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Tacora Resources Aquatic Baseline Report

REF # 142-039



20 YEARS

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1.0 Introduction

Tacora Resources Limited (Tacora) Scully Mine is located in southwest Labrador close to the town of Wabush and 16 km north of the Quebec-Labrador border. The Scully Mine consists of open pit mines, a concentrator and support facilities, waste rock and tailings management facilities and a spur railway line that connects to the Quebec North Shore and Labrador (QNS&L) Railway. The Scully Mine historically extracts annually approximately 11.8 million tonnes of raw ore from which approximately 4.1 million tonnes of iron concentrate were produced. Iron concentrate is transported by rail to a pelletizing plant in Pointe Noire (Sept-Iles), QC, for processing and shipment throughout North America and Europe.

Waste products generated by the milling process include 10.9 million tonnes of thickened tailings annually which have been deposited into Flora Lake originally under a license provided by the Province of Newfoundland (Order 410-62) and currently under approval by the Newfoundland and Labrador Department of Environment and Climate Change (NLDECC). Tailings were deposited on land in the Flora Lake watershed and over time Flora Lake was divided into distinct North and South Basins.

Regulatory approvals were finalized in 2009 through the Schedule 2 process under the Metal and Diamond Mining Effluent Regulations (MDMER) formally designating Flora Lake and portions of its watershed as the Flora Tailings Impoundment Area (TIA). The Flora TIA included the South Basin, the North Basin and associated tailings covered areas which have a total surface area of approximately 23.1 km^2. Thickened tailings were deposited into the South Basin which acted as a settling pond and discharge from the South Basin occurred through a 1.5 km-long, poorly defined channel into the North Basin. Tailings effluent and natural runoff drain from the North Basin into Flora Outlet Arm, into Flora River and subsequently into Wabush Lake. The Flora TIA Discharge is the Scully Mine tailings effluent compliance point for the MDMER, being the greatest single source of "deleterious substances".

The initial TIA was approved based on a deposition plan to end life of mine (ELOM) of 2025. The designation of the TIA specified limits for tailings deposition and identified fish habitat resources that were affected. The waterbodies to be affected by tailings deposition to 2025 were gazetted and listed in Schedule 2 of the MDMER. Tacora (formerly Wabush Mines) compensated (now termed offsetting) for loss of fish habitat within the TIA as required under the *Fisheries Act*.

Tacora has subsequently developed a feasibility study to demonstrate proven iron ore reserves that would support continued mining to an ELOM of 2047 (Tacora 2021). The tailings deposition plan to ELOM of 2047 determined that Tacora will require additional tailings storage capacity beyond the currently approved TIA. The proposed tailings expansion entails continuation of disposal of tailings in the same manner as current operations, within the same watershed, into new areas south of the

currently approved TIA. The preliminary tailings deposition plan indicated that 613 ha to the south of the existing facility will be infilled (both terrestrial and aquatic habitat) resulting in filling the remainder of Flora South and destruction of several lakes and streams (Tacora 2021). The expanded tailings impoundment area will require an amendment to the existing listing in Schedule 2 of the MDMER.

Tacora submitted an Environmental Assessment (EA) Registration on July 21, 2021, to provide regulators with details of the proposed tailings expansion project. To support the EA, and as a commitment in the EA Registration document, Sikumiut Environmental Management Ltd. (SEM) undertook detailed field and desktop studies to document existing features of the area that the Project is expected to affect. Tacora was subsequently released on March 31, 2022, from the requirement for further EA subject to a number of conditions and requirements. The release from further EA, with conditions, enables Tacora to proceed with obtaining required permits and approvals for the Project.

The tailings expansion project requires use of natural, fish-bearing water bodies for the disposal of mine waste, and as such the completion of an aquatic baseline study of fish and fish habitat was required to support the EA and all required regulatory approvals. Studies are required to determine the fisheries resources and fish habitat affected by tailings expansion. This information will be used to complete an analysis of the habitat alteration, disruption, and destruction (HADD) of fish habitat as the basis to determine the amount of offsetting that will be required under the *Fisheries Act*. The *Fisheries Act* as administered by Fisheries and Oceans Canada (DFO) requires that the affected fish habitat be replaced, or offset, in order for the project to proceed. The detailed aquatic baseline information will support development of a detailed habitat offsetting plan for approval by DFO and discussion with Environment and Climate Change Canada (ECCC). An acceptable offset plan is a requirement for the amendment to Schedule 2 of the MDMER.

The aquatic baseline surveys included quantification and classification of effected habitat outlined in the EA Registration Report (Tacora 2021) in lakes (232.8 ha) and streams (7.3 ha) for a total of 240.1 ha (Figure 1.1).

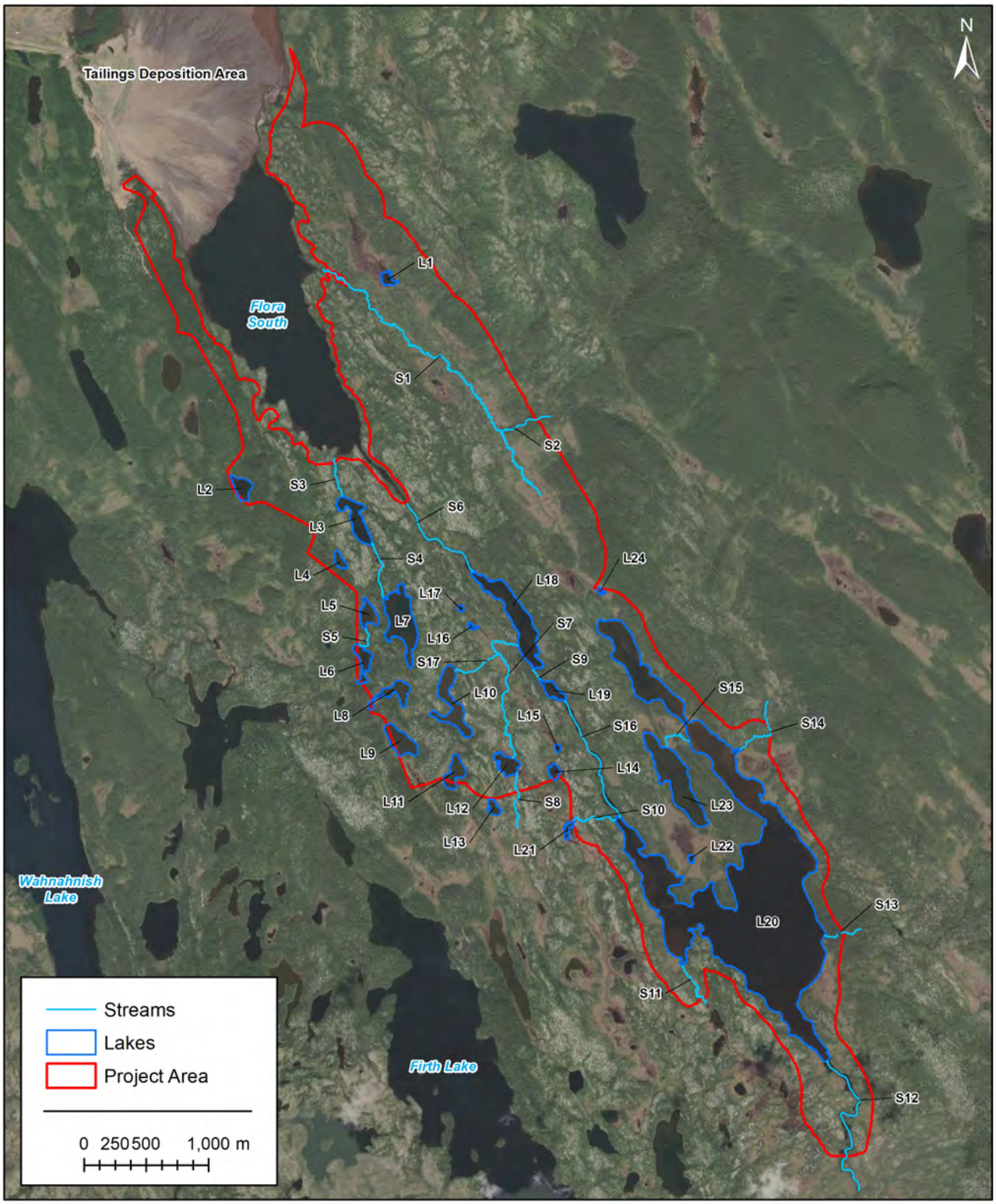


Figure 1.1 Aquatic Habitat Assessment.

2.0 Materials and Methods

2.1 Study Team

SEM assembled a Study Team of qualified and experienced professional and technical specialists for the fisheries and habitat assessment project. The Study Team and their roles are identified in Table 2.1.

Table 2.1 SEM Study Team.

Team Member	Title	Role
Grant Vivian	President, CEO	Client Liaison, Field Studies
Dave Scruton	Senior Scientist	Overall Scientific Lead
Tomer Katan	Senior Aquatic Biologist	Report Preparation Lead, Data Analysis, Project Quality Assurance/Quality Control
Heather Murphy	Environmental Scientist	Report Preparation, Data Analysis
Daniel Frampton	Engineer in Training	Director of Field Programs, Field Studies, Data Analysis, Report Preparation
Jason Lewis	GIS Professional	Data Analysis, Graphics Preparation, GIS
John Crocker	GIS Professional	Graphics Preparation, GIS
Colin Bursey	GIS Analyst	Data Analysis, Graphics Preparation, GIS
Crystal Kehoe	Director HSE/QM	HSE Management/QAQC
Makaila Hudson	Environmental Technician	Field Studies, Data Analysis
Brandi Burden	Environmental Technician	Field Studies, Data Analysis
Andrew Kearney	Civil Engineer Technologist	Field Studies, Data Analysis
Jody Penney	Environmental Technician	Field Studies
Tony Fowler	Environmental Technician	Field Studies

2.2 Study Sites and Aquatic Baseline Assessments

Aquatic habitat characterization, fish community, and fish population assessments were conducted in lakes and streams within the study area between June 16 and August 28, 2021. This section has been prepared such that all methodologies associated with lacustrine (lake) sampling has been provided first, followed by associated fluvial (stream) sampling methods. Should any overlap occur between the two types of aquatic environments, references to previous and appropriate sections are provided to avoid redundancy and duplication.

The key components of the aquatic baseline assessment for lake habitat consisted of:

- Shoreline and vegetation habitat mapping;
- Lake bathymetry;

- Secchi depth and littoral/profundal zone mapping;
- Water quality;
- Chlorophyll 'a';
- Phytoplankton;
- Zooplankton;
- Sediment quality;
- Benthic macroinvertebrate community;
- Bottom/sediment mapping;
- Fish community; and
- Fish population assessment using a mark and recapture program (brook trout populations only).

The key components of the aquatic baseline assessment for stream habitat consisted of:

- Habitat and substrate mapping;
- Stream bank and riparian vegetation assessment;
- Benthic macroinvertebrate community;
- Flow characteristics and discharge;
- Water quality;
- Fish community; and
- Fish population assessment using quantitative electrofishing (brook trout populations only).

The following sections provide detailed methodologies on each key study component. Sample collection (e.g., water, sediment, plankton, benthic community) in all lakes and streams involved a single representative sample being taken with the exception of the largest lake (L20) where samples were collected from three sections within the lake.

2.3 Lacustrine Baseline Assessment

2.3.1 Shoreline Habitat Mapping

A survey of the substrate/vegetation distribution in the littoral zone was performed to characterize lake habitat. A visual description of the habitat was made from a boat travelling parallel to the lake shoreline

and information was collected on the surrounding vegetation, shoreline substrate composition and connectivity to other waterbodies, while taking representative georeferenced photographs, and collecting detailed notes on a waterproof map. Substrate was described based on the Wentworth classification (1922), while the derivation of composite classification (as coarse, medium, fine) was based on Bradbury *et al*. (2001) (Table 2.2).

Table 2.2 Substrate Types, Codes and Size Ranges.

Broad Substrate Category	Detailed Substrate Category	Code	Definition
Coarse	Bedrock	Be	Continuous solid rock
	Boulder	Bo	Rocks greater than 250 mm in diameter
	Rubble	Ru	Large rocks ranging from 130 mm – 250 mm in diameter
Medium	Cobble	Co	Rocks ranging from 30 mm – 130 mm
	Gravel	Gr	Granule size or coarser, 2 mm – 30 mm
Fine	Sand	Sa	Fine deposits ranging from 0.06 mm – 2 mm
	Mud	Mu	Material encompassing both silt and clay < 0.06 mm

The distribution of substrate types was delineated on a field map and demarcated by way points collected with a GPS (see Figure 2.1). Nearshore substrate was delineated by boundaries of homogeneous substrate types and waypoints delineated a significant change in the distribution of substrate types. The distribution of substrate was often determined by the shape and orientation of the shoreline, exposure to wind and waves, and underlying surficial geology. In Figure 2.1 for example, waypoints 1 and 2 delineate the boundaries of an area of bedrock and boulder substrate, while waypoint 5 identifies the location of an inlet stream.

More than one substrate type was frequently present in each area, and this was denoted by recording the dominant combination of substrate types in an area (up to three types). Substrate types were subsequently categorized under four main headings: coarse (bedrock, boulder); medium (rubble, cobble, gravel); fine (sand, silt, muck, clay); and vegetation for consistency with Bradbury *et al*. (2001). The detailed substrate classification often contained more than one substrate category, and in this case, 50% of the habitat in that area was assigned to each category. The total area of each substrate category was then calculated separately for each lake.

The resulting lake habitat data was digitized and post-processed using ArcGIS software.

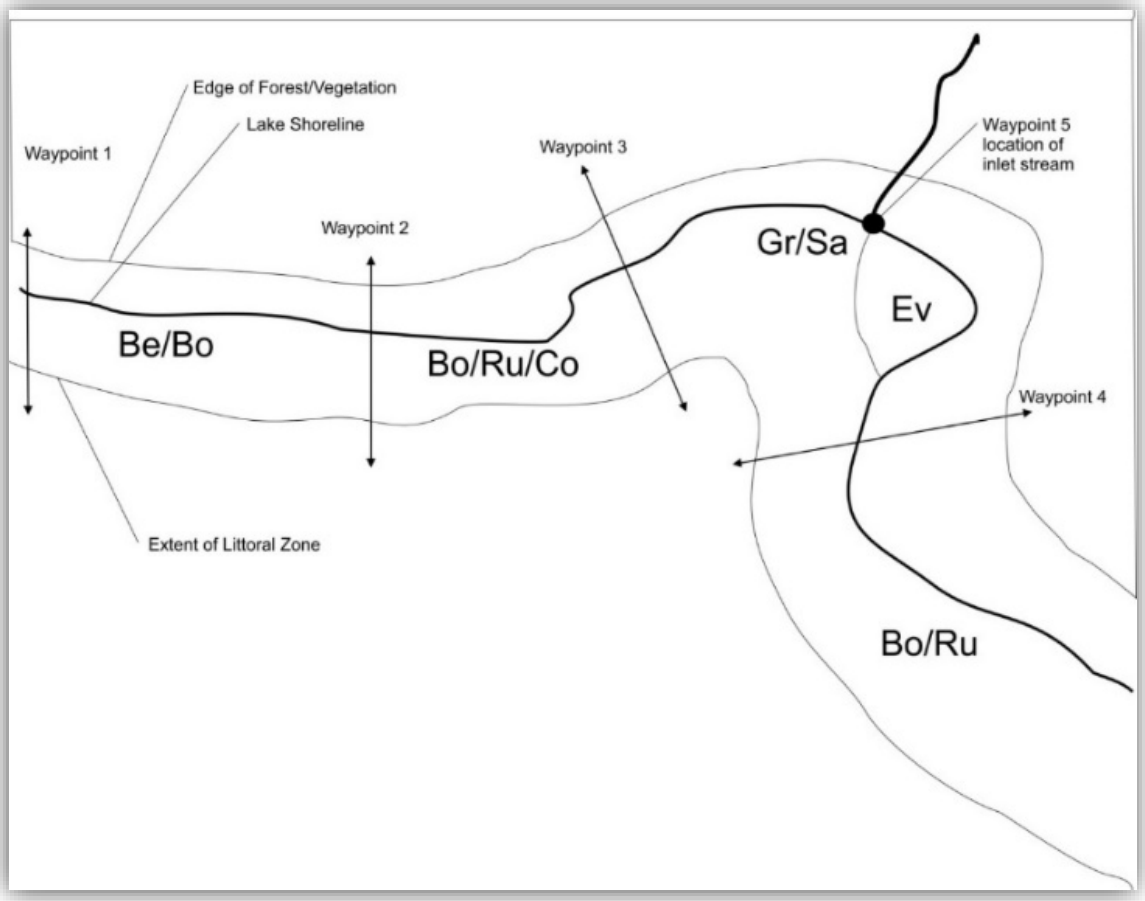


Figure 2.1 Example of Mapping of Lake Shoreline and Substrate Types.

2.3.2 Lake Bathymetry

A bathymetric survey was conducted for each lake in the study area to determine volume and depths. Where possible, bathymetric data was collected using a Sonarmite DFX dual frequency echosounder combining both low-frequency (33 kHz) and high frequency (200 kHz) transducers in one unit. This echosounder was supplemented with a portable handheld echosounder or manual measurement combined with GPS locations where depths were too shallow to operate the Sonarmite (<0.5 m). Bathymetry data (x, y, z; longitude, latitude, and depth) were collected along pre-determined transects and data were sent to a Panasonic Toughbook laptop computer (Model CF31). Bathymetry data were post-processed using Sonarvista software. Data processing involved application of a general process model which included smoothing, transient filtering, and bottom delineation of the raw data. Once all initial processing was complete, data were exported to a *.csv file for additional analysis and modelling in ArcGIS.

2.3.3 Secchi Depth, Littoral and Profundal Zone Mapping

Secchi depth was measured using a standard 30 cm diameter Secchi disk, with alternating black and white quadrants. The Secchi depth for each station was calculated as the average between depth where the disk was not visible on descent and where it was again viewed on ascent. To the extent possible, Secchi depth measurements were taken at the same period of the day (i.e., 10:00 to 15:00) and by the same individual. To ensure that incident sunlight was at similar angles the measurements were always conducted facing away from the direction of the sun.

The aquatic habitat zones were delineated using a combination of Secchi depth measurements and the bathymetric survey. The Secchi depth of each water body represented a reasonable approximation of light penetration and was used to delineate the extent of the littoral zone (Bradbury *et al*. 1999). The profundal zone was defined as the central region of the lake that extended beyond the outer limit of the littoral zone and was not penetrated by sunlight (Bradbury *et al*. 1999). GIS software analysis used the lake bathymetry data in conjunction with Secchi disk depth to delineate littoral and profundal zones.

2.3.4 Water Quality Survey

A comprehensive water quality sampling program was conducted in all waterbodies that would be impacted by the tailings expansion. The objective was to characterize the water quality of these waterbodies to support determination of the quantity and quality of affected fish habitat. Samples for water quality analysis were collected before all other samples were collected. Surface water samples were collected by grab technique for Rapid Chemical Analysis Package™ (RCAP) at an analytical laboratory. RCAP included a full metal scan and conventional parameters including nutrients, major anions and cations and total organic carbon (TOC) (Table 2.3). Ammonia was collected in a 40 ml clear glass vial (with sulphuric acid preservative and no head space). Samples for all other parameters were collected in three 120 ml plastic bottles with nitric acid preservative for metals, sulphuric acid preservative for TOC and no preservative for all other general parameters. Samples were stored on ice until they were placed in refrigeration at shore-based facilities, and then sent to Bureau Veritas Laboratories (Bedford, NS) for analyses. Units of reporting and reportable detection limits (RDLs) are provided in the results (certification of analysis and raw data is provided in Appendix A).

Data on field water quality parameters were collected at the same time as laboratory samples in all lakes. Temperature and water quality profiles were collected in lakes to determine the presence or absence of thermal or chemical stratification. This also allowed determination of whether there were any anoxic zones within the lake. Field water quality measurements were taken at 1 m depth increments in the deepest location of each lake. The water quality details were measured with a multiparameter YSI (ExoSonde 2), which was calibrated periodically prior to its use in the field. Measurements that were

taken included: temperature (0.01°C), pH (0.01 pH units), conductivity (1 µS/cm), dissolved oxygen (DO, 0.01 mg/L, % saturation [0.1%]), and oxygen reduction potential (0.1 mV).

Table 2.3 Water Quality Analysis Parameters

Rapid Chemical Analysis Package		
Alkalinity	Conductivity	Nitrate + Nitrate
Sulphate	Ammonia	Hardness
Orthophosphate	Total Dissolved Solids (TDS)	Bicarbonate, Carbonate
Ion Balance, Ion Sum	pH	Total Organic Carbon
Chloride	Reactive Silica	Turbidity
Colour	Saturated pH	Langelier Index
Metals: Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sn, Sr, Ti, Tl, U, V (determined by inductively coupled plasma spectrometry (ICP).		

Water quality data included comparison with Canadian Council of Ministers of the Environment (CCME) guidelines and comparison with past data and regional databases, wherever possible.

2.3.5 Chlorophyll 'a'

Subsurface chlorophyll 'a' samples were collected at 0.3 m depth in 1 L bottles by grab technique and were immediately wrapped in aluminum foil to ensure no light penetration. Samples were stored on ice in coolers in the field, then stored in a refrigerator until submission to Bureau Veritas Laboratories.

Laboratory analysis was completed by fluorometer with overnight 90% acetone extraction and with correction for phaeopigments by acidification. Duplicate samples were collected and analyzed and reported as the means of both due to the inherent sample variability and to rule out any problems with vacuum filtration. Chlorophyll 'a' was determined by both the acidification method (Holm-Hansen *et al*. 1965) and non-acidification method (Welschmeyer 1994), however, the acidification method result is reported in the body of the text.

2.3.6 Phytoplankton

A 250 ml subsurface water sample was collected and preserved with Lugol's solution for phytoplankton taxonomic analysis.

Sub-samples (5 ml) from field preserved phytoplankton samples were processed at laboratory facilities using settling chambers that produce permanent slides (Knoechel and Kalff 1976). The slides were examined under phase contrast illumination at 500 times magnification and individual cells, filaments or colonies were measured using an ocular scale and accumulated in size categories. The biomass (fresh weight) was calculated from abundance and specific biovolume estimates using formulae for simple

geometric solids and assuming unit density. The biovolumes of colonial taxa were based on the number of individuals in a colony. Data were accumulated in three size categories (<10 µm, 10-30 µm and >30 µm maximum linear dimensions) which are related to the relative availability of organisms to grazers (Sprules and Knoechel 1984). The <10 µm size range is considered as available to Rotifer grazers while Cladoceran and Calanoid Copepod grazers can feed on that size range plus the 10-30 µm size category. Cells, filaments and colonies greater than 30 µm are generally unavailable to grazers.

2.3.7 Zooplankton

Quantitative zooplankton samples were collected using a vertically integrating tube sampler (Knoechel and Campbell 1992) fitted with a 100 µm mesh Nitex net. The sampler was lowered to a suitable depth so as not to disturb the lake bottom and hauled to surface repeatedly until a total sampled depth of twenty meters (20 m of filtered water) had been obtained to provide a quantitative composite sample of the near-surface zooplankton community. The tows were composited to form one sample in 250 ml mason jars and preserved using 95% ethanol.

A measured sub-sample sufficient to contain at least 100 crustaceans from field preserved zooplankton samples was examined at the selected laboratory (Dr. Roy Knoechel). A dissecting microscope using phase contrast illumination at magnifications of 12 to 50 times was used to identify large (macro) zooplankton. Samples were examined using an inverted microscope at magnification of 200 to 400 times for rotifers and copepod nauplii. Individual organisms were measured using an ocular grid and sorted into taxonomic categories. Individual biomass was calculated from published weight-length regressions, accumulated in taxonomic categories, and then corrected for sub-sample volume and original sampled volume (6.74 L/m) to yield an estimate of total zooplankton biomass (mg/m^3 wet weight).

The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows:

- Copepods, a primarily carnivorous crustacean group as adults and calanoid copepods and nauplii, a primarily herbivorous crustacean group that can feed on all edible-sized phytoplankton in the adult and juvenile copepodite stages but on only the smaller phytoplankton when in the larval nauplius stages;
- Cladocerans, a primarily herbivorous crustacean group that can typically feed on all edible-sized (<30 µm) phytoplankton; and
- Rotifers, the smallest forms which typically feed on the smallest (<10 µm) phytoplankton.

2.3.8 Sediment Quality Survey

Sediment samples were collected from each station using a Petite Ponar grab (11. 3 kg, 0.023 m^2 and 2.4 L) and analyzed for metals, organic carbon, and particle size. Sediment samples were collected after all other samples had been collected.

Sample collection utilizing the Petite Ponar grab in lakes and some (low flow) stream sites consisted of first selecting a representative site where the Ponar could sit without being tipped on its side. Prior to deployment, the sampling platform was moored in position using a single anchor at the stern of the boat. The Petite Ponar was primed for release and lowered over the side of the vessel in a vertical position off the lake bottom. The mouth of the trap door mechanism and weight of the equipment allows for penetration into the substrates for sample collection. Once secure at the bottom of the lake or stream, a rapid upward pulling motion on the tether closes the trap door shut (by virtue of the weight of the sampling device), securing the sample inside the chamber. The sample was then retrieved to the surface and emptied into a 20 L bucket. To ensure sufficient sample volume, two grab samples were taken and combined for further sieving and washing at the laboratory (total surface area = 0.05 m^2). Following the retrieval of the sediment sample, a homogenized 250 ml sub-sample was collected using a plastic spoon for chemical analysis at the laboratory. The sample container was filled ensuring no head space above the sediment. The remaining sediment sample was placed in a 5 L plastic sample bucket for subsequent processing to collect a sample for benthic community analysis.

All sampling gear was thoroughly rinsed between collections. Nitrile gloves were worn when preparing the sub-sample for chemical analysis and were disposed of after each sample. All samples were kept in coolers with ice packs until stored at refrigeration facilities at the SEM office. Samples were then shipped to the selected analytical laboratory for analysis.

Sediment quality data were compared with CCME guidelines and with past data and regional databases, wherever possible.

2.3.9 Benthic Invertebrate Community

A minimum of 5 L of sediment containing Benthic Macroinvertebrates (BMIs) was collected using a Petite Ponar grab as described above. The Petite Ponar grab sampler was utilized in both lake and riverine environments where flow was low, and substrates were soft/mucky.

Subsequently, samples were sieved and washed with freshwater through a 500 µm mesh at the SEM Laboratory. All benthic organisms in the sieved sample were placed into 250 ml sample bottles and preserved with 90% ethanol for future sorting and identification.

Invertebrates were sent for taxonomic identification and enumeration at a contracted laboratory (Dr. Jack Zloty). All field samples were initially washed at the laboratory with a 200 µm mesh screen to remove any fine debris and any excess preservative. Samples were scanned under a binocular microscope at six to 12 times magnification to improve visibility of benthic organisms. All benthic invertebrates were then removed from the sample debris using fine forceps and transferred to a separate container and re-preserved in 70% ethanol. In some instances, samples were stained with either haematoxylin or rose Bengal to improve sorting quality.

All organisms were then identified to the lowest practical taxonomic level (genus or species wherever feasible) using current literature and nomenclature and enumerated. The lowest practical level of taxonomic identification, as previously used in studies in western Labrador were as follows for each major benthic group (Table 2.4).

Table 2.4 Lowest Practical Taxonomic Level Identified for Benthic Macroinvertebrates.

Major Taxon	Identification Level
Nematoda	Phylum
Oligochaeta	Family/Tribe
Gastropoda	Genus/species
Turbellaria	Family
Hirudinea	Genus/species
Mollusca	Genus/species
Hydracarina	Leave at this level
Cladocera	Order
Ostracoda	Leave at this level
Amphipoda	Genus
Insecta	Genus/species

Organisms which required detailed microscopic examination for identification (e.g., the Chironomidae and Oligochaeta) were mounted onto microscope slides using appropriate mounting media. A reference collection of all taxa identified from samples was prepared and retained for taxonomic verification to ensure consistent taxonomy in future benthic analysis.

The benthic community metrics that were used in data analyses and for comparisons between sites included abundance (total number of individuals), density (total number of individuals/m^2) and taxonomic richness (total number of taxa per sample).

2.3.10 Lake Fish Population Assessment

The fish community and population in each lake was determined through completion of a mark-recapture program using fyke nets, supplemented with minnow traps and short tended gill net sets. All fishing was conducted following conditions outlined in SEM's experimental license (NL-6483-21, Appendix B) issued by DFO for this project. Minnow traps and gill nets were used to target fish species in the lake that may not be susceptible to fyke netting (e.g., lake trout). Between two and ten fyke nets were deployed depending on the size of each lake. Fyke nets were set along the shoreline (typically perpendicular to the shoreline) and fished for at least 16 hours prior to checking. This allowed the nets to potentially capture fish during the dawn and dusk periods when fish are more actively feeding and moving. Nets were not baited. All captured fish were then identified to species and measured for fork length (1 mm) and weight (1 g).

Fish population estimates were determined using a mark-recapture method for lakes containing brook trout. After capture, brook trout were marked using a hole punch on the caudal fin and released close to their point of capture but not in the direct vicinity of the nets. After all nets were checked, a total count of fish by species was determined. After the first net set and marked fish had been released, all captures were examined to determine if the fish were marked or not (i.e., recaptured). Any unmarked brook trout would then be marked prior to release. The field team continued fishing until 10% of the total recaptures were marked in order to have data sufficient for a population estimate with reasonable confidence intervals.

Population estimates were determined using the Schnabel multiple mark-recapture method based on the numbers of marked and unmarked fish captured each day. The total number of net nights (nights x nets) of sampling effort in each lake was variable and related to lake size.

Length, weight, and condition factor (K) was measured for all fish. Fish assumed to be young-of-year (YoY) size (65 mm or less) were not included in the calculation as applying the condition factor to YoY can be highly inaccurate due to the resolution of weight measurements in small fish, and the fact that YoY fish could still be adapting to exogenous feeding. Further, condition factor was not calculated for burbot due to its dissimilar length-weight relationship (Polacek *et al.* 2006).

The main component of the fish capture program involved the use of fyke nets. Fyke nets utilized in the program had two wings and a leader or a leader only which guided fish towards the entrance. The entrance lead into a series of cone-shaped netting, with netting rings (hoops), allowing fish to pass only in one direction to the bag end, where fish were retained until released. Fyke nets were fixed to the bottom by anchors and were set perpendicular to shore (leader), with the wings set at approximately 30° angles to the entrance. Fyke nets were constructed of small mesh (1.27 cm mesh, stretch measure), which

reduced the chances of entanglement and subsequent death during capture. The 1.27 cm stretch measure mesh size also increased the fishing effectiveness for smaller fish, including juvenile salmonids and cyprinids (i.e., lake chub).

Minnow traps were set in proximity to the fyke traps and were treated in the same fashion as the fyke nets (i.e., fishing duration and mark-recapture procedure). Minnow traps consisted of a cylindrical 1.27 cm wire mesh with inside conical openings in both ends, leading to the inside of the trap. An experimental gill net was set to target species not susceptible to fyke traps, such as lake trout or whitefish species. Gill nets were experimental nets comprised of six-panel, multi-mesh monofilament with each panel measuring 15.2 m x 2.4 m deep, consisting of 2.5, 3.8, 5.1, 6.4, 7.6 and 10.2 cm (stretch) mesh sizes. Gill net sets were tended and set for very short durations (1-2 hours). Gill nets were set to fish in areas where fyke netting would not be productive or possible (e.g., pelagic zones, where present), were checked frequently (every hour) and were not used overnight. All live brook trout captured were marked and released as explained above. Gill netting was kept to a minimum and was terminated in cases when nets did not capture species that were not apparent in the fyke nets. Gill nets were also utilized in very small, shallow lakes to quickly determine presence/absence of fish, to decide if a more extensive fyke netting effort was warranted.

2.4 Fluvial Baseline Assessment

2.4.1 Stream Habitat Assessment

The approach taken for the stream surveys followed the methodology described by Scruton *et al*. (1992) as adapted by Sooley *et al*. (1998). These techniques are specific to small streams or streams that can be walked or waded. All stream segments were surveyed in an upstream direction from the confluence of the stream segment with a lake, steady, or another stream. Stream segments were delineated by an obvious change in habitat type.

SEM also evaluated each lake for the presence of tributaries and outlets during the initial survey and, where present, made a determination if the stream was likely to be intermittent and/or freeze completely in winter. Streams/outlets deemed to be permanent fish habitat were then surveyed following standard DFO methods (i.e., McCarthy, Grant, and Scruton 2007). Stream habitat was classified by reach, on a meso-habitat basis, as: (i) riffle; (ii) run; (iii) pool; (iv) steady; and (v) rapids/cascades/chutes/falls. For each stream segment the following information was collected:

- Measurement of depth, water velocity, wetted width, and channel width at representative transects;
- Classification of meso-habitat type;

- Classification of substrate types;
- Classification of cover types;
- Assessment of stream bank conditions; and
- Identification of potential obstructions to fish migration and description of each.

Substrate types were classified using the Wentworth (1922) classification and estimated as a percentage over the reach being assessed. Cover types were classified following Scruton *et al*. (1992) and estimated as a percentage over the reach being assessed. Stream bank conditions including stability, presence of eroding banks, and presence of undercut banks were assessed following Scruton *et al*. (1992) and estimated as a percentage of the reach. Potential obstructions to fish movement and migration were identified and assessed as complete or partial barriers. The GPS location and photograph of each barrier was collected.

2.4.2 Stream Flow Conditions and Discharge

Flow profiles using a Hach 950 Flow Meter were collected for descriptive purposes at one or more times during the field program, depending on whether flow changed due to rainfall. Water depth and velocity measurements were collected at selected locations on each of the study streams using a Hach FH950 Acoustic Doppler Flow Meter with wading rod. Transects were established and marked using survey tape. A measuring tape was stretched across the stream perpendicular to the shoreline at each transect. Depth (nearest cm) and velocity (0.01 m/s) were recorded starting at the water's edge and additional verticals thereafter, or when a noticeable change in velocity or depth was encountered. Velocity was recorded at 60% water depth. Depth and velocity measurements were subsequently used to calculate discharge. All field surveys and calculations followed protocols established by Environment Canada, Water Survey of Canada (WSC 1999).

A continuous recording water level logger was deployed to provide more information to characterize variability in discharge on Harold's Pond, Harold's Pond outlet and Stream S6. A Van Essen Mini Diver water level logger (Mini Diver) was utilized for its simplicity, long lifespan, and high level of accuracy. The Mini Diver measured the pressure of the column of water above it, as well as the pressure of the atmosphere above the water column (i.e., atmospheric pressure). Data was recorded in cm of H_2O (0.5 cm accuracy) and the Mini Diver was pre-programmed to record on an hourly basis. In addition to pressure, the Mini Diver recorded temperature in degrees Celsius (0.1°C accuracy). Depth data was corrected externally by using a pressure compensation Baro Diver installed in tandem with the Mini Diver. The Baro Diver was installed above the surface of the water and recorded the atmospheric pressure which was used to compensate data from the associated Mini Diver.

2.4.3 Water Temperature

The water temperatures were monitored by installing a thermograph (Onset Tidbit v2 Water Temperature Data Logger) programmed to record temperature on an hourly basis, for a continuous period. The data logger was installed on July 14, 2021, and data were downloaded on November 6, 2021.

Data were interpreted in relation to published temperature preferences for brook trout. Grant and Lee (2004) defined a critical temperature range of 0 to 24°C for brook trout. Scruton *et al*. (1998), based on work by Jirka and Homa (1990), McRae and Edwards (1994), and Power (1980) further delineated temperature ranges (strata) for brook trout as follows:

- <11°C – lower range; below optimum but not stressful;
- 11 to 16°C – optimum temperature range;
- 16 to 21°C – upper range; above optimum but not stressful;
- 21 to 24°C – potentially stressful conditions; and
- >24°C – above temperature preferences, potentially lethal.

Temperature data were analysed to determine the period (hours) each stream reach was within the above delineated temperature strata.

2.4.4 Water Quality Survey

Methods involved with collection of samples for water quality and collection of field water quality data in streams was consistent with methods used in lakes (see Section 3.0).

2.4.5 Benthic Macroinvertebrate Community

A Surber sampler (0.25 m tall by 0.5 m wide) was utilized in riverine habitats where water depths were 30 cm or less and flow was sufficient to carry organisms into the "cod end" of the net. Sample collection utilizing the Surber sampler consisted of selecting a representative site and positioning/securing the mouth of the net facing upstream such that the net portion ran parallel to flow. Substrates directly in front of the net (area = 0.25 m^2) were carefully cleaned with hands or a brush allowing organisms to drift into the collection end of the net. Larger rocks were visually inspected for clinging organisms and any present were manually transferred into the collection net (including pupa casings). Smaller substrates were disturbed using hands, toe-end of a boot or a small trowel to a depth of 5 cm to 10 cm. Once the substrate was thoroughly cleaned, the net was brought back to shore and rinsed using a squirt bottle into the collection cup (250 ml glass jar) to collect any clinging organisms. The sample was then labelled, secured, and brought back to the laboratory for further processing and fixation.

In streams with a soft bottom and low flow, the Petite Ponar grab sampler was utilized to collect the benthic invertebrate samples.

2.4.6 Fish Community Assessment

Fisheries productivity was determined for representative stream habitats using a backpack electrofisher (Smith Root LR-24), acknowledged to be effective in low conductivity waters typical of Labrador (Figure 2.2). All fishing was conducted following conditions outlined in SEM's experimental license (NL-6483-21, Appendix B) issued by DFO for this project. Representative sites of 100 to 200 m^2 in area were selected in riffle/run permanent fish habitats. Both spot electrofishing and quantitative electrofishing were conducted, depending on the size of the stream and the quality of the habitat. Quantitative electrofishing was completed using the removal method consistent with methods described in Scruton and Gibson (1995) and Sooley *et al*. (1998). Sites were cordoned off with barrier nets and fished completely to remove all fish during each pass. All fish were identified to species and measured for length (1 mm) and weight (1 g). Fish were removed from the site and the area fished for additional passes, completing a minimum of three passes, or more, if the population was not being depleted with each pass.

The MicroFish 3.0 for Windows software was used to generate population estimates from the quantitative electrofishing results (Van Deventer and Platts, 1985; Van Deventer, 1989). This program calculated maximum-likelihood population estimates (number and 95% confidence intervals around the estimate). The population estimates were adjusted per unit of habitat (100 m^2) and applied to the quantification of fish habitat in the entire stream to get a total estimate of fisheries productivity for each stream reach. Biomass estimates were calculated by applying the fish average weight at each site to the population estimates.



Figure 2.2 Typical Electrofishing Team Completing a Quantitative Fish Population Assessment.

2.5 Summary of Aquatic Surveys Complete

The following section provides a summary of the completed surveys in both lacustrine (Table 2.5) and fluvial systems (Table 2.6) within the Project area.

Table 2.5 Summary of Surveys Completed for Lakes in 2021.

Site ID	General Description	Bathymetry	Habitat Mapping	Water & Sediment Quality (Lab)	Water Quality (Field)	Fish Community	Benthic Community	Phytoplankton	Zooplankton
L1	✓	✓	✓	✓	✓	✓	✓*	✓	✓
L2	✓	✓	✓	x	✓	✓*	✓*	x	x
L3	✓	✓	✓	✓	✓	✓	✓	✓	✓
L4	✓	✓	✓	✓	✓	✓	✓	✓	✓
L5	✓	✓	✓	✓	✓	✓	✓	✓	✓
L6	✓	✓	✓	✓	✓	✓	✓	✓	✓
L7	✓	✓	✓	✓	✓	✓	✓	✓	✓
L8	✓	✓	✓	✓	✓	✓	✓	✓	✓
L9	✓	✓	✓	✓	✓	✓	✓	✓	✓
L10	✓	✓	✓	✓	✓	✓	✓	✓	✓
L11	✓	✓	✓	✓	✓	✓	✓	✓	✓
L12	✓	✓	✓	✓	✓	✓	✓	✓	✓
L13	✓	✓	✓	✓	✓	✓	✓	✓	✓
L14	✓	✓	✓	✓	✓	✓	✓	✓	✓
L15	✓	✓	✓	x	x	✓*	x	x	x
L16	✓	✓	✓	✓	✓	✓	✓*	✓	✓
L17	✓	✓	✓	✓	✓	✓	✓*	✓	✓
L18	✓	✓	✓	✓	✓	✓	✓	✓	✓
L19	✓	✓	✓	✓	✓	✓	✓	✓	✓
L20	✓	✓	✓	✓	✓	✓	✓	✓	✓
L21	✓	✓	✓	✓	✓	✓	✓	✓	✓
L22	✓	✓	✓	x	x	✓*	x	x	x
L23	✓	✓	✓	✓	✓	✓	✓	✓	✓
L24	✓	✓	✓	x	x	✓*	x	x	x

* No fish/benthic macroinvertebrates captured from effort employed in these lakes. In such instances, certain follow up monitoring was not completed (i.e., water/sediment quality, phytoplankton/zooplankton).

Table 2.6 Summary of Surveys Complete for Streams in 2021.

Site ID	General Description	Habitat Assessment	Water Quality (Lab)	Water Quality (Field)	Stream Flow	Fish Community	Benthic Community
S1	✓	✓	✓	✓	✓	✓	✓
S2	✓	✓	✓	✓	✓	✓	✓
S3	✓	✓	✓	✓	✓	✓	✓
S4	✓	✓	✓	✓	✓	✓	✓
S5	✓	X	✓	✓	X	X	X
S6	✓	✓	✓	✓	✓	✓	X
S7	✓	✓	✓	✓	✓	✓	✓
S8	✓	✓	✓	✓	✓	✓	✓
S9	✓	✓	✓	✓	✓	✓	✓
S10	✓	✓	✓	✓	✓	✓	✓
S11	✓	✓	✓	✓	✓	X	✓
S12	✓	✓	✓	✓	✓	✓	✓
S13	✓	✓	✓	✓	✓	✓	✓
S14	✓	✓	✓	✓	✓	✓	✓
S15	✓	✓	✓	✓	✓	✓	✓
S16	✓	✓	✓	✓	✓	✓	✓
S17	✓	✓	✓	X	✓	✓	✓

3.0 Lake Survey Results

3.1 Lake L1

3.1.1 General Overview Description

Lake L1 was situated east of Flora South Basin and was connected by an outlet flowing west into Stream S1 which then flowed into the basin. This was the main and only outlet of L1, and it was a very narrow stream section. Lake L1 was surrounded by a wetland environment. The main outlet was located on the western side of the lake, where the water gradually becomes shallower. Another outlet was also seen on the east side of Lake L1. The lake did not have any significant inlets and was instead likely fed by wetland drainage, groundwater, and runoff. There appeared to be a small stream that flowed into Lake L1 from the northwest end that, at the time of the survey, proved to be intermittent and a spring was not located. The shoreline of Lake L1 consisted mainly of wetland with sections of smaller black spruce trees. Lake L1 substrate was organic muck under sections of lily pads and grasses near shore. The locations of fishing nets and water quality sampling are provided in Figure 3.1. Fish were sampled using fyke nets (n=6). Water quality, Secchi depth, sediment quality, benthic community, phytoplankton, and zooplankton were all sampled from one location in the lake (Figure 3.1).

3.1.2 Lake Habitat Assessment

3.1.2.1 Bathymetry

Bathymetric studies were completed on Lake L1 on September 28, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of four transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.1). The surface area of the lake was 9,162 m^2 and the lake volume was 3,913 m^3. The lake bottom has a relatively constant depth of 0.5 m throughout.

3.1.2.2 Habitat Mapping

A survey of habitat in Lake L1 included substrate and vegetation and was conducted on August 23-24, 2021 (Figure 3.2). The entire lake was composed of littoral zone and due to the shallow characteristics of Lake L1 (Secchi depth of 0.5 m) no profundal zone existed. The lake shoreline habitat was entirely fines, and away from the shoreline (i.e., interior of the colored sections; Figure 3.2) was also composed of fines. There was a considerable amount of emergent vegetation along most of the lake shoreline. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.1.

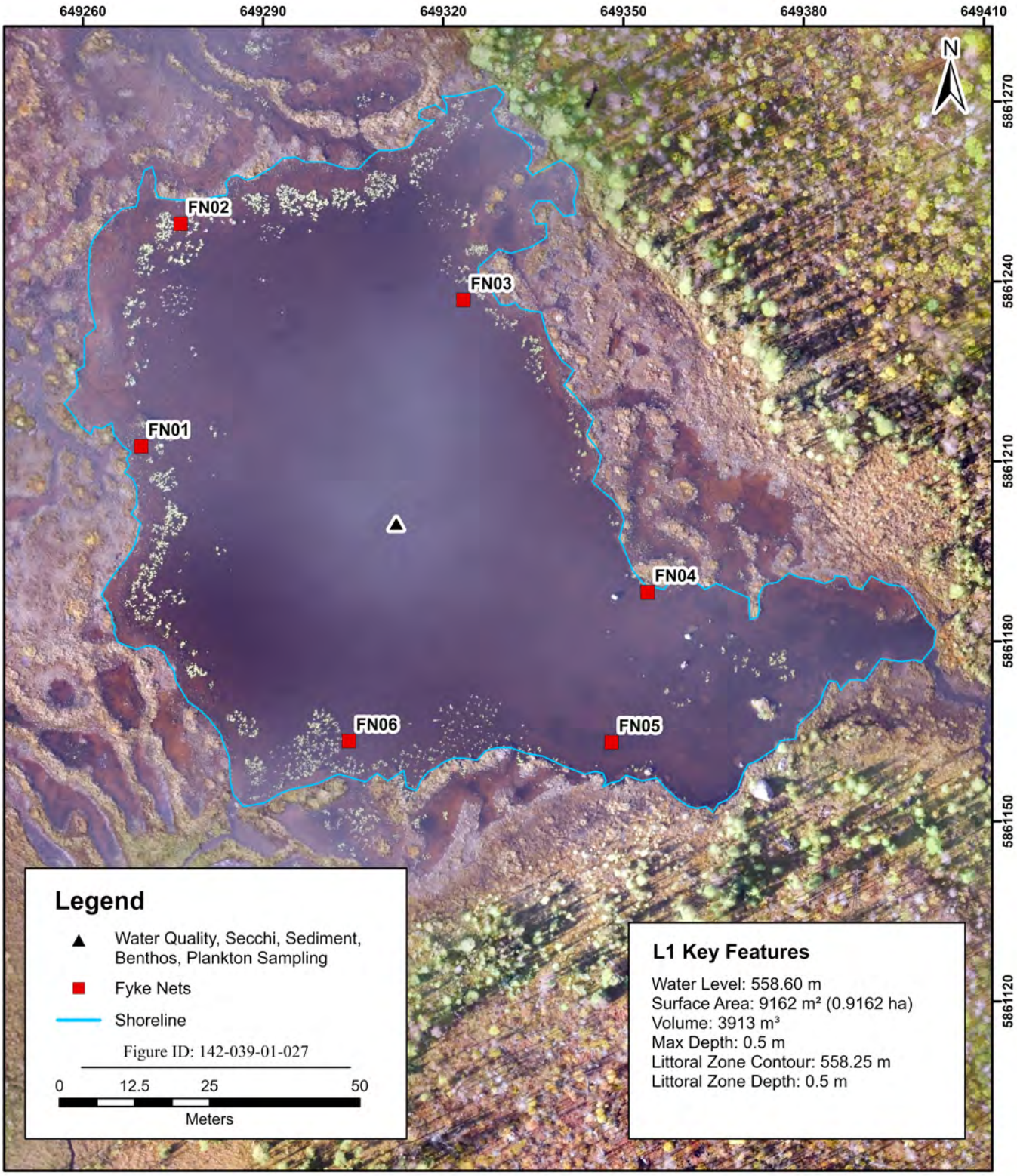


Figure 3.1 Lake L1 Sampling and Fishing Locations.

