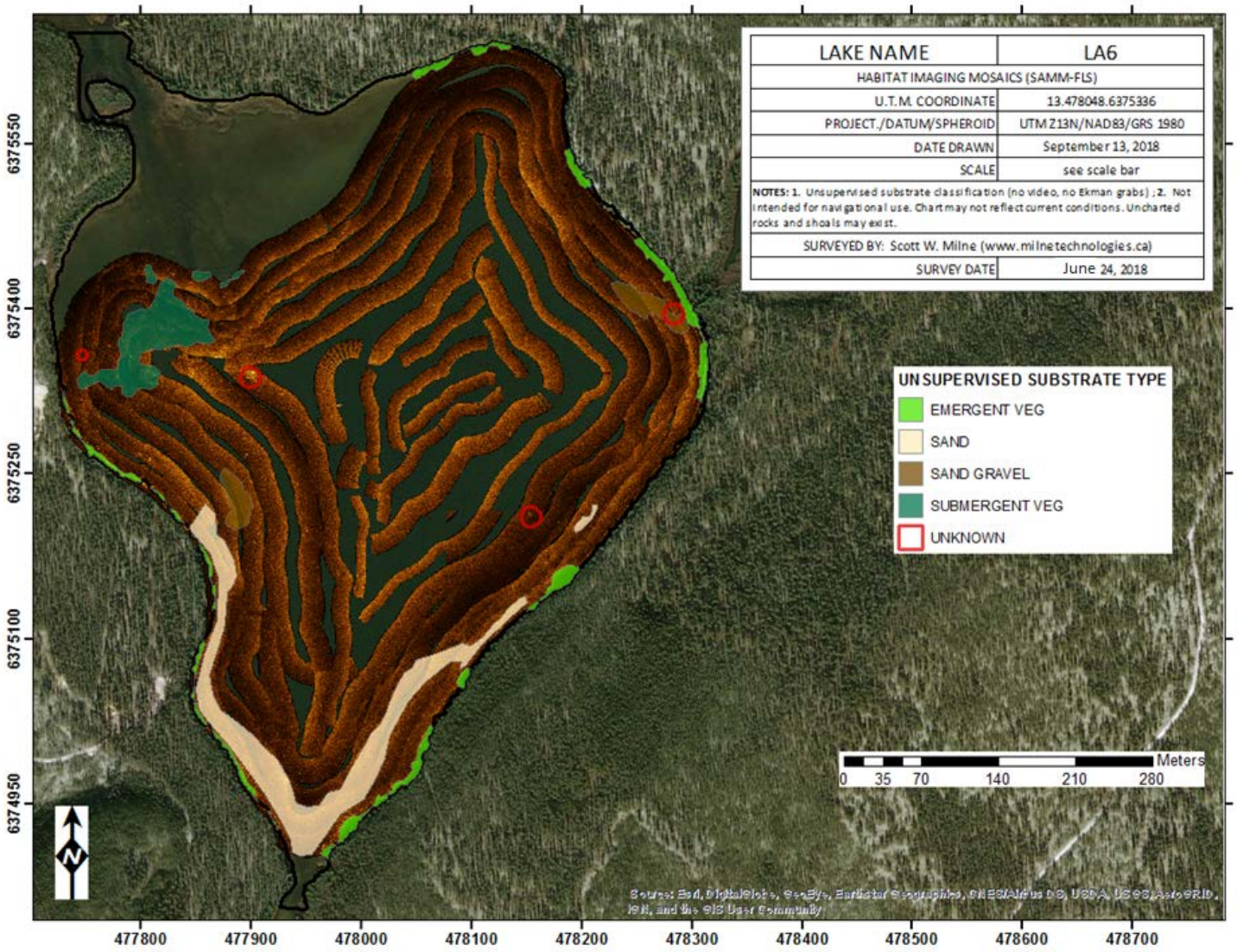



Figure 11. Sonar imaging habitat mosaic for Lake LA6. The bright speckling is acoustic scattering from macrophyte stems/leaves. Sand and gravel bars show up as bright patches whereas darker areas in away from shore indicate low acoustic reflection associated with mud, fines and detritus.

## 4.0 ACKNOWLEDGEMENTS

Special thanks to Jobie Daigneault for field assistance and support, as well as Elaine Mason and Goran Ivanis for project coordination and support.

## 5.0 REFERENCES

Smith, C. 2013. M3 Sonar: Collecting and processing bathymetry data. Kongsberg-Mesotech Ltd. Port Coquitlam, BC.

Blank Page