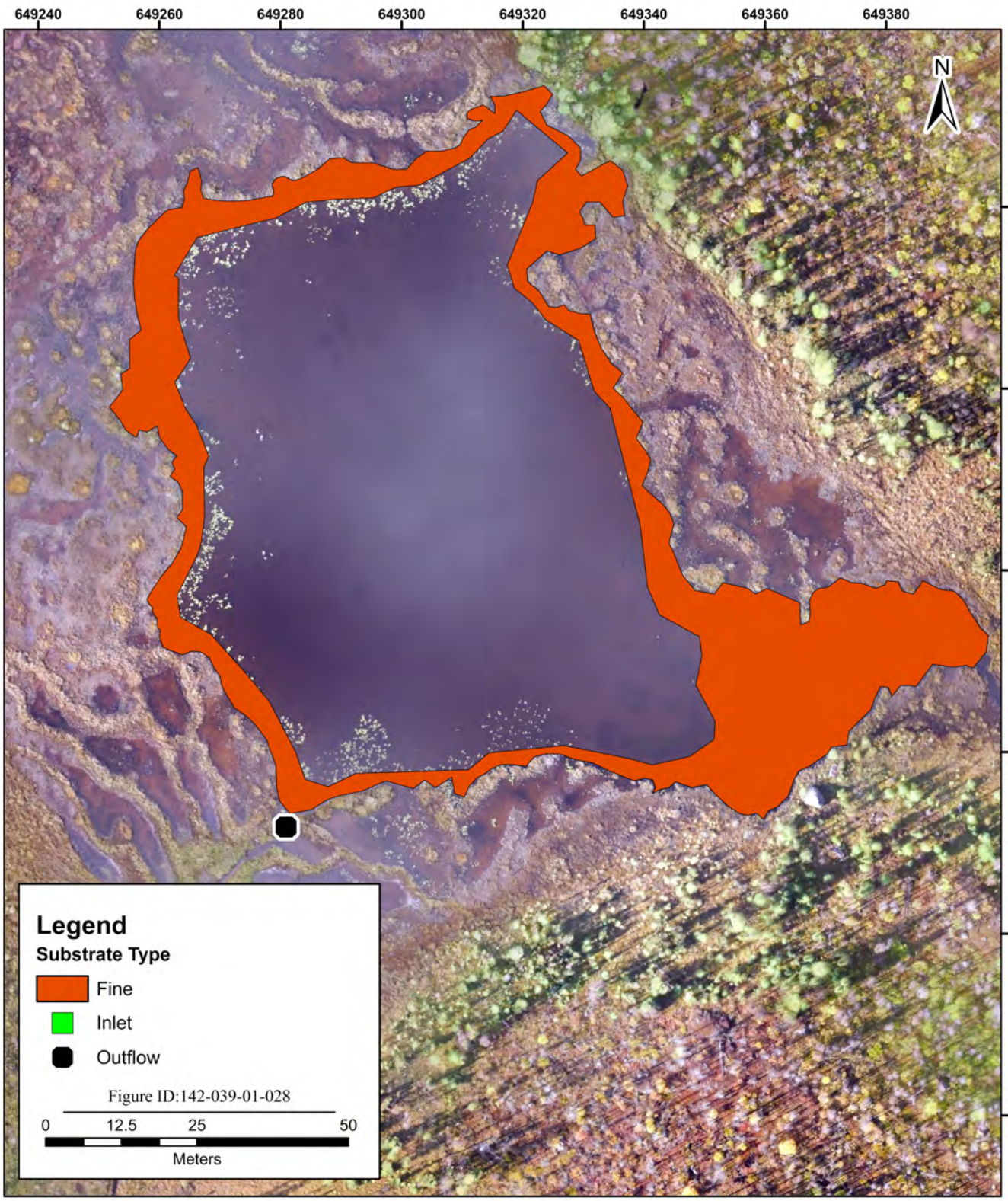


Figure 3.2 Lake L1 Habitat Map.

Table 3.1 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L1.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
9,162	3,913	Fine	With vegetation	297
			No vegetation	8,865
			Total	9,162

3.1.3 Lake L1 Water Quality

The water quality data for Lake L1 is provided in Appendix C. Most metals in Lake L1 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 0.35 µg/L and was typical of an oligotrophic lake (Appendix C).

Field water quality parameters were measured at one depth in Lake L1 (0.5 m) and are provided in Appendix C. The temperature measured 19.5°C, while pH, dissolved oxygen, conductivity, and oxidation-reduction potential (ORP) showed values of 7.44, 8.23 mg/L (or 89.6% saturation), 51.1 µS/cm, and 49.6 mV, respectively.

3.1.4 Lake L1 Sediment Quality

The sediment quality data for Lake L1 is provided in Appendix C. Many metals were at measurable amounts in the sediment except antimony, beryllium, bismuth, boron, lithium, molybdenum, rubidium, selenium, silver, thallium, and tin. Iron was high and measured 13,000 mg/kg. Total organic carbon in the sediment of Lake L1 measured 140 g/kg. The sediment particle size was mainly clay (63%), with some silt (31%) and small amounts of sand (6%; Appendix C).

3.1.5 Lake L1 Fish Population Assessment

3.1.5.1 Fish Community

The fish community in Lake L1 was composed entirely of brook trout (100%).

3.1.5.2 Fishing Effort and Catch

Fishing of Lake L1 was conducted using fyke nets to determine a mark-recapture population estimate for brook trout in the lake. Sampling locations are provided in Figure 3.1. A summary of the fyke net fishing

effort, fish catches and the catch per unit of effort (CPUE) are provided in Table 3.2. Fyke netting was conducted August 22-25, 2021, with six nets used for the duration. The total net nights fished was 18 and effort was limited by helicopter availability. Not all nets captured fish each night and the number of nets that captured fish ranged from two to four nets each night, averaging three nets. During three nights of fishing, 85 brook trout were captured. The total number of brook trout recaptured was five fish (5.9%). Catches of brook trout ranged from 13 to 47 fish per night, averaging 28.3 fish. CPUE for brook trout ranged from 2.2 to 7.8 fish/net night averaging 4.7 fish/net night. Brook trout CPUE was highest on the second day of fishing and lowest on the first day with a near average catch on the third day.

Table 3.2 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L1.

Set Date	Haul Date	No. Of Nets[1]	Net Nights	Brook Trout		CPUE[2]
				Total	Recap	Brook Trout
Aug. 22	Aug. 23	6(2)	6	13	0	2.2
Aug. 23	Aug. 24	6(3)	6	47	2	7.8
Aug. 24	Aug. 25	6(4)	6	25	3	4.2
Totals			18	85	5	4.7

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night.

3.1.5.3 Characteristics of the Fish Population

The length, weight and condition factor for brook trout captured in Lake L1 are summarized in Table 3.3. The length of brook trout captured ranged from 76 to 190 mm and averaged 129.2 mm (std. dev. = ± 19.3). Brook trout recaptured during fyke netting were slightly larger than the average for the population, and averaged 137.8 mm, with no fish less than 116 mm and a maximum length of 178 mm. Brook trout weight ranged from 4 to 64 g and averaged 21.6 g (std. dev. = ± 11.0). Similarly, the weights of brook trout recaptured were slightly larger than the overall average, and averaged 28.0 g, with no recaptured fish weighing more than 46 g or less than 21.0 g. Condition factor for brook trout captured in Lake L1 ranged from 0.8 to 1.2, averaging 0.9 (std. dev. = ± 0.1).

The length frequency distribution for brook trout captured in Lake L1 is provided in Figure 3.3. The distribution was unimodal with the peak size class between 125 to 150 mm (42.4%) and 100 to 125 mm (40.0%), with few fish captured less than 100 mm (5.9%). Similar numbers of fish were captured in the 150 to 175 mm (7.1%) and 175 to 200 mm (4.7%) size ranges.

Table 3.3 Summary of Meristic Data for Fish Caught by Fish Nets in Lake L1.

Species	Parameter	Mean	Min	Max	Std. Dev.
Brook trout (initial capture)	Length (mm)	129.2	76.0	190.0	19.3
	Weight (g)	21.6	4.0	64.0	11.0
	Condition (K)	0.9	0.8	1.2	0.1
Brook trout (recapture)	Length (mm)	137.8	116.0	178.0	21.3
	Weight (g)	28.0	21.0	46.0	10.4
	Condition (K)	0.9	0.8	1.0	0.1

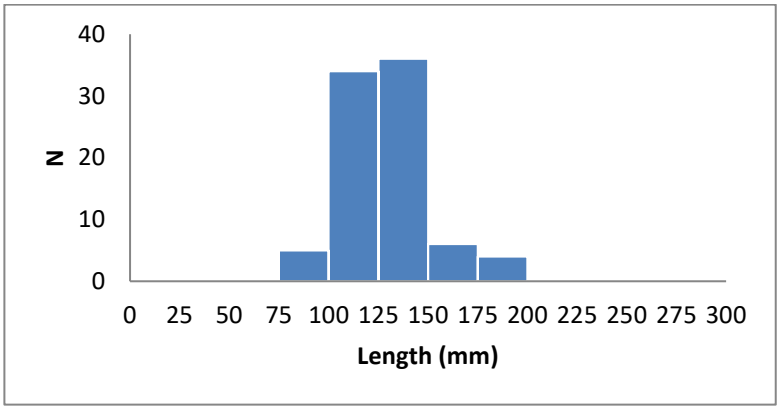


Figure 3.3 Length Frequency Distribution of Brook Trout Captured in Lake L1.

3.1.5.4 Fish Population Estimate

A fish population estimate for brook trout in Lake L1 was determined from a mark-recapture census and calculated using the Schnabel method. The brook trout population estimate in August 2021 was 460 fish with upper and lower 95% confidence intervals of 533 and 405 fish, respectively.

3.1.6 Phytoplankton

A phytoplankton sample was collected at one station in Lake L1 on August 23, 2021 (Figure 3.1). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L1 was 204 mg/m^3, and the 10-30 µm was the dominant size group with a biomass of 134 mg/m^3, while the > 30 µm size group was absent.

3.1.7 Zooplankton

A zooplankton sample was collected at one station in Lake L1 on August 23, 2021 (Figure 3.1). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group

and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 138.44, 280.81, and 0.01, respectively, for a total biomass of 419.26 mg/m^3. *Ceriodaphnia* were the largest single genus with a biomass of 243.33 mg/m^3, followed by calanoids as a group (138.02 mg/m^3), and the genus *Bosmina* (37.48 mg/m^3). Cladocerans were the dominant group while Rotifers has a very low biomass.

3.2 Lake L2

3.2.1 General Overview Description

Lake L2 was located southwest of Flora South Basin and approximately 80 meters west of the main ATV trail in the area. A short man-made trail was required to bring in a boat and equipment at the closest point between the existing trail and the lake's eastern side. This lake had only one outlet, located at the southwest corner. This outlet began at the lake as a 6 m wide section and water was barely visible through the grass and other riparian vegetation. It then transitioned to a narrower (0.3 m wide) and shallow section that appeared to run intermittently underground. No inlets were identified during the survey and the lake appeared mostly stagnant and turbid. Limited water flowed from the wetland area at the northern end of Lake L2. The shoreline of Lake L2 consisted of a mixture of wetland with sections of black spruce trees to the water's edge in most areas. Lake substrate was entirely organic muck with some sections of lily pads. The location of fishing nets, and other sampling points for the various assessments are provided in Figure 3.4. Fish were sampled using fyke nets (n=4), minnow traps (n=3) and a gill net (n=1).

3.2.2 Lake Habitat Assessment

3.2.2.1 Bathymetry

Bathymetric studies were completed on Lake L2 on August 15, 2021, using sonar and GPS. Transects were spaced approximately 25 m apart and oriented in an east-west direction. A total of eight transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.4). The surface area of the lake was 20,743 m^2 and the lake volume was 17,418 m^3. The lake bottom had a relatively constant gentle slope from its shoreline to its maximum depth of 1.5 m.

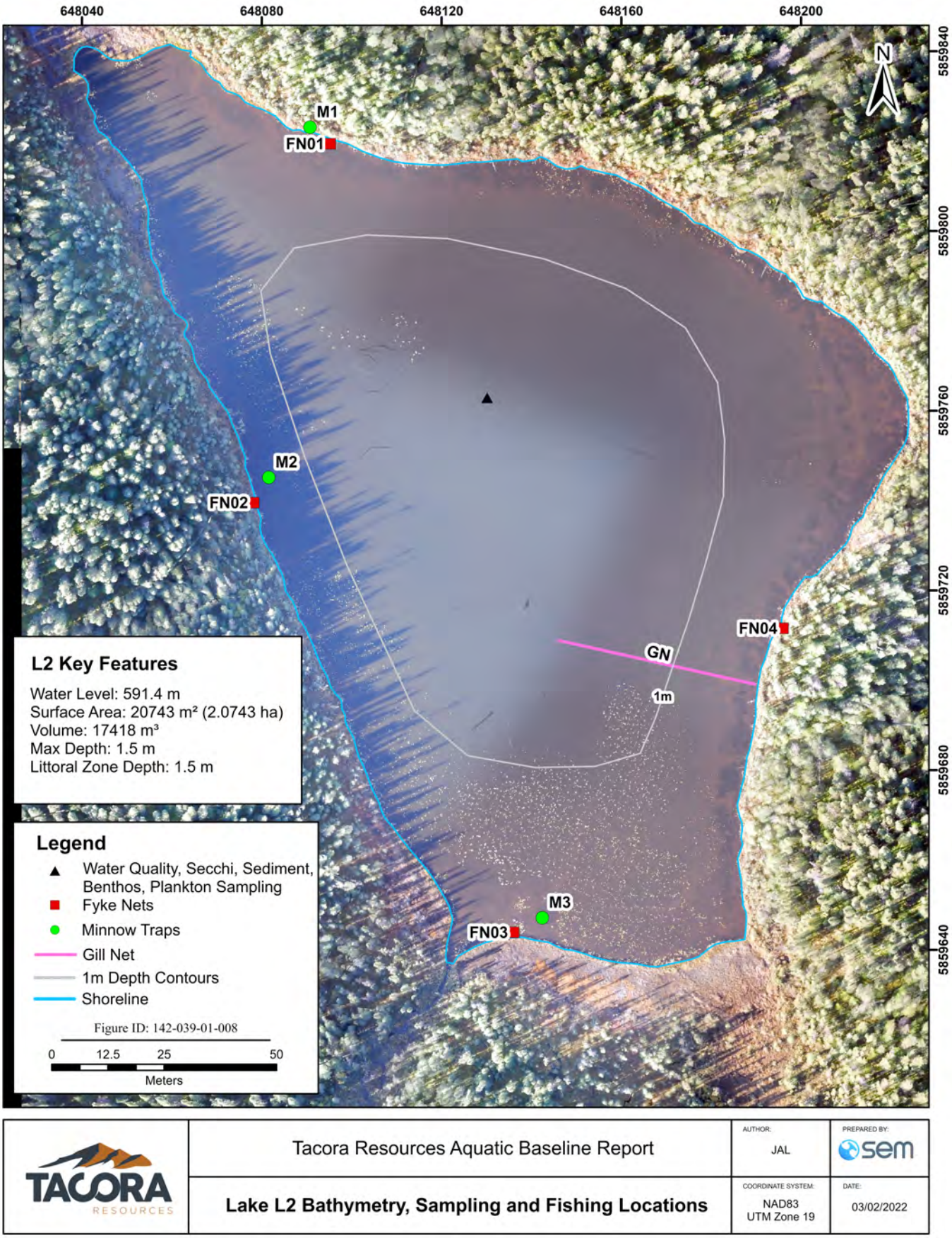


Figure 3.4 Lake L2 Bathymetry, Sampling and Fishing Locations.

3.2.2.2 Habitat Mapping

A survey of habitat in Lake L2 included substrate and vegetation and was conducted on August 26, 2021 (Figure 3.5). Lake L2 maximum depth was 1.5 m and the entire lake consisted of littoral zone. Similar to Lake L1, L2 was composed of fines near the shore and away from the shore. Basin characteristics (i.e., area, volume) and area of the fine substrate class are provided in Table 3.4.

Table 3.4 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L2.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
20,743	17,418	Fine	With vegetation	448
			No vegetation	20,295
			Total	20,743

3.2.3 Lake L2 Water Quality

There were no fish caught in Lake L2 and as per survey protocol, no water chemistry and sediment samples for laboratory analyses were collected.

Field water quality parameters were measured at two depths in L2 (i.e., 1 and 1.5 m) and are provided in Appendix C. The temperature difference between 1 m and 1.5 m was only 0.1°C. Dissolved oxygen showed a decrease at 1 m (to 8.39 mg/L or 95.0% saturation) from 1.5 m (8.56 mg/L or 99.4% saturation). pH, conductivity, and ORP levels were comparable and ranged from 7.32 (at 1.5 m) to 7.33 (at 1 m), 31.2 to 32.3 µS/cm, and 43.3 to 44.4 mV, respectively.

3.2.4 Lake L2 Fish Population Assessment

3.2.4.1 Fishing Effort and Catch

Fishing of Lake L2 was conducted using fyke nets (n=4) and minnow traps (n=3) on August 13 and 14, 2021, and one gill net was set on August 15, 2021. Fyke nets and minnow traps were checked after 24 and 48 hr but yielded no fish.

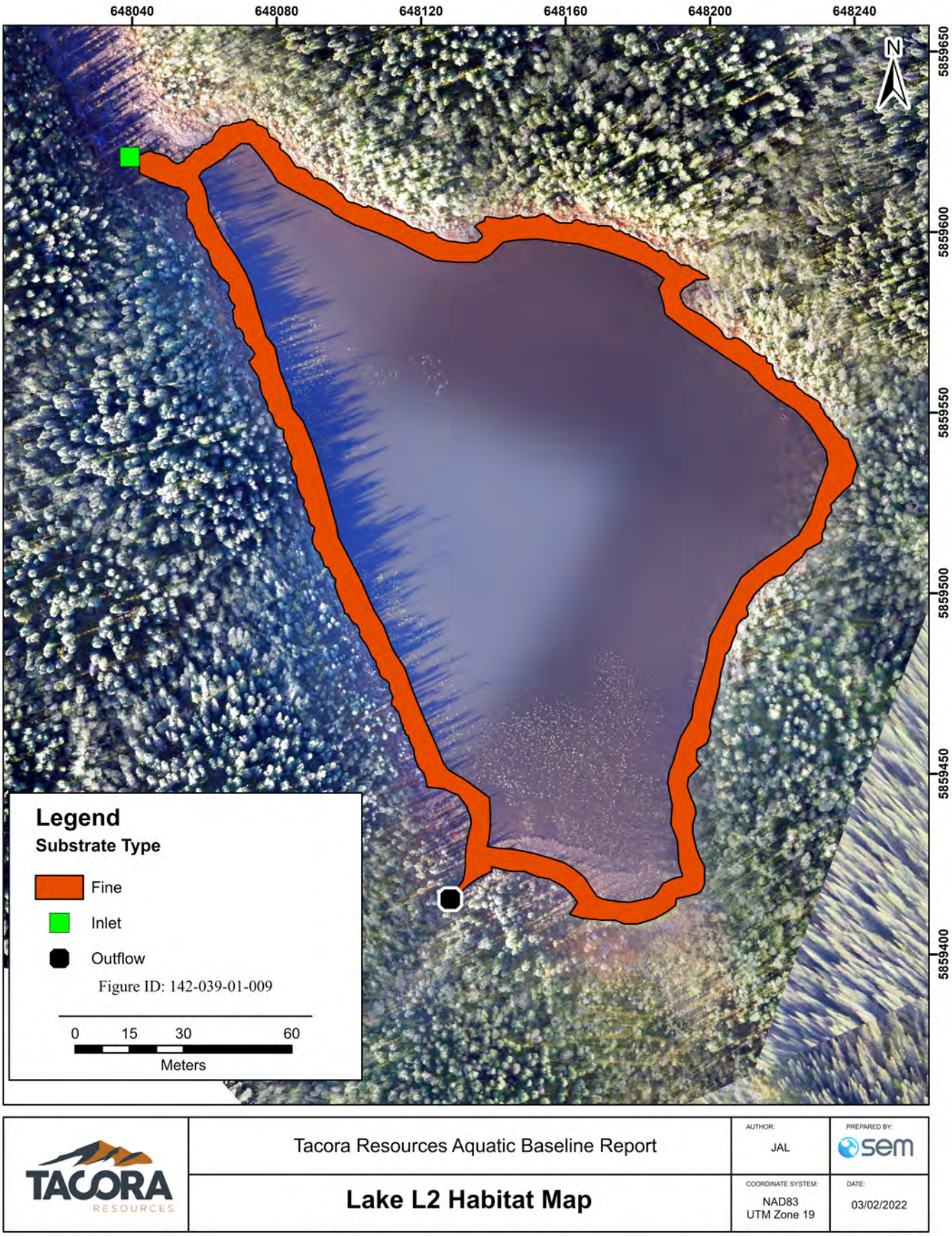


Figure 3.5 Lake L2 Habitat Map.

3.3 Lake L3

3.3.1 General Overview Description

Lake L3 was situated south of Flora South Basin, connected by an outlet stream flowing north into the basin. This was the main and only outlet of Lake L3 and was partially blocked due to the presence of a beaver dam. It was situated within a deep valley having steep slopes for the majority of the lake's perimeter. The main inlet of the lake near the southern end was shallow with a gently sloped section that extended approximately 20 m from shore. The profile was similar near the second small inlet to the northwest originating from Lake L4. The area surrounding the main inlet was frequented by brook trout, while the steeper areas of the shoreline were more prevalent with white suckers and burbot. ATV/snowmobile and hunting trails were present west of the lake, which provide access to cabins further south of Lake L3. There was a noted side trail connected to Lake L3 for access that appeared to have not been used in recent past, as it was overgrown with alders. The shoreline of Lake L3 consisted mainly of mature black spruce trees intermixed with some sections of smaller alders. The lake bottom contained a variety of substrate types with several sections of cobbles, boulders and sand extending to 20 meters. Beyond the littoral zone contained predominantly fines. The location of fishing nets and where other samples were collected are provided in Figure 3.6. Fish were sampled using fyke nets (n=10), minnow traps (n=2) and gill net (n=1). Water quality, Secchi depth, sediment quality, benthic community, phytoplankton, and zooplankton were all sampled from one location in the lake (Figure 3.6).

3.3.2 Lake Habitat Assessment

3.3.2.1 Bathymetry

Bathymetric studies were completed on Lake L3 on August 8, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of 18 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.6). The surface area of the lake was 43,299 m^2 and the lake volume was 107,015 m^3. The lake is deepest in its southern region, reaching a maximum depth of 4.5 m.

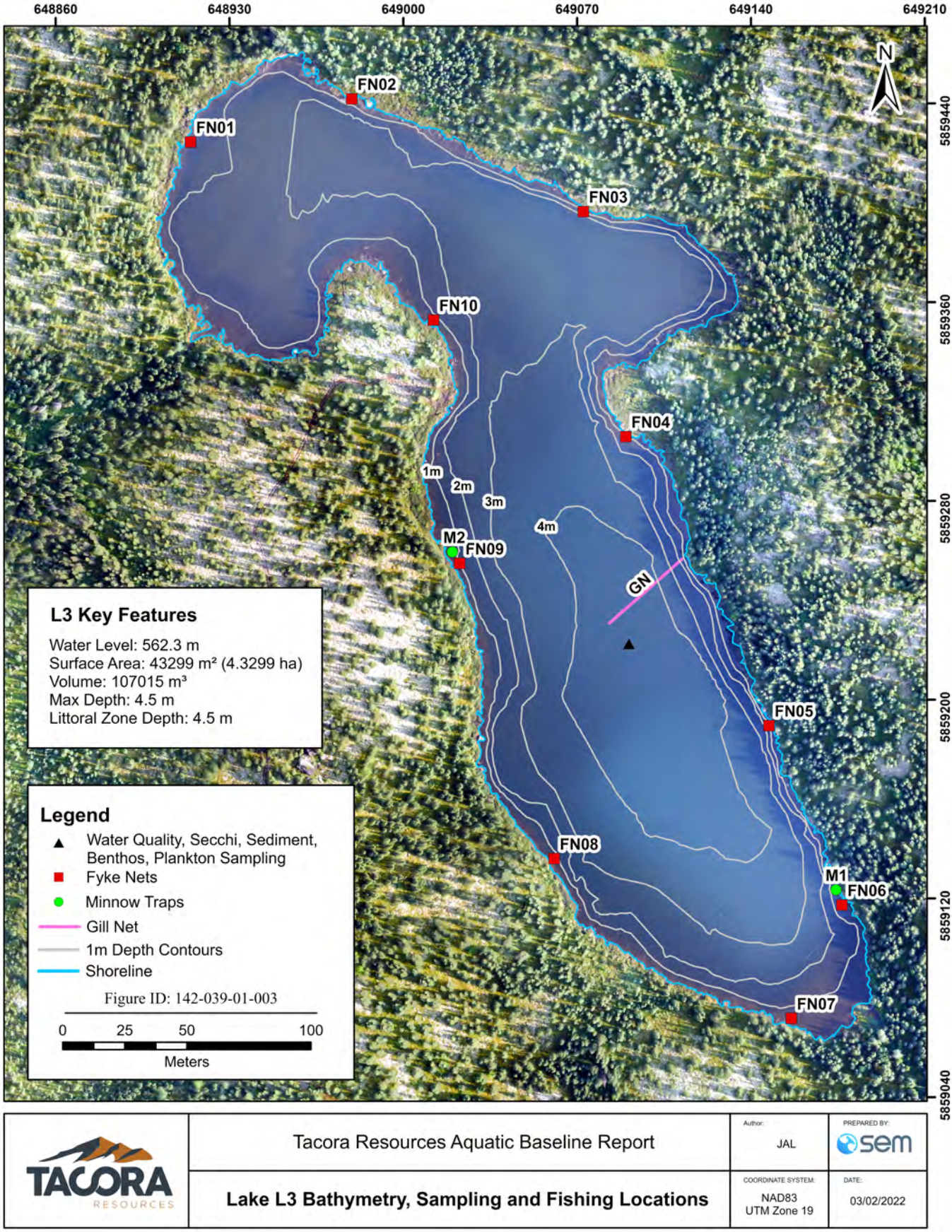


Figure 3.6 Lake L3 Bathymetry, Sampling and Fishing Locations.

3.3.2.2 Habitat Mapping

A survey of habitat in Lake L3 included substrate and vegetation and was conducted on August 8, 2021 (Figure 3.7). The entire lake was composed of littoral zone and due to the shallow characteristics of Lake L3 and the Secchi depth (i.e., 4 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the coloured sections; Figure 3.7) was composed of fines. The shoreline survey of Lake L3 identified the substrate classes as fine, fine/medium, coarse/medium, coarse/fine, and medium/coarse. The majority of the lake substrate was fines, comprising 42% of the total littoral zone, while coarse and medium comprised 31% and 28% of the total. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.5.

Table 3.5 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L3.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
43,299	107,015	Fine	With vegetation	0
			No vegetation	39,096
		Medium	With vegetation	0
			No vegetation	2,009
		Coarse	With vegetation	0
			No vegetation	2,194
			Total	43,299

3.3.3 Lake L3 Water Quality

The water quality data for Lake L3 is provided in Appendix C. Many metals in Lake L3 were below detection limits, while aluminum, barium, calcium, magnesium, manganese, potassium, sodium, strontium and zinc were detected. Iron, phosphorus, lead, and copper were undetected. The lake had a pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate and nitrite, nitrate + nitrite, and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 1.06 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at four depths in Lake L3 (i.e., 1, 2, 3, and 4 m) and are provided in Appendix C. The temperature difference between 1 m and 4 m was only 0.2°C. Dissolved oxygen showed a decrease at 4 m (to 7.1 mg/L or 67% saturation) from 1 m (7.8 mg/L or 79% saturation). pH, conductivity, and ORP levels were comparable and ranged from 7.55 (at 1 m) to 7.45 (at 4 m), 80 to 81.5 µS/cm, and 57.1 to 52 mV, respectively.

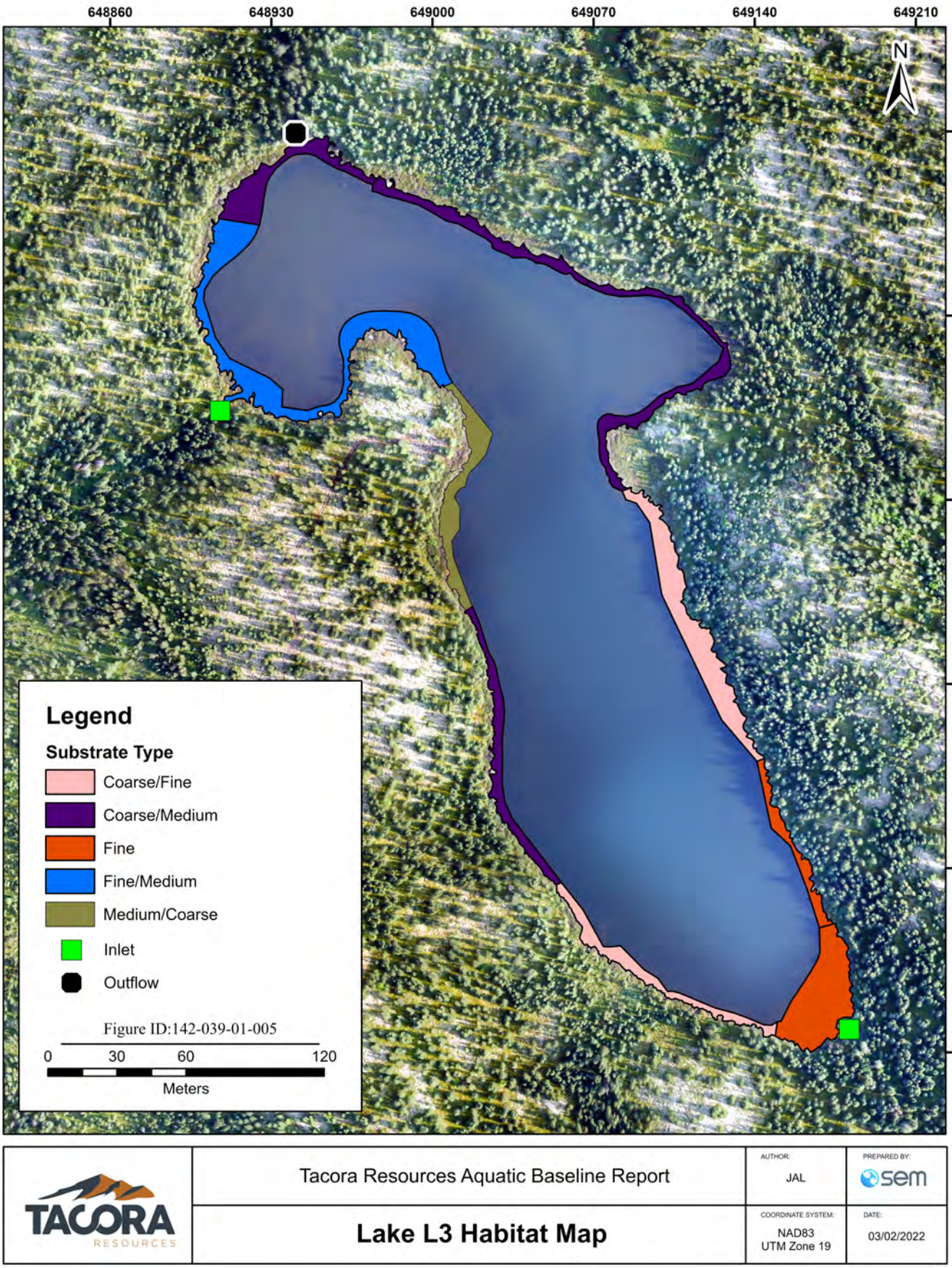


Figure 3.7 Lake L3 Habitat Map.

3.3.4 Lake L3 Sediment Quality

The sediment quality data for Lake L3 is provided in Appendix C. Most metals were at measurable amounts except antimony, beryllium, bismuth, boron, lithium, silver, and tin. Iron was high and measured 240,000 mg/kg. Total organic carbon in the sediment of Lake L3 measured 220 g/kg. The sediment was mainly composed of clay (75%), with some silt (23%) and small amounts of sand (2%); (Appendix C).

3.3.5 Lake L3 Fish Population Assessment

3.3.5.1 Fish Community

The fish community in Lake L3 was composed of lake chub (91%), white sucker (4.1%), brook trout (2.6%) and burbot (2.3%) (Figure 3.8). The abundance of longnose sucker was extremely low (i.e., 0.2%) and was not shown in Figure 3.8.

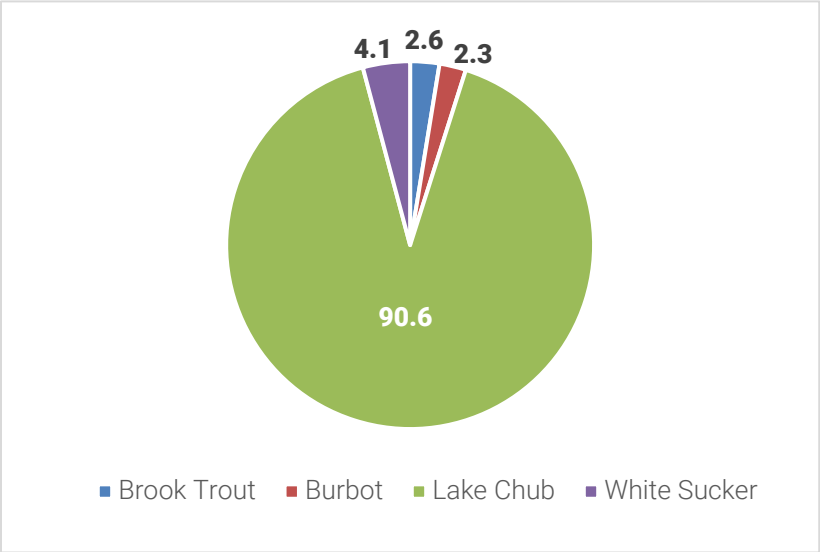


Figure 3.8 Fish Community Composition (% Abundance) for Lake L3.

3.3.5.2 Fishing Effort and Catch

Fishing of Lake L3 was conducted using fyke nets, minnow traps and a gill net, with the fyke net effort intended to determine a population estimate for brook trout. Sampling locations are provided in Figure 3.6. Fyke net fishing was conducted until a 10% recapture rate was achieved for brook trout. A summary of the fishing effort, fish catches and the CPUE is provided in Table 3.6.

Table 3.6 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing of Lake L3.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		Burbot	Lake Chub	White Sucker	Longnose Sucker	CPUE[2]				
				Total	Recap	Total	Total	Total	Total	Brook Trout	Burbot	Lake Chub	White Sucker	Longnose Sucker
Fyke Nets														
Aug. 3	Aug. 5	9(7)	18	61	0	21	826	68	0	3.4	1.2	45.9	3.8	0.0
Aug. 5	Aug. 7	10(8)	20	35	4	25	1,871	74	4	2.0	1.3	93.6	3.7	0.2
Aug. 7	Aug. 8	10(8)	10	11	3	29	606	29	2	1.4	2.9	60.6	2.9	0.2
Aug. 8	Aug. 9	10(9)	10	8	1	17	788	24	3	0.9	1.7	78.8	2.4	0.3
Aug. 9	Aug. 10	6(6)	6	15	5	30	695	23	0	3.3	5.0	115.8	3.8	0.0
Totals			64	130	13	122	4,786	218	9	2.2	1.9	74.5	3.4	0.1
Minnow Traps														
Aug. 3	Aug. 5	2(1)	2	0	0	0	1	0	0	0.0	0	0.5	0	0
Aug. 5	Aug. 7	2(1)	2	2	0	0	0	0	0	1.0	0	0	0	0
Aug. 7	Aug. 8	2(0)	2	0	0	0	0	0	0	0.0	0	0	0	0
Aug. 8	Aug. 9	2(0)	2	0	0	0	0	0	0	0.0	0	0	0	0
Aug. 9	Aug. 10	2(1)	2	0	0	1	0	0	0	0.0	0.5	0	0	0
Totals			10	2	0	1	1	0	0	0.2	0.1	0.1	0	0
Gill Net														
Aug. 9	Aug. 9	1(1)	1.5	3	0	0	0	0	0	2.0	0	0	0	0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets.

Fyke netting was conducted August 3-10, 2021, with nine nets set initially on August 3, then increased to ten nets on August 5. The total net nights fished was 64, ranging from six to ten nets per night, averaging nine nets per night. Not all nets captured fish each night and the number of nets that captured fish ranged from six to nine nets each night, averaging 7.6 nets. Five fish species were captured: 143 brook trout, 4,786 lake chub, 122 burbot, 218 white suckers, and nine longnose suckers. The total number of brook trout recaptured was 13 fish (9%). Catches of brook trout ranged from eight to 61 fish, averaging 18.5 fish. CPUE for brook trout ranged from 0.9 to 3.4 fish/net night averaging 1.7 fish/net. Brook trout CPUE was highest on the first day of fishing and lowest on the fourth day while other species CPUE was also highest on the last day of fishing and lowest on the fourth day (not including longnose sucker; Table 3.6).

Minnow traps were also placed near fyke nets for the duration of fishing. These traps caught a total of two brook trout, one burbot and one lake chub. Gill netting of Lake L3 was completed on August 9 and one experimental net was set during daylight hours between 10:56 am and 12:33 pm. Three brook trout were captured by gill net (Table 3.6).

Table 3.7 Summary of Meristic Data for Fish Caught in Lake L3.

Species	Parameter	Mean	Min	Max	Std. Dev.
Brook trout (initial capture)	Length (mm)	172	106	285	44.8
	Weight (g)	67	6	240	57.5
	Condition (K)	1.0	0.7	1.4	0.1
Brook trout (recapture)	Length (mm)	162.2	135	254	39.2
	Weight (g)	55.2	22	176	49.5
	Condition (K)	1.1	0.9	1.3	0.1
Lake chub	Length (mm)	72.9	43	120	16.8
	Weight (g)	6.5	3	37	4.2
	Condition (K)	1.1	0.7	1.4	0.1
Burbot	Length (mm)	165.1	45	315	67.2
	Weight (g)	51.2	8	173	26.7
White sucker	Length (mm)	177.1	38	490	72.5
	Weight (g)	110.8	7	1,450	221.4
	Condition (K)	1.1	0.7	1.4	0.1
Longnose sucker	Length (mm)	234.8	164	285	45.8
	Weight (g)	171.1	50	293	91.9
	Condition (K)	1.2	1.0	1.3	0.1

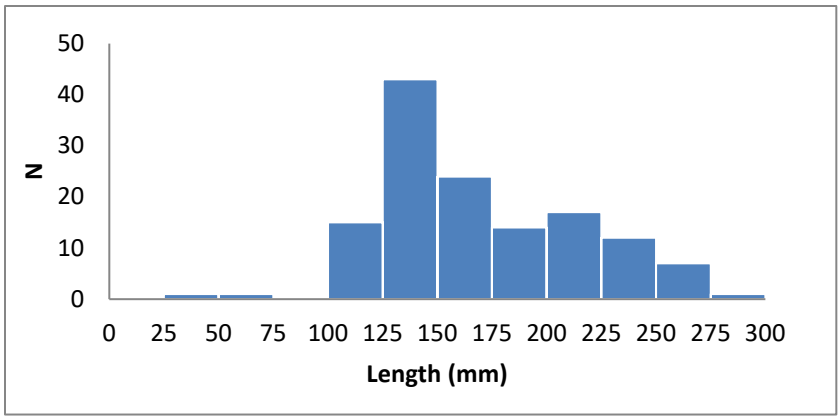


Figure 3.9 Length Frequency Distribution of Brook Trout Captured in Lake L3.

3.3.5.3 Fish Population Estimate

A fish population estimate for brook trout in Lake L3 in August 2021, was determined to be 411 fish with upper and lower 95% confidence intervals of 561 and 325 fish, respectively.

3.3.6 Benthic Community

Lake L3 benthic sample had a total abundance of 39 individuals (Appendix C). Chironomidae (Order: Diptera) were the dominant taxa (49% of the sample) while Pisidiidae (Order: Pelecypoda) comprised 41%. Pisidiidae (or "peaclams") are freshwater molluscs that typically reside in most freshwater aquatic environments and favour good water quality with silt, mud and sand substrates. The remaining 10% of organisms consisted of Valvatidae (Order: Gastropoda) and Chaoboridae (Order: Diptera). This resulted in a taxon richness of four and density of 780 organisms per square meter (Appendix C). Valvatidae (or "valve snails") are indicators of aquatic health and are generally tolerant to poor water quality. Both Dipteran families (Chironomidae and Chaoboridae), also known as "midges", represented in L3 are considered common in nearly all aquatic environments.

3.3.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L3 on August 8, 2021 (Figure 3.6). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L3 was 401 mg/m^3, with all three size groups present, and <10 µm was the dominant size group with a biomass of 252 mg/m^3.

3.3.8 Zooplankton

A zooplankton sample was collected at one station in Lake L3 on August 8, 2021 (Figure 3.6). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 80.06, 108.87, and 1.37, respectively, for a total biomass of 190.30 mg/m^3. *Daphnia* were largest single genus with a biomass of 84.31 mg/m^3 followed by calanoids as a group (62.44 mg/m^3), the genus *Ceriodaphnia* (21.97 mg/m^3), and cyclopoids as a group (17.19 mg/m^3). Cladocera's were the dominant group while Rotifers had the lowest biomass.

3.4 Lake L4

3.4.1 General Overview Description

Lake L4 was a small pond located at the bottom of a wooded depression and had steep treed slopes on three sides. Lake L4 was situated between two ATV/snowmobile trails. A main trail for cabin access passed along the western side of Lake L4 before it turned east near the southern end. Another trail began there and connected to Lake L3 and appeared to be much less frequently used. A small ATV trail was cut to Lake L4 to gain access with nets and equipment from the existing trail on the western side. This lake had one outlet, located at the northern end. This outlet was very narrow (0.3 m), shallow, and slow moving. Sections of this outlet flowed underground with the final destination in Lake L3. The lake did not have any inlets identified during the survey and was fed by runoff or groundwater from the surrounding sloped land. The shoreline of L4 consisted of a mixture of wetland with sections of black spruce trees and alders. Lake substrate was entirely mobile organic muck with some sections of sparse grasses near shore. There was a layer of organics floating on the surface of the lake approximately 0.1 m thick, covering 5% of the lake surface at the time of survey. The location of fishing nets and other samples are provided in Figure 3.10. Fish were sampled using fyke nets (n=6), minnow traps (n=4) and gill net (n=1).

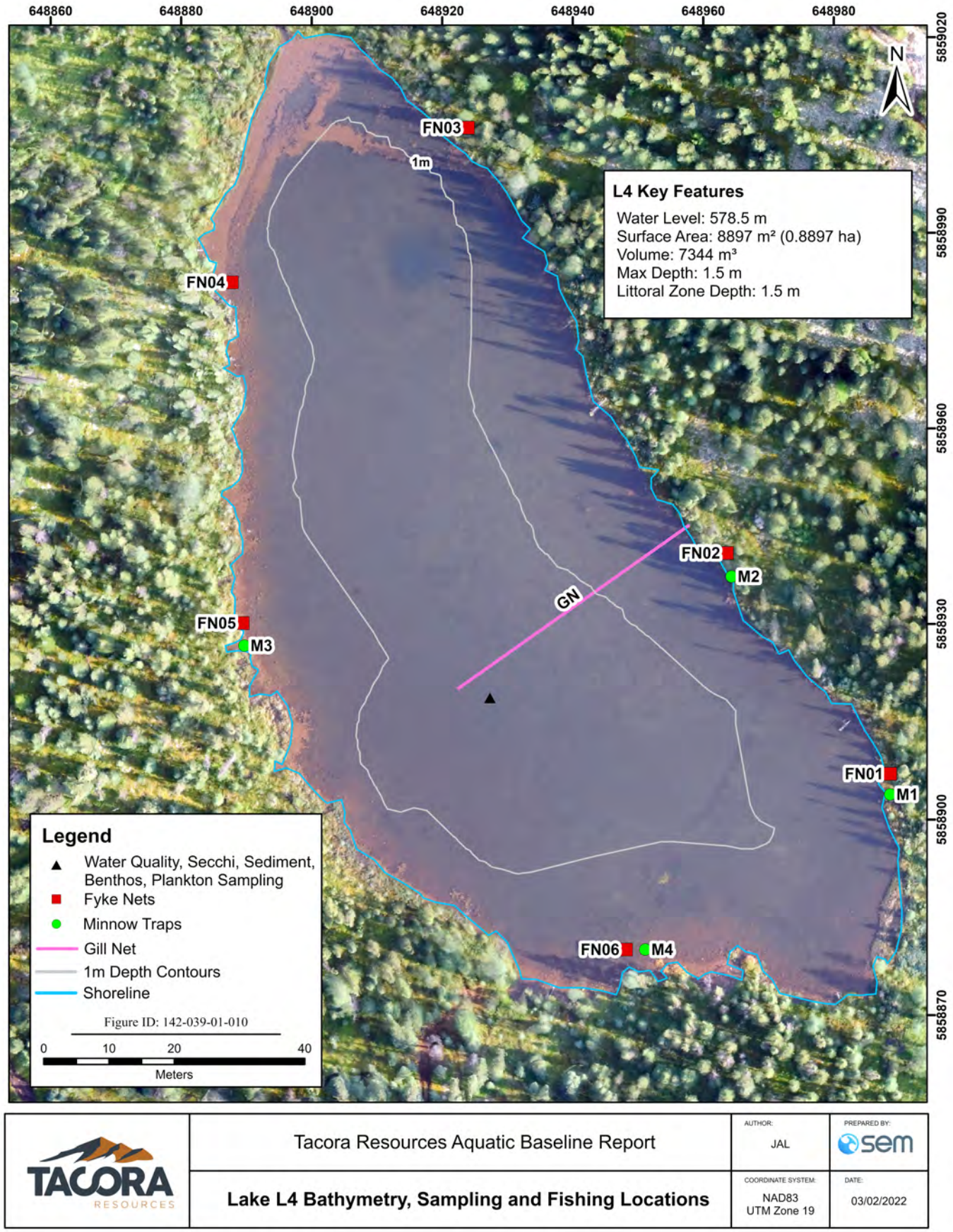


Figure 3.10 Lake L4 Bathymetry, Sampling and Fishing Locations.

3.4.2 Lake Habitat Assessment

3.4.2.1 Bathymetry

Bathymetric studies were completed on Lake L4 on August 12, 2021, using sonar and GPS. Transects were spaced approximately 15 m apart and oriented in a northeast-southwest direction. A total of nine transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.10). The surface area of the lake was 8,897 m^2 and the lake volume was 7,344 m^3. The lake bottom had a relatively constant gentle slope from its shoreline to its maximum depth of 1.5 m.

3.4.2.2 Habitat Mapping

A survey of habitat in Lake L4 included substrate and vegetation and was conducted on August 18, 2021 (Figure 3.11). Lake L4 had 100% littoral zone due to the shallow characteristics of the lake (i.e., maximum depth of 1.5 m) and exhibited no profundal zone. The lake habitat near and away from the shore was composed of fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.8.

Table 3.8 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L4.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
8,897	7,344	Fine	With vegetation	0
			No vegetation	8,897
			Total	8,897

3.4.3 Lake L4 Water Quality

The water quality data for Lake L4 is provided in Appendix C. Several metals in Lake L4 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, strontium, and uranium were detected. Phosphorus, lead, and copper were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride (Appendix C). Chlorophyll 'a' measured 0.23 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in Lake L4 (1.0 m) and are provided in Appendix C. The temperature measured 20.3°C, while pH, dissolved oxygen, conductivity, and ORP had values of 7.64, 8.35 mg/L (or 92.9% saturation), 99.3 µS/cm, 61.0 mV, respectively.

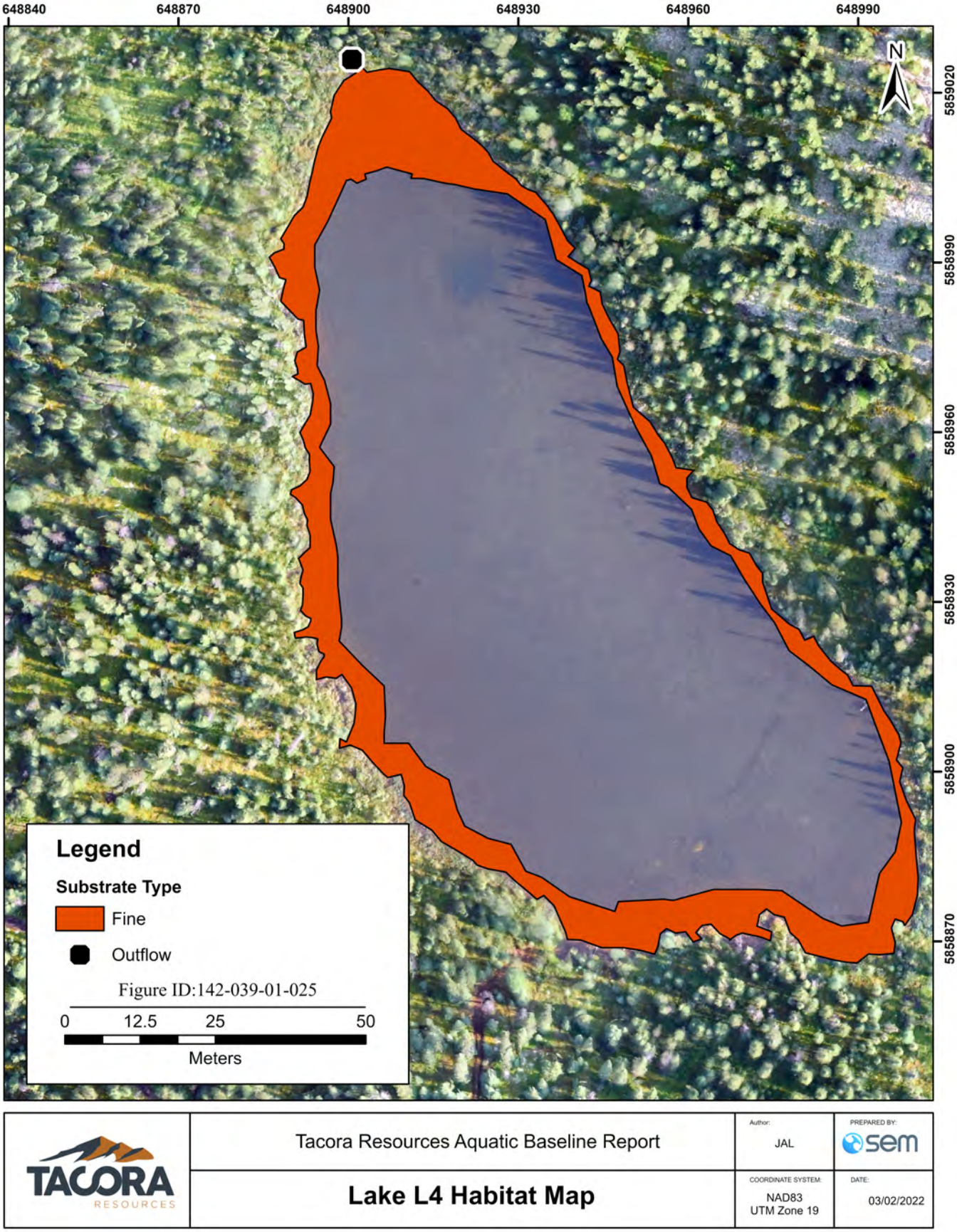


Figure 3.11 Lake L4 Habitat Map.

3.4.4 Lake L4 Sediment Quality

The sediment quality data for Lake L4 is provided in Appendix C. Most metals were not detected (ND) in the sediment except aluminum, barium, copper, iron, lead, manganese, molybdenum, selenium, strontium, uranium, and zinc. Iron measured 5,700 mg/kg. Total organic carbon in the sediment of Lake L4 measured 150 g/kg. The sediment was composed of clay (45%), with some silt (51%) and lesser amounts of sand (4%; Appendix C).

3.4.5 Lake L4 Fish Population Assessment

3.4.5.1 Fish Community

The fish community in Lake L4 was entirely composed of brook trout.

3.4.5.2 Fishing Effort and Catch

Fishing of Lake L4 was conducted using fyke nets, minnow traps and a gill net, with the fyke net effort intended to determine a population estimate for brook trout in the lake. Sampling locations are provided in Figure 3.10. The fyke net effort was conducted until a 10% recapture rate was achieved for brook trout. A summary of the fishing effort, fish catches and the CPUE is provided in Table 3.9. Fyke netting was conducted August 11-15, 2021, with six nets set initially on August 11, then decreased to four nets on August 13. The total net nights fished was 20, and ranged from four to six nets per night, and averaged five nets per night. Not all nets captured fish each night and the number of nets that captured fish ranged from two to four each night and averaged 2.75 nets. The total catch of brook trout was 40 fish with five (14%) recaptured. Catches of brook trout ranged from two to 16 fish per night and averaged nine fish/night. Total CPUE for brook trout in fyke, minnow and gill netting ranged from 0.1 to 2.0 fish/net night and averaged 3.4 fish/net night. Brook trout CPUE in the fyke nets was highest on the second day of fishing and lowest on the third day. Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught a total of one brook trout. Gill netting of Lake L4 was completed on August 14, 2021, and captured one brook trout.

Table 3.9 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing of Lake L4.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		CPUE[2]
				Total	Recap	Brook Trout
Fyke Nets						
Aug. 11	Aug. 12	6(4)	6	16	0	2.7
Aug. 12	Aug. 13	6(3)	6	15	2	2.8
Aug. 13	Aug. 14	4(2)	4	2	1	0.8
Aug. 14	Aug. 15	4(2)	4	2	2	1.0
Totals			20	35	5	2.0
Minnow Traps						
Aug. 11	Aug. 12	4(0)	4	0	0	0.0
Aug. 12	Aug. 13	4(0)	4	0	0	0.0
Aug. 13	Aug. 14	3(1)	3	1	0	0.3
Aug. 14	Aug. 15	2(0)	2	0	0	0.0
Totals			13	1	0	0.1
Gill Net						
Aug. 14	Aug. 14	1(1)	1	1	0	0.8

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets

3.4.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L4 are summarized in Table 3.10. The length of brook trout captured ranged from 58 to 238 mm and averaged 142.1 mm (std. dev. = ± 50.2). Brook trout recaptured during fyke netting had comparable mean length to the overall population, and averaged 142.2 mm, with no fish less than 100 mm and a maximum length of 185 mm captured. Due to the quantity of YoY sized fish caught, and the inability to mark these fish, the mark-recapture data are skewed towards larger fish in the population. Brook trout weight ranged from 5.0 to 143.0 g and averaged 47.7 g (std. dev. = ± 39.4). The weights of brook trout recaptured were slightly smaller than the overall population, and averaged 37.2 g, with no recaptured fish weighing more than 72.0 g. Condition factor for brook trout captured in L4 ranged from 0.8 to 1.4, averaging 1.1 (std. dev. = ± 0.1). The length frequency distribution for brook trout captured in Lake L4 is provided in Figure 3.12. The distribution was unimodal with the peak size class between 125 and 150 mm (23.8%). No fish were captured less than 50 mm and fewer fish were greater than 200 mm (11.9%).

Table 3.10 Summary of Meristic Data for Fish Caught in Lake L4.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	142.1	58.0	238.0	50.2
	Weight (g)	47.7	5.0	143.0	39.4
	Condition (K)	1.1	0.8	1.4	0.1
Brook trout (recapture)	Length (mm)	142.2	100.0	185.0	30.7
	Weight (g)	37.2	13.0	72.0	23.5
	Condition (K)	1.1	0.9	1.3	0.1

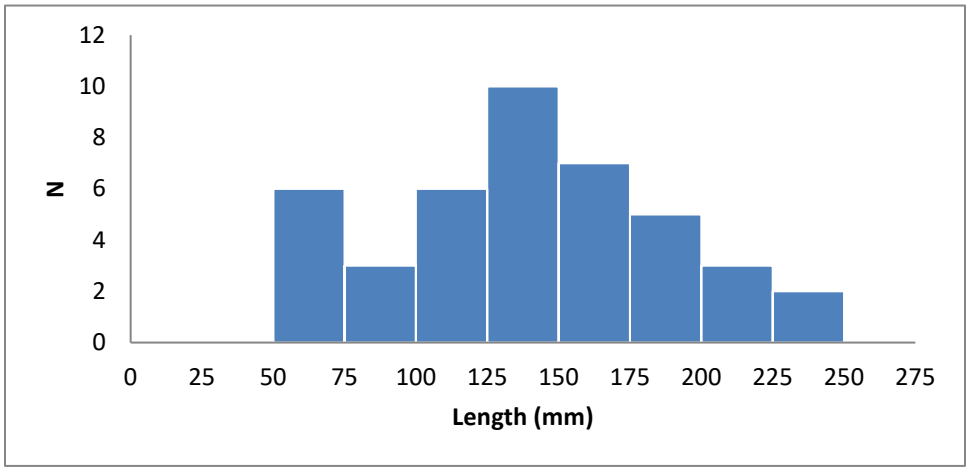


Figure 3.12 Length Frequency Distribution of Brook Trout Captured in Lake L4.

3.4.5.4 Fish Population Estimate

A fish population estimate for brook trout in Lake L4 was determined in August 2021, which was 106 fish with upper and lower 95% confidence intervals of 157 and 80 fish, respectively.

3.4.6 Benthic Community

Lake L4 had one benthic macroinvertebrate in the sample with a taxonomic richness of one and density of 33 individuals/m^3 (Appendix C). The family represented in the sample consisted of Pisidiidae, the most common benthic macroinvertebrate found in eight of the 17 lakes in the study area.

3.4.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L4 on August 14, 2021 (Figure 3.10). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L4 was 233 mg/m^3 with <10 µm the dominant size group

with a biomass of 124 mg/m^3, followed closely by the 10-30 µm size group at 102 mg/m^3. The >30 µm was very low (7 mg/m^3).

3.4.8 Zooplankton

A zooplankton sample was collected at one station in Lake L4 on August 14, 2021 (Figure 3.10). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods and Cladocerans were 43.07 and 14.14, respectively, for a total biomass of 57.21, while Rotifers were absent. Calanoids as a group (42.97 mg/m^3) had the greatest biomass, followed by the genus *Holopedium* (5.40 mg/m^3), the genus *Bosmina* (5.30 mg/m^3), and the genus *Daphnia* (3.20 mg/m^3). Copepods were the dominant group while Rotifers were absent.

3.5 Lake L5

3.5.1 General Overview Description

Lake L5 was a small pond surrounded by relatively flat to gentle sloped land on all sides other than the southeast peninsula, where there was a steep sloped area. The lake was located immediately next to an ATV trail that provided easy access. There also appeared to be markings for a snowmobile trail that would cross the pond in the winter months. A cabin was located southeast of the lake approximately 80 m from the shoreline. No outlet was identified for Lake L5 during the survey, however there was evidence of possible drainage northeast of Lake L5 as the ATV trail had a notable wet section. Lake L5 had a small inlet at the southern end that was intermittent, originating from the wetland area located south of the lake. The shoreline of Lake L5 consisted of a mixture of wetland with sections of black spruce trees and alders. The lake substrate was entirely organic muck with some sections of emergent grasses nearshore. The location of fishing nets and sampling points for the various assessments are shown in Figure 3.13. Fish were sampled using fyke nets (n=6), minnow traps (n=3) and gill net (n=1).

3.5.2 Lake Habitat Assessment

3.5.2.1 Bathymetry

Bathymetric studies were completed on Lake L5 on August 12, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of 12 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.13). The surface area of the lake was 21,217 m^2 and the lake volume was 12,922 m^3. The lake has a shallow region in its southeast corner. The deepest section of the lake was near the centre, reaching a depth of 1.3 m.

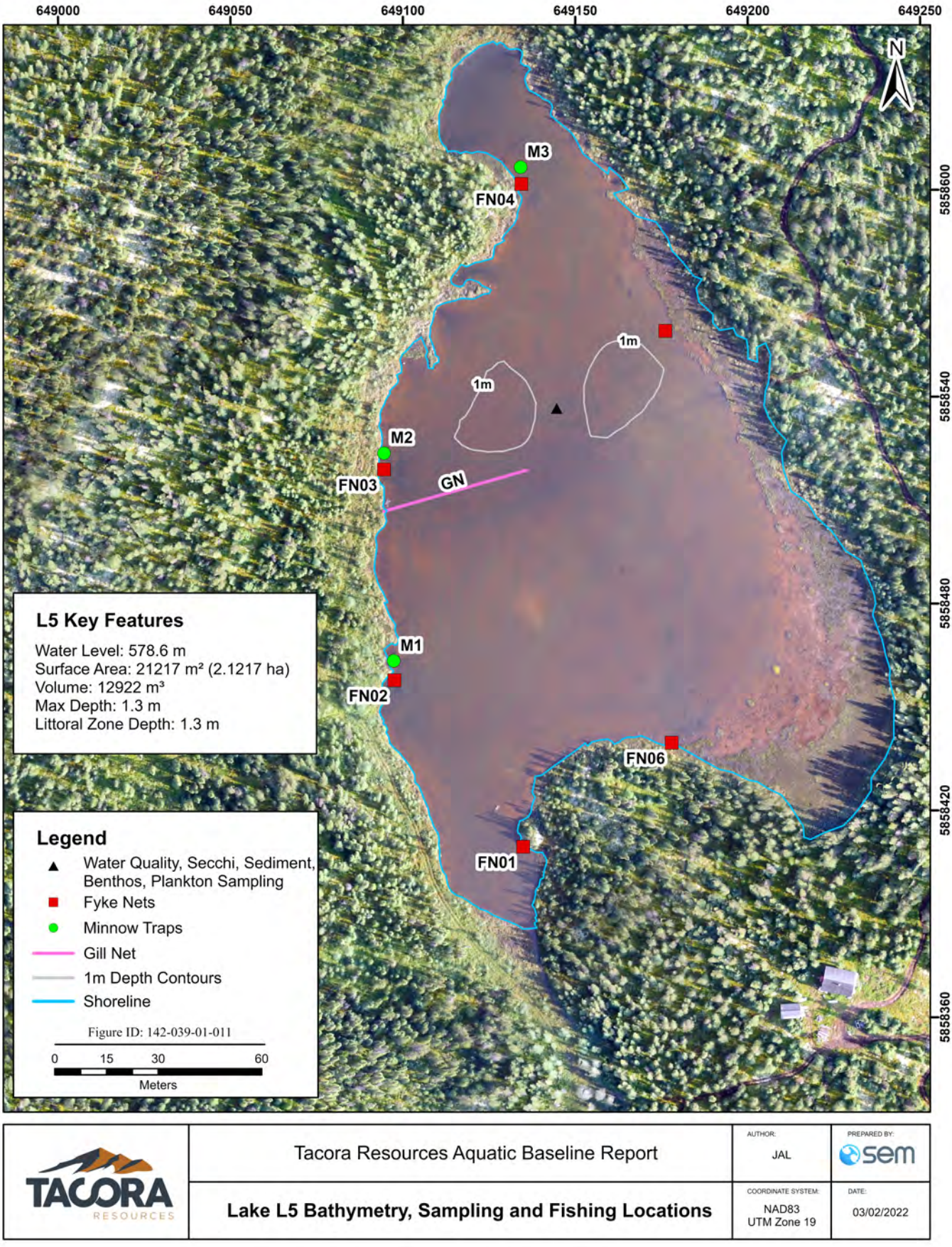


Figure 3.13 Lake L5 Bathymetry, Sampling and Fishing Locations.

3.5.2.2 Habitat Mapping

A survey of habitat in Lake L5 included substrate and vegetation and was conducted on August 14, 2021. Secchi depth was 1.3 m, consequently the lake was entirely littoral zone, and all lake substrates were classified as fines (Figure 3.14). Basin area, volume, and substrate areas are shown in Table 3.11.

Table 3.11 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L5.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
21,217	12,922	Fine	With vegetation	522
			No vegetation	20,695
			Total	21,217

3.5.3 Lake L5 Water Quality

Water quality data for Lake L5 is provided in Appendix C. Many metals in Lake L5 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected (Appendix C). Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride (Appendix C). Chlorophyll 'a' in Lake L5 measured 0.63 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in Lake L5 (0.7 m) and data are provided in Appendix C. The temperature measured 21.8°C, while pH, dissolved oxygen, conductivity, and ORP showed had values of 7.38, 8.11 mg/L (or 91.0% saturation), 44.0 µS/cm, and 46.9 mV, respectively.

3.5.4 Lake L5 Sediment Quality

The sediment quality data for L5 is provided in Appendix C. Most metals were detected in the sediment except antimony, arsenic, beryllium, bismuth, boron, lithium, rubidium, silver, thallium, and tin were undetected. Iron was high and measured 17,000 mg/kg. Total organic carbon in the sediment of Lake L5 measured 350 g/kg. The sediment was composed of clay (78%), with some silt (17%) and lesser amounts of sand (5%; Appendix C).

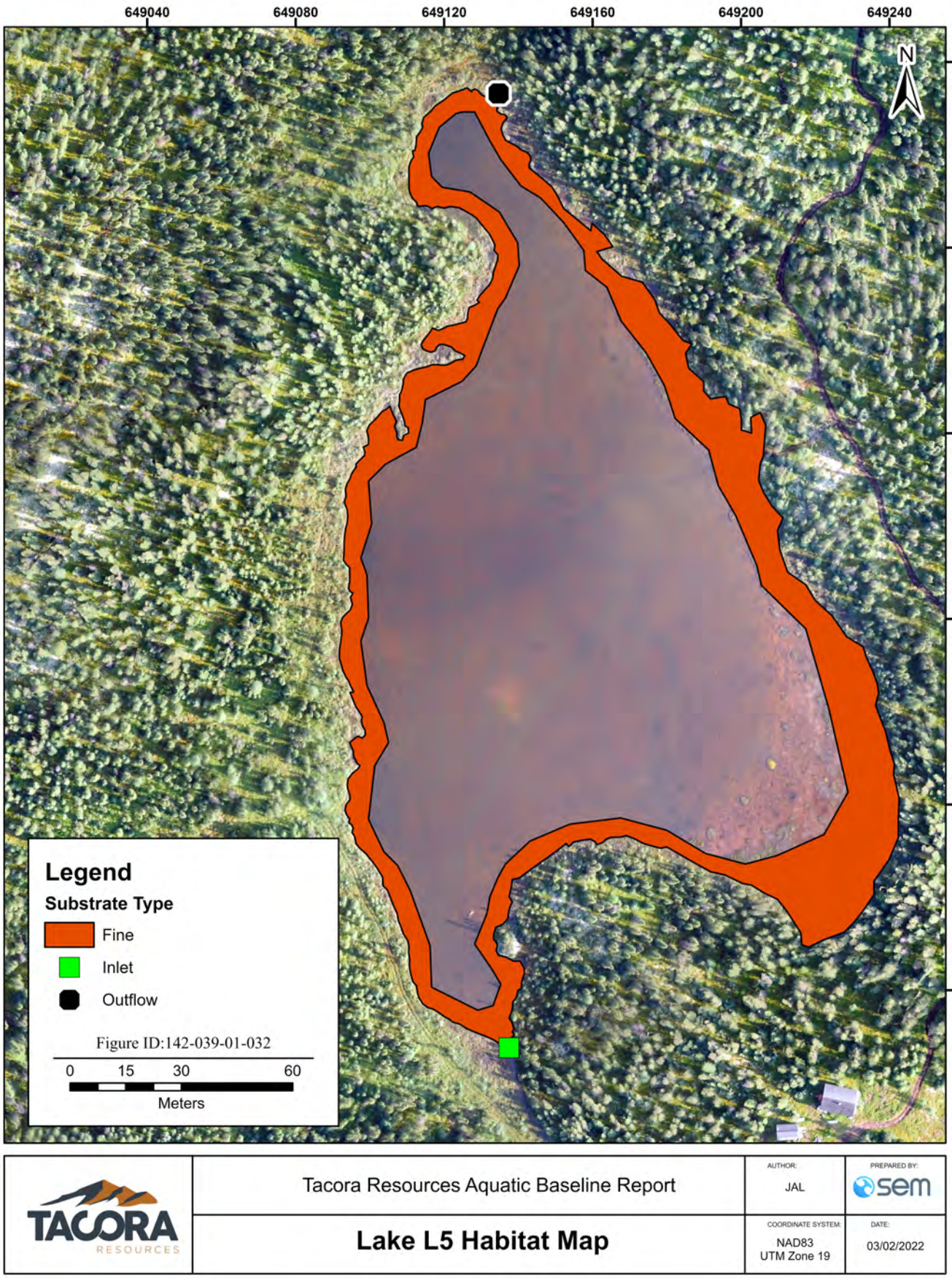


Figure 3.14 Lake L5 Habitat Map.

3.5.5 Lake L5 Fish Population Assessment

3.5.5.1 Fish Community

The fish community in Lake L5 was composed entirely of lake chub (i.e.,100%).

3.5.5.2 Fishing Effort and Catch

Fishing of Lake L5 was performed using fyke nets, minnow traps and a gill net. Sampling locations are provided in Figure 3.13. A summary of fishing effort, fish catches and CPUE is provided in Table 3.12.

Fyke netting was conducted August 10-13, 2021, with six nets set for the entire duration. The total net nights fished was 18, with six nets set each night with every net capturing fish. The total catch of lake chub was 4,705 fish. CPUE for lake chub ranged from 212.3 to 332.0 fish/net night and averaged 261.4 fish/net. CPUE was highest on the first day of fishing and lowest on the second day.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught fish every night with a total of 299 lake chub captured. Gill netting of Lake L5 was completed on August 13 with no fish captured.

Table 3.12 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing of Lake L5.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Lake Chub	CPUE[2]
				Total	Lake Chub
Fyke Nets					
Aug. 10	Aug. 11	6(6)	6	1,992	332.0
Aug. 11	Aug. 12	6(6)	6	1,274	212.3
Aug. 12	Aug. 13	6(6)	6	1,439	239.8
Totals			18	4,705	261.4
Minnow Traps					
Aug. 10	Aug. 11	3(2)	3	59	19.7
Aug. 11	Aug. 12	3(3)	3	150	50
Aug. 12	Aug. 13	3(3)	3	90	30
Totals			9	299	33.2
Gill Net					
Aug. 13	Aug. 13	1(0)	1.5	0	0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets.

3.5.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L5 are summarized in Table 3.13. The length of lake chub captured ranged from 30 to 120 mm and averaged 68.9 mm (std. dev. = ± 25.2). Lake chub weight ranged from 0.3 to 18.0 g and averaged 4.9 g (std. dev. = ± 4.7). Condition factor ranged from 0.7 to 1.4 (mean = 1.1; std. dev. = ± 0.1).

Table 3.13 Summary of Meristic Data for Lake Chub Caught in Lake L5.

Species	Parameter	Mean	Min	Max	Std. Dev.
Lake chub	Length (mm)	68.9	30.0	120	25.2
	Weight (g)	4.9	0.3	18.0	4.7
	Condition (K)	1.1	0.7	1.4	0.1

3.5.6 Benthic Community

The total abundance of benthic macroinvertebrates in Lake L5 was three, with a taxon richness of three, while density was 100 individuals/m^2 (Appendix C). The three families represented in Lake L5 were Lumbriculidae, Corduliidae and Dytiscidae. Two of three families present in Lake L5 samples were not found at any other site, Corduliidae (33%) and Dytiscidae (33%), while the other family present was Lumbriculidae (33%). Corduliidae (Order: Odonata) are commonly known as "Emerald Dragonflies" and their aquatic nymph stages typically inhabit shallow peatland and ponds.

3.5.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L5 on August 13, 2021 (Figure 3.13). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton total biomass in Lake L5 was 274 mg/m^3 with the <10 µm the dominant size group with a biomass of 172 mg/m^3, followed by the 10-30 µm group (102 mg/m^3), and the >30 µm was absent.

3.5.8 Zooplankton

A zooplankton sample was collected at one station in Lake L5 on August 13, 2021 (Figure 3.13). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 49.99, 32.87, and 0.0, respectively, for a total biomass of 82.87 mg/m^3. Calanoids as a group (89.08 mg/m^3) had the greatest biomass, followed by the genus *Bosmina* (18.58 mg/m^3), the genus *Ceriodaphnia* (7.62 mg/m^3), and the

genus *Daphnia* (6.67 mg/m^3). Copepods were the dominant group while Rotifers represented less than 0.1 mg/m^3 of the biomass.

3.6 Lake L6

3.6.1 General Overview Description

Lake L6 is a small pond located south of Lake L5 and appears to be connected to the same wetland at certain water level conditions. The lake was accessed by an existing ATV trail that passes near its most eastern point and some brush and small trees were removed to allow access to the water's edge. There was no inlet identified for Lake L6, however it is probable that the wetland to the north would drain into the lake under certain conditions. The lake does, however, have one outlet located at its most southwest point. This outlet was very narrow and was partially blocked off due the presence of accumulated organics that flowed from the lake. The shoreline of Lake L6 consisted of a mixture of wetland with sections of black spruce, larch trees and alders. Lake substrate was entirely organic muck with some sections of sparse grasses near shore. There were also large boulders present in Lake L6. The location of fishing nets and where the other various data and samples were collected are provided in Figure 3.15. Fish were sampled using fyke nets (n=6), minnow traps (n=3) and a gill net (n=1).

3.6.2 Lake Habitat Assessment

3.6.2.1 Bathymetry

Bathymetric studies were completed on Lake L6 on August 11, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of 12 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.15). The surface area of the lake was 22,095 m^2 and the lake volume was 17,573 m^3. The lake was separated into two distinct sections separated by a narrow channel. The northern section had a maximum depth of 2.5 m, and the southern section had a maximum depth of 1.2 m.

3.6.2.2 Habitat Mapping

A survey of habitat in Lake L6 identifying substrate and vegetation was conducted on August 7, 2021 (Figure 3.16). The entire lake was composed of littoral zone and due to the shallow characteristics of L6 and Secchi depth (i.e., 2.5 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) was composed of fines, with limited boulders in the southern end that can be seen in Figure 3.16. The shoreline survey of Lake L6 identified only the substrate fines, with isolated boulders sparsely distributed in minimal locations. Basin characteristics (i.e., area, volume) and area of fines are provided in Table 3.14.

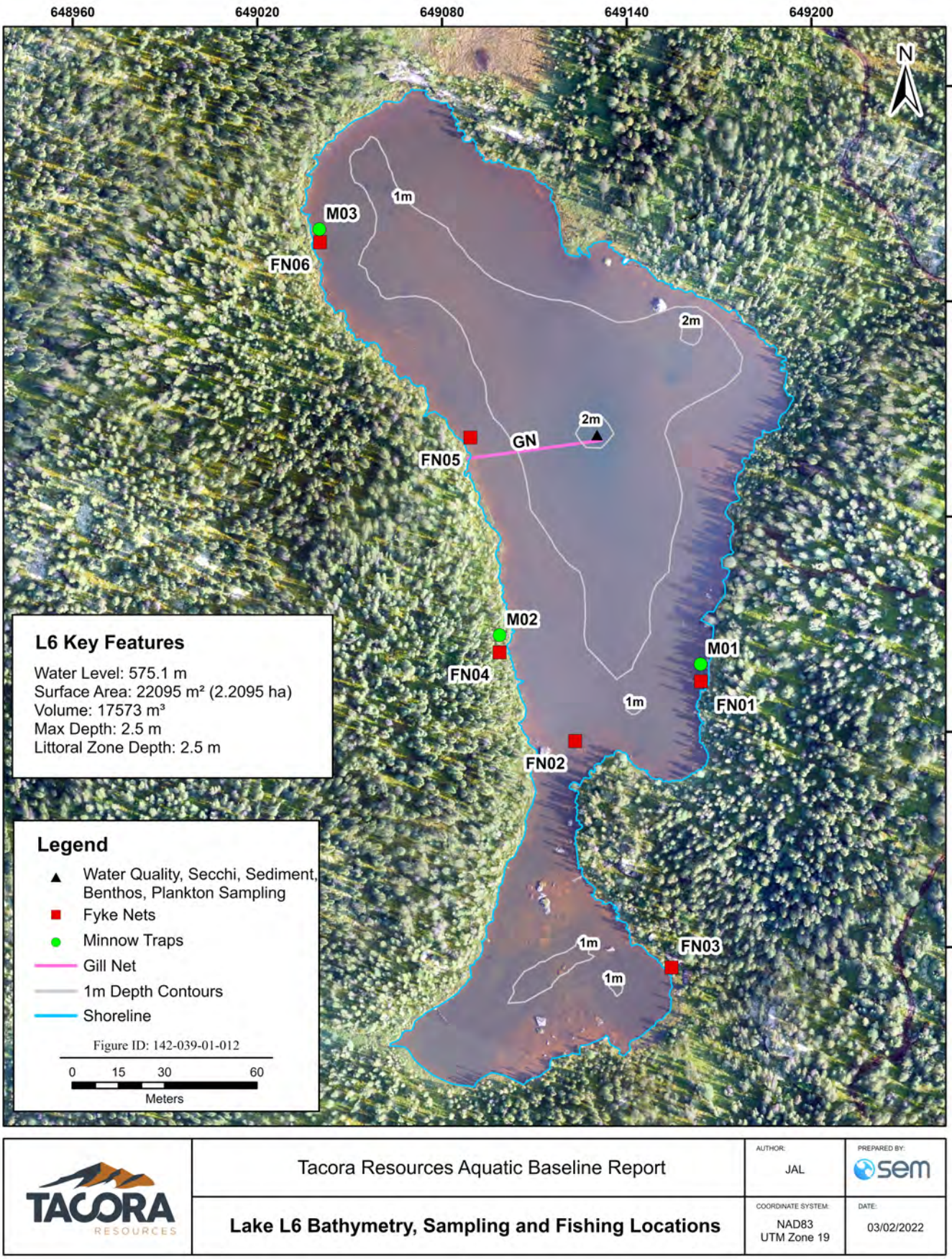


Figure 3.15 Lake L6 Bathymetry, Sampling and Fishing Locations.

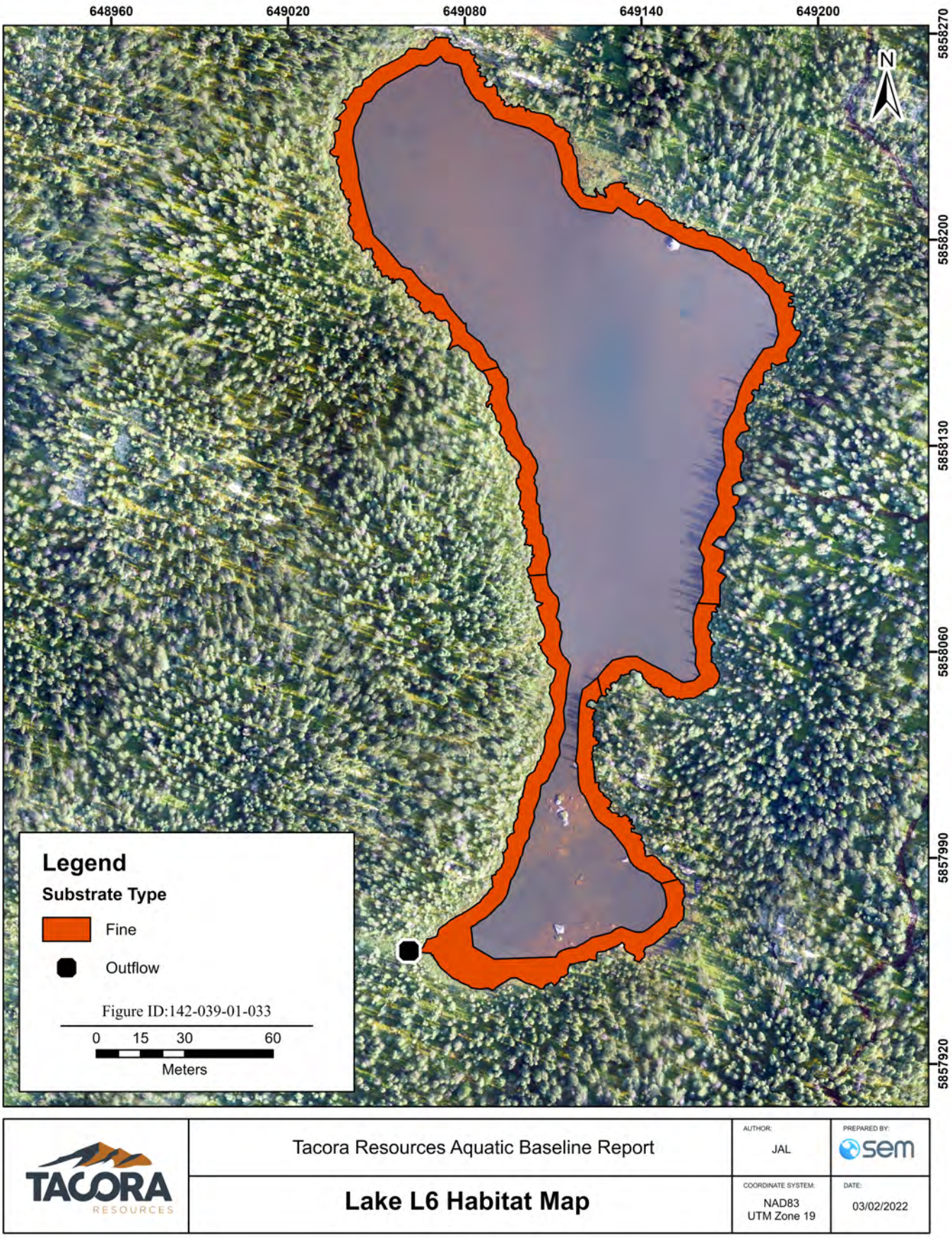


Figure 3.16 Lake L6 Habitat Map.

Table 3.14 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L6.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
22,095	17,573	Fine	With vegetation	0
			No vegetation	22,095
			Total	22,095

3.6.3 Lake L6 Water Quality

The water quality data for Lake L6 is provided in Appendix C. Most metals in L6 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, strontium, and uranium were detected. Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 0.33 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at two depths in L6 (i.e., 1 to 1.5 meters) and are shown in Appendix C. The temperature difference between 1 m and 1.5 m was only 0.5°C and no thermocline was observed over this depth range. Dissolved oxygen showed an increase at 1.5 m (9.10 mg/L or 98.4% saturation) from 1 m (to 8.00 mg/L or 84.3% saturation). Measured pH, conductivity, and ORP levels were comparable and ranged from 8.10 (at 1.5 m) to 8.23 (at 1 m), 121.0 to 114.3 µS/cm, and 86.9 to 93.0 mV, respectively.

3.6.4 Lake L6 Sediment Quality

The sediment quality data for Lake L6 is provided in Appendix C. Most metals were detected in the sediment except antimony, beryllium, bismuth, boron, lithium, silver, and thallium. Iron was very high and measured to be 29,000 mg/kg. Total organic carbon in the sediment of Lake L6 measured 260 g/kg. The sediment was composed of clay (63%), with some silt (28%) and lesser amounts of sand (9%; Appendix C).

3.6.5 Lake L6 Fish Population Assessment

3.6.5.1 Fish Community

The fish community in Lake L6 was composed of lake chub (98.8%), while brook trout (1.2%) were prevalent to a lesser extent (Figure 3.17).

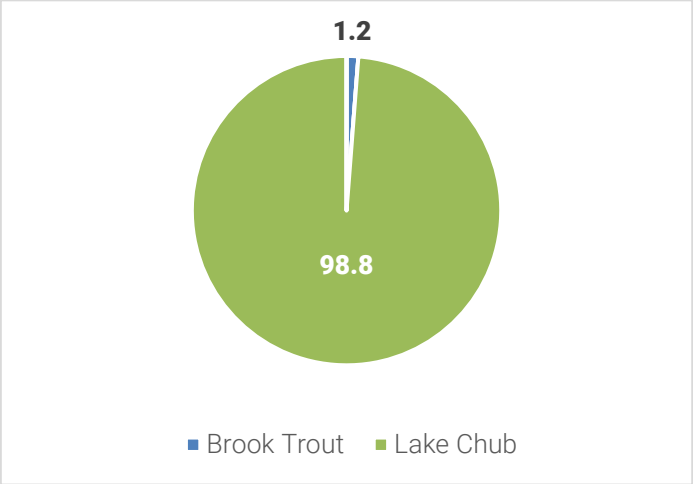


Figure 3.17 Fish Community Composition (% Abundance) for Lake L6.

3.6.5.2 Fishing Effort and Catch

Fishing of Lake L6 was conducted using fyke nets, minnow traps and a gill net. Sampling locations were provided in Figure 3.15. The fyke net effort was conducted until a 10% recapture rate was achieved for brook trout. A summary of the fishing effort, fish catches and the CPUE is provided in Table 3.15.

Fyke netting was conducted August 7-11, 2021, with six nets set initially on August 7, then decreasing to four nets on August 8 and five nets on August 10. The total net nights fished was 20, ranging from four to six nets per night, averaging five nets per night. Not all nets captured fish each night with the number of nets capturing fish ranging from three to five nets each night, averaging four nets each night. Two fish species were captured: brook trout (n=17) and lake chub (n=1,476). The total number of brook trout recaptured was two fish (13%). Catches of brook trout ranged from one to eight fish per night, averaging 3.75 fish. CPUE for brook trout captured in fyke nets ranged from 0.2 to 1.3 fish/net night averaging 1.7 fish/net. Brook trout CPUE was highest on the first day of fyke net fishing and lowest on the fourth day. Fyke net catches of lake chub ranged from 182 to 455 fish per night, averaging 369 fish. Fyke net CPUE for lake chub ranged from 36.4 to 111.3. Lake chub CPUE by fyke netting was highest on the second day and lowest on the third day of fishing (Table 3.15).

Minnow traps were also placed near fyke nets from August 10 to 13. These traps caught a total of 299 lake chub (Table 3.15). Gill netting of Lake L6 was completed on August 10 capturing three brook trout (Table 3.15).

Table 3.15 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing of Lake L6.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		Lake Chub	CPUE[2]	
				Total	Recap	Total	Brook Trout	Lake Chub
Fyke Nets								
Aug. 7	Aug. 8	6(4)	6	8	0	455	1.3	75.8
Aug. 8	Aug. 9	4(3)	4	4	1	445	1.3	111.3
Aug. 9	Aug. 10	5(4)	5	2	1	182	0.6	36.4
Aug. 10	Aug. 11	5(5)	5	1	0	394	0.2	78.8
Totals			20	15	2	1,476	0.9	73.8
Minnow Traps								
Aug. 10	Aug. 11	3(2)	3	0	0	59	0.0	19.7
Aug. 11	Aug. 12	3(3)	3	0	0	150	0.0	50.0
Aug. 12	Aug. 13	3(3)	3	0	0	90	0.0	30.0
Totals			9	0	0	299	0.0	33.2
Gill Net								
Aug. 10	Aug. 10	1(1)	1.4	3	0	0	1.0	0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets.

3.6.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L6 are summarized in Table 3.16. The length of brook trout captured ranged from 102.0 to 235.0 mm and averaged 168.0 mm (std. dev. = ± 37.1). Brook trout recaptured during fyke netting were slightly smaller than the overall population, averaging 165.0 mm, with no fish less than 115.0 mm and a maximum length of 215.0 mm captured. Brook trout weight ranged from 8.0 to 157.0 g, averaging 63.6 g (std. dev. = ± 38.6). Similarly, the weights of brook trout recaptured were slightly smaller than the overall population, averaging 62.5 g, with no recaptured fish weighing less than 17.0 g and a maximum length of 108.0 g. Condition factor for brook trout captured in Lake L6 ranged from 0.8 to 1.3, averaging 1.1 (std. dev. = ± 0.1). The length of lake chub ranged from 43.0 to 122.0 mm, averaging 83.3 mm (std. dev. = ± 20.2). Weight of lake chub ranged from 0.9 to 25.0 g, averaging 7.3 g (std. dev. = ± 4.8). Lake chub condition factor ranged from 0.7 to 1.4, averaging 1.1 (std. dev. = ± 0.1). The length distribution for brook trout captured in Lake L6 is provided in Figure 3.18. The distribution was unimodal with the peak size class between 150 and 175 mm (31.8%), with majority of the other size classes between 13 to 18% of the total brook trout caught. Only one captured fish was larger than 225 mm (4.5%) and none were less than 100 mm.

Table 3.16 Summary of Meristic Data for Fish Caught in Lake L6.

Species	Parameter	Mean	Min	Max	Std. Dev.
Brook trout (initial capture)	Length (mm)	168.0	102.0	235.0	37.1
	Weight (g)	63.6	8.0	157.0	38.6
	Condition (K)	1.1	0.8	1.3	0.1
Brook trout (recapture)	Length (mm)	165.0	115.0	215.0	50.0
	Weight (g)	62.5	17.0	108.0	45.5
	Condition (K)	1.1	1.1	1.1	0.0
Lake chub	Length (mm)	83.3	43.0	122.0	20.2
	Weight (g)	7.3	0.9	25.0	4.8
	Condition (K)	1.1	0.7	1.4	0.1

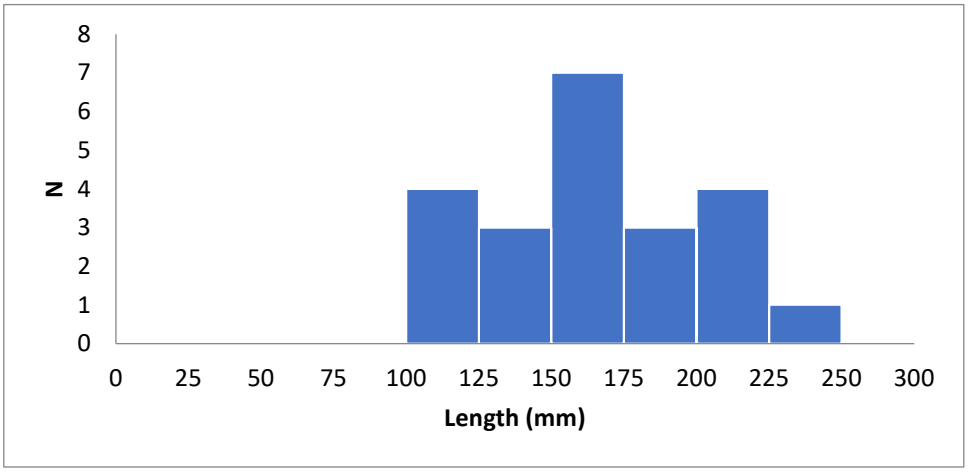


Figure 3.18 Length Frequency Distribution of Brook Trout Captured in Lake L6.

3.6.5.4 Fish Population Estimate

Brook trout population estimate for Lake L6 in August 2021, was 103 fish with upper and lower 95% confidence intervals of 577 and 56 fish, respectively. The wide range of confidence interval is due to the low capture rates of brook trout and the low numbers of recaptures in this lake.

3.6.6 Benthic Community

A total abundance of four, taxon richness of two and density of 133 individuals/m^2 characterize the benthic macroinvertebrate community at Lake L6. Families represented at Lake L6 consisted of Pisidiidae (75%) and Chironomidae (25%), which are the two most abundant benthic macroinvertebrate family types present in the study area.

3.6.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L6 on August 8, 2021 (Figure 3.15). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L6 was 341 mg/m^3, with the 10-30 µm dominant size group with a biomass of 221 mg/m^3. The >30 µm size group was absent.

3.6.8 Zooplankton

A zooplankton sample was collected at one station in Lake L6 on August 8, 2021 (Figure 3.15). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 348.10, 79.05, and 0.05, respectively, for a total biomass of 427.21 mg/m^3. Calanoids were the largest group at 324.24 mg/m^3, followed by the genus *Ceriodaphnia* (74.88 mg/m^3), and the genus *Epischura* (18.86 mg/m^3). Copepods were the dominant group while Rotifers had the lowest biomass (less than 1.0 mg/m^3).

3.7 Lake L7

3.7.1 General Overview Description

Lake L7 was situated south of Flora South Basin, and was connected to Lake L3, by an outlet stream flowing north. This was the main and only outlet of Lake L7 and is described in more detail as Stream S4. The lake had gentle sloped shores for most of its perimeter other than the eastern side of the main body. Here the water typically dropped off several meters directly from shore. The southern end near the main inlet of the lake profile was shallower, with a near flat bottom covered by mobile organics. The shallow areas surrounding the main inlet was frequented by lake chub while the steeper area of shoreline was more active with white suckers and burbot, and the majority of trout were caught near the outlet. ATV/snowmobile and hunting trails were present west of the lake that access two cabins on the lake. There was also another trail that followed the western side and around the southern end before heading off to the east. The shoreline of Lake L7 consisted mainly of mature black spruce intermixed with some sections of alders. Lake bottom contained a variety of substrate types with several sections of cobbles, boulders, sand, and organics extending to approximately 10 m, beyond which the deeper areas contained predominantly fines, with some boulders that can be seen from the maps below. The location of fishing nets and where the other various data and samples were collected are provided in Figure 3.19. Fish were sampled using fyke nets (n=10), minnow traps (n=6) and a gill net (n=1).

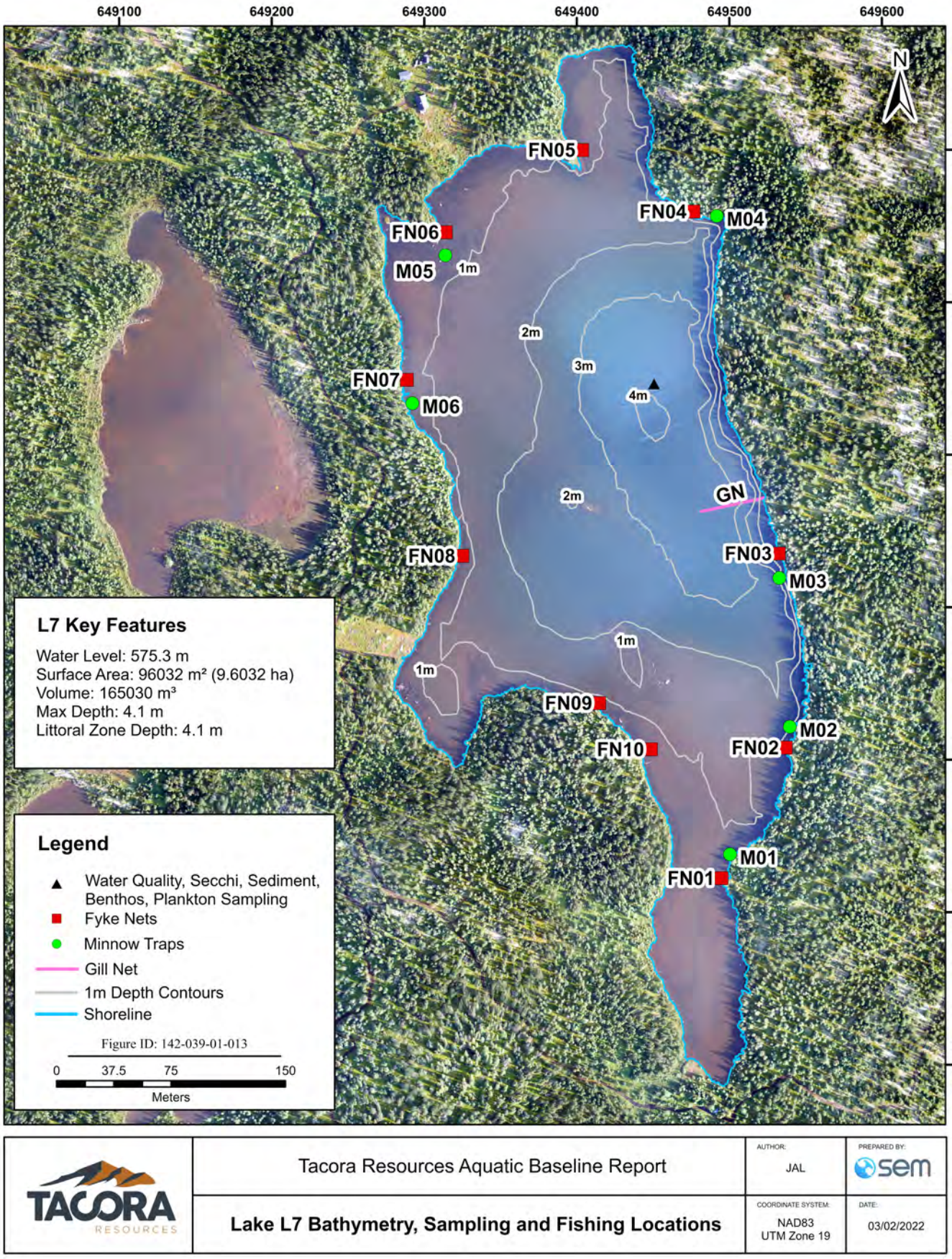


Figure 3.19 Lake L7 Bathymetry, Sampling and Fishing Locations.

3.7.2 Lake Habitat Assessment

3.7.2.1 Bathymetry

Bathymetric studies were completed on Lake L7 on August 6, 2021, using sonar and GPS. Transects were spaced approximately 25 m apart and oriented in an east-west direction. A total of 24 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.19). The surface area of the lake was 96,032 m^2 and the lake volume was 165,030 m^3. The lake had a shallow arm in the south where the maximum depth was 0.5 m. The deepest area was in the eastern half of the main body of the lake, where the depth reached 4.1 m. It was shallower and the slope was more gradual in the western half.

3.7.2.2 Habitat Mapping

A survey of habitat in Lake L7 identifying substrate and vegetation was conducted on August 6, 2021 (Figure 3.20). The entire lake was composed of littoral zone and due to the shallow characteristics of L7 and as per the Secchi depth (i.e., 4.1 m), no profundal zone existed. The lake habitat away from the shoreline was composed of fines, with limited boulders that can be seen in Figure 3.20. The shoreline survey of Lake L7 identified the substrate classes as fine, coarse/medium, and medium/fine. The majority of the lake substrate was fines, comprising 91% of the total littoral zone, while coarse and medium comprised 5% and 4% of the total. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.17.

Table 3.17 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L7.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
96,032	165,030	Fine	With vegetation	0
			No vegetation	87,847
		Medium	With vegetation	0
			No vegetation	3,684
		Coarse	With vegetation	0
			No vegetation	4,501
			Total	96,032

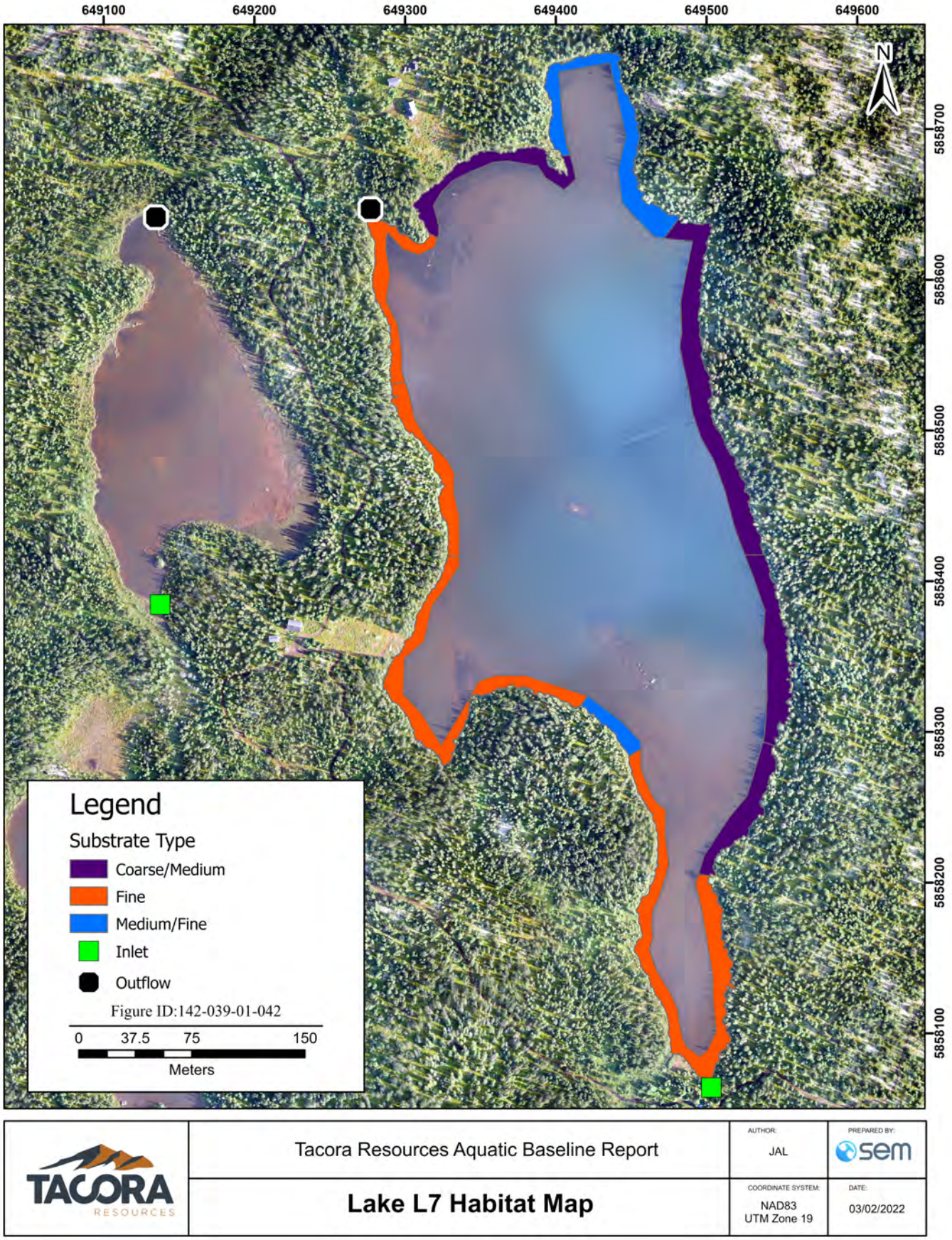


Figure 3.20 Lake L7 Habitat Map.

3.7.3 Lake L7 Water Quality

The water quality data for Lake L7 is provided in Appendix C. Most metals in L7 were below detection limits, while barium, calcium, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 1.12 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at four depths in Lake L7 (i.e., one to four meters) and are shown in Appendix C. The temperature difference between 1 m and 4 m was only 0.5°C and no thermocline was observed over this depth range. Dissolved oxygen showed a decrease at 4 m (to 5.32 mg/L or 67.0% saturation) from 1 m (8.80 mg/L or 93.2% saturation). Measured pH, conductivity, and ORP levels were comparable and ranged from 6.99 (at 4 m) to 8.12 (at 3 m), 91.3 to 156 µS/cm, and 27.0 to 87.1 mV, respectively.

3.7.4 Lake L7 Sediment Quality

The sediment quality data for Lake L7 is provided in Appendix C. Most metals were detected in the sediment except antimony, beryllium, bismuth, boron, lithium, silver, and tin. Iron was very high and measured to be 37,000 mg/kg. Total organic carbon in the sediment of Lake L7 measured 300 g/kg. The sediment was composed of clay (65%), with some silt (26%) and lesser amounts of sand (9%; Appendix C).

3.7.5 Lake L7 Fish Population Assessment

3.7.5.1 Fish Community

The fish community in Lake L7 was primarily composed of lake chub (86.3%), while white sucker (0.3%), brook trout (5.5%) and burbot (8.0%) were prevalent to a lesser extent (Figure 3.21).

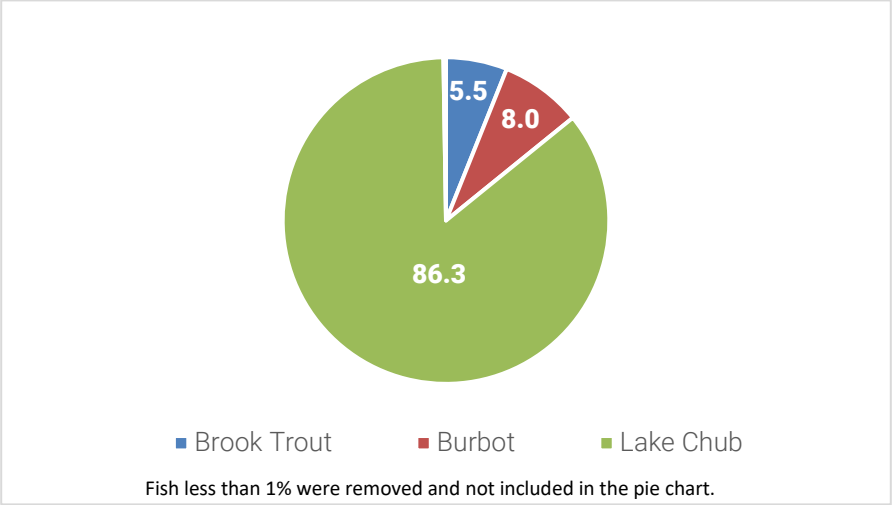


Figure 3.21 Fish Community Composition (% Abundance) for Lake L7.

3.7.5.2 Fishing Effort and Catch

Fishing of Lake L7 was conducted using fyke nets, minnow traps and a gill net. Sampling locations were provided in Figure 3.19. The fyke net fishing effort was conducted until a 10% recapture rate was achieved for brook trout. A summary of fishing effort, fish catches and the CPUE are provided in Table 3.18.

Table 3.18 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L7.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		Burbot	Lake Chub	White Sucker	CPUE[2]			
				Total	Recap	Total	Total	Total	Brook Trout	Burbot	Lake Chub	White Sucker
Fyke Nets												
Aug. 1	Aug. 3	10(8)	20	57	0	45	626	1	2.9	2.3	31.3	0.1
Aug. 3	Aug. 5	10(5)	20	20	4	51	577	1	1.2	2.6	28.9	0.1
Aug. 5	Aug. 6	8(5)	8	11	5	21	155	2	2.0	2.6	19.4	0.3
Totals			48	88	9	117	1,358	4	2.0	2.4	28.3	0.1
Minnow Traps												
Aug. 1	Aug. 3	6(5)	6	0	0	7	8	0	0.0	1.2	1.3	0
Aug. 3	Aug. 5	6(3)	6	0	0	1	7	0	0.0	0.2	1.2	0
Aug. 5	Aug. 6	6(4)	6	0	0	2	2	0	0.0	0.3	0.3	0
Totals			18	0	0	10	17	0	0.0	0.6	0.9	0
Gill Net												
Aug. 11	Aug. 11	1(0)	1.3	0	0	0	0	0	0.0	0	0	0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps, fish per hour for gill nets.

Fyke netting was conducted August 1-6, 2021, with ten nets set initially on August 1, decreasing to eight nets on August 5. The total net nights fished was 48, ranging from eight to ten nets per night, averaging 9.3 nets per night. Not all nets captured fish each night with the number of nets capturing fish ranging from five to eight nets each night, averaging six nets. Four fish species were captured: 97 brook trout, 1,358 lake chub, 117 burbot and four white suckers. The total number of brook trout recaptured was nine fish (9.3%). Catches of brook trout per fyke net set ranged from 11 to 57 fish, averaging 32 fish/fyke set. CPUE for brook trout ranged from 1.2 to 2.9 fish/net night averaging 2.0 fish/net. Brook trout CPUE was highest on the first day of fishing and lowest on the second day.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught a total of 17 lake chub and ten burbot with no brook trout.

3.7.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L7 are summarized in Table 3.19. The length of brook trout captured ranged from 115 to 310 mm and averaged 213.6 mm (std. dev. = ± 39.0). Brook trout recaptured during fyke netting were slightly smaller than the overall population, averaging 200.6 mm, with no fish less than 160 mm and a maximum length of 225 mm captured. Brook trout weight ranged from 13 to 375.0 g, averaging 118.9 g (std. dev. = ± 67.8). Similarly, the weights of brook trout recaptured were slightly smaller than the overall population, averaging 85.6 g, with no recaptured fish weighing more than 118.0 g. Condition factor for brook trout captured in Lake L7 ranged from 0.9 to 1.3, averaging 1.1 (std. dev. = ± 0.1). The length of lake chub ranged from 50 to 140 mm (mean = 82.2 mm), while burbot and white sucker had length ranges of 55 – 360 mm (mean = 216.0 mm) and 132 – 220 mm (mean = 166.8 mm), respectively.

The length distribution for brook trout captured in Lake L7 is provided in Figure 3.22. The distribution was unimodal with the peak size class between 200 and 225 mm (28.9%), while the 175 to 200 mm size class was also large (26.8%), with very few fish captured less than 175 mm (12.4%) and greater than 300 mm (3.1%).

Table 3.19 Summary of Meristic Data for Fish Caught in Lake L7.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	213.6	115.0	310.0	39.0
	Weight (g)	118.9	13.0	375.0	67.8
	Condition (K)	1.1	0.9	1.3	0.1
Brook trout (recapture)	Length (mm)	200.6	160.0	225.0	19.1
	Weight (g)	85.6	35.0	118.0	24.9
	Condition (K)	1.0	0.9	1.2	0.1
Lake chub	Length (mm)	82.2	50.0	140.0	20.3
	Weight (g)	6.5	2.5	16.1	2.9
	Condition (K)	1.0	0.7	1.4	0.2
Burbot	Length (mm)	216.0	55.0	360.0	47.6
	Weight (g)	63.6	1.3	243.0	39.3
White sucker	Length (mm)	166.8	132.0	220.0	36.8
	Weight (g)	78.3	26.0	140.0	47.0
	Condition (K)	1.2	1.1	1.3	0.1

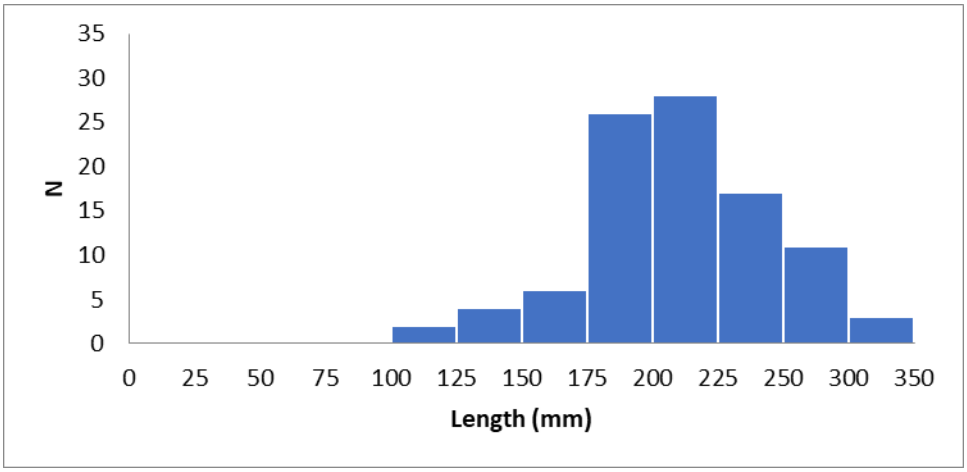


Figure 3.22 Length Frequency Distribution of Brook Trout Captured in Lake L7.

3.7.5.4 Fish Population Estimate

The brook trout population estimate for Lake L7 in August 2021 was 282 fish with upper and lower 95% confidence intervals of 328 and 247 fish, respectively.

3.7.6 Benthic Community

Lake L7 had the most diverse (taxonomic richness of nine) and dense (3567 individuals/m^2) benthic macroinvertebrate community compared to all study sites (including streams). The majority of the benthic macroinvertebrates found in the sample were Pisidiidae (81%) followed by Chironomidae (11%).

The remaining 8% of organisms consisted of seven other families. Two of those families are not found in any other site, including Gomphidae ("club-tailed dragonfly") and Perlodidae ("perlodid stoneflies"). The other five families were found in other sites and consisted of Perlidae, Hydropsychidae, Rhyacophilidae, Elmidae and Tipulidae.

3.7.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L7 on August 6, 2021 (Figure 3.19). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L7 was 1,005 mg/m^3, with all size groups present, and the 10-30 µm size class was dominant with a biomass of 533 mg/m^3.

3.7.8 Zooplankton

A zooplankton sample was collected at one station in Lake L7 on August 6, 2021 (Figure 3.19). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 175.65, 87.84, and 1.23, respectively, for a total biomass of 264.72 mg/m^3. Calanoids were the largest group at 173.39 mg/m^3, followed by the genus *Daphnia* (75.24 mg/m^3), and the genus *Bosmina* (9.89 mg/m^3). Copepods were the dominant group while Rotifers had the lowest biomass.

3.8 Lake L8

3.8.1 General Overview Description

Lake L8 was situated south of Lake L7 and connected to Lake L7 by a small outlet stream flowing north. This was the main and only outlet of Lake L8, and it had minimal flow with some sections flowing over dense grasses in a wetland area. No inlet was present for Lake L8. The lake had gentle sloped shores for the majority of its perimeter with the exception of the west end and a section of the northwestern shore. In these areas, the shoreline was overtaken by floating bog creating a steep drop off down to the bottom of the shallow lake. An ATV/snowmobile trail was present northwest of the lake, continuing south and another trail was present along the north end of the lake heading easterly. The shoreline of Lake L8 consisted mainly of black spruce intermixed with some sections of alders and small wetland areas. Lake L8 substrate was consistent with mobile organics making up nearly the entire lake bottom, but more densely observed on the eastern shore. Lake L8 also had some scattered boulders that can be seen from aerial mapping. The location of fishing nets and where the other various data and samples

were collected are provided in Figure 3.23. Fish were sampled using fyke nets (n=6), minnow traps (n=6) and a gill net (n=1).

3.8.2 Lake Habitat Assessment

3.8.2.1 Bathymetry

Bathymetric studies were completed on Lake L8 on June 17, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in a north-south direction. A total of 20 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.23). The surface area of the lake was 27,577 m^2 and the lake volume was 18,577 m^3. The lake was relatively shallow throughout, having a maximum depth of 1.3 m. The southwest region of the lake was much narrower than in the northeast.

3.8.2.2 Habitat Mapping

A survey of habitat in Lake L8, identifying substrate and vegetation, was conducted on June 19, 2021 (Figure 3.24). The entire lake was composed of littoral zone and due to the shallow characteristics of L8 and as per the Secchi depth (i.e., 1.3 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) was composed of fines, with limited boulders that can be seen in Figure 3.24. The shoreline survey of L8 identified only the substrate fines. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.20.

Table 3.20 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L8.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
27,577	18,577	Fine	With vegetation	0
			No vegetation	27,577
			Total	27,577

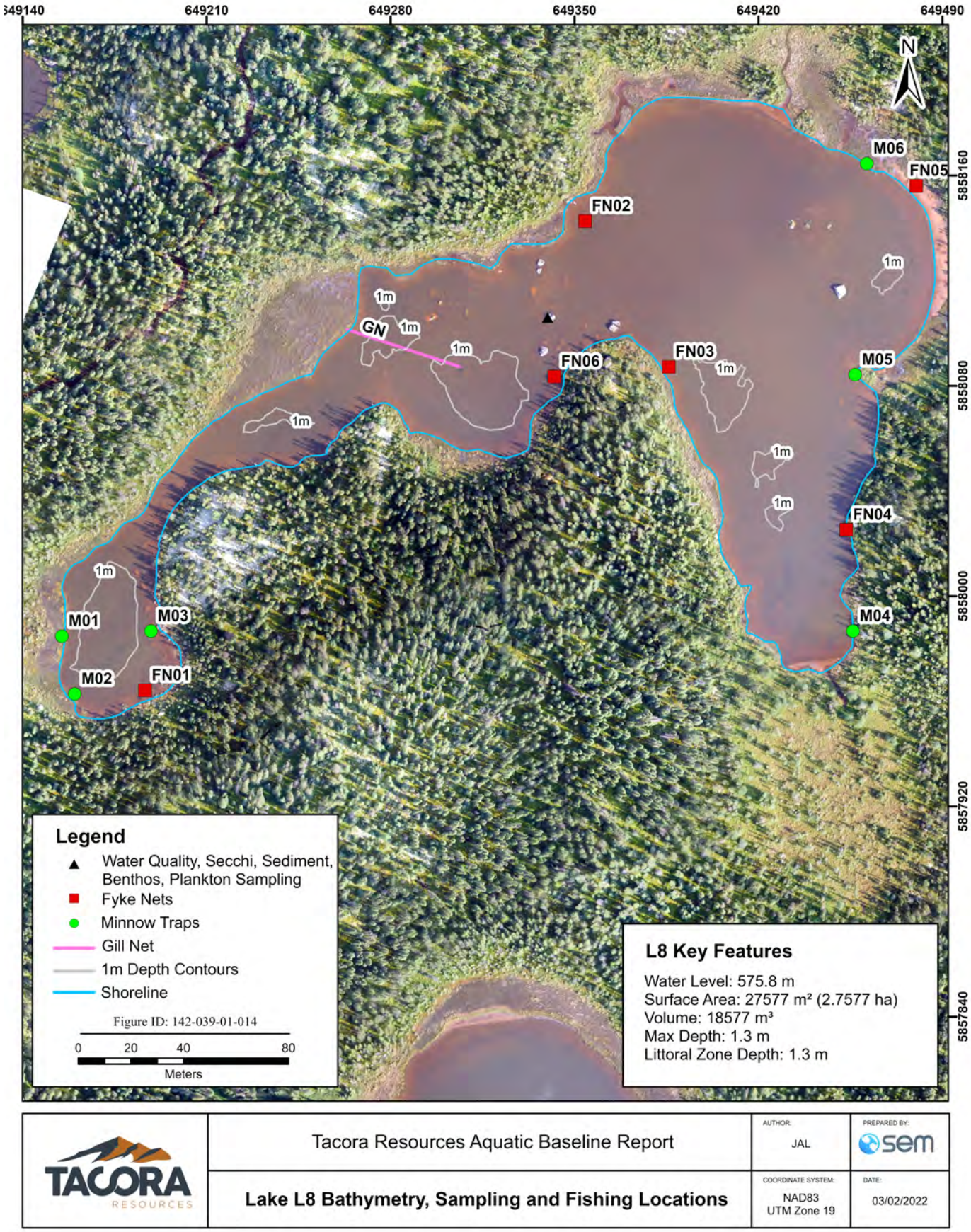


Figure 3.23 Lake L8 Bathymetry, Sampling and Fishing Locations.

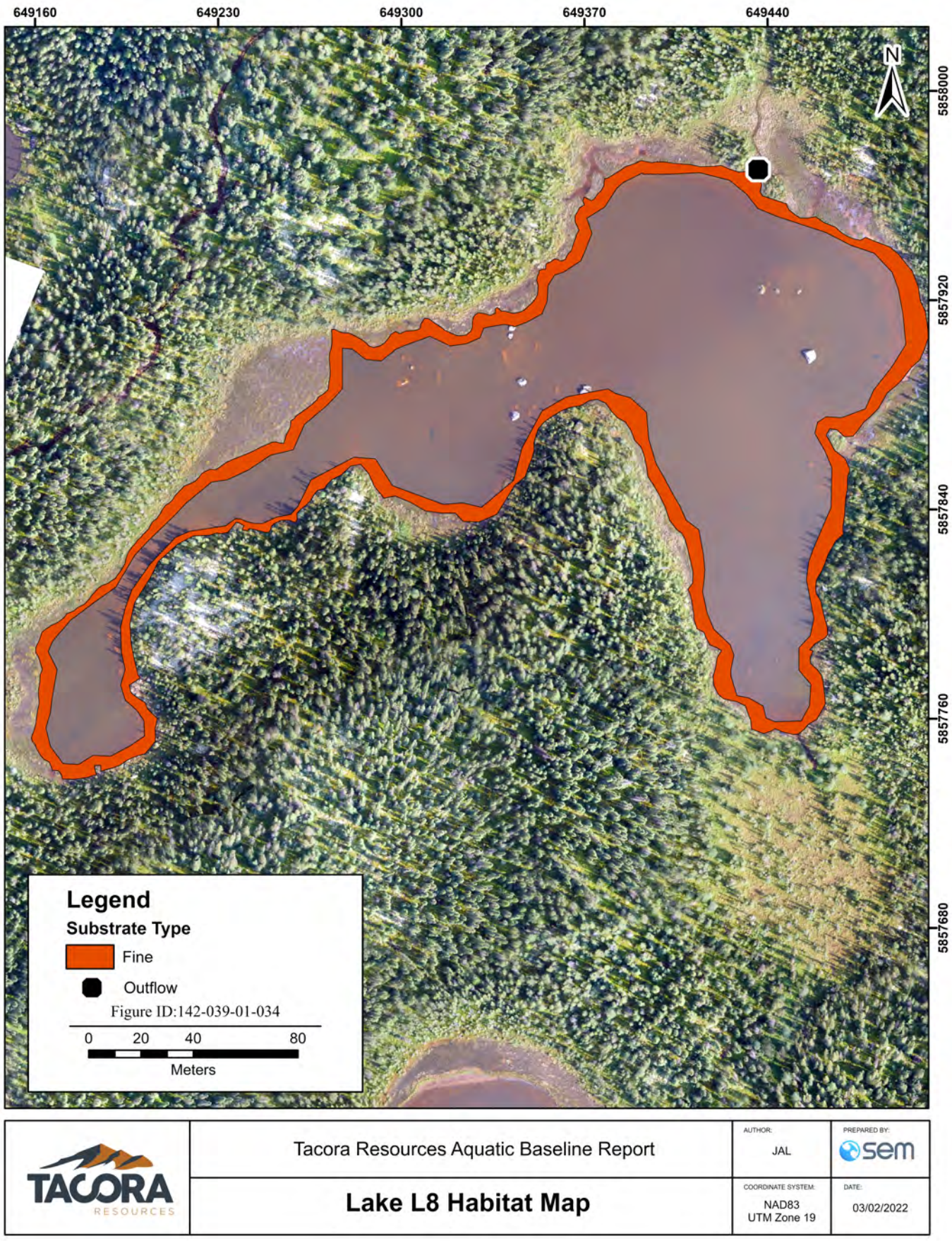


Figure 3.24 Lake L8 Habitat Map.

3.8.3 Lake L8 Water Quality

The water quality data for Lake L8 is provided in Appendix C. Most metals in Lake L8 were below detection limits, while aluminum, barium, cadmium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 0.30 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in L8 (0.9 m) and are shown in Appendix C. The temperature measured 14.0°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 7.96, 9.19 mg/L (or 90.5% saturation), 117.2 µS/cm, and 66.0 mV, respectively.

3.8.4 Lake L8 Sediment Quality

The sediment quality data for Lake L8 is provided in Appendix C. Most metals were detected in the sediment except antimony, arsenic, beryllium, bismuth, boron, lithium, mercury, silver, and thallium were undetected. Iron was high and measured 12,000 mg/kg. Total organic carbon in the sediment of Lake L8 measured 380 g/kg. The sediment was composed of clay (73%), with some silt (20%) and lesser amounts of sand (7%; Appendix C).

3.8.4.1 Fish Community

The fish community in Lake L8 was primarily composed of lake chub (94.8%), while brook trout (1.1%) and burbot (4.1%) were present to a lesser extent (Figure 3.25). Brook trout were only caught on one day (n=5) and therefore a population estimate could not be performed.

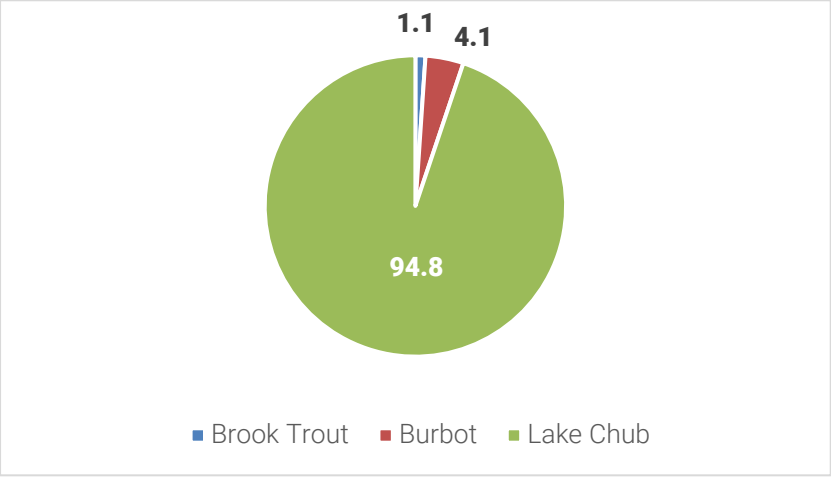


Figure 3.25 Fish Community Composition (% Abundance) for Lake L8.

3.8.4.2 Fishing Effort and Catch

Fishing of Lake L8 was conducted using fyke nets, minnow traps and a gill net. Sampling locations are provided in Figure 3.23. A summary of fish catches and the CPUE are provided in Table 3.21.

Fyke netting was conducted June 16-18, 2021, with two nets set initially on June 16, then increased to four nets on June 17. The total net nights fished was eight, ranging from two to four nets per night, averaging four nets per night. Three fish species were captured: five brook trout, 398 lake chub, and 19 burbot. No brook trout were recaptured. Five brook trout were captured by fyke nets with CPUE range of 0 to 1.3 fish/net night. Fyke netting catches of lake chub ranged from 50 to 348 fish/set, averaging 199 fish/set. CPUE for lake chub ranged from 12.5 to 87.0 fish/net night averaging 49.8 fish/net. Brook trout CPUE was highest on the second day of fishing. Fyke netting catches of burbot ranged from five to 14 fish/set, averaging 9.5 fish/set. CPUE for burbot caught by fyke nets ranged from 1.3 to 3.5 fish/net night averaging 2.4 fish/net. Burbot CPUE was highest on the second day of fishing, while other species CPUE was highest on the last day of fyke netting (Table 3.21).

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught a total of 43 lake chub and had a CPUE of 7.2 fish/net night for this species.

Table 3.21 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing of Lake L8.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		Burbot	Lake Chub	CPUE[2]		
				Total	Recap	Total	Total	Brook Trout	Burbot	Lake Chub
Fyke Nets										
Jun. 16	Jun. 18	2(2)	4	0	0	5	50	0.0	1.3	12.5
Jun. 16	Jun. 17	4(4)	4	5	0	14	348	1.3	3.5	87.0
Totals			8	5	0	19	398	0.6	2.4	49.8
Minnow Traps										
Jun. 16	Jun. 18	1(1)	1	0	0	0	26	0.0	0	26
Jun. 17	Jun. 18	5(3)	5	0	0	0	17	0.0	0	3.4
Totals			6	0	0	0	43	0.0	0	7.2
Gill Net										
Jun.17	Jun.17	1(0)	1.5	0	0	0	0	0.0	0	0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps, fish per hour for gill nets.

3.8.4.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L8 are summarized in Table 3.22. The length of brook trout captured ranged from 140 to 240.0 mm and averaged 181.0 mm (std. dev. = ± 42.9). Brook trout weight ranged from 29.0 to 183.0 g, averaging 89.8 g (std. dev. = ± 62.5). Condition factor for brook trout captured in L8 ranged from 0.9 to 1.3, averaging 1.1 (std. dev. = ± 0.2). The length of lake chub ranged from 40.0 to 110.0 mm, averaging 68.2 mm (std. dev = ± 16.6). Weight of lake chub ranged from 1.6 to 13.0 g, averaging 4.4 g (std. dev. = ± 2.2). Burbot had a length range of 105.0 to 320.0 mm, averaging 217.6 mm (std. dev. = ± 59.0). Weight of burbot ranged from 6.0 to 205.0 g, averaging 79.7 g (std. dev. = ± 50.5).

The length frequency distribution for brook trout captured in Lake L8 is provided in Figure 3.26. The distribution was unimodal with the peak size class between 125 and 150 mm (40%), while the 150 to 175 mm, 200 to 225 mm, and 225 to 250 mm size classes had equal frequencies (20% each).

Table 3.22 Summary of Meristic Data for Fish Caught in Lake L8.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	181.0	140.0	240.0	42.9
	Weight (g)	89.8	29.0	183.0	62.5
	Condition (K)	1.1	0.9	1.3	0.2
Lake chub	Length (mm)	68.2	40.0	110.0	16.6
	Weight (g)	4.4	1.6	13.0	2.2
	Condition (K)	1.3	1.3	1.4	0.1
Burbot	Length (mm)	217.6	105.0	320.0	59.0
	Weight (g)	79.7	6.0	205.0	50.5

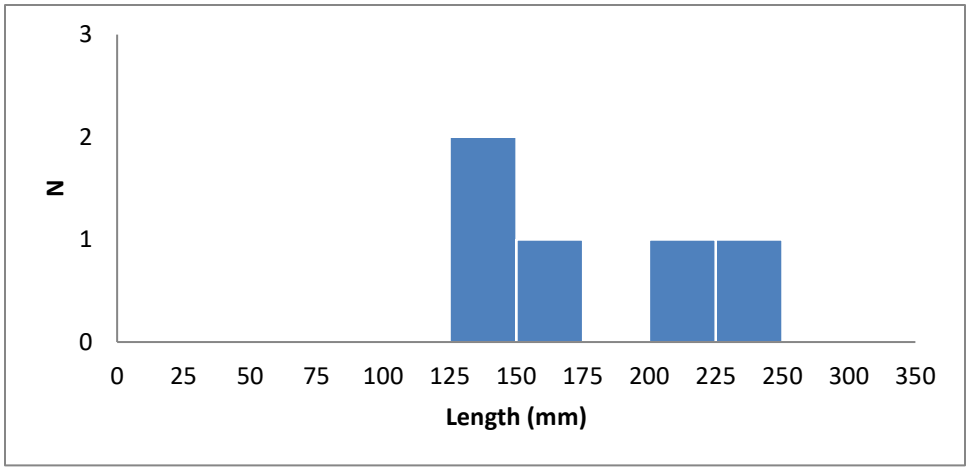


Figure 3.26 Length Frequency Distribution of Brook Trout Captured in Lake L8.

3.8.4.4 Fish Population Estimate

Brook trout were only caught in one day (n=5) in Lake L8, and therefore population estimate could not be performed.

3.8.5 Benthic Community

One Chironomid was found in Lake L8, giving this site a taxon richness of one and total density of 33 individuals/m^2.

3.8.6 Phytoplankton

A phytoplankton sample was collected at one station in Lake L8 on June 19, 2021 (Figure 3.23). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L8 was 630 mg/m^3 and the 10-30 µm size class dominant with a biomass of 376 mg/m^3. The > 30 µm size class was absent.

3.8.7 Zooplankton

A zooplankton sample was collected at one station in Lake L8 on June 19, 2021 (Figure 3.23). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 257.59, 25.77, and 9.05, respectively, for a total biomass of 292.41 mg/m^3. Calanoids were the largest group at 166.02 mg/m^3, followed by the genus *Epischura* (84.39 mg/m^3) and the genus *Bosmina* (23.93 mg/m^3). Copepods were the dominant group while Rotifers had the lowest biomass.

3.9 Lake L9

3.9.1 General Overview Description

Lake L9 is located south of Lake L8, with no known connection to nearby water bodies. This lake however, had one outlet in the northwest corner that flowed west. The outlet was too small for electrofishing but did have sections of gravel and small riffles. The lake had no inlet streams and instead was fed largely from a wetland to the southwest. Gentle sloped shores were present on the southern section, while the remainder was covered by floating bog, creating a steep drop off at the shoreline. Access to the lake was completed by an existing ATV/snowmobile trail headed south on the west side of the lake continuing to Firth Lake. A connecting ATV trail was cut to connect the 150 m gap between

these trails and the lake. The shoreline of Lake L9 consisted mainly of floating bog, with black spruce and some sections of alders on the southern areas. Lake substrate was composed of mostly mobile organics, however in the southern end there were boulders, cobbles and gravels present. Gravels were at times covered by a thin layer of mobile organics. Lake L9 also had some scattered boulders in the southern end that can be seen from the aerial mapping. The location of fishing nets and the other various data and sample collection sites are provided in Figure 3.27. Fish were sampled using fyke nets (n=9), minnow traps (n=5) and gill nets (n=2).

3.9.2 Lake Habitat Assessment

3.9.2.1 Bathymetry

Bathymetric studies were completed on Lake L9 on June 19, 2021, using sonar and GPS. Transects were spaced approximately 25 m apart and oriented in a southeast-northwest direction. A total of 13 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.27). The surface area of the lake was 38,282 m^2 and the lake volume was 38,895 m^3. The lake bottom had a relatively constant slope from its shoreline to its maximum depth of 1.6 m.

3.9.2.2 Habitat Mapping

A survey of habitat in Lake L9, identifying substrate and vegetation, was conducted on June 19, 2021 (Figure 3.28). The entire lake was composed of littoral zone and due to the shallow characteristics of L9 and the Secchi depth (i.e., 1.6 m), no profundal zone existed. The lake habitat further from the shoreline (i.e., interior of the coloured sections) was composed of fines, with limited boulders in the southern end of the main body. The shoreline survey of Lake L9 identified the substrate classes as fine and medium/fine. The majority of the lake substrate was fines, comprising 97% of the total littoral zone, while coarse and medium comprised <1% and 2% of the total, respectively. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.23.

Table 3.23 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L9.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
38,282	38,895	Fine	With vegetation	99.8
			No vegetation	37,218
		Medium	With vegetation	33.5
			No vegetation	770
		Coarse	With vegetation	6.7
			No vegetation	154
			Total	38,282

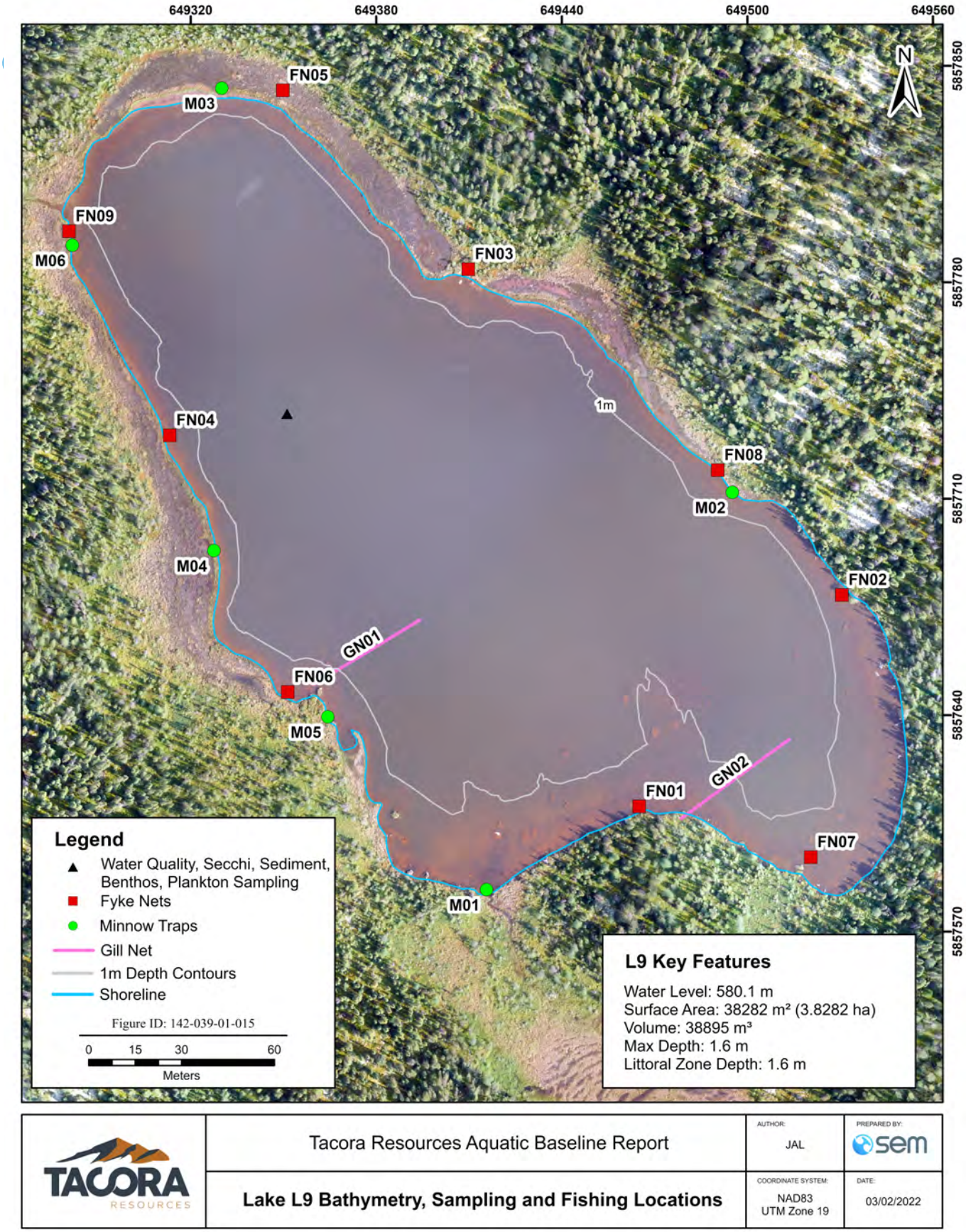


Figure 3.27 Lake L9 Bathymetry, Sampling and Fishing Locations.

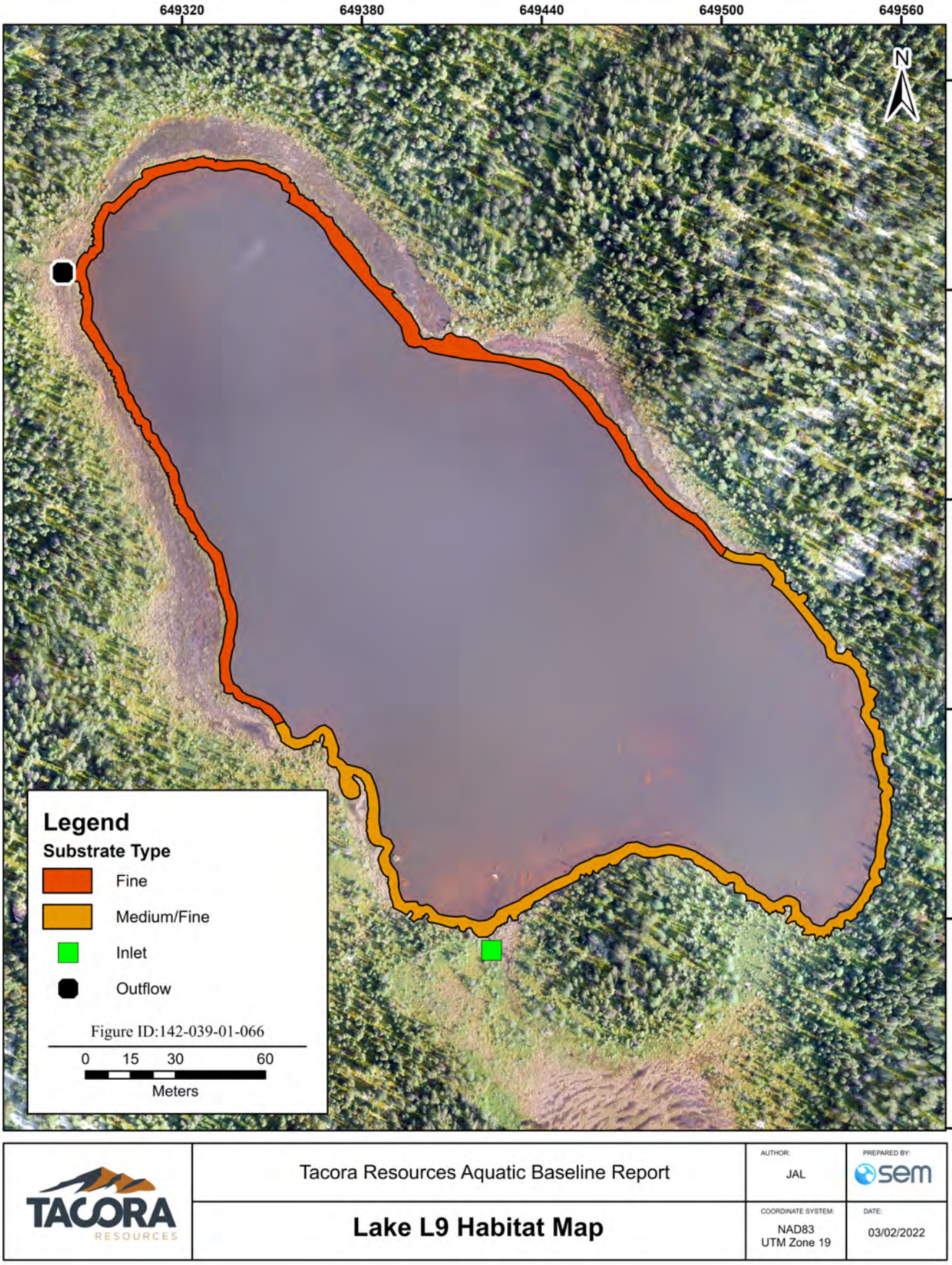


Figure 3.28 Lake L9 Habitat Map.

3.9.3 Lake L9 Water Quality

The water quality data for Lake L9 is provided in Appendix C. Most metals in Lake L9 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride (Appendix C). Chlorophyll 'a', as an indicator of primary productivity, measured 0.08 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in Lake L9 (1 m) and are shown in Appendix C. The temperature measured 15.4°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 7.50, 9.63 mg/L (or 100% saturation), 67.0 µS/cm, and 43.8 mV, respectively.

3.9.4 Lake L9 Sediment Quality

The sediment quality data for Lake L9 is provided in Appendix C. Most metals were detected in the sediment except antimony, arsenic, beryllium, bismuth, boron, cadmium, lithium, mercury, molybdenum, rubidium, silver, and thallium. Iron was high and measured to be 26,000 mg/kg. Total organic carbon in the sediment of L9 measured 350 g/kg. The sediment was composed of clay (63%), with some silt (31%) and lesser amounts of sand (6%; Appendix C).

3.9.5 Lake L9 Fish Population Assessment

3.9.5.1 Fish Community

The fish community in Lake L9 was composed entirely of brook trout (100%).

3.9.5.2 Fishing Effort and Catch

Fishing of Lake L9 was conducted using fyke nets, minnow traps and a gill net. Sampling locations were provided in Figure 3.27. The fyke net fishing effort was conducted until a 10% recapture rate was achieved for brook trout. A summary of fishing effort, fish catches and CPUE are provided in Table 3.24.

Fyke netting was conducted June 19-21, 2021, with five nets set initially on June 19, then increased to nine nets on June 20. The total net nights fished was 15, ranging from one to nine nets per night, averaged seven nets per night. Not all nets captured fish each night, and the number of nets capturing fish ranged from one to six nets each night, averaging four nets. Brook trout was the only species caught (n=37). The total number of brook trout recaptured was one fish (2.6%). Fyke netting catches of brook trout ranged from four to 18 fish/set, averaging 12.7 fish/set. CPUE for brook trout caught by fyke nets

ranged from 2.1 to 4.0 fish/net night averaging 2.5 fish/net. Brook trout fyke netting CPUE was highest on the last day of fishing and lowest on the second day.

Minnow traps were also placed near fyke nets for two nights and no fish were caught. Gill netting of Lake L9 was completed on June 19 and June 21, capturing seven and recapturing eight brook trout, bringing the total number of recaptures in the lake to nine fish (20.5%).

Table 3.24 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L9.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		CPUE[2]
				Total	Recap	Brook Trout
Fyke Nets						
Jun. 19	Jun. 20	5(2)	5	15	0	3.0
Jun. 20	Jun. 21	9(6)	9	18	1	2.1
Jun. 21	Jun. 21	1(1)	1	4	0	4.0
Totals			15	37	1	2.5
Minnow Traps						
Jun. 19	Jun. 20	5(0)	5	0	0	0.0
Jun. 20	Jun. 21	5(0)	5	0	0	0.0
Totals			10	0	0	0.0
Gill Net						
Jun. 19	Jun. 19	1	2.1	3	0	1.4
Jun. 21	Jun. 21	1	1	4	8	12.0
Totals			3.1	7	8	4.8

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps, fish per hour for gill net.

3.9.5.3 Characteristics of the Fish Population

The length, weight and condition factor for brook trout captured in Lake L9 are summarized in Table 3.25. The length of brook trout captured ranged from 99 to 270 mm and averaged 140.5 mm (std. dev. = ± 31.0). Brook trout recaptured during fyke netting were slightly smaller than the overall population, averaged 126.9 mm, with no fish less than 110 mm and a maximum length of 145 mm captured. Brook trout weight ranged from 11.0 g to 245.0 g averaged 38.5 g (std. dev. = ± 36.0). Similarly, the weights of brook trout recaptured were slightly smaller than the overall population, averaged 25.3 g, with no recaptured fish weighing less than 17.0 g and no fish more than 39.0 g. Condition factor for brook trout captured in Lake L9 ranged from 1.0 to 1.3, averaged 1.1 (std. dev. = ± 0.1). The length distribution for brook trout captured in Lake L9 is provided in Figure 3.29. The distribution was unimodal with peak size classes between 100 and 125 mm (37.0%) and 125 to 150 mm (38.9%). Very few captured fish were less than 100 mm (3.8%) and greater than 200 mm (7.5%).

Table 3.25 Summary of Meristic Data for Fish Caught in Lake L9.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	140.5	99.0	270.0	31.0
	Weight (g)	38.5	11.0	245.0	36.0
	Condition (K)	1.2	1.0	1.4	0.1
Brook trout (recapture)	Length (mm)	126.9	110.0	145.0	11.7
	Weight (g)	25.3	17.0	39.0	7.6
	Condition (K)	1.1	1.0	1.3	0.1

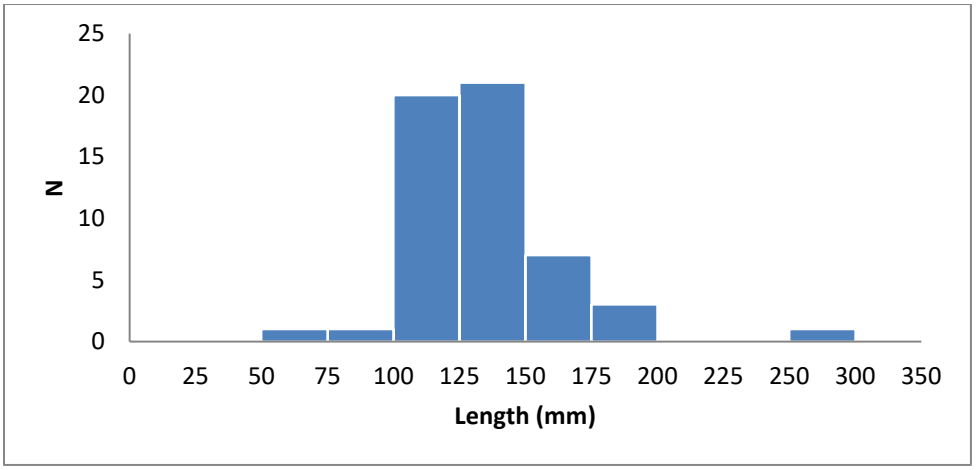


Figure 3.29 Length Frequency Distribution of Brook Trout Captured in Lake L9.

3.9.5.4 Fish Population Estimate

The brook trout population estimate for Lake L9 in August 2021, was 75 fish with upper and lower 95% confidence intervals of 82 and 68 fish, respectively.

3.9.6 Benthic Community

Benthic macroinvertebrates at Lake L9 had a total abundance of three, taxon richness of two and total density of 100 individuals/m^2. The two families representing Lake L9 consist of Lumbriculidae (66%) and Valvatidae (33%).

3.9.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L9 on June 19, 2021 (Figure 3.27). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L9 was 52 mg/m^3 and the <10 µm size class was dominant with a biomass of 52 mg/m^3. Both the 10-30 µm and > 30 µm size classes were absent.

3.9.8 Zooplankton

A zooplankton sample was collected at one station in Lake L9 on June 19, 2021 (Figure 3.27). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 280.34, 172.91, and 0.22, respectively, for a total biomass of 453.46 mg/m^3. Calanoids were the largest group at 280.30 mg/m^3, followed by the genus *Bosmina* (68.21 mg/m^3), the genus *Holopedium* (56.28 mg/m^3), and the genus *Daphnia* (48.41 mg/m^3). Copepods were the dominant group while Rotifers had the lowest biomass.

3.10 Lake L10

3.10.1 General Overview Description

Lake L10 was situated southeast of Lake L7. Lake L10 had a single outlet that flowed west to Lake L18. This outlet is described in more detail as Stream S17. No stream inlet was identified during the survey however, evidence indicated flow into Lake L10 at the southern end through a wetland, originating from Lake L11. The lake had steep shores for most of its perimeter dropping straight down to its shallow (0.5 m) depth. The exception of this is the eastern cove where the slope was more gradual. Access was provided by ATV/snowmobile trails that were present north of the lake traveling east to west. The shoreline of Lake L10 consisted mainly of mature black spruce intermixed with some sections of alders and small sections of wetland. Lake substrate contained mainly mobile organics in all areas except for the western cove where there were large and small boulders present amongst the organics. Limited amounts of boulders were also present sparsely near shore. The location of fishing nets, where samples were collected from, and other various data are provided in Figure 3.30. Fish were sampled using fyke nets (n=10), minnow traps (n=6) and gill nets (n=2).

3.10.2 Lake Habitat Assessment

3.10.2.1 Bathymetry

Bathymetric studies were completed on Lake L10 on July 26, 2021, using manual measurements as the lake was too shallow to use sonar equipment. Depth measurements were taken in representative areas throughout the lake and these measurements were used to create a detailed bathymetric map for the lake (Figure 3.30). The surface area of the lake was 63,096 m^2 and the lake volume was 29,181 m^3. The lake bottom had a relatively constant depth of 0.5 m throughout.

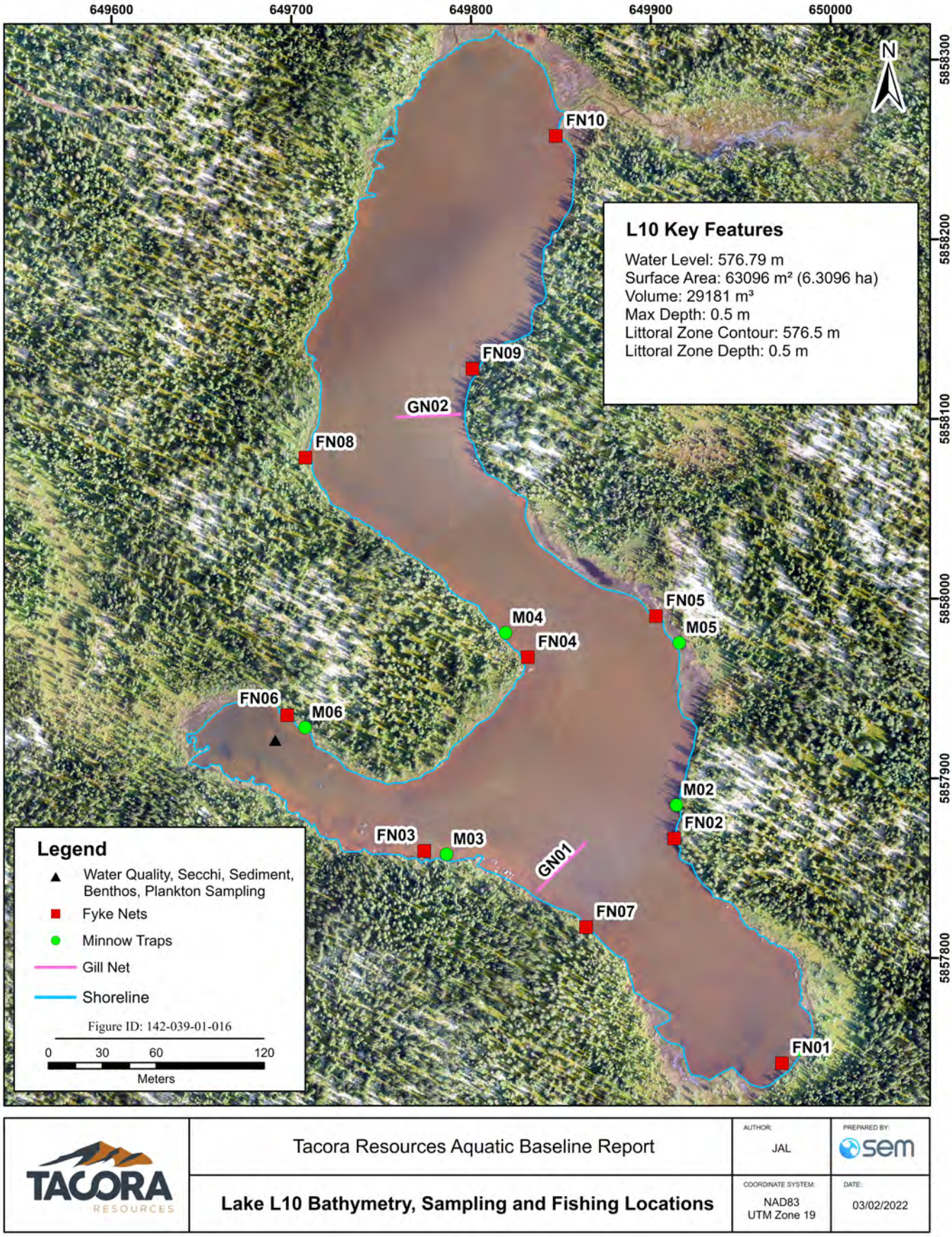


Figure 3.30 Lake L10 Bathymetry, Sampling and Fishing Locations.

3.10.2.2 Habitat Mapping

A survey of habitat in Lake L10, identifying substrate and vegetation, was conducted on July 26, 2021 (Figure 3.31). The entire lake was composed of littoral zone and due to the shallow characteristics of L10 and the Secchi depth (i.e., 0.5 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) was composed of fines. The shoreline survey of L10 only identified the substrate class fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.26.

Table 3.26 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L10.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
63,096	29,181	Fine	With vegetation	0
			No vegetation	63,096
			Total	63,096

3.10.3 Lake L10 Water Quality

The water quality data for Lake L10 is provided in Appendix C. Most metals in L10 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 0.72 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in L10 (0.5 m) and are shown in Appendix C. The temperature measured 20.2°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 8.6, 7.56 mg/L (or 84.8% saturation), 109.6 µS/cm, and 104.6 mV, respectively.

3.10.4 Lake L10 Sediment Quality

The sediment quality data for L10 is provided in Appendix C. Most metals were detected in the sediment except antimony, beryllium, bismuth, boron, cadmium, mercury, selenium, silver, and tin. Iron was very high and measured 46,000 mg/kg. Total organic carbon in the sediment of L10 measured 12,000 g/kg. The sediment was composed of silt (63%), with some clay (24%) and lesser amounts of sand (13%; Appendix C).

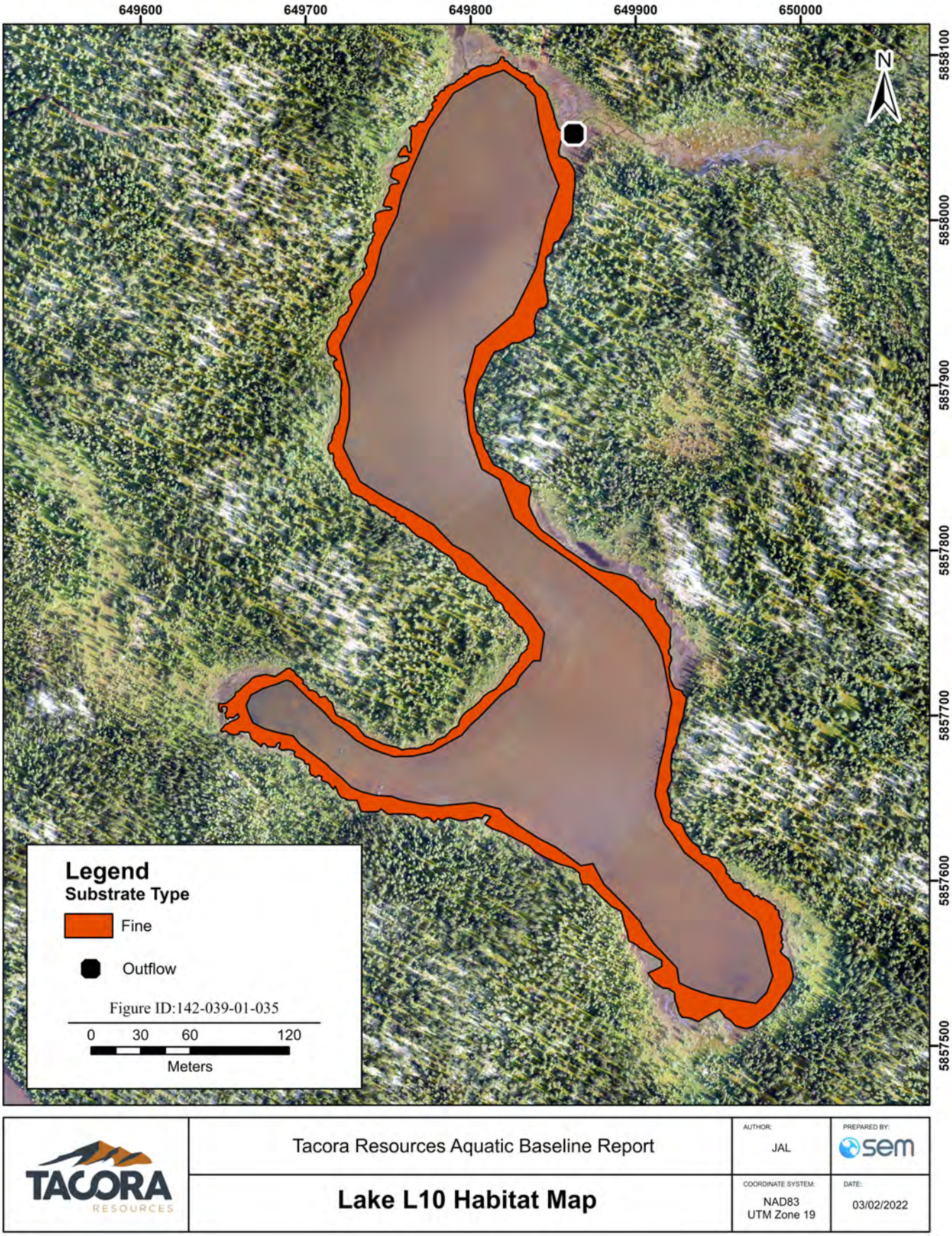


Figure 3.31 Lake L10 Habitat Map.

3.10.5 Lake L10 Fish Population Assessment

3.10.5.1 Fish Community

The fish community in Lake L10 was primarily composed of lake chub (71%), while brook trout (14.1%), burbot (13.1%) and white sucker (1.8%) were prevalent to a lesser extent (Figure 3.32).

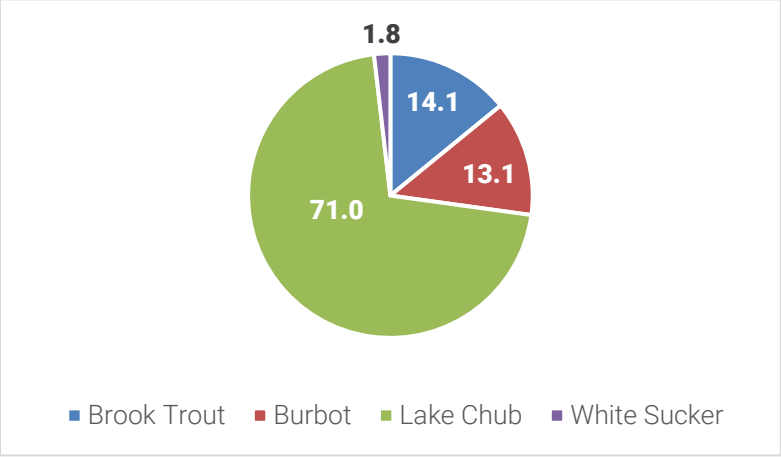


Figure 3.32 Fish Community Composition (% Abundance) for Lake L10.

3.10.5.2 Fishing Effort and Catch

Fishing of Lake L10 was conducted using fyke nets, minnow traps and gill nets. Sampling locations were provided in Figure 3.30. A summary of fishing effort, fish catches and CPUE is provided in Table 3.27.

Fyke netting was conducted July 25-31, 2021, with three nets set initially on July 25, then increased to four nets on July 26, six nets on July 27 and ten nets on July 28. The total net nights fished was 43, ranging from three to ten nets per night, averaging seven nets per night. Not all nets captured fish each night with the number of nets capturing fish ranging from three to nine nets each night, averaging 5.7 nets. Four fish species were captured: 39 brook trout, 397 lake chub, 67 burbot and 11 white suckers. The total number of brook trout recaptured was five fish (14.7%). Fyke netting catches of brook trout ranged from five to nine fish/set, averaging 5.7 fish/set. Fyke netting CPUE for brook trout ranged from 0.6 to 1.7 fish/net night averaging 1.0 fish/net. Brook trout CPUE was highest on the first day of fishing and lowest on the fifth day of fyke net fishing, while for other species fyke netting CPUE was highest on the last day of fishing and lowest on the first and third days.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught a total of seven burbot and 20 lake chub. Gill netting of L10 was completed on July 27 and July 29, and eight brook trout were caught in total.

Table 3.27 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing Netting of Lake L10.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		Burbot	Lake Chub	White Sucker	CPUE[2]			
				Total	Recap	Total	Total	Total	Brook Trout	Burbot	Lake Chub	White Sucker
Fyke Nets												
Jul. 25	Jul. 26	3(3)	3	5	0	2	28	1	1.7	0.7	9.3	0.3
Jul. 26	Jul. 27	4(4)	4	3	0	5	38	2	0.8	1.3	9.5	0.5
Jul. 27	Jul. 28	6(6)	6	6	1	12	20	2	1.2	2.0	3.3	0.3
Jul. 28	Jul. 29	10(9)	10	9	0	22	110	3	0.9	2.2	11.0	0.3
Jul. 29	Jul. 30	10(6)	10	6	0	16	104	2	0.6	1.6	10.4	0.2
Jul. 30	Jul. 31	10(6)	10	5	4	10	97	1	0.9	7.7	43.6	1.7
Totals			43	34	5	67	397	11	0.9	1.6	9.2	0.3
Minnow Traps												
Jul. 25	Jul. 26	4(2)	4	0	0	3	15	0	0.0	0.8	3.8	0.0
Jul. 26	Jul. 27	4(2)	4	0	0	2	0	0	0.0	0.5	0.0	0.0
Jul. 27	Jul. 28	4(2)	4	0	0	2	2	0	0.0	0.5	0.5	0.0
Jul. 28	Jul. 29	4(0)	4	0	0	0	0	0	0.0	0.0	0.0	0.0
Jul. 29	Jul. 30	4(1)	4	0	0	0	2	0	0.0	0.0	0.5	0.0
Jul. 30	Jul. 31	4(1)	4	0	0	0	1	0	0.0	0.0	0.3	0.0
Totals			24	0	0	7	20	0	0.0	0.3	0.8	0.0
Gill Net												
Jul. 27	Jul. 27	1	1.9	3	0	0	0	0	1.6	0.0	0.0	0.0
Jul. 27	Jul. 27	1	1.9	0	0	0	0	0	0.0	0.0	0.0	0.0
Jul. 27	Jul. 27	1	1.5	0	0	0	0	0	0.0	0.0	0.0	0.0
Jul. 27	Jul. 27	1	1.5	1	0	0	0	0	0.7	0.0	0.0	0.0
Jul. 29	Jul. 29	1	1.9	1	0	0	0	0	0.5	0.0	0.0	0.0
Jul. 29	Jul. 29	1	1.6	1	0	0	0	0	0.6	0.0	0.0	0.0
Jul. 29	Jul. 29	1	1.8	2	0	0	0	0	1.1	0.0	0.0	0.0
Jul. 29	Jul. 29	1	1.9	0	0	0	0	0	0.0	0.0	0.0	0.0
Totals			14	8	0	0	0	0	4.5	0.0	0.0	0.0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets.

3.10.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L10 are summarized in Table 3.28. The length of brook trout captured ranged from 105 to 273 mm and averaged 154.1 mm (std. dev. = ± 35.2). Brook trout recaptured during fyke netting were slightly smaller than the overall population, averaging 134.8 mm, with no fish less than 105 mm and a maximum length of 180 mm captured. Brook trout weight ranged from 12.0 to 197 g, averaging 45.9 g (std. dev. = ± 35.5). Similarly, the weights of brook trout recaptured were slightly smaller than the overall population, averaging 27.8 g, with no recaptured fish weighing less than 12 g or more than 63 g. Condition factor for brook trout captured in L10 ranged from 0.8 to 1.3, averaging 1.0 (std. dev. = ± 0.1). The length of lake chub ranged from 37 to 126 mm (mean = 75.4 mm), while burbot and white sucker had length ranges of 94 – 253 mm (mean = 157.7 mm) and 117 – 234 mm (mean = 166.5 mm) respectively.

The length frequency distribution for brook trout captured in Lake L10 is provided in Figure 3.33. The distribution was unimodal with comparable peak size classes between 100 to 125 mm (29.2%), 125 to 150 mm (25.0%) and 150 to 175 mm (27.1%). Few captured brook trout were between 175 to 300 mm (18.8%), and none were below 100 mm.

Table 3.28 Summary of Meristic Data for Fish Caught in Lake L10.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	154.1	105.0	273.0	35.2
	Weight (g)	45.9	12.0	197.0	35.5
	Condition (K)	1.0	0.8	1.3	0.1
Brook trout (recapture)	Length (mm)	134.8	105.0	180.0	29.1
	Weight (g)	27.8	12.0	63.0	20.9
	Condition (K)	1.0	0.8	1.1	0.1
Lake chub	Length (mm)	75.4	37.0	126.0	15.1
	Weight (g)	5.2	1.0	20.0	3.1
	Condition (K)	1.1	0.8	1.4	0.1
Burbot	Length (mm)	157.7	94.0	253.0	39.8
	Weight (g)	25.1	3.0	88.0	18.1
White sucker	Length (mm)	166.5	117.0	234.0	43.8
	Weight (g)	60.2	20.0	154.0	53.4
	Condition (K)	1.1	1.0	1.3	0.1

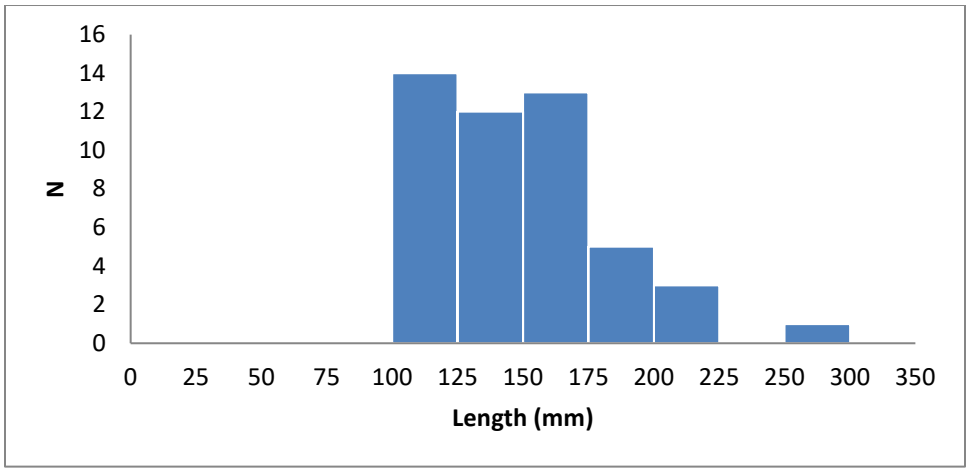


Figure 3.33 Length Frequency Distribution of Brook Trout Captured in Lake L10.

3.10.5.4 Fish Population Estimate

Brook trout population estimate for Lake L10 in August 2021, was 154 fish with upper and lower 95% confidence intervals of 685 and 87 fish, respectively. The reason for the wide confidence interval is due to the low total number of brook trout recaptures in this lake (i.e., n=5).

3.10.6 Benthic Community

Two families (Valvatidae and Chironomidae) of benthic macroinvertebrates characterized Lake L10. Therefore, total abundance of benthic macroinvertebrates was two and density was 100 individuals/m^2.

3.10.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L10 on July 26, 2021 (Figure 3.30). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L10 was 524 mg/m^3 and the 10-30 µm size class was dominant with a biomass of 298 mg/m^3, while the <10 µm was also large (226 mg/m^3) and the > 30 µm size class was absent.

3.10.8 Zooplankton

A zooplankton sample was collected at one station in Lake L10 on July 26, 2021 (Figure 3.30). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 43.46, 25.68, and 0.14,

respectively, for a total biomass of 69.27 mg/m^3. Calanoids were the largest group at 36.96 mg/m^3 followed by the genus *Bosmina* (22.08 mg/m^3). Copepods were the dominant group while Rotifers had the lowest biomass.

3.11 Lake L11

3.11.1 General Overview Description

Lake L11 was situated near the southwest corner of the assessment area, just south of Lake L10. This lake was not connected to any nearby water bodies by streams and during the survey of the area no inlet or outlet streams could be identified. The lake had the appearance of gentle sloped shores for most of its perimeter, however this is only because of the layer of mobile organics covering the lake bottom. The water level of this lake dropped off to near maximum depth immediately at the shoreline. This sub meter depth was then maintained for the majority of the lake area, only differing in a few pockets visible on the bathymetric map. ATV/snowmobile and hunting trails were not present near enough to the lake to be used for access and instead a helicopter was used for transportation to the lake. The shoreline of Lake L11 consisted mainly of wetland, other than the northeastern side and one section on the southwestern end where there were mostly black spruce trees. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of fishing nets and where other various data and samples were collected are provided in Figure 3.34. Fish were sampled using fyke nets (n=8) and minnow traps (n=6).

3.11.2 Lake Habitat Assessment

3.11.2.1 Bathymetry

Bathymetric studies were completed on Lake L11 on September 28, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of 13 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.34). The surface area of the lake was 26,776 m^2 and the lake volume was 18,151 m^3. The lake was deepest in its southern region, reaching a maximum depth of 1.7 m.

3.11.2.2 Habitat Mapping

A survey of habitat in Lake L11, identifying substrate and vegetation, was conducted on August 20, 2021 (Figure 3.35). The entire lake was composed of littoral zone and due to the shallow characteristics of L11 and the Secchi depth (i.e., 1.7 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of each identified substrate class are provided in Table 3.29.

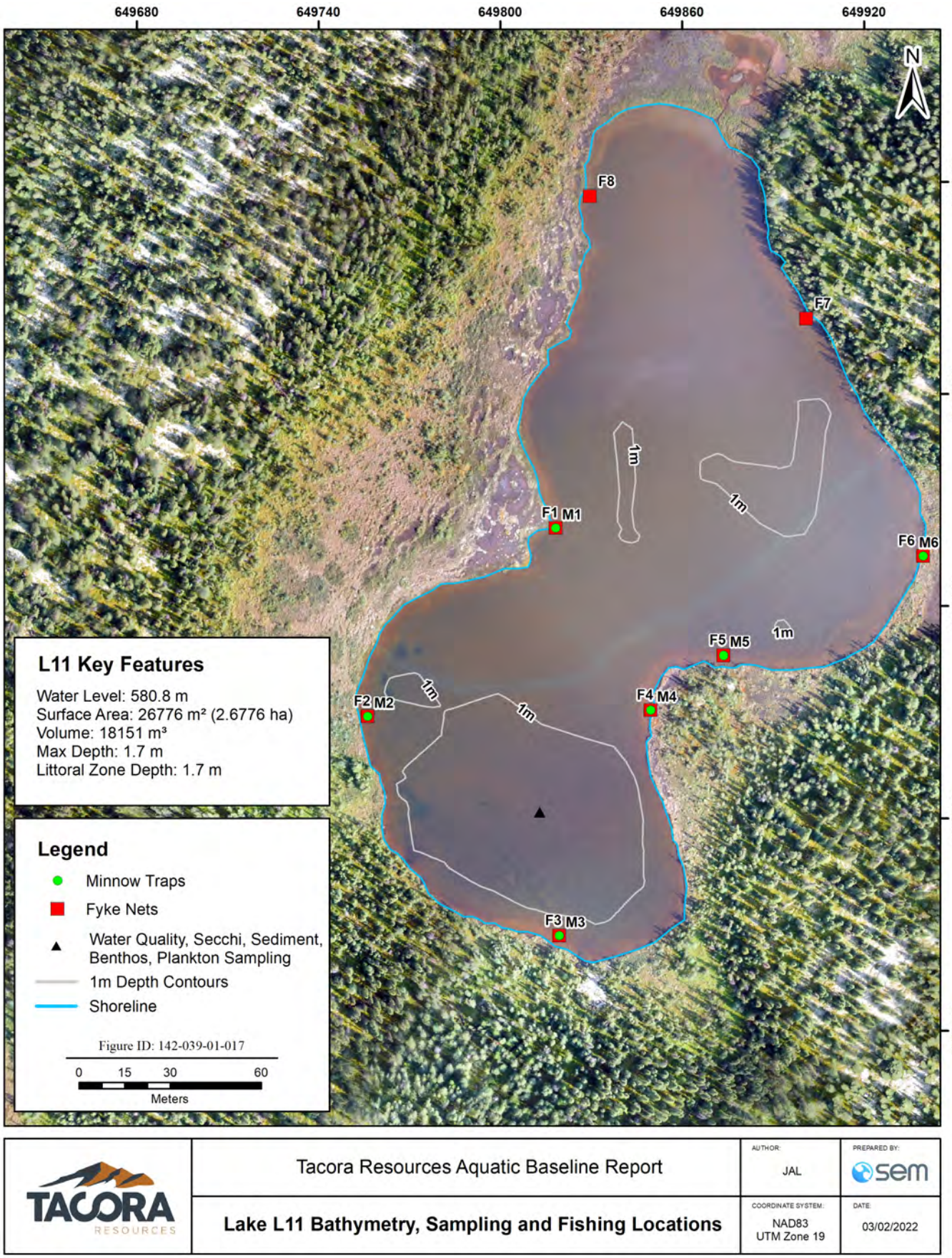


Figure 3.34 Lake L11 Bathymetry, Sampling and Fishing Locations.

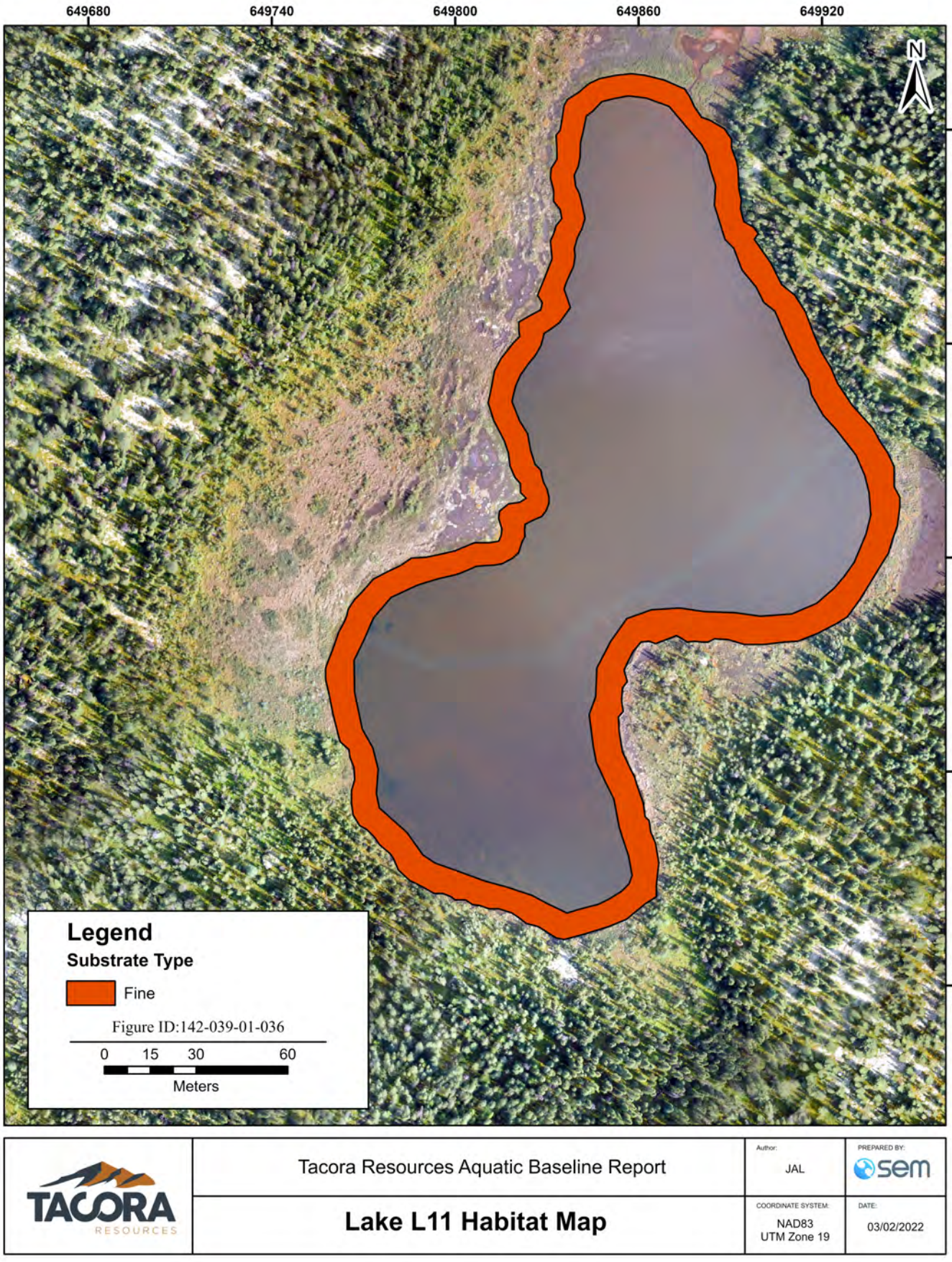


Figure 3.35 Lake L11 Habitat Map.

Table 3.29 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L11.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
26,776	18,151	Fine	With vegetation	0
			No vegetation	26,776
			Total	26,776

3.11.3 Lake L11 Water Quality

The water quality data for Lake L11 included metals, inorganics, calculated parameters, and chlorophyll 'a' and is shown in Appendix C. Most metals in Lake L11 were below detection limits, while barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride (Appendix C). Chlorophyll 'a', as an indicator of primary productivity, measured 0.56 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at two depths in L11 (i.e., surface and one meter) and are shown in Appendix C. There was no temperature difference between 0 m and 1 m. Dissolved oxygen showed a decrease at 1 m (9.02 mg/L or 96.9% saturation) from 0 m (to 9.14 mg/L or 99.1% saturation). pH, conductivity, and ORP levels were comparable and ranged from 8.20 (at 0 m) to 8.29 (at 1 m), 73.9 to 75.3 µS/cm, and 89.8 to 95.1 mV, respectively.

3.11.4 Lake L11 Sediment Quality

The sediment quality data for L11 is provided in Appendix C. Most metals were detected in the sediment except antimony, arsenic, beryllium, bismuth, boron, cobalt lithium, rubidium, silver, and thallium were undetected. Iron was very high and measured 17,000 mg/kg. Total organic carbon in the sediment of Lake L11 measured 450 g/kg. The sediment was composed of clay (88%), with some sand (8%) and lesser amounts of silt (4%; Appendix C).

3.11.5 Lake L11 Fish Population Assessment

3.11.5.1 Fish Community

The fish community in Lake L11 was primarily composed of lake chub (6694 total; 98.5%), with smaller numbers of burbot (96 total; 1.4%). A limited number of white sucker (two total; 0.03%) and brook trout (two total; 0.03%) were also caught in Lake L11 (Figure 3.36).

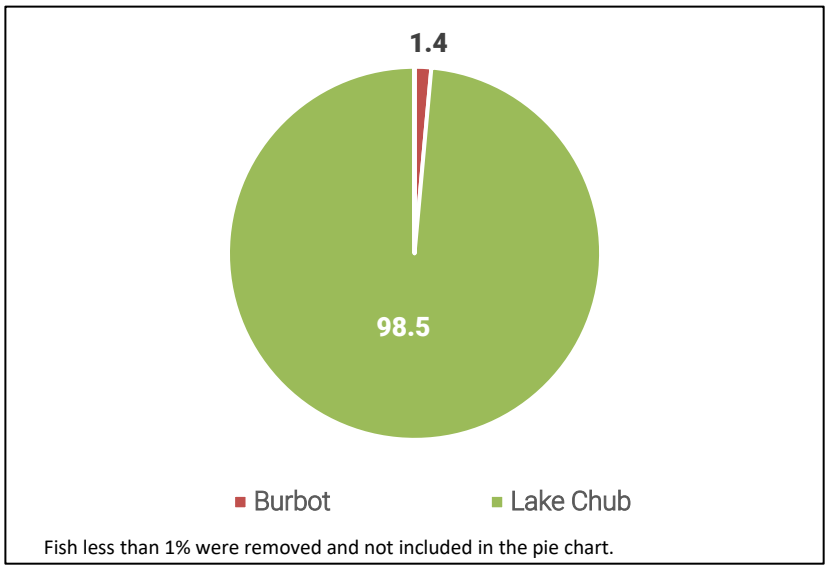


Figure 3.36 Fish Community Composition (% Abundance) for Lake L11.

3.11.5.2 Fishing Effort and Catch

Fishing of Lake L11 was conducted using fyke nets and minnow traps. Sampling locations are provided in Figure 3.34. A summary of fishing effort, fish catches and CPUE is provided in Table 3.30.

Table 3.30 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing Netting of Lake L11.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		Burbot	Lake Chub	White Sucker	CPUE[2]			
				Total	Recap	Total	Total	Total	Brook Trout	Burbot	Lake Chub	White Sucker
Fyke Nets												
Aug. 20	Aug. 22	8(8)	16	1	0	45	3,439	1	0.1	2.8	214.9	0.1
Aug. 22	Aug. 23	8(8)	8	0	1	51	3,190	1	0.1	6.4	398.8	0.1
Totals			24	1	1	96	6,629	2	0.1	4.0	276.2	0.1
Minnow Traps												
Aug. 20	Aug. 22	6(2)	12	0	0	0	43	0	0.0	0	3.6	0
Aug. 22	Aug. 23	6(5)	6	0	0	0	22	0	0.0	0	3.7	0
Totals			18	0	0	0	65	0	0.0	0	3.6	0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night.

Fyke netting was conducted August 20-23, 2021. Eight nets were set each day and the total net nights fished was 24. Brook trout (n=1), lake chub (n=6629), burbot (n=96), and white sucker (n=2) were the species caught during fyke netting. The total number of brook trout recaptured was one fish (100%). Fyke netting CPUE for brook trout was 0.1 fish/net night, while CPUE for lake chub ranged from 214.9 to

398.8 fish/net night. Burbot fyke netting CPUE ranged from 2.8 to 6.4 fish/net, and white sucker had CPUE of 0.1 fish/net night.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught a total of 65 lake chub and had CPUE of 3.6 fish/net for this species.

3.11.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L11 are summarized in Table 3.31. The length of lake chub ranged from 36 to 118 mm, averaging 76.5 mm (std. dev. = ± 21.3), while weight ranged from 0.5 to 17.0 g, and averaged 5.6 g (std. dev. = ± 4.1). Condition factor ranged from 0.6 to 1.2 and averaged 1.0 (std. dev. = ± 0.1). Burbot length ranged from 55 to 360 mm, averaging 216 mm (std. dev = ± 47.6), and weight had a range of 1.3 to 243 g (mean = 63.6; std. dev. = ± 39.3). The captured brook trout had a length of 166 mm, a weight of 42 g and a condition factor of 0.92. White sucker had a mean length, weight, and condition factor of 166.8 mm, 78.3 g, and 1.2, respectively.

Table 3.31 Summary of Meristic Data for Fish Caught in Lake L11.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Lake chub	Length (mm)	76.5	36.0	118.0	21.3
	Weight (g)	5.6	0.5	17.0	4.1
	Condition (K)	1.0	0.6	1.2	0.1
Burbot	Length (mm)	216.0	55.0	360.0	47.6
	Weight (g)	63.6	1.3	243.0	39.3

3.11.6 Benthic Community

Lake L11 had a benthic macroinvertebrate density of zero. Of note, the Petite Ponar grab sample at this site did contain some zooplankton (Appendix C).

3.11.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L11 on August 21, 2021 (Figure 3.34). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L11 was 268 mg/m^3 and the <10 µm and 10-30 µm size classes were co-dominant with a biomass of 133 and 135 mg/m^3, respectively. The >30 µm size class was absent.

3.11.8 Zooplankton

A zooplankton sample was collected at one station in Lake L11 on August 21, 2021 (Figure 3.34). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows:

Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 1.18, 0.59, and 0.01, respectively, for a total biomass of 1.79 mg/m^3. Copepods were the dominant major group while calanoids were the largest group at 1.12 mg/m^3. The taxonomist cautioned that there was a very small volume of sample for analysis and there may have been loss of sample during shipping.

3.12 Lake L12

3.12.1 General Overview Description

Lake L12 was situated near the southwest portion of the assessment area, southeast of Lake L10. This lake was connected to Lake L18 by its single outlet stream flowing north, a long stream in comparison to other streams in the area. This stream is explained in more detail as Stream S7. Lake L12 also had a single inlet stream originating south of the area flowing north, assessed in more detail as Stream S8. Comparable to other lakes in the area, Lake L12 had the appearance of gentle sloped shores for most of its perimeter, however this is only because of the layer of mobile organics covering the lake bottom. The water level of this lake dropped off to near maximum depth immediately at the shoreline, but this was hidden by the presence of non-supporting mobile organics. ATV/snowmobile and hunting trails were present 250 m from the lake with the remaining distance occupied by largely spaced trees allowing ATV access near the lake with limited tree cutting to access the shore. The shoreline of Lake L12 consisted mainly of wetland, with the end of the lake and start of the land not easily distinguished as the lake appeared to be flooding onto the wetland. The exception to this was the western shoreline where there were mostly black spruce trees. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of fishing nets and where the other various data and samples were collected are provided in Figure 3.37. Fish were sampled using fyke nets (n=7), minnow traps (n=6), and gill nets (n=2).

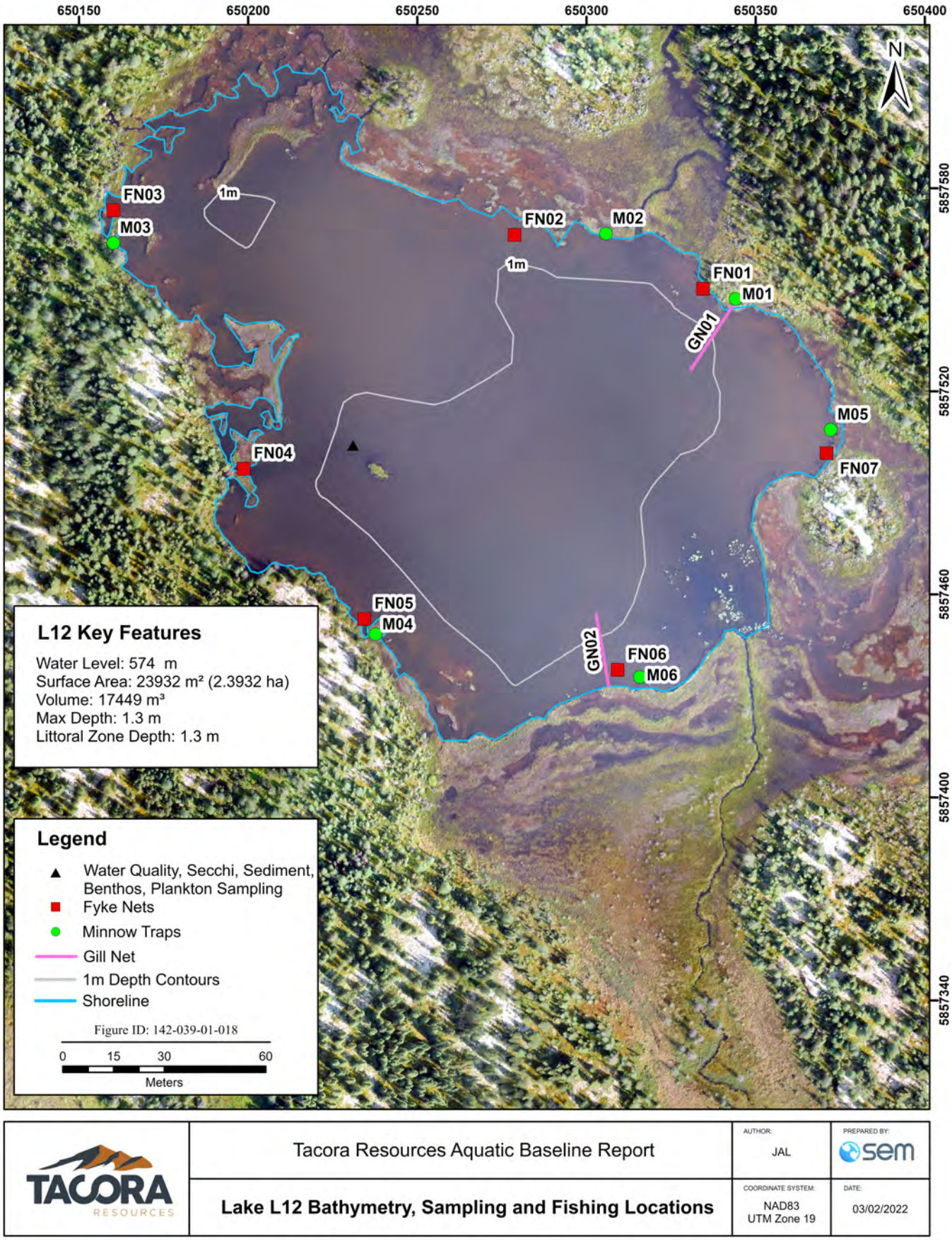


Figure 3.37 Lake L12 Bathymetry, Sampling and Fishing Locations.

3.12.2 Lake Habitat Assessment

3.12.2.1 Bathymetry

Bathymetric studies were completed on Lake L12 on July 20, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in a southeast-northwest direction. A total of 11 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.37). The surface area of the lake was 23,932 m^2 and the lake volume was 17,449 m^3. The lake was relatively shallow throughout, having a maximum depth of 1.3 m. The deepest area was in the southern half.

3.12.2.2 Habitat Mapping

A survey of habitat in Lake L12 identifying substrate and vegetation was conducted on July 16, 2021 (Figure 3.38). The entire lake was composed of littoral zone and due to the shallow characteristics of L12 and the Secchi depth (i.e., 1.3 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of each identified substrate class are provided in Table 3.32.

Table 3.32 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L12.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
23,932	17,449	Fine	With vegetation	75
			No vegetation	23,857
			Total	23,932

3.12.3 Lake L12 Water Quality

The water quality data for Lake L12 is provided in Appendix C. Most metals in L12 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected (Appendix C). Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 0.82 µg/L and was typical of an oligotrophic lake (Appendix C).

Field water quality parameters were measured at two depths in Lake L12 (i.e., 1 and 1.7 meters) and are shown in Appendix C. The temperature difference between 1 and 1.7 m was only 0.6°C and no thermocline was observed over this depth range. Dissolved oxygen showed a decrease at 1.7 m (3.4 mg/L or 35.9% saturation) from 1 m (to 8.7 mg/L or 93.5% saturation). pH, conductivity, and ORP levels were comparable and ranged from 6.96 (at 1.7 m) to 7.76 (at 1 m), 28.8 to 115.2 µS/cm, and 11.4 to 60.3 mV, respectively (Appendix C).

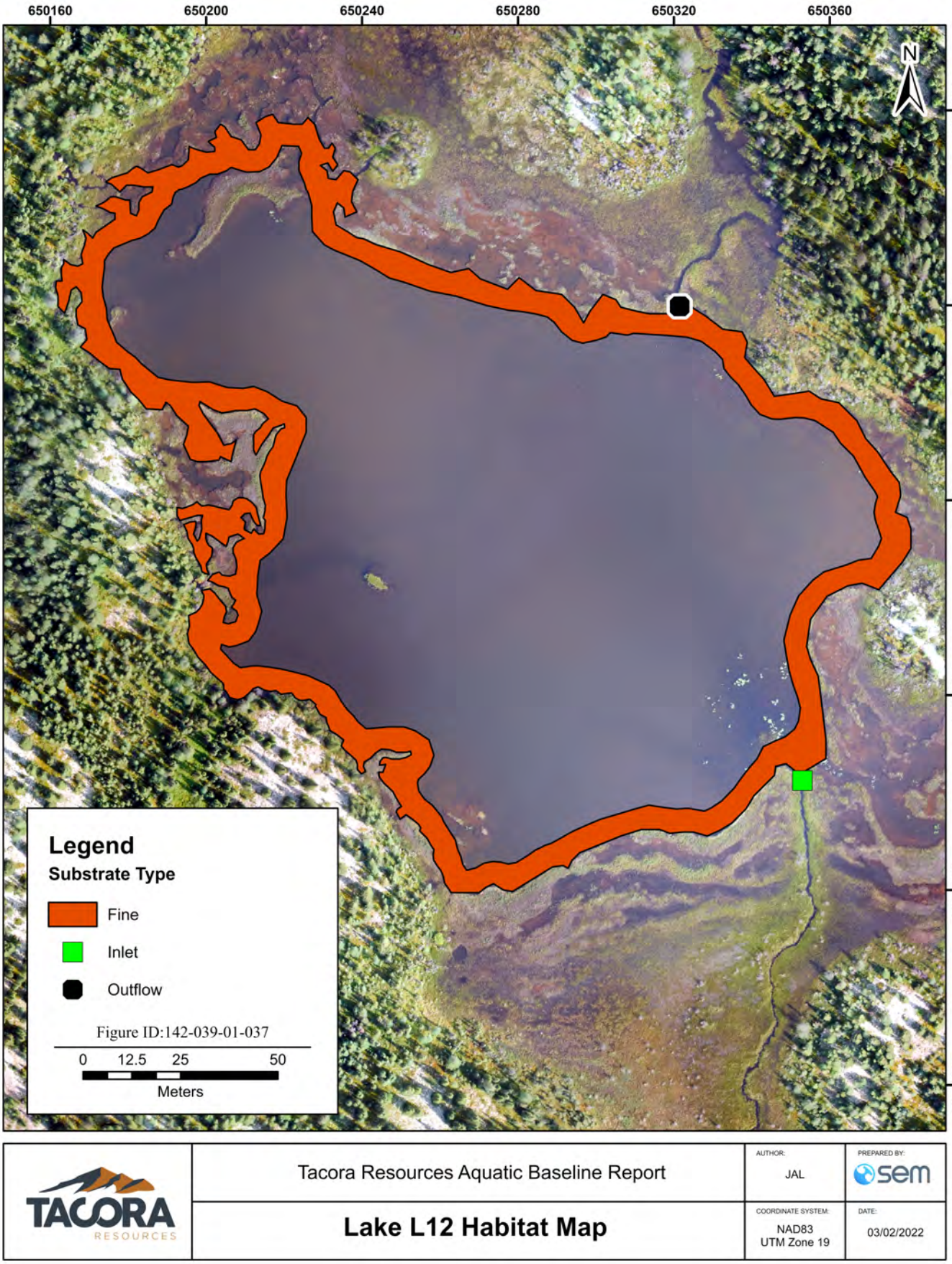


Figure 3.38 Lake L12 Habitat Map.

3.12.4 Lake L12 Sediment Quality

The sediment quality data for Lake L12 is provided in Appendix C. Most metals were detected in the sediment except antimony, beryllium, bismuth, boron, and silver. Iron was very high and measured to be 88,000 mg/kg. Total organic carbon in the sediment of Lake L12 was measured to be 160 g/kg. The sediment was composed of clay (74%), with some silt (18%) and lesser amounts of sand (8%; Appendix C).

3.12.5 Lake L12 Fish Population Assessment

3.12.5.1 Fish Community

The fish community in Lake L12 was primarily composed of lake chub (86.4%), while white sucker (5.8%), brook trout (5.1%) and burbot (2.6%) were prevalent to a lesser extent (Figure 3.39).

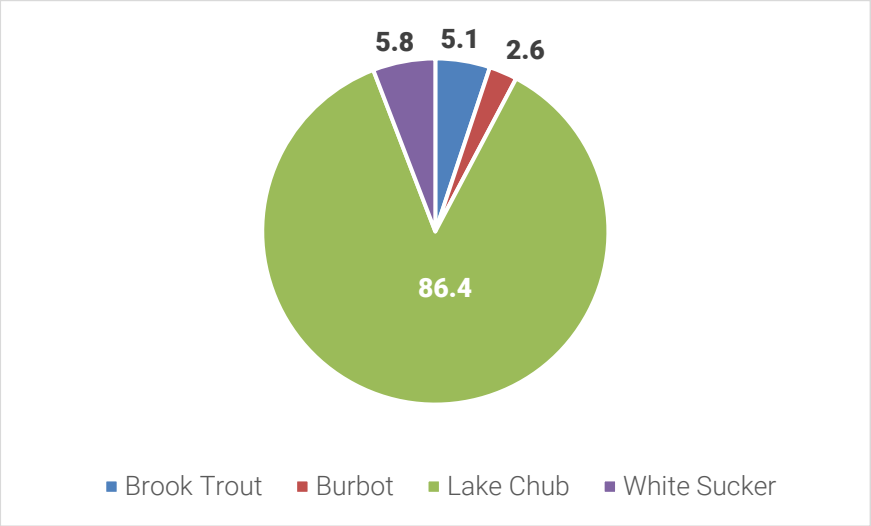


Figure 3.39 Fish Community Composition (% Abundance) for Lake L12.

3.12.5.2 Fishing Effort and Catch

Fishing of Lake L12 was conducted using fyke nets, minnow traps and a gill net. Sampling locations are provided in Figure 3.37. A summary of fishing effort, fish catches and CPUE is provided in Table 3.33. Fyke netting was conducted July 15-17, 2021, with seven nets set each night totalling 14 net nights fished. Not all nets captured fish each night with the number of nets capturing fish ranging from five to six nets each night, averaging 5.5 nets. Four fish species were captured by fyke nets: 19 brook trout, 580 lake chub, 16 burbot and 30 white suckers. The total number of brook trout recaptured in fyke nets was one fish (5.3% of total catch). Fyke netting catches of brook trout ranged from five to 14 fish/set,

averaged 9.5 fish/set. CPUE for brook trout ranged from 0.9 to 2.0 fish/net night averaging 1.5 fish/net. Trout fyke netting CPUE was highest on the first day of fishing and lowest on the second day.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught a total of one brook trout, two burbot and 12 lake chub. Gill netting of Lake L12 was completed on July 17, and captured 16 brook trout, of which one was recaptured. Ten white suckers were also caught with the gill net.

Table 3.33 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fishing Netting of Lake L12.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Brook Trout		Burbot	Lake Chub	White Sucker	CPUE[2]			
				Total	Recap	Total	Total	Total	Brook Trout	Burbot	Lake Chub	White Sucker
Fyke Nets												
Jul. 15	Jul. 16	7(6)	7	14	0	11	399	20	2.0	1.6	57.0	2.9
Jul. 16	Jul. 17	7(5)	7	5	1	5	181	10	0.9	0.7	25.9	1.4
Totals			14	19	1	16	580	30	1.4	1.1	41.4	2.1
Minnow Traps												
Jul. 15	Jul. 16	6(4)	6	1	0	1	8	0	0.2	0.2	1.3	0.0
Jul.16	Jul. 17	6(3)	6	0	0	1	4	0	0.0	0.2	0.7	0.0
Totals			12	1	0	2	12	0	0.1	0.2	1.0	0.0
Gill Net												
Jul. 17	Jul. 17	2(2)	2.0	16	1	0	0	10	8.5	0	0	5

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets.

3.12.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L12 are summarized in Table 3.34. The length of brook trout captured ranged from 86 to 262 mm and averaged 152.4 mm (std. dev. = ± 37.1). Brook trout recaptured during fyke netting averaged 160.0 mm, with no fish less than 115 mm and no greater than 235 mm captured. Brook trout weight ranged from 6.0 to 135 g, averaging 44 g (std. dev. = ± 31.5). The weights of brook trout recaptured averaged 61 g, with no recaptured fish weighing more than 140 g. Condition factor for brook trout captured in L12 ranged from 0.7 to 1.3, averaging 1.0 (std. dev. = ± 0.1). The length of lake chub ranged from 30 to 130 mm (mean = 70.6 mm), while burbot and white sucker had length ranges of 30 – 130 mm (mean = 70.6 mm) and 95 – 215 mm (mean = 139.7 mm) respectively.

The length frequency distribution for brook trout captured in Lake L12 is provided in Figure 3.40. The distribution was unimodal with the peak size class between 125 and 150 mm (37.1%). Very few captured fish were less than 100 mm (8.6%) and greater than 200 mm (8.6%).

3.12.5.4 Fish Population Estimate

The brook trout population estimate for Lake L12 in July 2021 was 100 fish. However, due to the short duration of fishing (i.e., 2 days) no confidence interval could be generated.

Table 3.34 Summary of Meristic Data for Fish Caught in Lake L12.

Species	Parameter	Mean	Min	Max	Std. Dev.
Brook trout (initial capture)	Length (mm)	152.4	86.0	262.0	37.1
	Weight (g)	44.0	6.0	135.0	31.5
	Condition (K)	1.0	0.7	1.3	0.1
Brook trout (recapture)	Length (mm)	160.0	115.0	235.0	53.4
	Weight (g)	61.0	16.0	140.0	56.0
	Condition (K)	1.1	1.1	1.2	0.1
Lake chub	Length (mm)	70.6	30.0	130.0	13.0
	Weight (g)	4.0	0.3	25.0	2.8
	Condition (K)	1.1	0.7	1.4	0.1
Burbot	Length (mm)	70.6	30.0	130.0	13.0
	Weight (g)	4.0	0.3	25.0	2.8
White sucker	Length (mm)	139.7	95.0	215.0	31.4
	Weight (g)	37.4	9.0	130.0	30.0
	Condition (K)	1.1	0.7	1.3	0.1

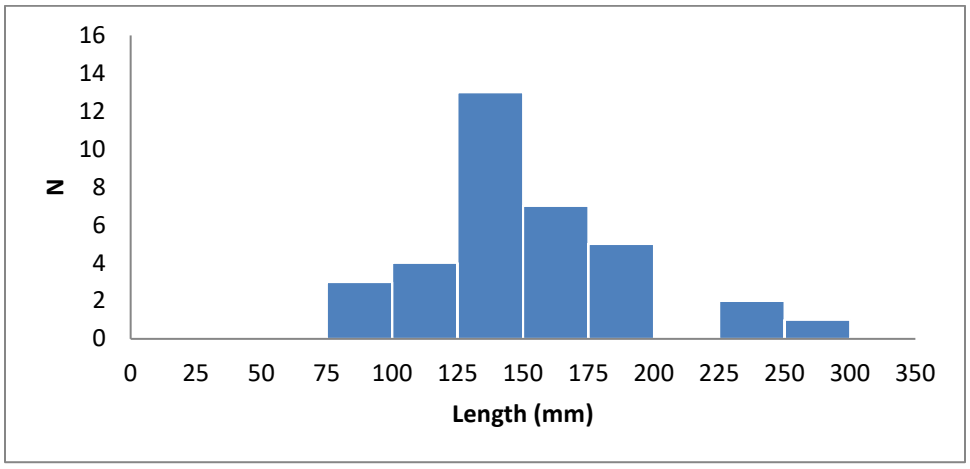


Figure 3.40 Length Frequency Distribution of Brook Trout Captured in Lake L12.

3.12.6 Benthic Community

Lake L12 benthic macroinvertebrate community had a total abundance of three and taxon richness of three. The density of macroinvertebrates at Lake L12 was 100 individuals/m^2. The three families present in L12 were Lumbriculidae (33%), Planoribidae (33%) and Valvatidae (33%).

3.12.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L12 on July 15, 2021 (Figure 3.37). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L12 was 929 mg/m^3 and the 10-30 µm size class was dominant with a biomass of 642 mg/m^3. The > 30 µm size class was absent.

3.12.8 Zooplankton

A zooplankton sample was collected at one station in Lake L12 on July 15, 2021 (Figure 3.37). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 162.71, 105.33, and 0.01, respectively, for a total biomass of 268.05 mg/m^3. Calanoids were the largest group at 162.58 mg/m^3 followed by the genus *Bosmina* (64.71 mg/m^3) and the genus *Daphnia* (40.62 mg/m^3). Copepods were the dominant group while Rotifers had a very low biomass.

3.13 Lake L13

3.13.1 General Overview Description

Lake L13 was a small lake situated near the southwest corner of the assessment area. This lake was not connected to any nearby water bodies by streams and during the survey of the area no inlet or outlet streams could be identified. The lake had the appearance of gentle sloped shores for most of its perimeter, however this was only because of the layer of thick mobile organics covering the lake bottom. The water level of this lake dropped off to near maximum depth immediately at the shoreline. This sub meter depth was then maintained for most of the lake area, except for many floating and wetland islands throughout. ATV/snowmobile and hunting trails were not present near enough to the lake to be used for access and instead a helicopter was used for transportation to the lake. The shoreline of Lake L13 consisted mainly of wetland, other than a few locations where black spruce trees were present. Lake L13 substrate contained no variation and instead was completely composed of mobile organics. The

location of fishing nets and other various data and sample collection sites are provided in Figure 3.41. Fish were sampled using fyke nets (n=4).

3.13.2 Lake Habitat Assessment

3.13.2.1 Bathymetry

Bathymetric studies were completed on Lake L13 on September 28, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of five transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.41). The surface area of the lake was 9,360 m^2 and the lake volume was 3,153 m^3. The lake bottom had a relatively constant depth of 0.6 m throughout.

3.13.2.2 Habitat Mapping

A survey of habitat in Lake L13 identifying substrate and vegetation was conducted on August 21, 2021 (Figure 3.42). The entire lake was composed of littoral zone and due to the shallow characteristics of L13 and the Secchi depth (i.e., 0.6 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.35.

Table 3.35 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L13.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
9,360	3,153	Fine	With vegetation	0
			No vegetation	9,360
			Total	9,360

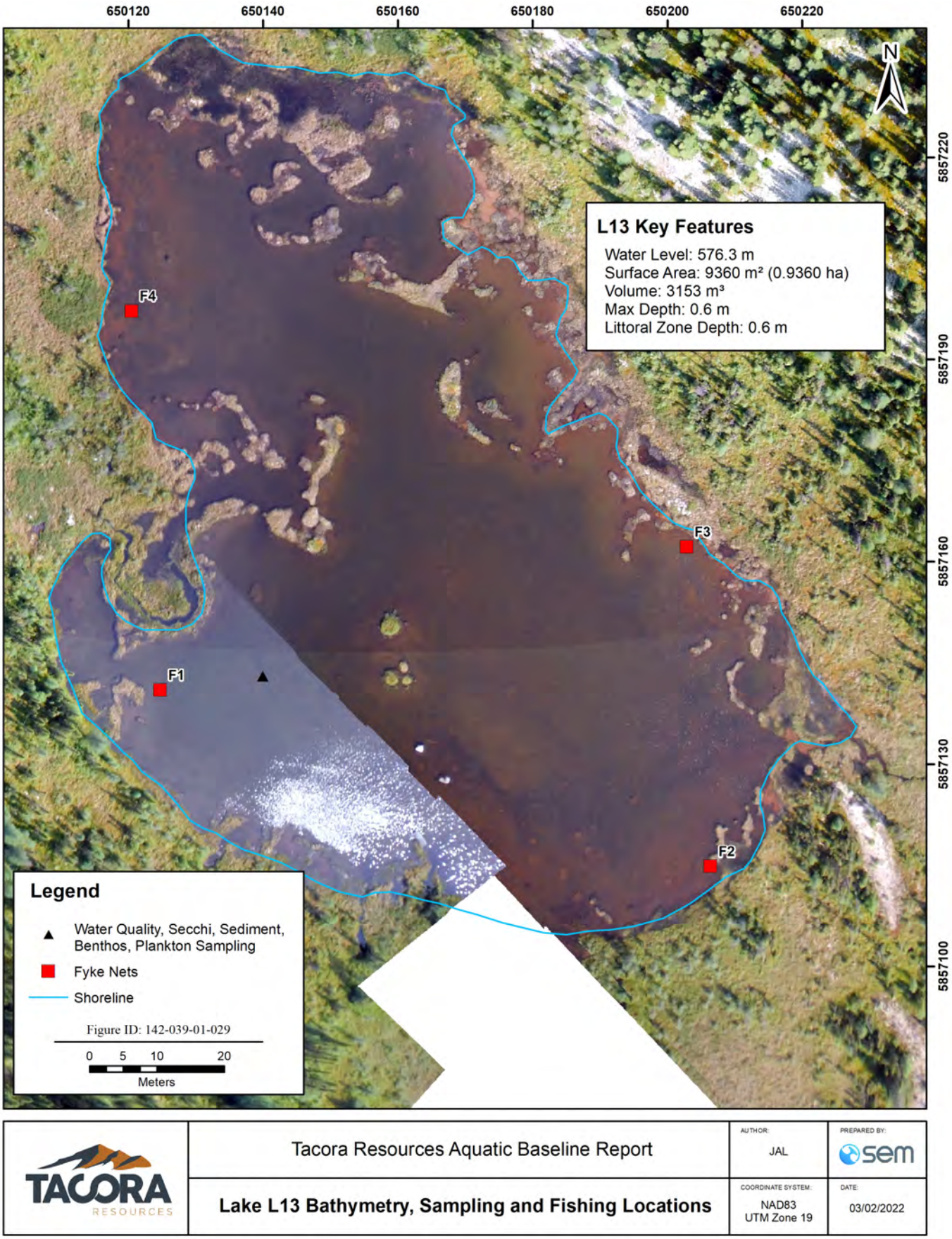


Figure 3.41 Lake L13 Bathymetry, Sampling and Fishing Locations.

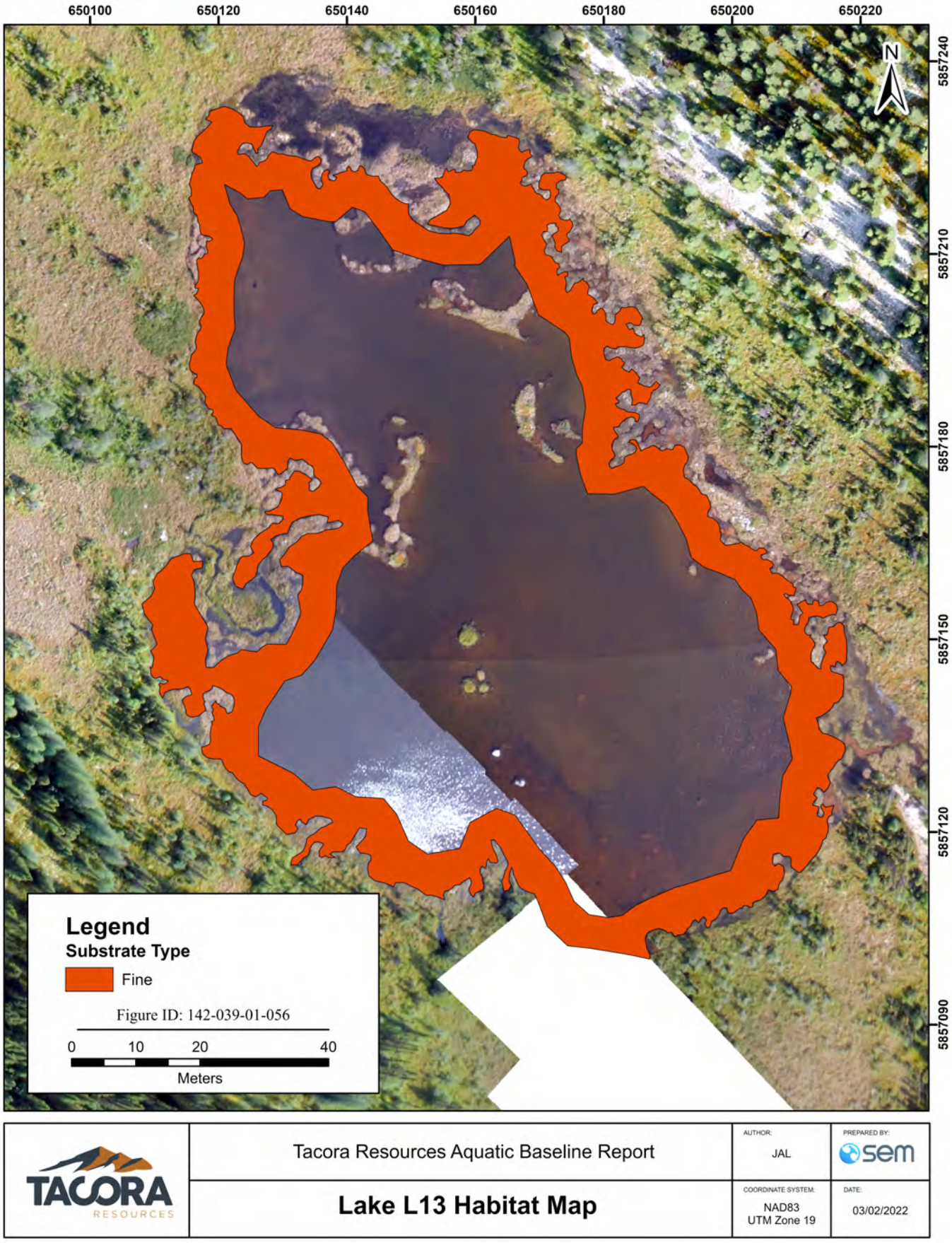


Figure 3.42 Lake L13 Habitat Map.

3.13.3 Lake L13 Water Quality

The water quality data for Lake L13 (i.e., metals, inorganics, calculated parameters, and chlorophyll 'a') is provided in Appendix C. Most metals in Lake L13 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, strontium, uranium, and zinc were detected (Appendix C). Phosphorus, lead, and copper were undetected. Further, this lake had pH near neutral, low alkalinity and turbidity, and undetected levels of nitrite and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 0.41 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in L13 (0.5 m) and are shown in Appendix C. The temperature measured 15.7°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 8.15, 9.60 mg/L (or 89.4% saturation), 136.6 µS/cm, and 86.3 mV, respectively.

3.13.4 Lake L13 Sediment Quality

The sediment quality data for Lake L13 is also provided in Appendix C. Most metals were detected in the sediment except antimony, beryllium, bismuth, boron, cadmium, mercury, selenium, silver, and tin. Iron was very high and measured 56,000 mg/kg. Total organic carbon in the sediment of Lake L13 measured 50 g/kg. The sediment was composed of silt (80%), with some sand (11%) and lesser amounts of clay (9%; Appendix C).

3.13.5 Lake L13 Fish Population Assessment

3.13.5.1 Fish Community

The fish community in Lake L13 was primarily composed of lake chub (77.8%), while white sucker (12.5%), brook trout (2.3%) and burbot (6.8%) were prevalent to a lesser extent (Figure 3.43). The population estimate for brook trout could not be calculated due to their low catch (n=4).

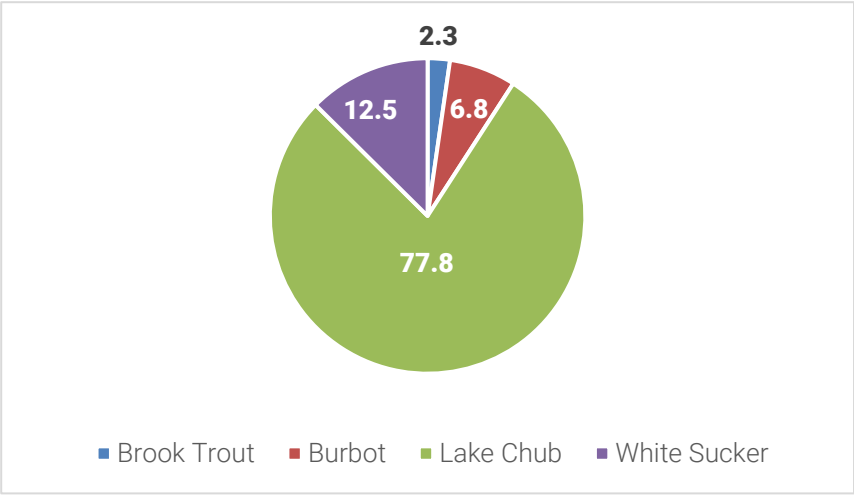


Figure 3.43 Fish Community Composition (% Abundance) for Lake L13.

3.13.5.2 Fishing Effort and Catch

Fishing of Lake L13 was conducted using fyke nets, which was intended to determine a population estimate for brook trout in the lake. Sampling locations were provided in Figure 3.41. A summary of the fishing effort, fish catches and the CPUE is provided in Table 3.36. Fyke netting was conducted August 20-21, 2021, with four nets. The total net nights fished was four nights with three nets capturing fish. Four fish species were captured: brook trout (n=4), lake chub (n=137), white sucker (n=22), and burbot (n=12). CPUE for brook trout, lake chub, white sucker, and burbot were 1.0, 34.3, 5.5 and 3.0 fish/net night, respectively.

Table 3.36 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L13.

Set Date	Haul Date	No. Of Nets[1]	Net Nights	Brook Trout		Burbot	Lake Chub	White Sucker	CPUE[2]			
				Total	Recap	Total	Total	Total	Brook Trout	Lake Chub	White Sucker	Burbot
Aug. 20	Aug. 21	4(3)	4	4	0	12	137	22	1.0	34.3	5.5	3.0
Totals			4	4	0	12	137	22	1.0	34.3	5.5	3.0

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night.

3.13.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L13 are summarized in Table 3.37. The length of brook trout captured ranged from 95.0 to 232 mm and averaged 133.8 mm (std. dev. = ± 57.0). Brook trout weight ranged from 8.0 to 135 g and averaged 41.0 g (std. dev. = ± 54.3). Condition factor for brook trout captured in L13 ranged from 0.8 to 1.1, averaged 1.0 (std. dev. = ± 0.1). The length of lake chub ranged from 71.0 to 103 mm and averaged 85.7 mm (std. dev. = ± 13.2), while the weight ranged

from 4.0 to 11.0 g and averaged 7.7 g (std. dev. = ± 2.9). Condition factor for lake chub ranged from 1.0 to 1.4 and averaged 1.2 (std. dev. = ± 0.2). White sucker had a length range of 139 to 268 mm and averaged 184.2 mm (std. dev. = ± 35.9), while weight ranged between 30.0 to 234 g and averaged 82.9 g (std. dev. = ± 57.1). White sucker condition factor ranged from 1.1 to 1.3 and averaged 1.2 (std. dev. = ± 0.1). Burbot had a length range of 160 to 232 mm and averaged 199.3 mm (std. dev. = ± 20.4). Burbot weight range was 21 to 61 g, averaging 38.9 g (std. dev. = ± 10.8).

Table 3.37 Summary of Meristic Data for Fish Caught in Lake L13.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	133.8	95.0	232.0	57.0
	Weight (g)	41.0	8.0	135.0	54.3
	Condition (K)	1.0	0.8	1.1	0.1
Lake chub	Length (mm)	85.7	71.0	103.0	13.2
	Weight (g)	7.7	4.0	11.0	2.9
	Condition (K)	1.2	1.0	1.4	0.2
White sucker	Length (mm)	184.2	139.0	268.0	35.9
	Weight (g)	82.9	30.0	234.0	57.1
	Condition (K)	1.2	1.1	1.3	0.1
Burbot	Length (mm)	199.3	160.0	232.0	20.4
	Weight (g)	38.9	21.0	61.0	10.8

The length frequency distribution for brook trout captured in Lake L13 is provided in Figure 3.44. The peak size class was 75 to 100 mm, while the other two captured brook trout were in the 100 to 125 mm and 225 to 250 mm size range.

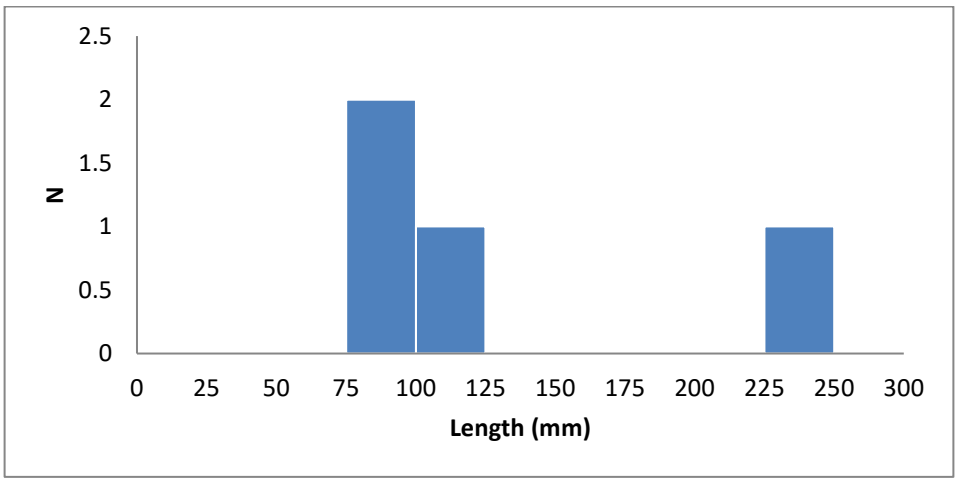


Figure 3.44 Length Frequency Distribution of Brook Trout Captured in Lake L13.

3.13.6 Benthic Community

Lake L13 benthic macroinvertebrate community had a total abundance of two and taxon richness of one. The density of macroinvertebrates at Lake L13 was 67 individuals per square meter. The only family present in Lake L13 was Planorbidae (100%).

3.13.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L13 on August 21, 2021 (Figure 3.41). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L13 was 244 mg/m^3 and the 10-30 µm size class was dominant with a biomass of 223 mg/m^3. The > 30 µm size class was absent.

3.13.8 Zooplankton

A zooplankton sample was collected at one station in Lake L13 on August 21, 2021 (Figure 3.41). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 104.74, 7.81, and 0.06, respectively, for a total biomass of 112.62 mg/m^3. Calanoids were the largest group at 99.10 mg/m^3 followed by the genus *Daphnia* (6.86 mg/m^3) and *Epischura* (5.28 mg/m^3). Copepods were the dominant group while Rotifers had a very low biomass.

3.14 Lake L14

3.14.1 General Overview Description

Lake L14 is a small lake situated west of Lake L12. This lake was not connected to any nearby water bodies by streams and during the survey of the area no inlet or outlet streams could be identified. The water level of this Lake dropped off to near maximum depth immediately at the shoreline except for the northwestern end where the divide between wetland and lake is less clear. ATV/snowmobile and hunting trails were present immediately near the lake running east to west between lakes L14 and L15 allowing for easy access with equipment. This same trail continued to Lake L20 nearby the eastern side of Lake L14. The shoreline of Lake L14 consisted mainly of wetland, other than a few locations where black spruce trees were present immediately at the waters edge. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of fishing nets and other various data and samples collection sites are provided in Figure 3.45. Fish were sampled using fyke nets (n=4), minnow traps (n=4), and gill net (n=1). There were no fish present in Lake L14 and as such further assessment of the fish habitat was not completed.

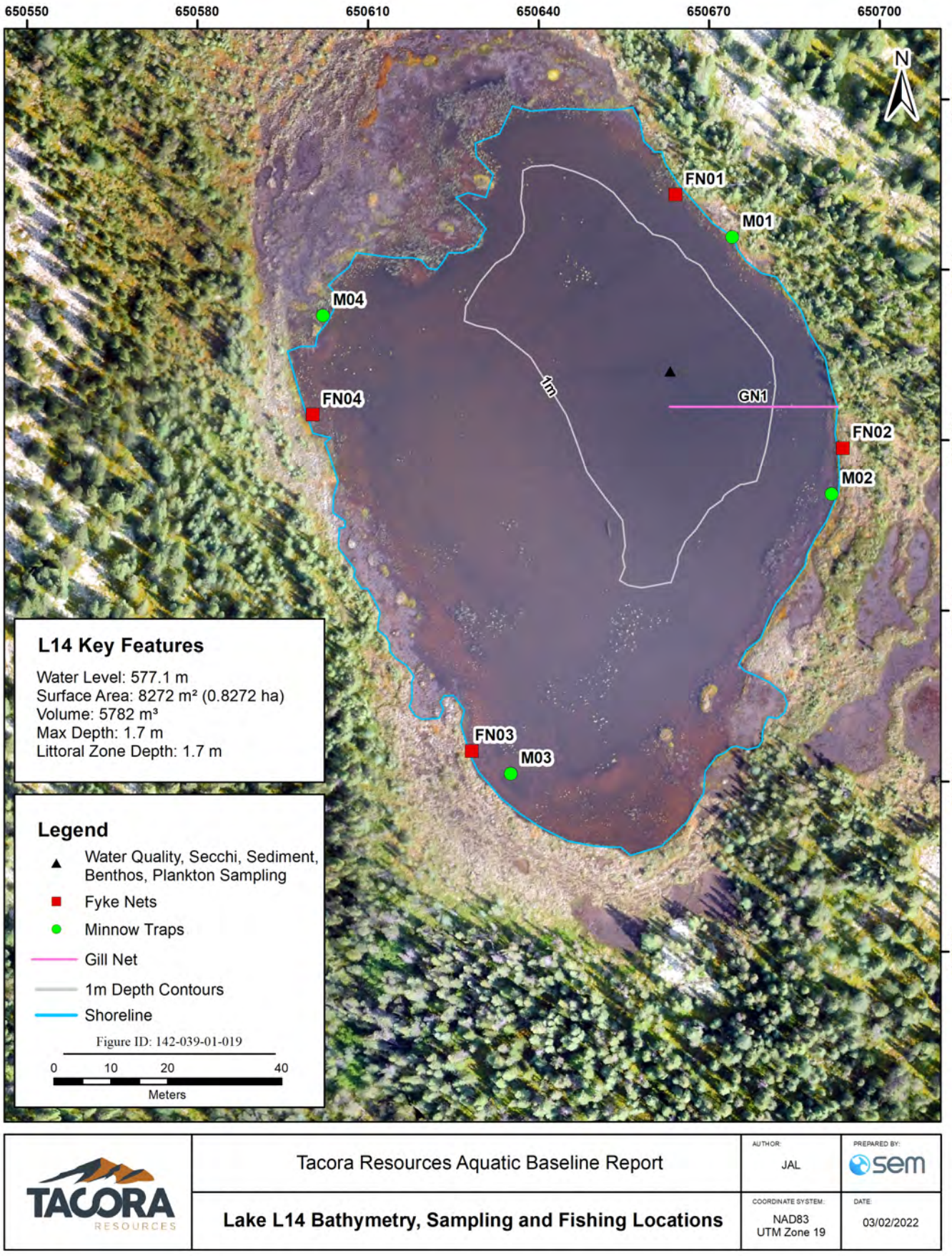


Figure 3.45 Lake L14 Bathymetry, Sampling and Fishing Locations.

3.14.2 Lake Habitat Assessment

3.14.2.1 Bathymetry

Bathymetric studies were completed on Lake L14 on July 12, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of six transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.45). The surface area of the lake was 8,272 m^2 and the lake volume was 5,782 m^3. The lake was deepest in the northeast, reaching a maximum depth of 1.7 m.

3.14.2.2 Habitat Mapping

A survey of habitat in Lake L14, identifying substrate and vegetation, was conducted on July 12, 2021 (Figure 3.46). The entire lake was composed of littoral zone and due to the shallow characteristics of L14 and the Secchi depth (i.e., 1.7 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.38.

Table 3.38 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L14.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
8,272	5,782	Fine	With vegetation	290
			No vegetation	7,982
			Total	8,272

3.14.3 Lake L14 Sediment Quality

The sediment quality data for Lake L14 is provided in Appendix C. Many metals were detected in the sediment except antimony, arsenic, beryllium, bismuth, boron, lithium, rubidium, silver, thallium, and tin were undetected. Iron was very high and measured 25,000 mg/kg. Total organic carbon in the sediment of Lake L14 measured 440 g/kg. The sediment particle size was mainly clay (63%), with some silt (28%) and lesser amounts of sand (9%; Appendix C).

3.14.4 Benthic Community

Lake L14 benthic macroinvertebrate community had a total abundance of two and taxon richness of two. The density of macroinvertebrates at Lake L14 was 67 individuals/m^2. The two families present in Lake L14 were Pisidiiae (50%) and Libellulidae (50%).

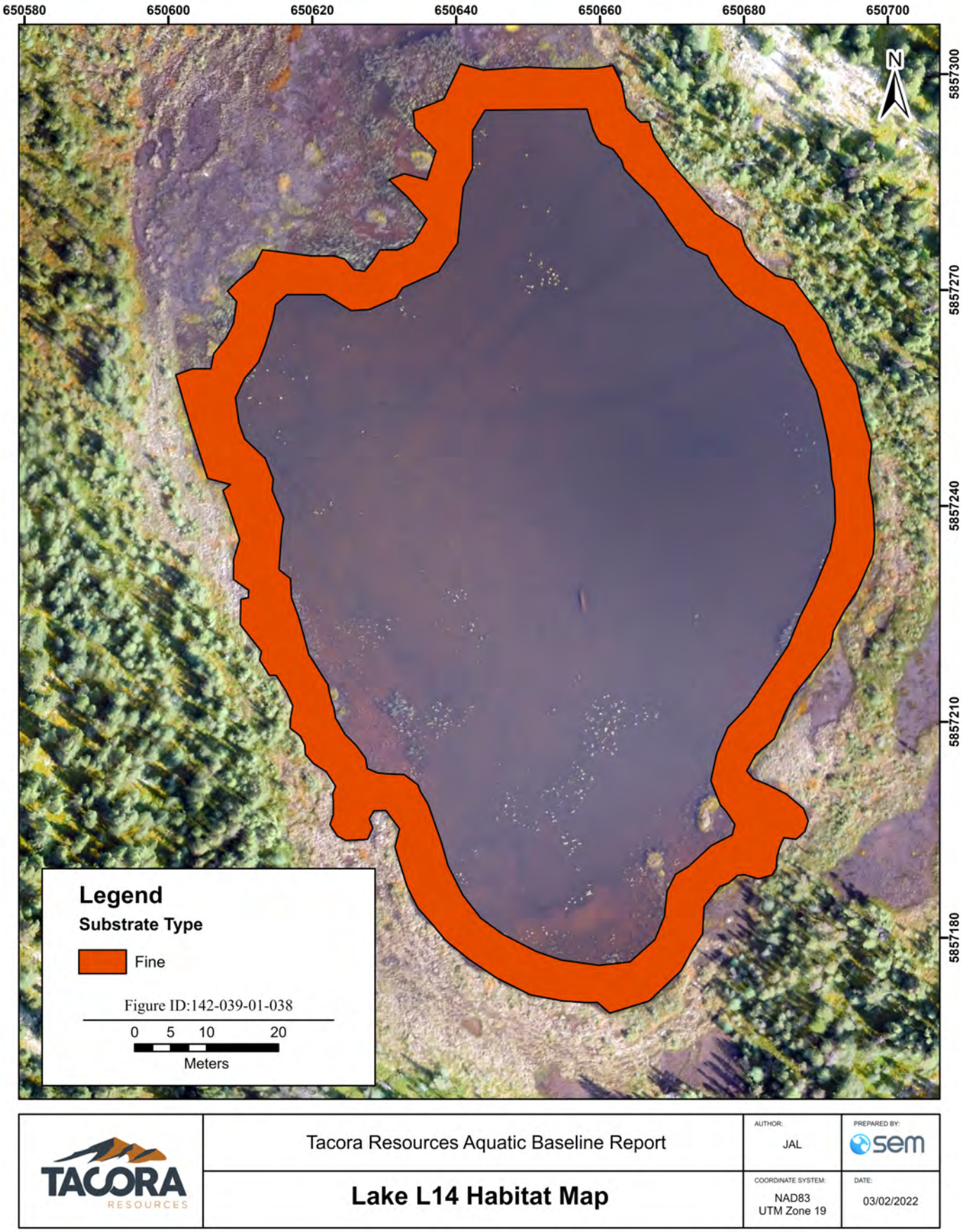


Figure 3.46 Lake L14 Habitat Map.

3.14.5 Phytoplankton

A phytoplankton sample was collected at one station in Lake L14 on July 13, 2021 (Figure 3.45). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L14 was 458 mg/m^3 and the <10 µm size class was dominant with a biomass of 328 mg/m^3. The > 30 µm size class was very low (7 mg/m^3).

3.14.6 Zooplankton

A zooplankton sample was collected at one station in Lake L14 on July 13, 2021 (Figure 3.45). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3), for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 99.77, 192.92, and 0.07, respectively, for a total biomass of 292.77 mg/m^3. *Holopedium* were the largest genus at 180.53 mg/m^3, followed by the calanoid group (98.88 mg/m^3) and the genus *Daphnia* (12.28 mg/m^3). Cladocerans were the dominant group while Rotifers had a very low biomass.

3.15 Lake L15

3.15.1 General Overview Description

Lake L15 is a small lake situated west of Lake L12 and north of Lake L14. This lake was not connected to any nearby water bodies by streams and during the survey of the area, no inlet or outlet streams could be identified. The water level of this lake dropped off to near maximum depth immediately at the shoreline. ATV/snowmobile and hunting trails were present immediately near the lake running east to west between lakes L14 and L15, allowing for easy access with equipment. The shoreline of Lake L15 consisted entirely of wetland, other than a few black spruce trees that were present immediately at the waters edge. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of the fishing net is provided in Figure 3.47. Fish were sampled using a gill net (n=1) set from end to end across the pond to determine presence or absence of fish. There were no fish present in Lake L15 and as such, further assessment of the fish habitat was not completed.

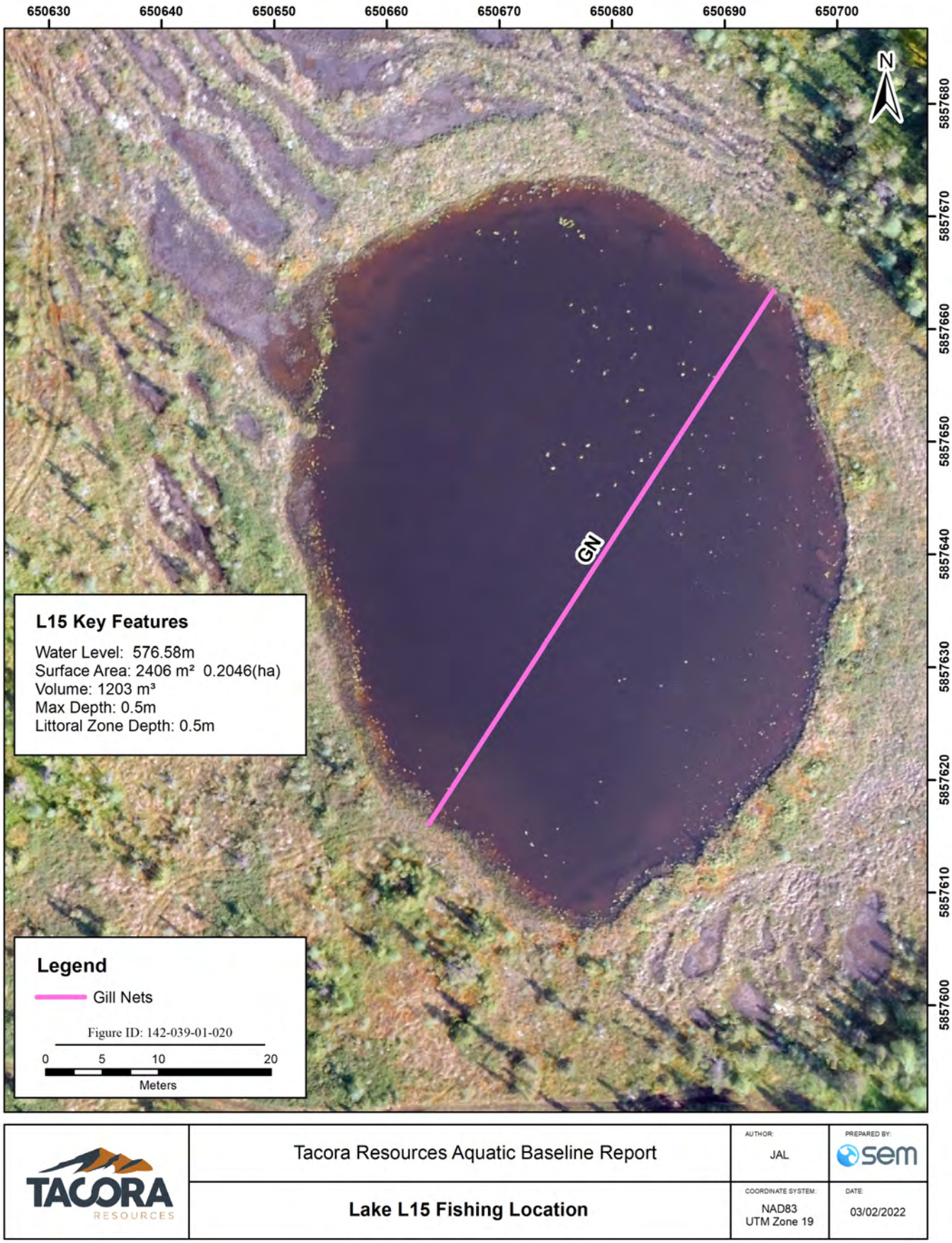


Figure 3.47 Lake L15 Fishing Location.

3.15.2 Lake Habitat Assessment

3.15.2.1 Habitat Mapping

A survey of habitat in Lake L15 identifying substrate and vegetation was conducted on July 12, 2021 (Figure 3.48). The entire lake was composed of littoral zone and due to the shallow characteristics of L15 and the Secchi depth (i.e., 0.5 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.39.

Table 3.39 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L15.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
2,406	1,203	Fine	With vegetation	57
			No vegetation	2,349
			Total	2,406

3.15.3 Phytoplankton and Zooplankton

Lake L15 was assessed by the field crew as a bog pond that would likely freeze to the bottom and would contain no fish. As per study design, no samples were collected for plankton analysis when the lake was deemed to be likely fishless.

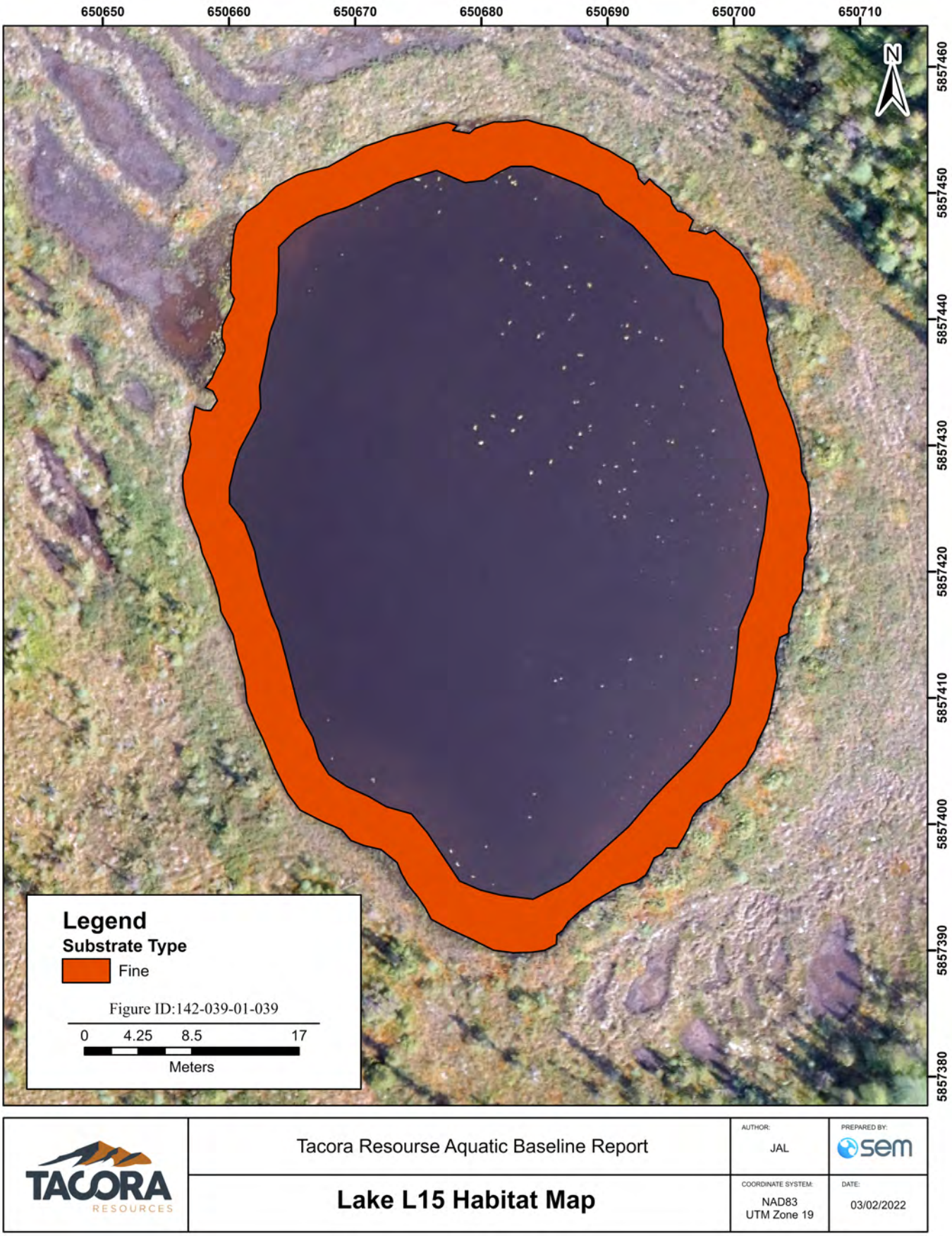


Figure 3.48 Lake L15 Habitat Map.

3.16 Lake L16

3.16.1 General Overview Description

Lake L16 was a small water body situated between Lakes L7 and L18. This lake had one outlet that flowed into Stream S7. There was evidence of a connection to Lake L17, however no flowing water or channel was identified during the survey. The shallow water level of this lake dropped off to near maximum depth immediately at the shoreline and had a relatively flat bottom throughout. ATV/snowmobile and hunting trails were present approximately 240 m south of the lake. A trail was created for the remaining distance through the largely spaced forest. The shoreline of Lake L16 consisted mainly of wetland, other than the southern end where there were black spruce trees and alders. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of fishing nets and where the other various data and samples were collected are provided in Figure 3.49. Fish were sampled using fyke nets (n=2).

3.16.2 Lake Habitat Assessment

3.16.2.1 Bathymetry

Bathymetric studies were completed on Lake L16 on July 28, 2021, using manual measurements as the lake was too small and shallow to use sonar equipment. Depth measurements were taken in representative areas throughout the lake and these measurements were used to create a detailed bathymetric map for the lake (Figure 3.49). The surface area of the lake was 2,660 m^2 and the lake volume was 1,330 m^3. The lake bottom had a relatively constant depth of 0.8 m throughout.

3.16.2.2 Habitat Mapping

A survey of habitat in Lake L16, identifying substrate and vegetation, was conducted on July 26, 2021 (Figure 3.50). The entire lake was composed of littoral zone and due to the shallow characteristics of L16 and the Secchi depth (i.e., 0.8 m), no profundal zone existed. The lake habitat further from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.40.

Table 3.40 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L16.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
2,660	1,330	Fine	With vegetation	0
			No vegetation	2,660
			Total	2,660

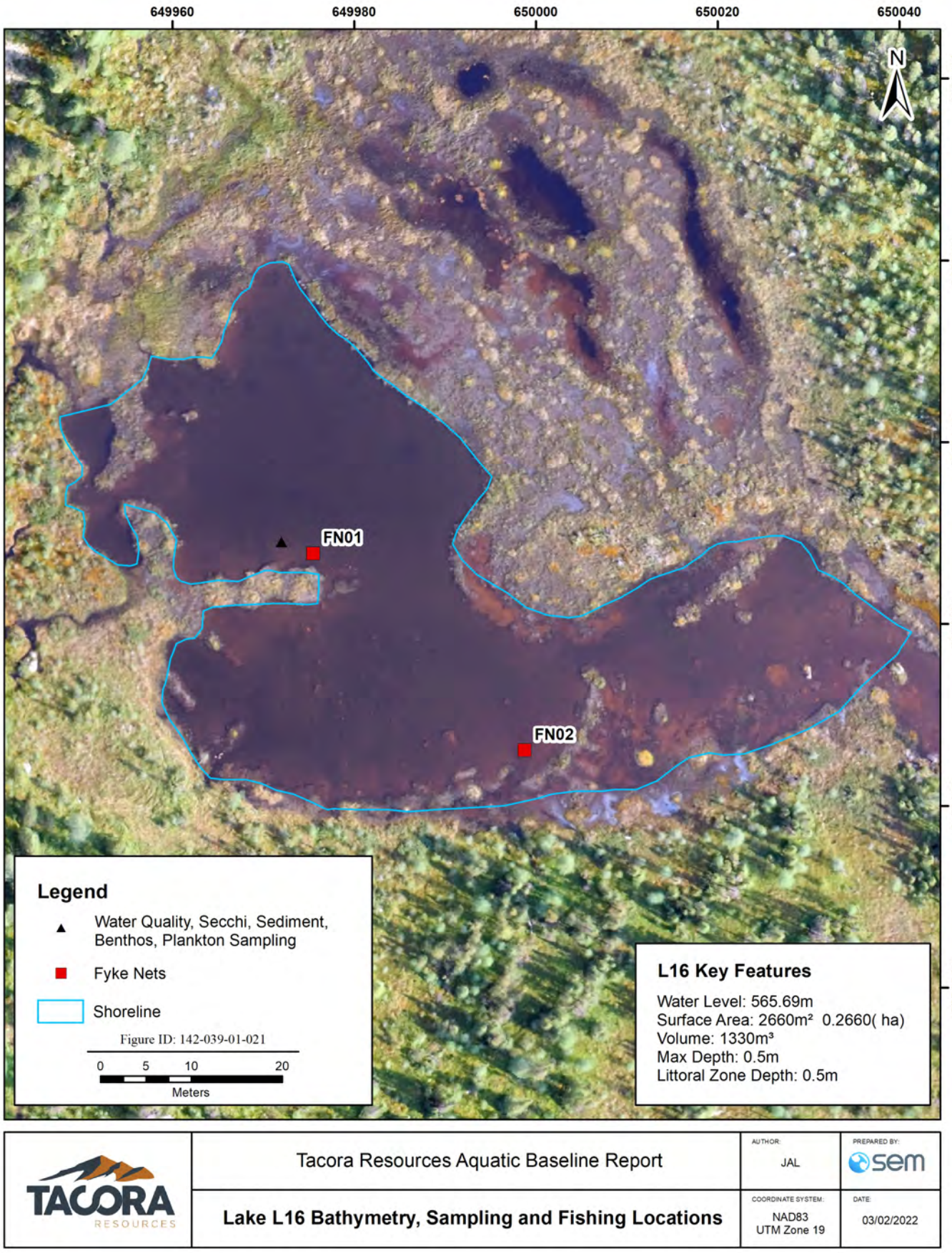


Figure 3.49 Lake L16 Bathymetry, Sampling and Fishing Locations.

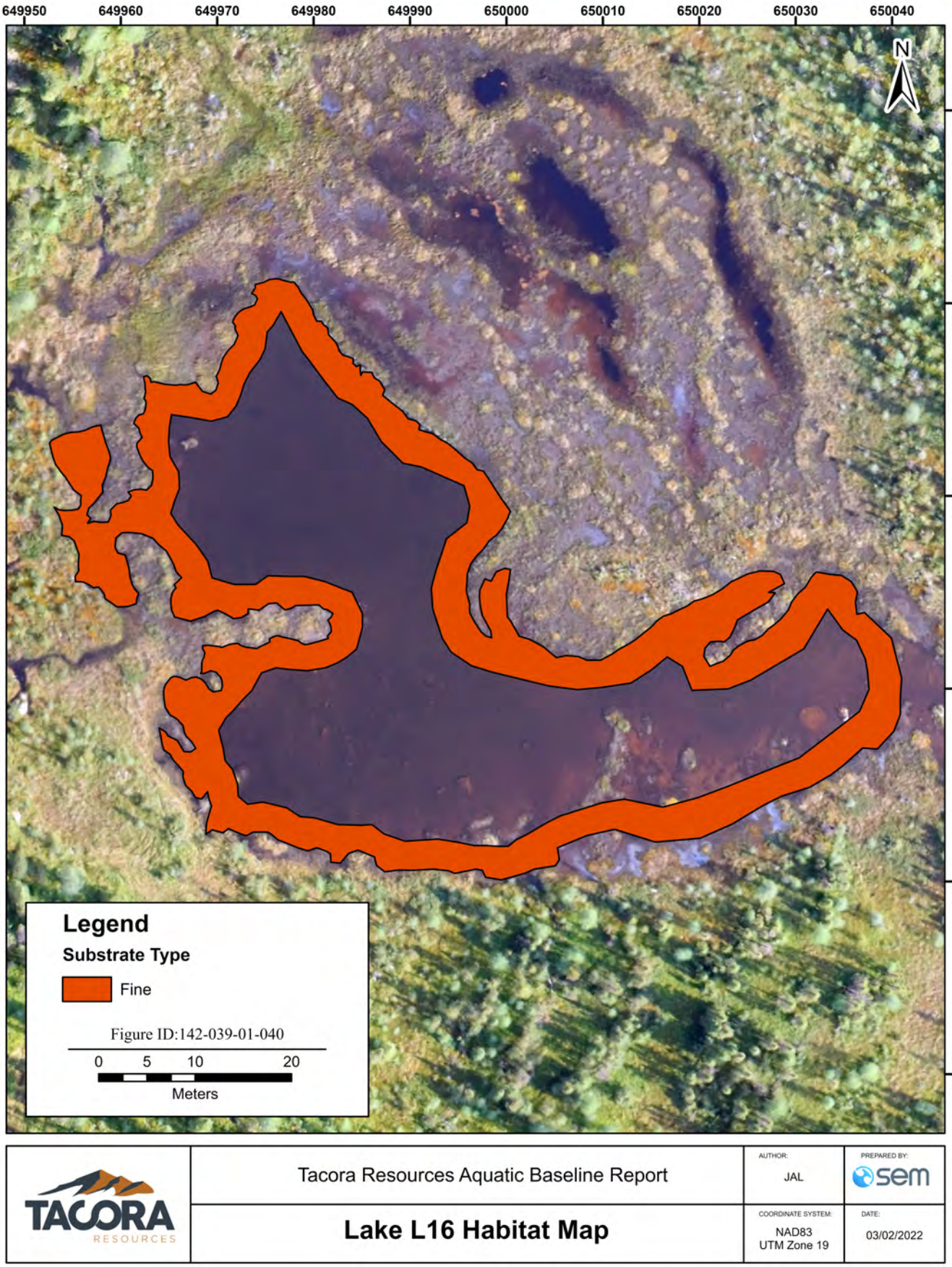


Figure 3.50 Lake L16 Habitat Map.

3.16.3 Lake L16 Water Quality

The water quality data for Lake L16 is provided in Appendix C. Most metals in Lake L16 were below detection limits, while aluminum, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus and lead were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, and their sum (i.e., nitrate + nitrite). Chlorophyll 'a', as an indicator of primary productivity, measured 0.75 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in L16 (0.75 m) and are shown in Appendix C. The temperature measured 15.2°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 6.87, 9.31 mg/L (or 90.2% saturation), 72.7 µS/cm, and 17.8 mV, respectively.

3.16.4 Lake L16 Sediment Quality

The sediment quality data for Lake L16 is provided in Appendix C. Many metals were detected in the sediment while antimony, arsenic, beryllium, bismuth, boron, cadmium, cobalt, lithium, mercury, rubidium, silver, thallium, and vanadium were undetected. Iron measured 8,200 mg/kg. Total organic carbon in the sediment of Lake L16 measured 430 g/kg. The sediment particle size was mainly clay (63%), with some silt (28%) and lesser amounts of sand (9%; Appendix C).

3.16.5 Fish Population Assessments

3.16.5.1 Fish Community

The fish community in Lake L16 was primarily composed of lake chub (81.6%), while white sucker (14.3%), brook trout (2.0%) and burbot (2.0%) were prevalent to a lesser extent (Figure 3.51).

3.16.5.2 Fishing Effort and Catch

Fishing of Lake L16 was conducted using fyke nets. Sampling locations were provided in Figure 3.49. A summary of the fyke net fishing effort, fish catches and CPUE is provided in Table 3.41. Fyke netting was conducted July 23-28, 2021, with two nets set each night, and the total net nights fished was ten. Four fish species were captured: three brook trout, 120 lake chub, three burbot and 21 white suckers. No brook trout were recaptured. CPUE for brook trout ranged from 0.0 to 0.5 fish/net night and averaged 0.3 fish/net. Brook trout, lake chub and white sucker CPUE was highest on the first three days of fishing.

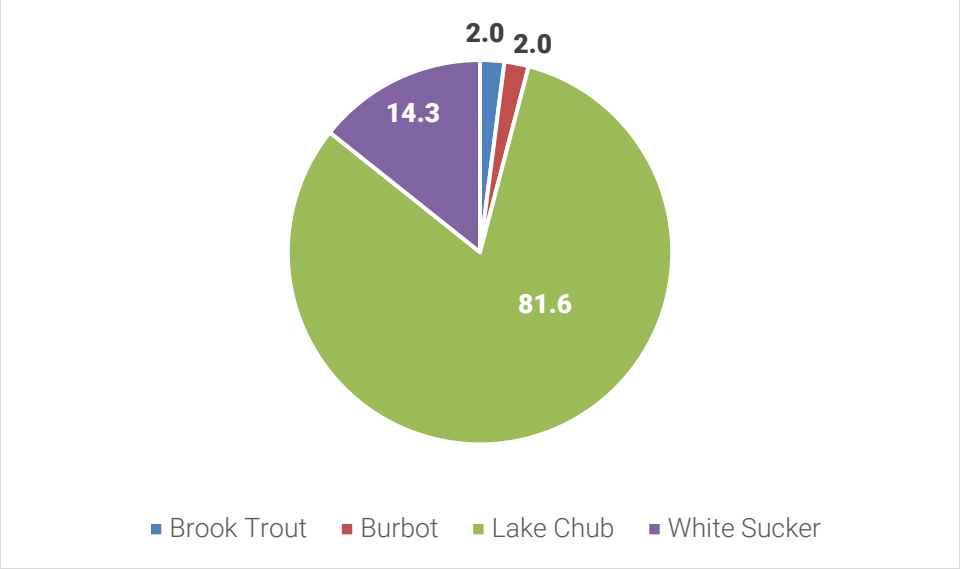


Figure 3.51 Fish Community Composition (% Abundance) for Lake L16.

Table 3.41 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L16.

Set Date	Haul Date	No. Of Nets[1]	Net Nights	Brook Trout		Burbot	Lake Chub	White Sucker	CPUE[2]			
				Total	Recap	Total	Total	Total	Brook Trout	Burbot	Lake Chub	White Sucker
Jul. 23	Jul. 24	2(2)	2	1	0	0	37	6	0.5	0.0	18.5	3.0
Jul. 24	Jul. 25	2(2)	2	1	0	2	22	4	0.5	1.0	11.0	2.0
Jul. 25	Jul. 26	2(2)	2	1	0	0	24	7	0.5	0.0	12.0	3.5
Jul. 26	Jul. 27	2(2)	2	0	0	1	21	0	0.0	0.5	10.5	0.0
Jul. 27	Jul. 28	2(2)	2	0	0	0	16	4	0.0	0.0	8.0	2.0
Totals			10	3	0	3	120	21	0.3	0.3	12.0	2.1

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night

3.16.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L16 are summarized in Table 3.42. The length of captured brook trout ranged from 159 to 199 mm and averaged 176.3 mm (std. dev. = ± 16.8). Brook trout weight ranged from 44 to 53 g, averaging 48.5 g (std. dev. = ± 4.5). Condition factor for brook trout captured in L16 was 1.1. The length of lake chub ranged from 45 to 109 mm (mean = 71.4 mm), while burbot and white sucker had length ranges of 136 – 173 mm (mean = 160.7 mm) and 94 – 239 mm (mean = 156 mm) respectively. The length frequency distribution for brook trout fished in Lake L16 is provided in Figure 3.52. The peak size class was between 150 and 175 mm (66.7%) and the 175 to 200 mm size class represented 33.3%.

Table 3.42 Summary of Meristic Data for Fish Caught in Lake L16.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	176.3	159.0	199.0	16.8
	Weight (g)	48.5	44.0	53.0	4.5
	Condition (K)	1.1	1.1	1.1	0.0
Lake chub	Length (mm)	71.4	45.0	109.0	14.1
	Weight (g)	4.4	1.1	15.0	2.7
	Condition (K)	1.1	0.7	1.4	0.1
Burbot	Length (mm)	160.7	136.0	173.0	17.4
	Weight (g)	23.3	15.0	28.0	5.9
White sucker	Length (mm)	156.0	94.0	239.0	52.9
	Weight (g)	59.9	4.6	162.0	53.4
	Condition (K)	1.2	1.1	1.3	0.0

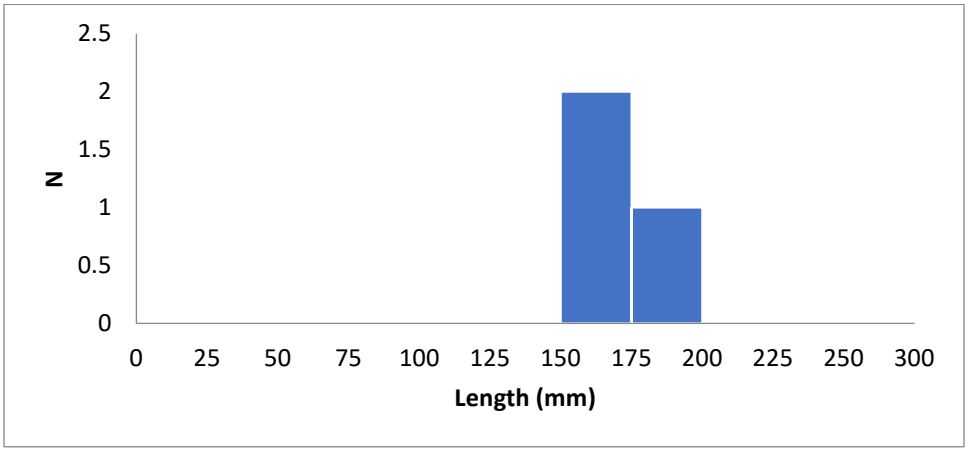


Figure 3.52 Length Frequency Distribution of Brook Trout Captured in Lake L16.

3.16.6 Phytoplankton

A phytoplankton sample was collected at one station in Lake L16 on July 28, 2021 (Figure 3.49). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L16 was 537 mg/m^3 and the <10 µm and 10-30 µm size classes were co-dominant with a biomass of 269 and 266 mg/m^3, respectively. The > 30 µm size class was very low (2 mg/m^3).

3.16.7 Zooplankton

A zooplankton sample was collected at one station in Lake L16 on July 28, 2021 (Figure 3.49). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group

and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3) for each major taxonomic group of Copepods and Cladocerans were 37.29 and 3.55, respectively, while the Rotifers were absent, for a total biomass of 40.84 mg/m^3. Calanoids were the largest group at 29.06 mg/m^3 followed by the genus *Epischura* (6.93 mg/m^3). Copepods were the dominant group.

3.17 Lake L17

3.17.1 General Overview Description

Lake L17 is a small water body situated between Lakes L7 and L18. This lake had no identified inlets or outlets. There was evidence of a connection to Lake L17, however no flowing water was present during the survey. The shallow water level of this lake dropped off to near maximum depth immediately at the shoreline and had a relatively flat bottom throughout. The same ATV trail created for access to Lake L16 was extended to gain access to Lake L17. The shoreline of Lake L17 consisted mainly of wetland on all shores but the western, where there were black spruce and alders present. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of fishing nets and other various data and sample collection locations are provided in Figure 3.53. Fish were sampled using fyke nets (n=2).

3.17.2 Lake Habitat Assessment

3.17.2.1 Bathymetry

Bathymetric studies were completed on Lake L17 on July 28, 2021, using manual measurements as the lake was too small and shallow to use sonar equipment. Depth measurements were taken in representative areas throughout the lake and these measurements were used to create a detailed bathymetric map for the lake (Figure 3.53). The surface area of the lake was 1,801 m^2 and the lake volume was 901 m^3. The lake bottom had a relatively constant depth of 0.5 m throughout.

3.17.2.2 Habitat Mapping

A survey of habitat in Lake L17, identifying substrate and vegetation, was conducted on July 26, 2021 (Figure 3.54). The entire lake was composed of littoral zone and due to the shallow characteristics of L17 and the Secchi depth (i.e., 0.7 m), no profundal zone existed. The lake habitat further from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.43.

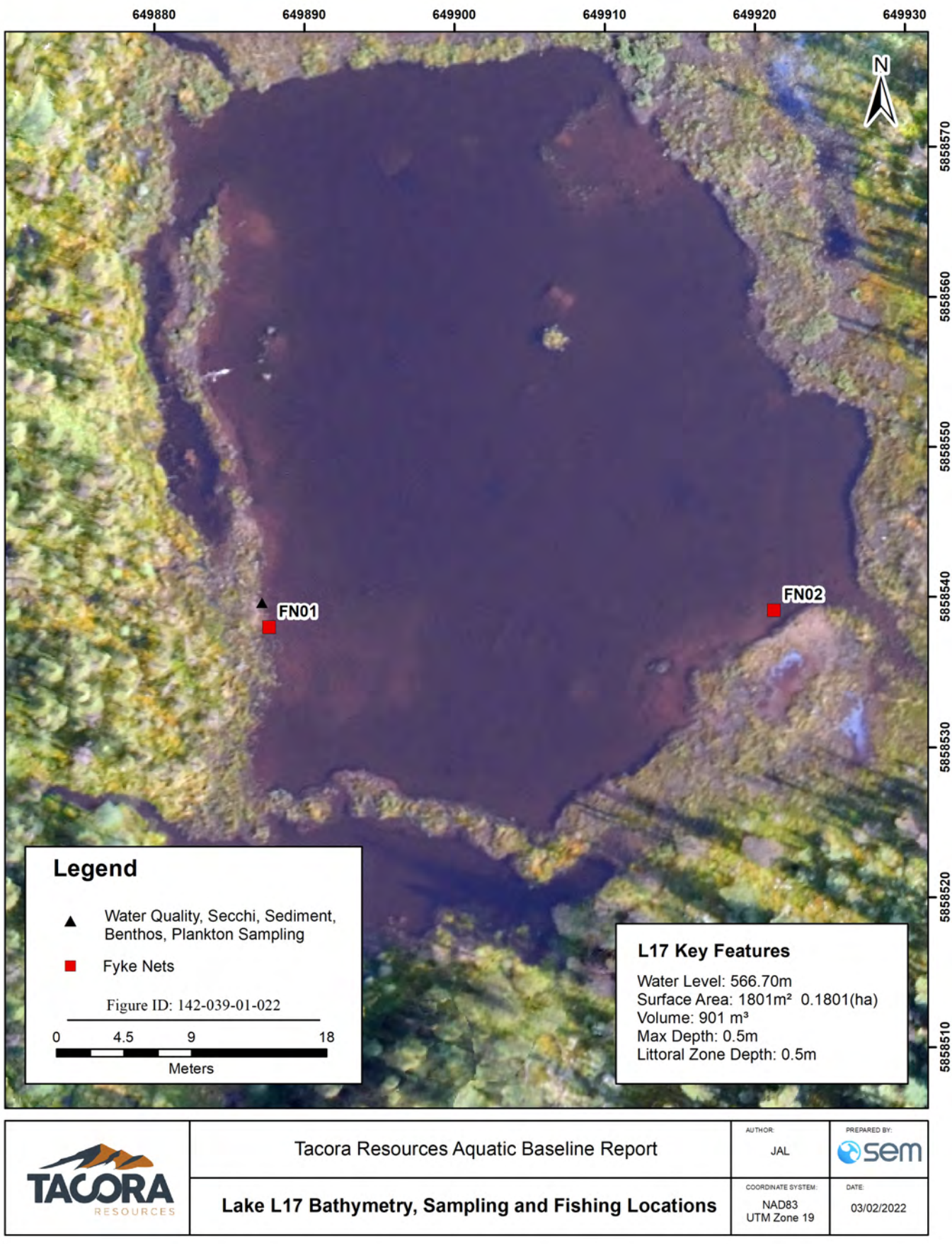


Figure 3.53 Lake L17 Bathymetry, Sampling and Fishing Locations.

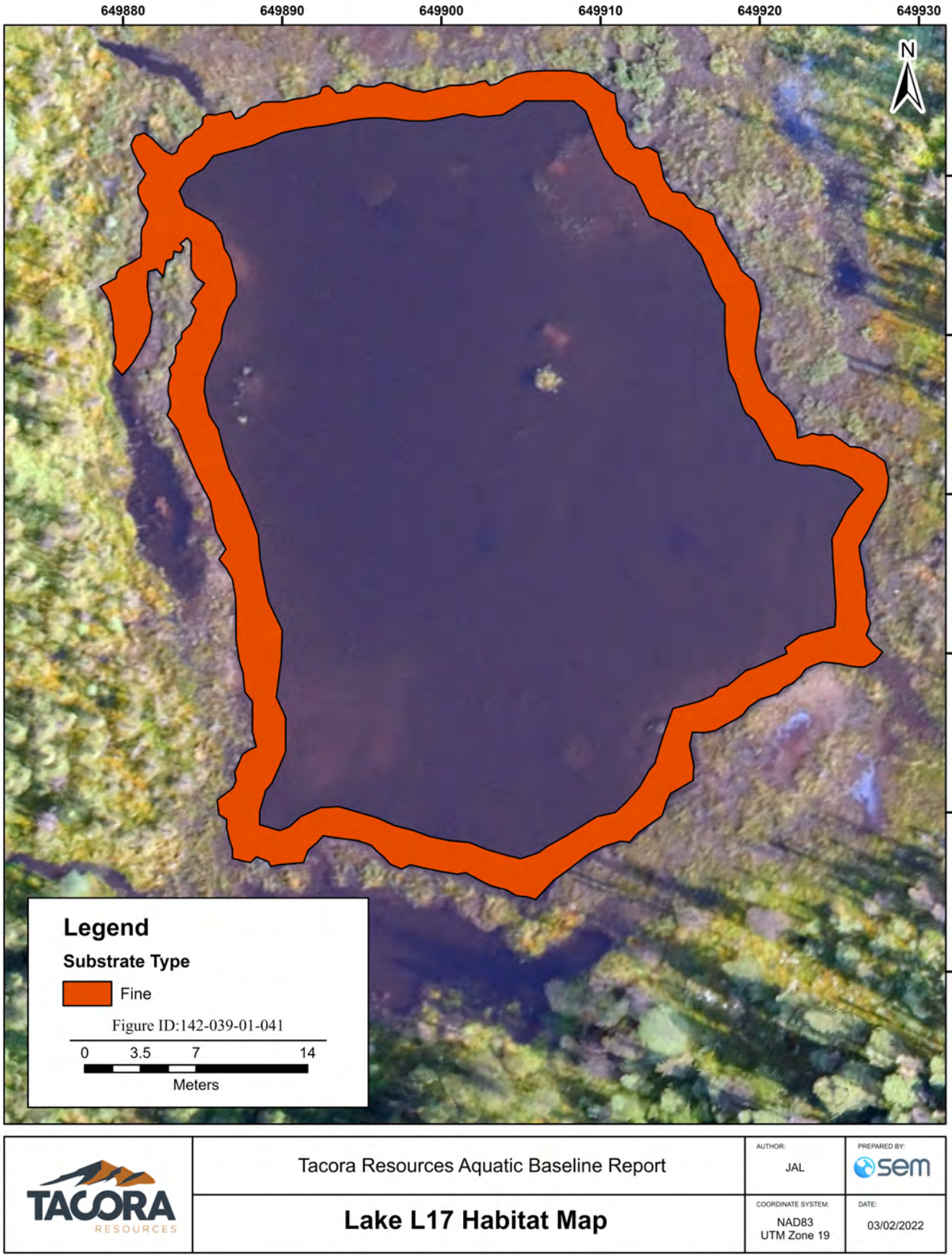


Figure 3.54 Lake L17 Habitat Map.

Table 3.43 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L17.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
1,801	901	Fine	With vegetation	0
			No vegetation	1,801
			Total	1,801

3.17.3 Lake L17 Water Quality

The water quality data for Lake L17 is provided in Appendix C. Most metals in Lake L17 were below detection limits, while aluminum, barium, cadmium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, and their sum (i.e., nitrate + nitrite) (Appendix C). Chlorophyll 'a', as an indicator of primary productivity, measured 0.77 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in Lake L17 (0.6 m) and this is shown in Appendix C. The temperature measured 15.6°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 6.80, 8.71 mg/L (or 83.8% saturation), 61.0 µS/cm, and 14.0 mV, respectively.

3.17.4 Lake L17 Sediment Quality

The sediment quality data for Lake L17 is provided in Appendix C. Many metals were detected in the sediment while antimony, arsenic, beryllium, bismuth, boron, cadmium, lithium, mercury, rubidium, silver, and thallium were undetected. Iron was very high and measured 15,000 mg/kg. Total organic carbon in the sediment of Lake L17 measured 330 g/kg. The sediment particle size was mainly clay (73%), with some silt (22%) and lesser amounts of sand (5%; Appendix C).

3.17.5 Lake L17 Fish Population Assessment

3.17.5.1 Fish Community

The fish community in Lake L17 was primarily composed of lake chub (97.1%), while white sucker (0.6%), brook trout (1.8%) and burbot (0.6%) were prevalent to a lesser extent (Figure 3.55).

3.17.5.2 Fishing Effort and Catch

Fishing of Lake L17 was performed using fyke nets. Sampling locations are provided in Figure 3.53. A summary of fishing effort, fish catches and CPUE is provided in Table 3.44. Fyke netting was conducted July 24-28, 2021, with two nets set each night, and the total net nights fished was eight. Not all nets

captured fish each night, and the number of nets that captured fish ranged from one to two nets per night (averaged 1.5 nets). Four fish species were captured: three brook trout, 165 lake chub, one burbot and one white sucker. No brook trout were recaptured. Catches of brook trout ranged from one to two fish/set. CPUE for brook trout ranged from 0.0 to 1.0 fish/net night and averaged 0.4 fish/net. Brook trout CPUE was highest on the first day of fishing. Catches of lake chub ranged from 21 to 60 fish/set. CPUE for lake chub ranged from 10.5 to 30 fish/net night and averaged 20.6 fish/net. CPUE of this fish species was highest on the third day of fishing. CPUE for burbot and white sucker ranged from 0 to 0.5 fish/net night.

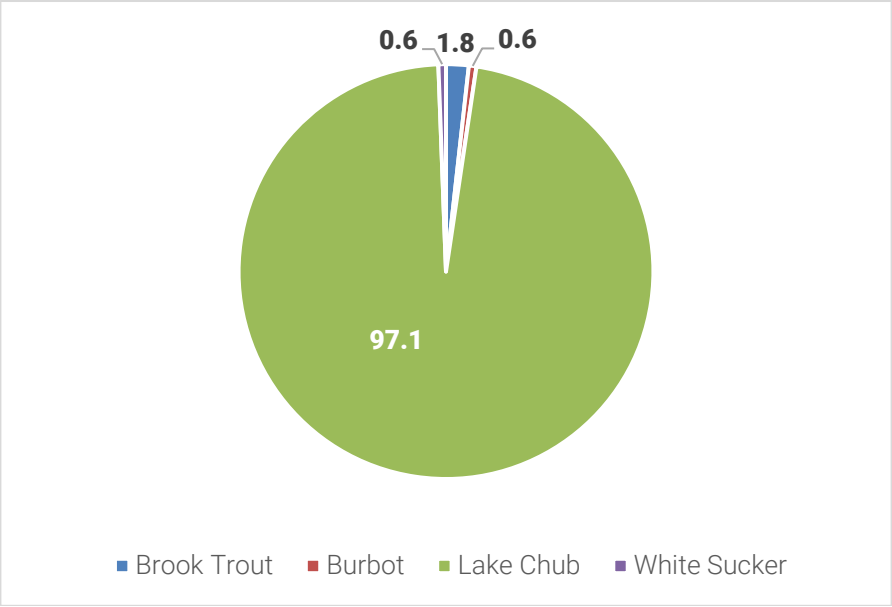


Figure 3.55 Fish Community Composition (% Abundance) for Lake L17.

Table 3.44 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L17.

Set Date	Haul Date	No. Of Nets[1]	Net Nights	Brook Trout		Burbot	Lake Chub	White Sucker	CPUE[2]			
				Total	Recap	Total	Total	Total	Brook Trout	Burbot	Lake Chub	White Sucker
Jul. 24	Jul. 25	2(1)	2	2	0	0	21	0	1.0	0.0	10.5	0.0
Jul. 25	Jul. 26	2(1)	2	0	0	0	38	0	0.0	0.0	19.0	0.0
Jul. 26	Jul. 27	2(2)	2	1	0	0	60	1	0.5	0.0	30.0	0.5
Jul. 27	Jul. 28	2(2)	2	0	0	1	46	0	0.0	0.5	23.0	0.0
Totals			8	3	0	1	165	1	0.4	0.1	20.6	0.1

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night.

3.17.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L17 are summarized in Table 3.45. The length of brook trout ranged from 170 to 217 mm and averaged 186.3 mm (std. dev. = ± 21.7). Brook trout weight ranged from 52 to 117 g, averaging 75.3 g (std. dev. = ± 29.5). Condition factor for brook trout captured in L17 was 1.1. Lake chub length ranged from 46 to 124 mm (mean = 81.0 mm), while burbot and white sucker had lengths of 144 and 107 mm, respectively. White sucker had a condition factor of 1.3 (Table 3.45).

The length frequency distribution for brook trout captured in Lake L17 is provided in Figure 3.56. Two brook trout caught were between 150 and 175 mm (66.7%), and one fish was in the 200 to 225 mm size class (33.3%).

Table 3.45 Summary of Meristic Data for Fish Caught in Lake L17.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Brook trout (initial capture)	Length (mm)	186.3	170.0	217.0	21.7
	Weight (g)	75.3	52.0	117.0	29.5
	Condition (K)	1.1	1.06	1.1	0.04
Lake chub	Length (mm)	81.0	46.0	124.0	13.4
	Weight (g)	6.3	0.9	23.0	3.9
	Condition (K)	1.1	0.8	1.3	0.1
Burbot	Length (mm)	144.0	144.0	144.0	0.0
	Weight (g)	22.8	22.8	22.8	0.0
White sucker	Length (mm)	107.0	107.0	107.0	0.0
	Weight (g)	16.0	16.0	16.0	0.0
	Condition (K)	1.3	1.3	1.3	0.0

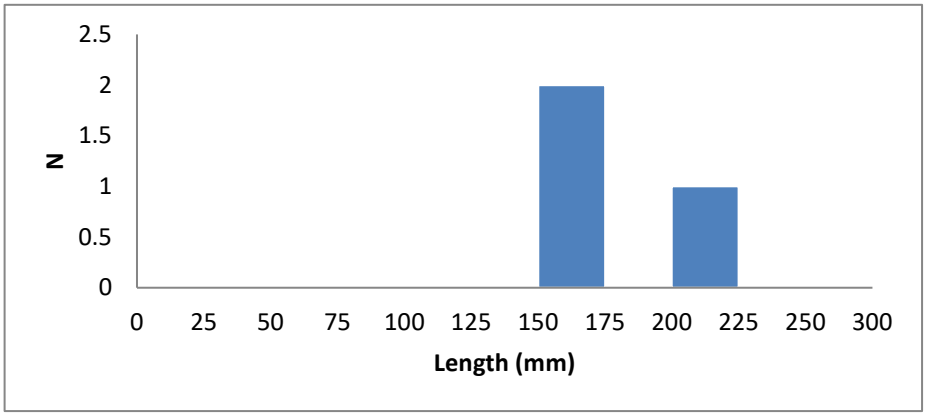


Figure 3.56 Length Frequency Distribution of Brook Trout Captured in Lake L17.

3.17.6 Phytoplankton

A phytoplankton sample was collected at one station in Lake L17 on July 28, 2021 (Figure 3.53). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L17 was 678 mg/m^3 and the <10 µm and 10-30 µm size class were co-dominant with a biomass of 331 and 345 mg/m^3, respectively. The > 30 µm size class was very low (2 mg/m^3).

3.17.7 Zooplankton

A zooplankton sample was collected at one station in Lake L17 on July 28, 2021 (Figure 3.53). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3) for each major taxonomic group of Copepods and Cladocerans were 247.69 and 32.38, respectively, while Rotifers were absent, and total biomass was 280.07 mg/m^3. Calanoids were the largest group at 233.71.53 mg/m^3, followed by the genus *Daphnia* (32.03 mg/m^3) and the genus *Epischura* (11.54 mg/m^3). Copepods were the dominant group.

3.18 Lake L18

3.18.1 General Overview Description

Lake L18 was situated southwest of Flora South Basin and acted as the main supply to the basin's largest inlet. This was the main and only outlet of L18 and is described in more detail as Stream S6. This lake was long and narrow with a raised water level due to the presence of a beaver dam at its outlet. The lake had moderate sloped shores for most of its perimeter, however the slope was steeper on the eastern side, as there was a deeper channel through the lake near this side. The southern end of the lake held the location of the main inlet described as Stream S9. The lake possessed one additional, much smaller inlet on the western side along its side from the bottom. This stream is described in more detail as Stream S7. ATV/snowmobile and hunting trails were present west of the lake and a 250 m ATV trail was added to access the lake. There was also evidence of human activity in the past in this lake as two small boats were left on the western side. The shoreline of Lake L18 consisted mainly of mature black spruce intermixed with some sections of grasses. Lake substrate contained a variety of substrate types with several sections of cobbles, boulders, sand, and organics extending to between 6 and 12 meters, beyond which the deeper areas contained predominantly fines, with some boulders that can be seen from the maps below. The location of fishing nets and other various data and samples collection sites are provided in Figure 3.57. Fish were sampled using fyke nets (n=8), minnow traps (n=6) and gill net (n=3).

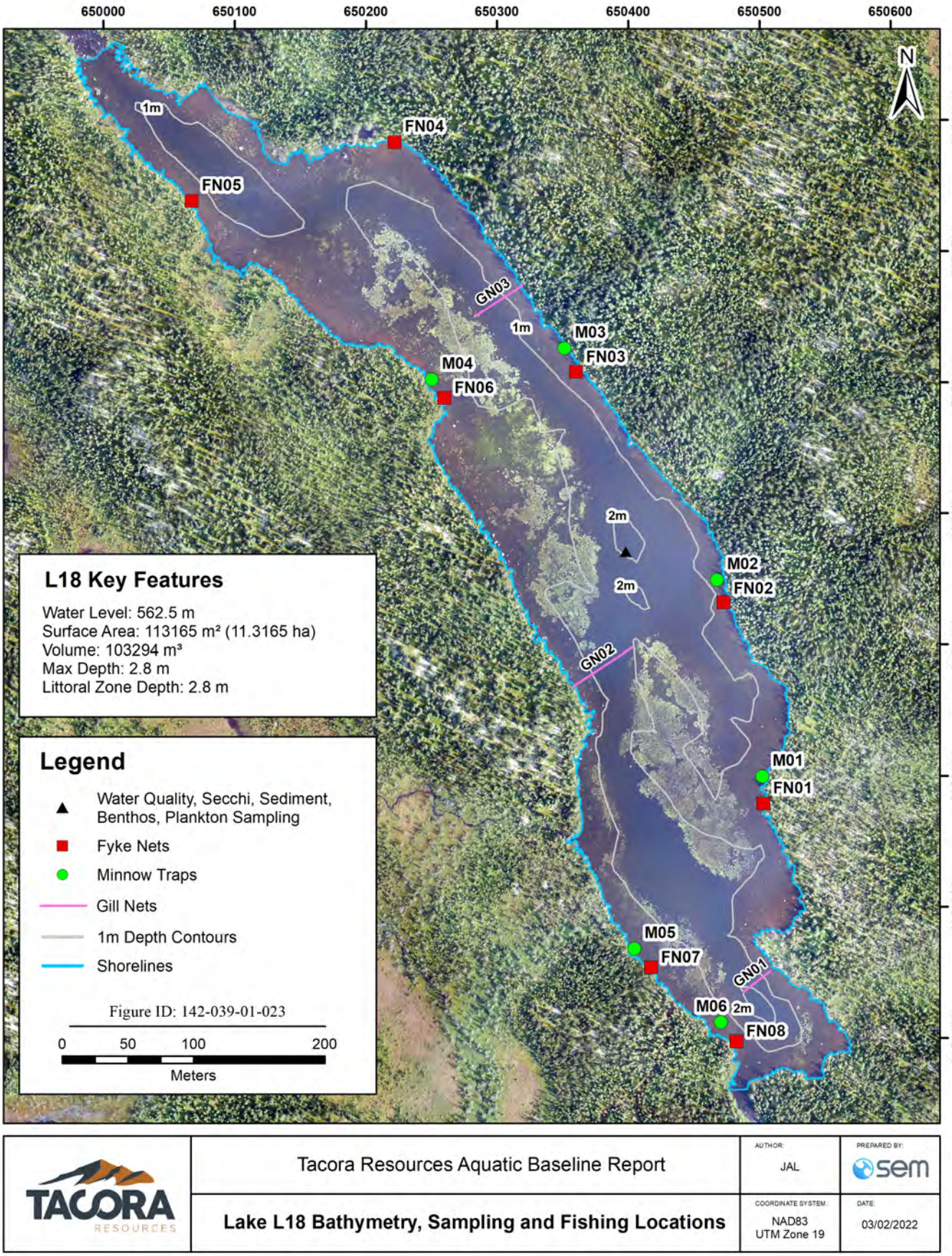


Figure 3.57 Lake L18 Bathymetry, Sampling and Fishing Locations.

3.18.2 Lake Habitat Assessment

3.18.2.1 Bathymetry

Bathymetric studies were completed on Lake L18 on July 18, 2021, using sonar and GPS. Transects were spaced approximately 30 m apart and oriented in an east-west direction. A total of 25 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.57). The surface area of the lake was 113,165 m^2 and the lake volume was 103,294 m^3. The lake was deeper in the southern, eastern, and northern areas where flowing water has created a trench with a maximum depth of 2.8 m.

3.18.2.2 Habitat Mapping

A survey of habitat in Lake L18, identifying substrate and vegetation, was conducted on July 19, 2021 (Figure 3.58). The entire lake was composed of littoral zone and due to the shallow characteristics of L18 and the Secchi depth (i.e., 2.8 m) no profundal zone existed. The lake habitat further from the shoreline (i.e., interior of the colored sections) was composed of fines and large amounts of vegetation. The shoreline survey of L18 identified the substrate classes fine, coarse, fine/medium, coarse/medium, coarse/fine, and medium/coarse. The majority of the lake substrate was fines, comprising 83% of the total littoral zone, while coarse and medium comprised 11% and 6% of the total, respectively. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.46.

Table 3.46 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L18.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
113,165	103,294	Fine	With vegetation	15,782
			No vegetation	77,833
		Medium	With vegetation	414
			No vegetation	6,617
		Coarse	With vegetation	434
			No vegetation	12,085
			Total	113,165

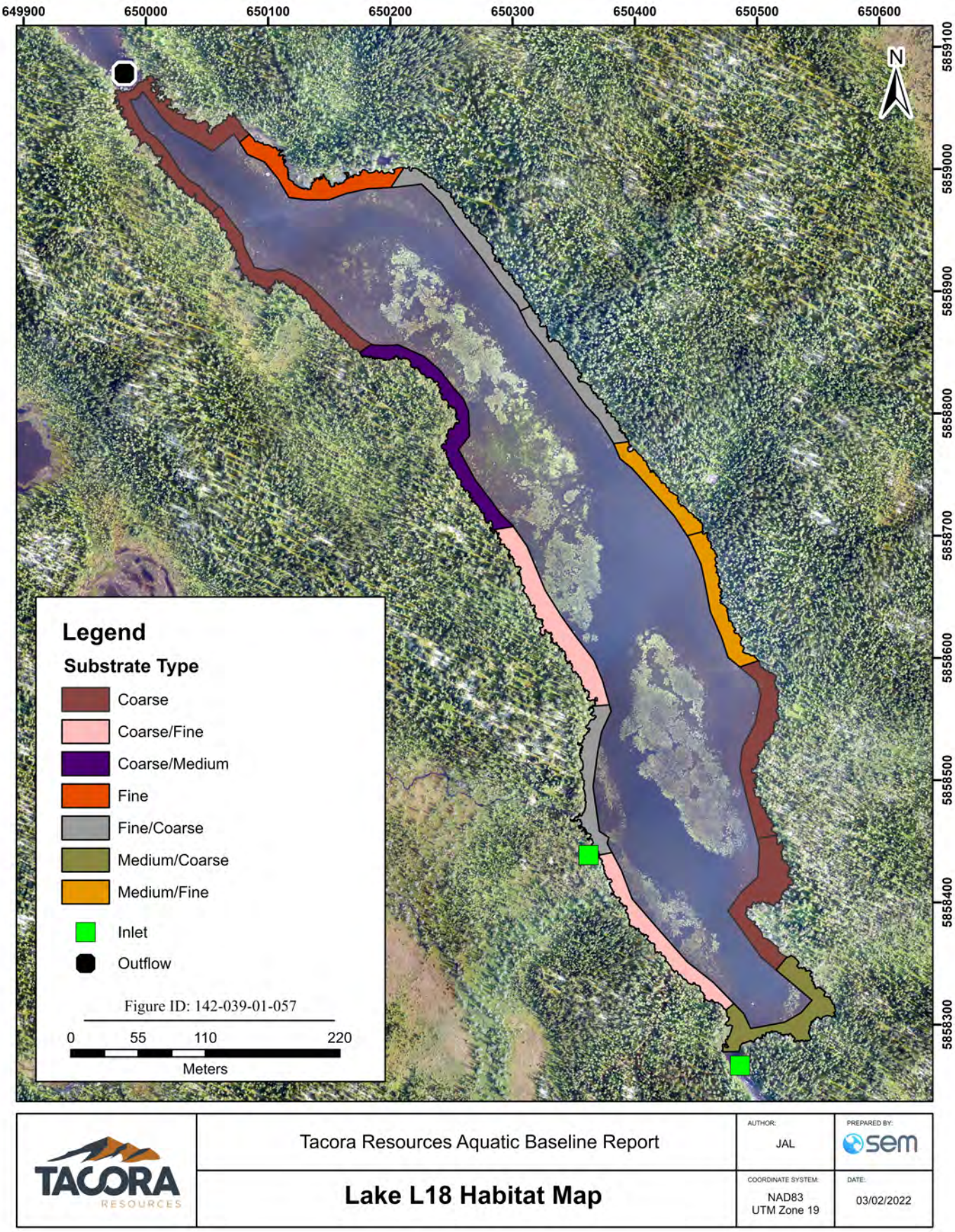


Figure 3.58 Lake L18 Habitat Map.

3.18.3 Lake L18 Water Quality

The water quality data for Lake L18 is provided in Appendix C. Most metals in this lake were below detection limits, while aluminum, barium, cadmium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, copper, and lead were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, and undetected levels of nitrate, nitrite, and their sum. (i.e., nitrate + nitrite). Chlorophyll 'a', as an indicator of primary productivity, measured 3.46 µg/L (Appendix C).

Field water quality parameters were measured at two depths in Lake L18 (i.e., 1 and 2 m) and are provided in Appendix C. The temperature at 1 m (17.3°C) was 0.6°C higher than at 2 m (16.7°C). Dissolved oxygen showed a decrease at 2 m (7.97 mg/L or 84.1% saturation) from 1 m (to 8.23 mg/L or 84.9% saturation). pH, conductivity, and ORP levels were comparable and ranged from 7.28 (at 1 m) to 7.29 (at 2 m), 59.8 (at 1 m) to 82.2 µS/cm (at 2 m), and 35.9 (at 1 m) to 33.7 mV (at 2 m), respectively.

3.18.4 Lake L18 Sediment Quality

The sediment quality data for Lake L18 is provided in Appendix C. Many metals were detected in the sediment while antimony, arsenic, beryllium, bismuth, boron, cadmium, lithium, rubidium, silver, thallium, and tin were undetected. Iron measured 23,000 mg/kg. Total organic carbon in the sediment of Lake L18 measured 300 g/kg. The sediment particle size was mainly clay (51%), with some sand (26%) and lesser amounts of silt (23%; Appendix C).

3.18.5 Lake L18 Fish Population Assessment

3.18.5.1 Fish Community

The fish community in Lake L18 was primarily composed of white sucker (64.5%), while northern pike (25.8%) and burbot (9.7%) were prevalent to a lesser extent (Figure 3.59).

3.18.5.2 Fishing Effort and Catch

Fishing of Lake L18 was conducted using fyke nets, minnow traps and gill nets. Sampling locations are provided in Figure 3.57. A summary of fishing effort, fish catches, and CPUE is provided in Table 3.47. Fyke netting was conducted July 18-22, 2021, with eight nets set each night. The total net nights fished was 32. Not all nets captured fish each night, and the number of nets capturing fish ranged from one to four nets each night (averaged three nets). Three fish species were captured: three burbot, nine white sucker and six northern pike.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. Six traps were set each night and no fish were captured. Gill netting was completed on July 20 and 21, 2021, and captured a total of 11 white sucker and two northern pike.

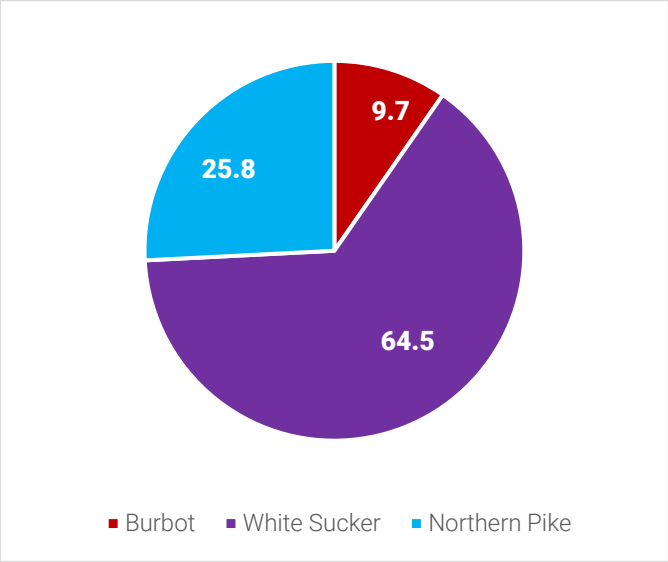


Figure 3.59 Fish Community Composition (% Abundance) for Lake L18.

Table 3.47 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L18.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Burbot	White Sucker	Northern Pike	CPUE[2]		
				Total	Total	Total	Burbot	White Sucker	Northern Pike
Fyke Nets									
Jul. 18	Jul. 19	8(4)	8	0	3	2	0.0	0.4	0.3
Jul. 19	Jul. 20	8(3)	8	0	2	3	0.0	0.3	0.4
Jul. 20	Jul. 21	8(4)	8	3	1	1	0.4	0.1	0.1
Jul. 21	Jul. 22	8(1)	8	0	3	0	0.0	0.4	0.0
Totals			32	3	9	6	0.1	0.3	0.2
Minnow Traps									
Jul. 18	Jul. 19	6(0)	6	0	0	0	0	0	0
Jul. 19	Jul. 20	6(0)	6	0	0	0	0	0	0
Jul. 20	Jul. 21	6(0)	6	0	0	0	0	0	0
Jul. 21	Jul. 22	6(0)	6	0	0	0	0	0	0
Totals			24	0	0	0	0	0	0
Gill Net									
Jul. 20	Jul. 20	4(3)	8	0	8	1	0	1.0	0.1
Jul. 21	Jul. 21	5(2)	9	0	3	1	0	0.3	0.1
Totals			17	0	11	2	0	0.6	0.1

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets.

3.18.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L18 are summarized in Table 3.48. The length of captured burbot ranged from 45 to 140 mm and averaged 78 mm (std. dev. = ± 43.9). Burbot weight ranged from 1.0 to 17 g and averaged 6.3 g (std. dev. = ± 7.5). The length of white sucker ranged from 179.0 to 440.0 mm and averaged 313.3 (std. dev. = ± 66.1). White sucker had a wide weight range of 60 to 1,260 g and averaged 489.2 g (std. dev. = ± 313.9). White sucker condition factor ranged from 1.0 to 1.4 and averaged 1.3 (std. dev. = ± 0.1). Northern pike had a length range of 69 to 350 mm and averaged 187.9 mm (std. dev. = ± 113.3), weight ranged from 4 to 334 g and averaged 98.8 g (std. dev. = ± 122) and had a condition factor range of 0.6 to 1.2 (averaged 0.8).

Table 3.48 Summary of Meristic Data for Fish Caught in Lake L18.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Burbot	Length (mm)	78.0	45.0	140.0	43.9
	Weight (g)	6.3	1.0	17.0	7.5
White sucker	Length (mm)	313.3	179.0	440.0	66.1
	Weight (g)	489.2	60.0	1,260.0	313.9
	Condition (K)	1.3	1.0	1.4	0.1
Northern pike	Length (mm)	187.9	69.0	350.0	113.3
	Weight (g)	98.8	4.0	334.0	122.0
	Condition (K)	0.8	0.6	1.2	0.2

3.18.6 Benthic Community

Lake L18 benthic macroinvertebrate community had a total abundance of six and taxon richness of two. The density of macroinvertebrates at Lake L18 was 200 individuals/m^2. The two families present in Lake L18 were Hylellidae (83%) and Valvatidae (17%).

3.18.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L18 on July 18, 2021 (Figure 3.57). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L18 was 1,034 mg/m^3 with the <10 µm and 10-30 µm size classes comparable in size with a biomass of 530 and 479 mg/m^3, respectively. The > 30 µm size class was low (25 mg/m^3).

3.18.8 Zooplankton

A zooplankton sample was collected at one station in Lake L18 on July 18, 2021 (Figure 3.57). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group

and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3) for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 0.23, 1.01 and 0.13, respectively, and total biomass was 1.37 mg/m^3. No one particular group or genus were abundant with the genus *Bosmina* the largest taxa (0.87 mg/m^3). Zooplankon biomass in Lake L18 was the second lowest in all the lakes surveyed.

3.19 Lake L19

3.19.1 General Overview Description

Lake L19 was situated southwest of Lake L18 and connected to L18 by its main outlet. This was the main and only outlet of L19 and is described in more detail as Stream S9. This lake was similar to L18 in that it had a beaver dam present at its outlet raising its water level. With the very shallow level of lake, it is likely that the dam has widened this lake and without the dam it would behave as a wide section of stream. The lake had gentle sloped shores for most of its perimeter, however the slope was steeper on the eastern side, as there was a deeper channel through the lake near this side. The southern end of the lake held the location of the main and only inlet described as Stream S16 and with the dam flooding the lake the border between lake and stream is not easily delineated. ATV/snowmobile and hunting trails were present west of the lake, and a short ATV trail was added to access Lake L19 from Lake L18. The shoreline of Lake L19 consisted mainly of mature black spruce intermixed with some sections of grasses. Lake substrate contained a mixture of boulders, cobbles and fines with no locations having sand or gravel. This extended only a few meters on the western side and approximately 8 meters on the eastern side, beyond which the lake contained predominantly fines, with some boulders that can be seen from the maps below. The location of fishing nets and where the other various data and samples were collected are provided in Figure 3.60. Fish were sampled using fyke nets (n=6), minnow traps (n=6) and gill net (n=2).

3.19.2 Lake Habitat Assessment

3.19.2.1 Bathymetry

Bathymetric studies were completed on Lake L19 on August 4, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of 18 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.60). The surface area of the lake was 16,916 m^2 and the lake volume was 9,347 m^3. The lake was deeper in the eastern and northern areas where flowing water has created a trench with a maximum depth of 1.9 m.

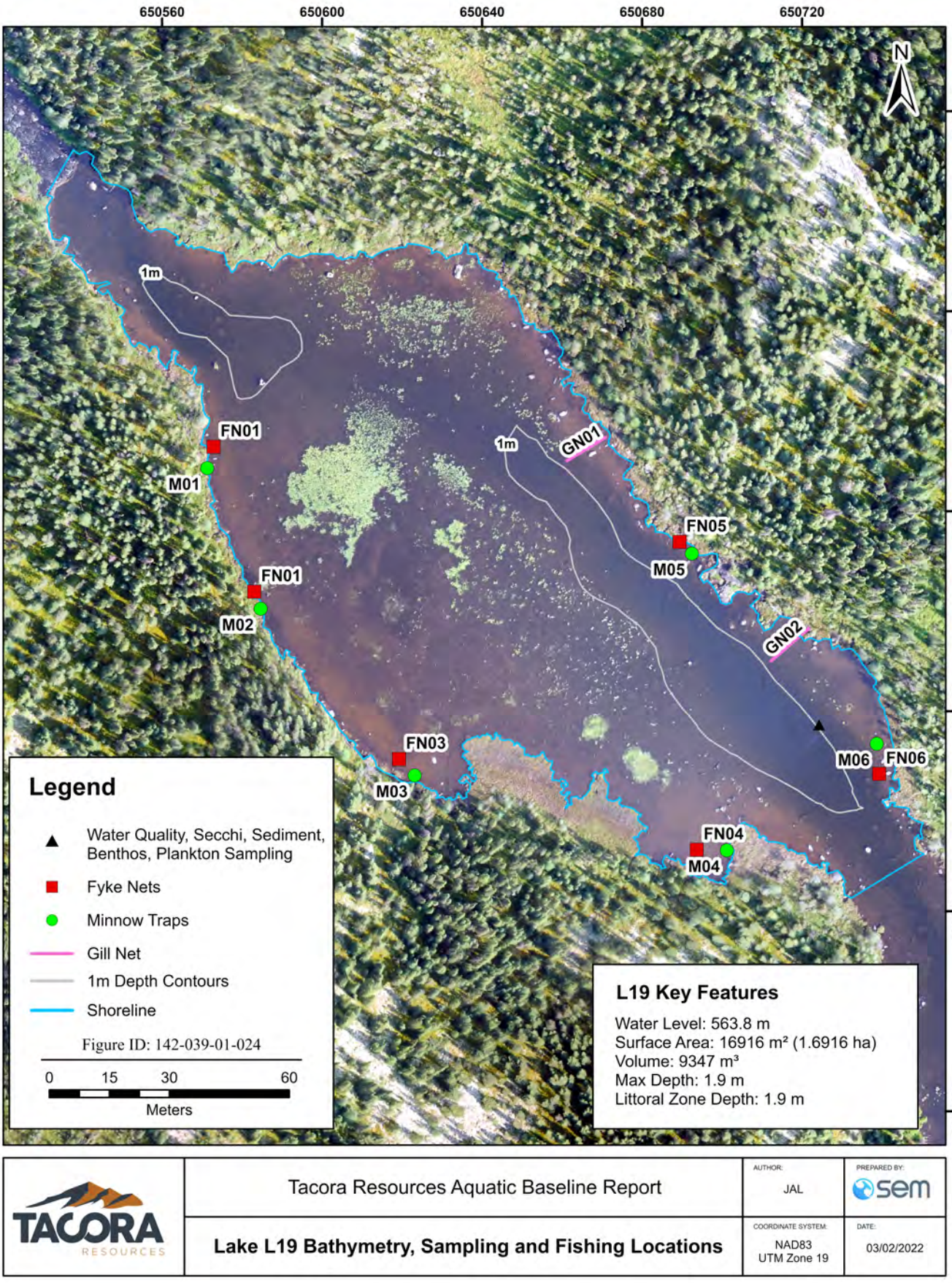


Figure 3.60 Lake L19 Bathymetry, Sampling and Fishing Locations.

3.19.2.2 Habitat Mapping

A survey of habitat in Lake L19 identifying substrate and vegetation was conducted on July 21, 2021 (Figure 3.61). The entire lake was composed of littoral zone and due to the shallow characteristics of L19 and the Secchi depth (i.e., 1.9 m), no profundal zone existed. The lake habitat further from the shoreline (i.e., interior of the colored sections) was composed of fines with vegetation and intermixed with boulders as shown on Figure 3.61. The shoreline survey of L19 identified the main substrate classes as coarse and fine.

The majority of the lake substrate was fines, comprising 82% of the total littoral zone, while coarse and medium comprised 15% and 3% of the total. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.49.

Table 3.49 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L19.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
16,916	9,347	Fine	With vegetation	944
			No vegetation	12,927
		Medium	With vegetation	4
			No vegetation	445
		Coarse	With vegetation	4
			No vegetation	2,592
			Total	16,916

Note: the substrate class medium was identified to a lesser extent in the shoreline survey. This was not primary or secondary substrate class and thus not included in the habitat map.

3.19.3 Lake L19 Water Quality

The water quality data for Lake L19 is provided in Appendix C. Most metals in Lake L19 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, nickel, potassium, sodium, and strontium were detected (Appendix C). Phosphorus, lead, and copper were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, with undetected levels of nitrate, nitrite, and their sum (i.e., nitrate + nitrite). Chlorophyll 'a', as an indicator of primary productivity, measured 0.90 µg/L, typical of an oligotrophic lake (Appendix C).

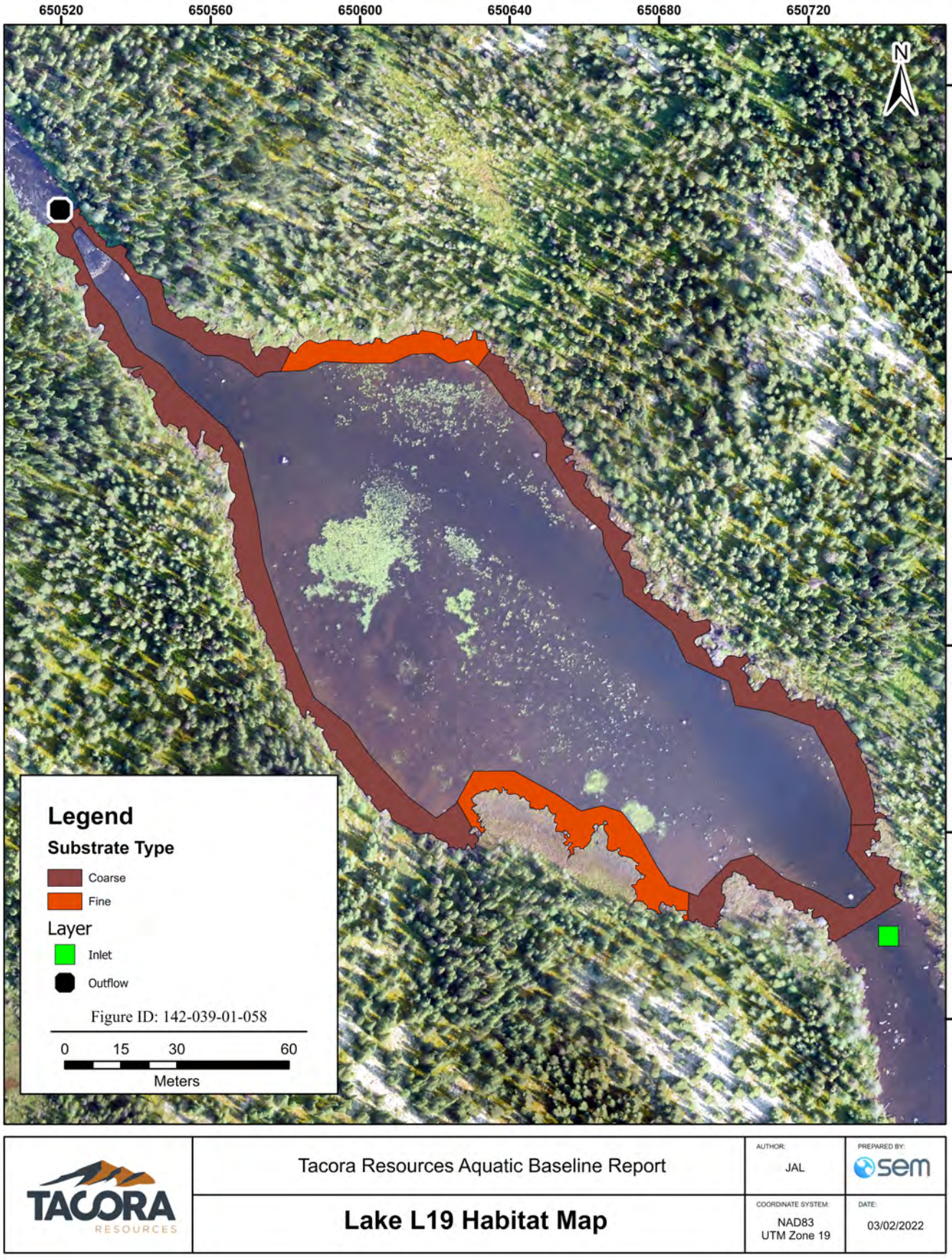


Figure 3.61 Lake L19 Habitat Map.

Field water quality parameters were measured at two depths in Lake L19 (i.e., 1 and 1.9 m) and are provided in Appendix C. There was no temperature difference between 1 m and 1.9 m (measured 15.5°C). Dissolved oxygen showed a decrease at 1.9 m (8.73 mg/L or 87.0% saturation) from 1 m (9.71 mg/L or 95.1% saturation). pH, conductivity, and ORP levels were comparable and ranged from 7.17 (at 1 m) to 7.20 (at 1.9 m), 54.7 (at 1 m) to 54.8 (at 1.9 m) µS/cm, and 29.2 (at 1 m) to 31.8 mV (at 1.9 m), respectively.

3.19.4 Lake L19 Sediment Quality

The sediment quality data for Lake L19 is provided in Appendix C. Several metals were detected in the sediment while antimony, arsenic, beryllium, bismuth, boron, cadmium, mercury, molybdenum, selenium, silver, strontium, and tin were undetected. Iron was very high and measured 19,000 mg/kg. Total organic carbon in the sediment of L19 measured 11,000 g/kg. The sediment particle size was mainly sand (71%), with some gravel (25%), with lesser amounts of silt (2%) and clay (2%; Appendix C).

3.19.5 Lake L19 Fish Population Assessment

3.19.5.1 Fish Community

The fish community in Lake L19 was composed of northern pike (60%) and white sucker (40%) as shown in Figure 3.62.

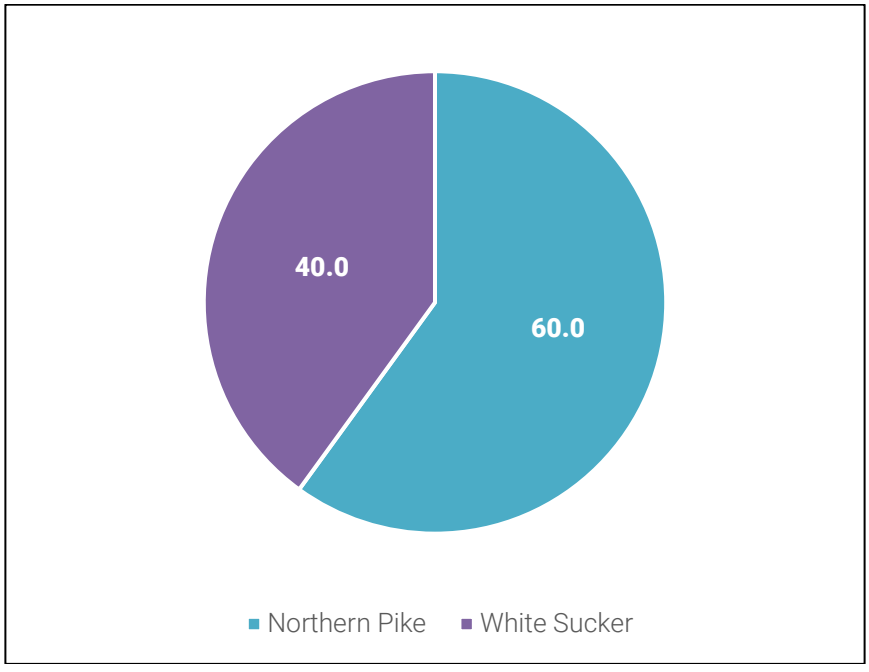


Figure 3.62 Fish Community Composition (% Abundance) for Lake L19.

3.19.5.2 Fishing Effort and Catch

Fishing of Lake L19 was conducted using fyke nets, minnow traps and gill nets. Sampling locations are provided in Figure 3.60. A summary of fishing effort, fish catches and their CPUE is provided in Table 3.50. Fyke netting was conducted July 22-25, 2021, with six nets set each night. The total net nights fished was 18. Not all nets captured fish each night, and the number of nets capturing fish ranged from one to two nets each night (averaged two nets). Two species were captured: six northern pike and one white sucker.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing. These traps caught no fish. Gill netting of Lake L19 was completed on July 23 and July 24, 2021, capturing three white suckers.

Table 3.50 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L19.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	White Sucker	Northern Pike	CPUE[2]	
				Total	Total	White Sucker	Northern Pike
Fyke Nets							
Jul. 22	Jul. 23	6(1)	6	0	1	0.0	0.2
Jul. 23	Jul. 24	6(2)	6	1	4	0.2	0.7
Jul. 24	Jul. 25	6(1)	6	0	1	0.0	0.2
Totals			18	1	6	0.1	0.3
Minnow Traps							
Jul. 22	Jul. 23	6(0)	6	0	0	0	0
Jul. 23	Jul. 24	6(0)	6	0	0	0	0
Jul. 24	Jul. 25	6(0)	6	0	0	0	0
Totals			18	0	0	0	0
Gill Net							
Jul. 23	Jul. 23	2(1)	4.5	2	0	0.4	0.0
Jul. 24	Jul. 24	2(1)	4.2	1	0	0.2	0.0

1 Number of nets that caught fish are in brackets.
2 Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill net

3.19.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L19 are summarized in Table 3.51. The length of white sucker ranged from 125 to 287 mm and averaged 243.0 mm (std. dev. = ± 68.3). The weight of white sucker ranged from 21 to 340 g and averaged 246.3 g (std. dev. = ± 130.6). Condition factor for white sucker captured in L19 ranged from 1.1 to 1.3, averaging 1.2 (std. dev. = ± 0.1). The length of northern pike ranged from 84 to 392 mm (mean = 137.2 mm; std. dev. = ± 114). Northern pike weight ranged from 4.0 to 366 g (averaged 64.5 g; std. dev. = ± 134.8), while condition factor showed a range of 0.6 to 0.8 (averaged 0.7; std. dev. = ± 0.7).

Table 3.51 Summary of Meristic Data for Fish Caught in Lake L19.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
White sucker	Length (mm)	243.0	125.0	287.0	68.3
	Weight (g)	246.3	21.0	340.0	130.6
	Condition (K)	1.2	1.1	1.3	0.1
Northern pike	Length (mm)	137.2	84.0	392.0	114.0
	Weight (g)	64.5	4.0	366.0	134.8
	Condition (K)	0.7	0.6	0.8	0.1

3.19.6 Benthic Community

Lake L19 benthic macroinvertebrate community had a total abundance of five and taxon richness of two. The density of macroinvertebrates at Lake L19 was 167 individuals/m^2. The two families present in Lake L14 were Molannidae (60%) and Ephemerellidae (40%).

3.19.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L19 on July 23, 2021 (Figure 3.60). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L19 was 711 mg/m^3 and the 10-30 µm size class was dominant with a biomass of 450 mg/m^3. The > 30 µm size class was low (27 mg/m^3).

3.19.8 Zooplankton

A zooplankton sample was collected at one station in Lake L19 on July 23, 2021 (Figure 3.60). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3) for each major taxonomic group of Copepods and Rotifers were 0.05 and 0.11, respectively, while Cladocerans were absent, and total biomass was 0.16 mg/m^3. No one group or genus was abundant with the genus *Kelicottia* comprising the largest taxa (0.106 mg/m^3).

3.20 Lake L20

3.20.1 General Overview Description

Lake L20 was situated at the southwest end of the assessment area and was the largest of the lakes assessed by a considerable amount. The lake was connected to L19 by its main outlet at its northwest end. This was the main and only outlet of L20 and is described in more detail as Stream S16. This lake had six inlets of varying sizes and habitat types and described individually as Streams S10 through S15.

Lake L20 was an irregularly shaped lake with three distinct zones. One area of the lake contained the outlet, with mixtures of course and fine substrate. A second area of the lake extended narrowly on the northeast side to a dead end made up of mainly fines. The third area was that of the open main body of the lake, this section was the deepest and possessed a rocky shoreline. The southern end of the lake was also of note as it held the location of a large inlet. In this area there existed a long, narrowing area riddled with boulders slowly transitioning from lake to stream. This lake had gentle sloped shores for most of its perimeter, however there were localized areas with steeper shores in the main body. ATV/snowmobile and hunting trails were present near Lake L20, and these were used to travel to the lake near the outlet. There also existed a trail following along the western side of the lake terminating at stream S11. The shoreline of Lake L20 consisted mainly of alders in the main body, while the other sections possessed either one or a combination of mature black spruce, wetland, or alder. Lake substrate contained a mixture of bedrock, boulder, cobble, gravel, sand, and organics with varying amounts around the perimeter. This extended approximately 10 m from shore, beyond which the lake contained predominantly fines, with some boulders present. Lake L20 also had a small section of sandy beach on the western side of the main body, with a cabin present in this location. The location of fishing nets and where the other various data and samples were collected are provided in Figure 3.63. Fish were sampled using fyke nets (n=11), minnow traps (n=6) and gill net (n=2).

3.20.2 Lake Habitat Assessment

3.20.2.1 Bathymetry

Bathymetric studies were completed on Lake L20 on June 26-27, 2021, using sonar and GPS. Transects were spaced approximately 50 m apart and oriented in a southeast-northwest direction. A total of 90 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.63). The surface area of the lake was 1,631,690 m^2 and the lake volume was 2,697,541 m^3. The large lake consisted of a main body of water in the south, a western arm that terminated at the outflow, and a long and narrow northern arm. The northern arm was relatively shallow, with only a very small area measuring over 2 m depth. Most of the arm was less than 1 m in depth. The western arm was also relatively shallow, however with a deeper trench that measured between 1 and 2 m deep. The main body of water had a maximum depth of 4.75 m and was located near the centre of the lake.

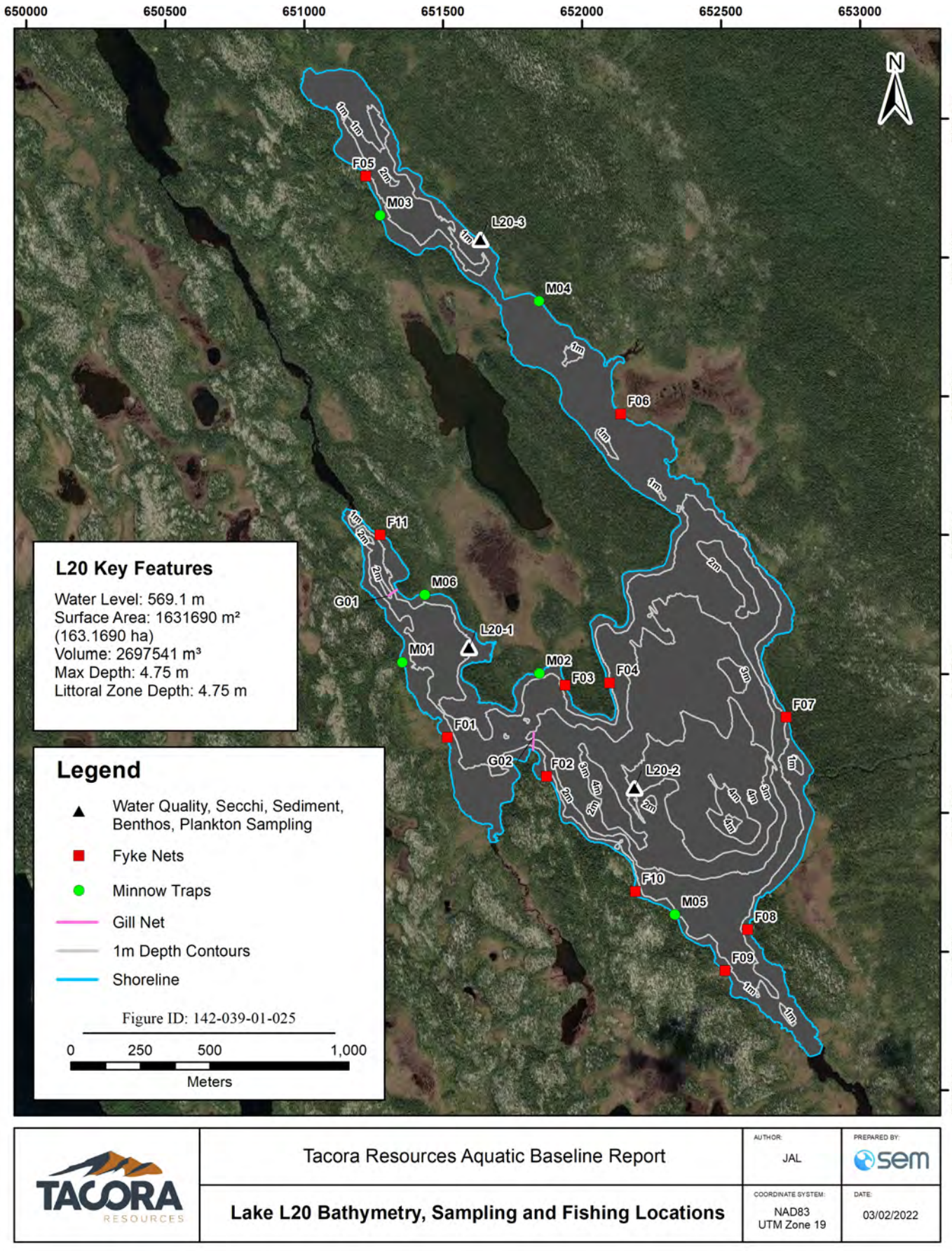


Figure 3.63 Lake L20 Bathymetry, Sampling and Fishing Locations.

3.20.2.2 Habitat Mapping

A survey of habitat in Lake L20 identifying substrate and vegetation was conducted on July 8, 2021 (Figure 3.64). The entire lake was composed of littoral zone and due to the shallow characteristics of L20 and the Secchi depth (i.e., 4.8 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) was composed of fines. The shoreline survey of L20 identified the substrate classes as coarse, medium and fine. The majority of the lake substrate was fines, comprising 90% of the total littoral zone, while coarse and medium comprised 6% and 4% of the total, respectively. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.52.

Table 3.52 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L20.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
1,631,690	2,697,541	Fine	With vegetation	1,854
			No vegetation	1,467,767
		Medium	With vegetation	374
			No vegetation	67,616
		Coarse	With vegetation	404
			No vegetation	93,675
			Total	1,631,690

3.20.3 Lake L20-1 Water Quality

The water quality data for Lake L20-1 is provided in Appendix C. Most metals in L20-1 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, with undetected levels of nitrate, nitrite, their sum. (i.e., nitrate + nitrite), and dissolved chloride (Appendix C). Chlorophyll 'a', as an indicator of primary productivity, measured 1.04 µg/L.

Field water quality parameters were measured at one depth in L20-1 (1.0 m) and are shown in Appendix C. The temperature measured 15.9°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 7.83, 8.39 mg/L (or 86.0% saturation), 117 µS/cm, and 67.2 mV, respectively.

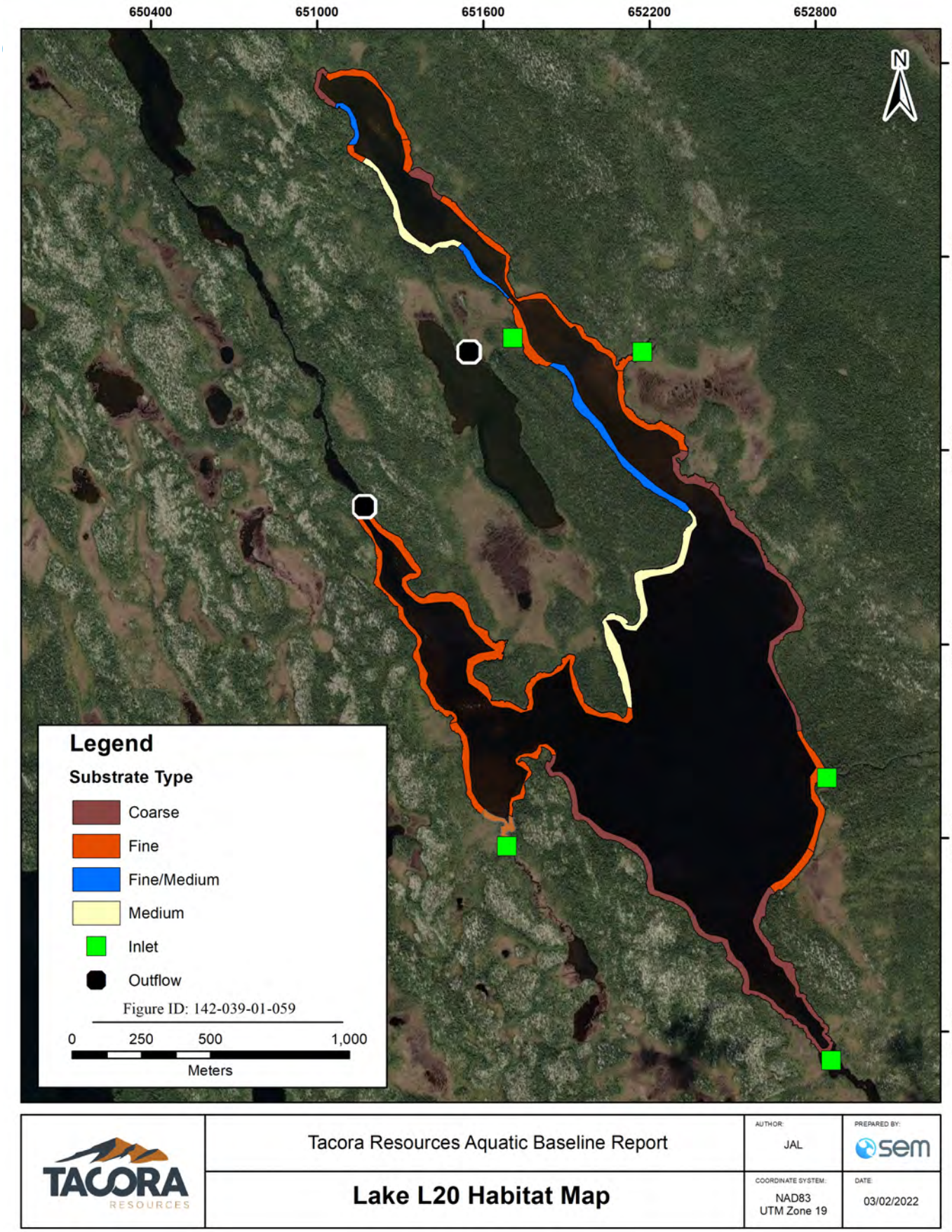


Figure 3.64 Lake L20 Habitat Map.

3.20.4 Lake L20-1 Sediment Quality

The sediment quality data for L20-1 is provided in Appendix C. All metals were detected in the sediment except antimony, beryllium, bismuth, boron, and silver. Iron was high and measured 82,000 mg/kg. Total organic carbon in the sediment of L20-1 measured 190 g/kg. The sediment particle size was mainly clay (60%), with some silt (31%) and lesser amounts of sand (9%; Appendix C).

3.20.5 Lake L20-2 Water Quality

The water quality data for Lake L20-2 is provided in Appendix C. Most metals in L20-2 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. This lake section had pH near neutral, low alkalinity, conductivity and turbidity, with undetected levels of nitrate, nitrite, their sum. (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 0.96 µg/L and was typical of an oligotrophic lake (Appendix C).

Field water quality parameters were measured at three depths in L20-2 (i.e., 1, 2, and 2.5 meters) and are shown in Appendix C. The temperature difference between 1 m and 2.5 m was 0.5°C. Dissolved oxygen showed a slight increase at 2.5 m (8.51 mg/L) from 1 m (8.10 mg/L). pH, conductivity, and ORP levels were comparable and ranged from 7.33 to 7.37, 74.0 to 76.0 µS/cm, and 34.4 to 43.0 mV, respectively.

3.20.6 Lake L20-2 Sediment Quality

The sediment quality data for L20-2 is provided in Appendix C. Many metals were detected in the sediment while antimony, beryllium, bismuth, boron, silver, and tin were undetected. Iron was high and measured 61 000 mg/kg. Total organic carbon in the sediment of L20-2 measured 160 g/kg. The sediment particle size was mainly clay (59%), with some silt (37%) and lesser amounts of sand (4%; Appendix C).

3.20.7 Lake L20-3 Water Quality

The water quality data for Lake L20-3 is provided in Appendix C. Many metals in L20-3 were below detection limits, while aluminum, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, strontium, and zinc were detected. Phosphorus and lead were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, with undetected levels of nitrate, nitrite, their sum. (i.e., nitrate + nitrite), and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 1.85 µg/L, typical of an oligotrophic lake (Appendix C).

Field water quality parameters were measured at one depth in L20-3 (1.0 m) and are shown in Appendix C. The temperature measured 16.4°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 7.22, 7.91 mg/L (or 71.0% saturation), 106 µS/cm, and 28.0 mV, respectively.

3.20.8 Lake L20-3 Sediment Quality

The sediment quality data for L20-3 is provided in Appendix C. Many metals were detected in the sediment while antimony, arsenic, beryllium, bismuth, boron, silver, and tin were undetected. Iron measured 26,000 mg/kg. Total organic carbon in the sediment of L20-3 measured 180 g/kg. The sediment particle size was mainly clay (61%), with some silt (34%) and lesser amounts of sand (5%; Appendix C).

3.20.9 Lake L20 Fish Population Assessment

3.20.9.1 Fish Community

The fish community in Lake L20 was composed of a wide variety of species, with neither appearing to lead the population in catch. However, white sucker (21.5%), sculpin (20.3%), northern pike (17.7%), and burbot (16.5%) had the highest proportions in Lake L20 (Figure 3.65).

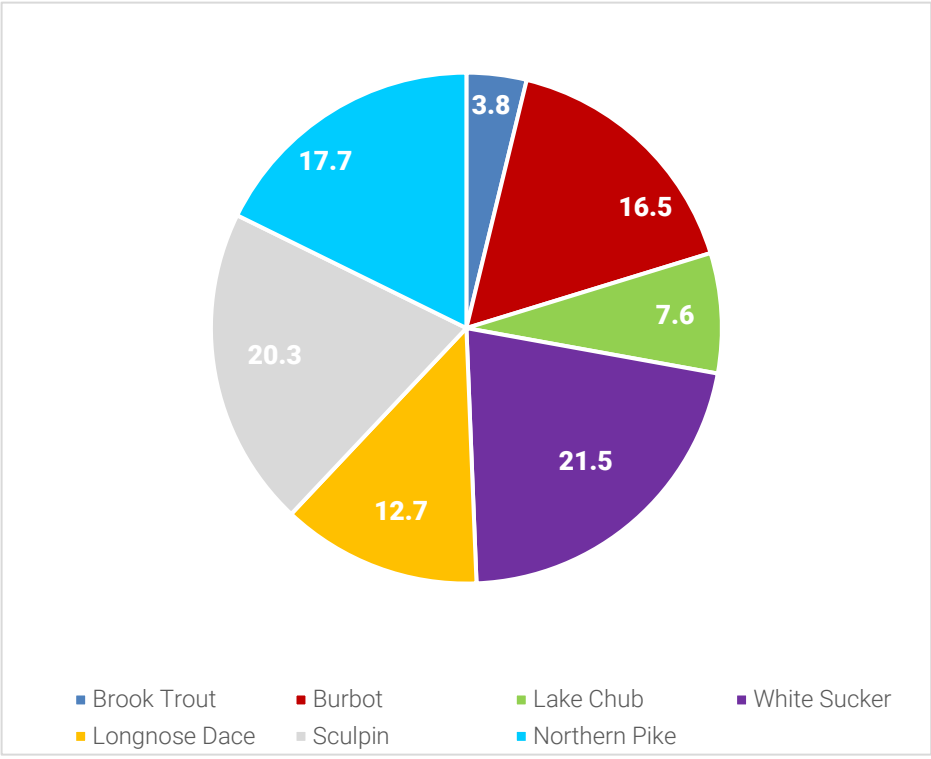


Figure 3.65 Fish Community Composition (% Abundance) for Lake L20.

3.20.9.2 Fishing Effort and Catch

Fishing of Lake L20 was conducted using fyke nets, minnow traps and gill nets. Sampling locations are provided in Figure 3.63. A summary of fishing effort, fish catches and CPUE is provided in Table 3.53. Fyke netting was conducted June 22-29, 2021, with eight nets set initially on June 22. The total net nights fished was 74. Not all nets captured fish each night, and the number of nets capturing fish ranged from zero to five nets each set (averaged 2.6 nets per night). Seven fish species were captured: three brook trout, 13 burbot, six lake chub, 17 white suckers, ten longnose dace, 14 sculpin, and 14 northern pike. CPUE for brook trout ranged from 0 to 0.13 fish/net night and averaged 0.04 fish/net.

Minnow traps were also placed near fyke nets for the duration of fyke net fishing and captured two burbot. Gill netting of Lake L20 was completed on June 23 and 24, 2021, and captured 14 white suckers and ten northern pike (Table 3.53).

3.20.9.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L20 are summarized in Table 3.54. The length of the only three brook trout captured is unknown as they were found partially eaten in the net by the northern pike.

The length of captured lake chub ranged from 50 to 105 mm and averaged 73.3 mm (std. dev. = ± 19.9). Lake chub weight ranged from 0.5 to 12.0 g and averaged 4.0 g (std. dev. = ± 4.4). Condition factor ranged from 0.9 to 1.0 (mean = 1.0; std. dev. = ± 0.1). Burbot length ranged from 95 to 180 mm (average = 128.1 mm; std. dev. = ± 26.9), and weight range was 5 to 33 g (average = 13.8 g; std. dev. = ± 9.0). Longnose dace length ranged from 68 to 100 mm (average = 77.7 mm; std. dev. = ± 9.6), and weight range was 3 to 20 g (average = 6.6 g; std. dev. = ± 4.7). Sculpin had a length range of 20 to 95 mm (average = 49.9 mm; std. dev. = ± 19.7). The length of captured white sucker ranged from 30 to 485 mm and averaged 386.8 mm (std. dev. = ± 148.4). White sucker weight ranged from 6 to 1,660 g and averaged 1,172.4 g (std. dev. = ± 477.1). Condition factor ranged from 0.9 to 1.4 (mean = 1.3; std. dev. = ± 0.2). Northern pike length ranged from 165 to 700 mm (average = 425.2 mm; std. dev. = ± 232), and weight range was 25 to 1,998 g (average = 868.2 g; std. dev. = ± 827.8). This fish had a condition factor range of 0.6 to 0.7 (average = 0.6).

Table 3.53 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L20.

Set Date	Haul Date	No. Of Nets[1]	Net / Trap Nights / Hours	Brook Trout		Burbot	Lake Chub	Longnose Dace	Sculpin	White Sucker	Northern Pike	CPUE[2]						
				Total	Recap	Total	Total	Total	Total	Total	Total	Brook Trout	Burbot	Lake Chub	Longnose Dace	Sculpin	White Sucker	Northern Pike
Fyke Nets																		
Jun. 22	Jun. 25	8(5)	24	3	0	2	6	3	8	0	1	0.13	0.08	0.25	0.13	0.33	0.00	0.04
Jun. 22	Jun. 26	3(1)	12	0	0	0	0	0	1	0	1	0.00	0.00	0.00	0.00	0.08	0.00	0.08
Jun. 25	Jun. 29	8(5)	32	0	0	6	0	7	5	2	1	0.00	0.19	0.00	0.22	0.16	0.06	0.03
Jun. 26	Jun. 29	2(0)	6	0	0	3	0	0	0	1	1	0.00	0.50	0.00	0.00	0.00	0.17	0.17
Totals			74	3	0	11	6	10	14	3	4	0.04	0.15	0.08	0.14	0.19	0.04	0.05
Minnow Traps																		
Jun. 22	Jun. 25	3(0)	9	0	0	0	0	0	0	0	0	0.0	0.00	0	0	0	0	0
Jun. 22	Jun. 26	3(1)	12	0	0	1	0	0	0	0	0	0.0	0.08	0	0	0	0	0
Jun. 25	Jun. 29	3(1)	12	0	0	1	0	0	0	0	0	0.0	0.08	0	0	0	0	0
Jun. 26	Jun. 29	3(0)	9	0	0	0	0	0	0	0	0	0.0	0.00	0	0	0	0	0
Totals			42	0	0	2	0	0	0	0	0	0.0	0.05	0	0	0	0	0
Gill Net																		
Jun. 23	Jun. 23	3(3)	6.2	0	0	0	0	0	0	9	2	0.0	0	0	0	0	1.5	0.3
Jun. 24	Jun. 24	2(2)	4.3	0	0	0	0	0	0	5	8	0.0	0	0	0	0	1.2	1.9
Total			10.5	0	0	0	0	0	0	14	10	0.0	0	0	0	0	1.3	1.0

1 Number of nets that caught fish are in brackets.
2 Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps, fish per hour for gill nets.

Table 3.54 Summary of Meristic Data for Fish Caught in Lake L20.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Lake chub	Length (mm)	73.3	50.0	105.0	19.9
	Weight (g)	4.0	0.5	12.0	4.4
	Condition (K)	1.0	0.9	1.0	0.1
Burbot	Length (mm)	128.1	95.0	180.0	26.9
	Weight (g)	13.8	5.0	33.0	9.0
Longnose dace	Length (mm)	77.7	68.0	100.0	9.6
	Weight (g)	6.6	3.0	20.0	4.7
	Condition (K)	1.1	0.9	1.4	0.1
Sculpin	Length (mm)	49.9	20.0	95.0	19.7
White sucker	Length (mm)	386.8	30.0	485.0	148.4
	Weight (g)	1172.4	6.0	1,660.0	477.1
	Condition (K)	1.3	0.9	1.4	0.2
Northern pike	Length (mm)	425.2	165.0	700.0	232.0
	Weight (g)	868.2	25.0	1,998.0	827.8
	Condition (K)	0.6	0.6	0.7	0.03

3.20.10Benthic Community

Lake L20 benthic macroinvertebrate community had a total abundance of 29 and taxon richness of five. The density of macroinvertebrates at Lake L20 was 322 individuals/m^2. The five families present in Lake L20 consisted of Hylellidae (46%), Chironomidae (41%), Valvatidae (7%), Ceratopogindae (3%) and Phryganeidae (3%). Ceratopogindae (commonly known as, “no-see-ums”) and Phryganeidae (commonly known as, “giant caddisflies”) were both unique to this site.

3.20.11Phytoplankton

Phytoplankton samples were collected at three stations in Lake L20 on July 9, 2021, owing to the relatively large size of the lake (Figure 3.63). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm; Appendix C) and data are summarized in Table 3.55. Phytoplankton biomass in Lake L20 ranged from 196 to 1,353 mg/m^3 and the <10 µm size class was dominant at stations B and C with a biomass of 136 and 277 mg/m^3, respectively. The 10-30 size class was dominant at Station A at a biomass of 822 mg/m^3. The > 30 µm size class was lowest at all three stations (ranged from 12 to 20 mg/m^3; Table 3.55).

Table 3.55 Phytoplankton Biomass (mg/m^3) at Three Stations in Lake L20 in July 2021.

Size Class	Station A	Station B	Station C
<10 µm	519	136	277
10-30 µm	822	40	114
>30 µm	12	20	13
Total	1,353	196	404

3.20.12 Zooplankton

Zooplankton samples were also collected at the same three stations in Lake L20 on July 9, 2021 (Figure 3.63). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C, and summarized in Table 3.56. Zooplankton biomass in Lake L20 ranged from 62.87 to 226.20 mg/m^3 and the Cladocerans class were dominant at stations A and B with a biomass of 54.81 and 198.15 mg/m^3, respectively, while Copepods were dominant at Station C at a biomass of 179.15 mg/m^3 (Table 3.56).

Polyphemus was the dominant taxa at Station A, while Calanoids were of lesser importance at 52.56 and 6.31 mg/m^3, respectively. *Daphnia* and Polyphemus were co-dominant at Station B with a biomass of 99.01 and 95.57 mg/m^3, respectively, while Calanoids were of lesser importance at 21.99 mg/m^3. Calanoids were the largest group at Station C (179.15 mg/m^3), followed by the genus *Kelicottia* (24.52 mg/m^3) and the group of Copepod nauplii (20.66 mg/m^3).

Table 3.56 Zooplankton Biomass (mg/m^3) at Three Stations in Lake L20 in July 2021.

Taxonomic Group	Station A	Station B	Station C
Copepods	7.85	24.84	179.15
Cladocerans	54.81	198.15	17.60
Rotifers	0.21	3.20	24.52
Total	62.87	226.20	221.27

Lake L20 was characterized by considerable variation between stations in community composition. Station A was dominated by the predatory Cladoceran Polyphemus which appeared to suppress other taxonomic groups. Station B was mostly *Daphnia*, with Bosmina and Holopedium, and no Polyphemous, while Station C had low Cladocera (mostly Bosmina) and no Polyphemous. Lake L20 had by far the highest Rotifer biomass of any of the study lakes.

3.21 Lake L21

3.21.1 General Overview Description

Lake L21 was situated west of the outlet of Lake L20 and was connected to it by an outlet stream flowing east. This was the main and only outlet of Lake L21 and was assessed in more detail as Stream S10. Lake L21 also had a single inlet stream flowing through wetland originating south of the area flowing north. The shoreline of this wetland pond was steep and dropped off to near maximum depth immediately from shore, similar to the other lakes nearby. ATV/snowmobile and hunting trails were present 220 m east from the lake traveling north to south, however they could not be used to gain access to the lake. Instead, transportation was completed via helicopter. The shoreline of Lake L21 consisted mainly of wetland, but sections of black spruce also occurred. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of fishing nets and other various data and sample collection sites are provided in Figure 3.66. Fish were sampled using fyke nets (n=4).

3.21.2 Lake Habitat Assessment

3.21.2.1 Bathymetry

Bathymetric studies were completed on Lake L21 on September 28, 2021, using sonar and GPS. Transects were spaced approximately 20 m apart and oriented in an east-west direction. A total of six transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.66). The surface area of the lake was 5,880 m^2 and the lake volume was 2,569 m^3. The lake bottom had a relatively constant depth of 0.5 m throughout.

3.21.2.2 Habitat Mapping

A survey of habitat in Lake L21 identifying substrate and vegetation was conducted on August 22, 2021 (Figure 3.67). The entire lake was composed of littoral zone and due to the shallow characteristics of L21 and Secchi depth (i.e., 0.5 m), no profundal zone existed. The lake habitat further from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.57.

Table 3.57 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L21.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
5,880	2,569	Fine	With vegetation	141
			No vegetation	5,739
			Total	5,880

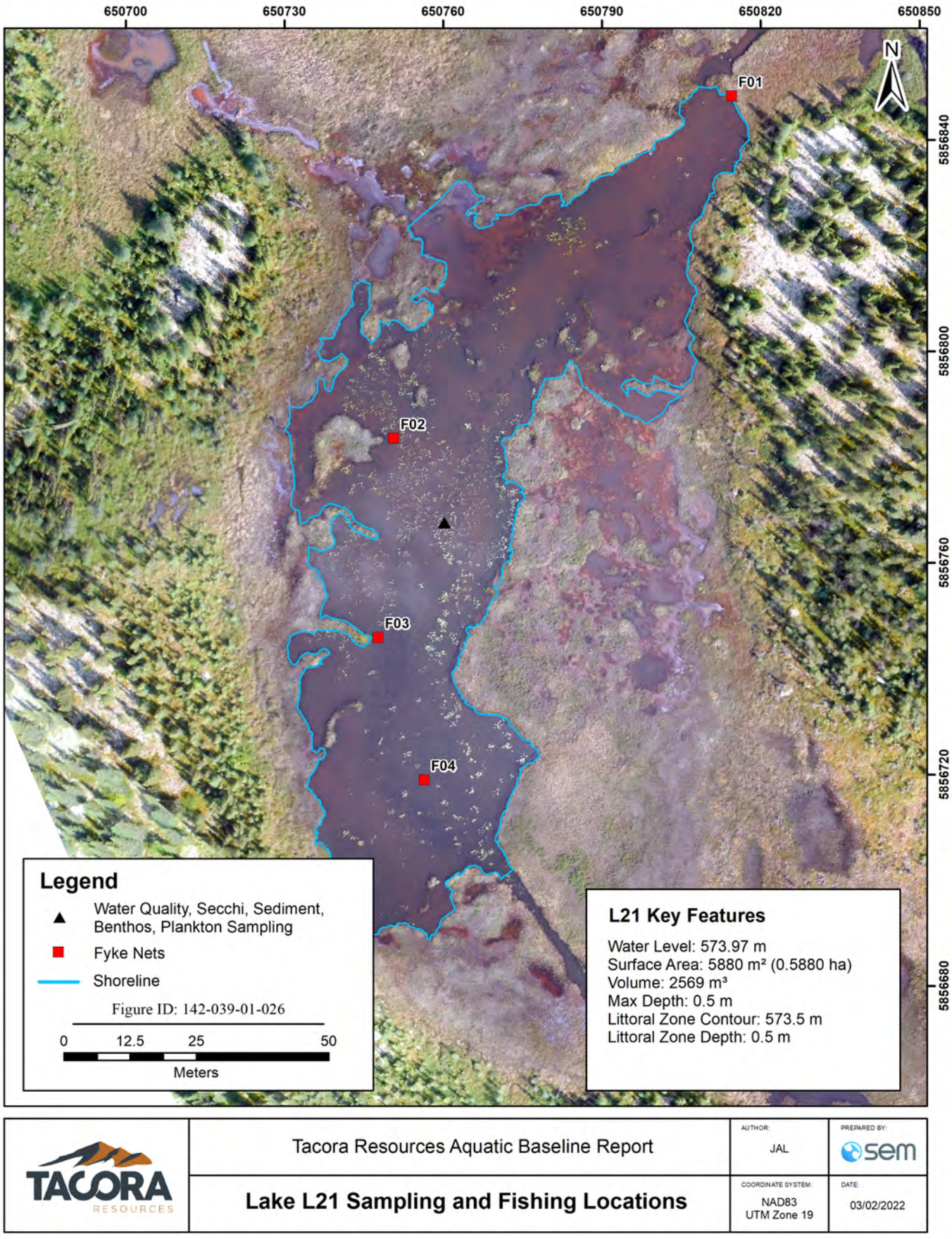


Figure 3.66 Lake L21 Sampling and Fishing Locations.

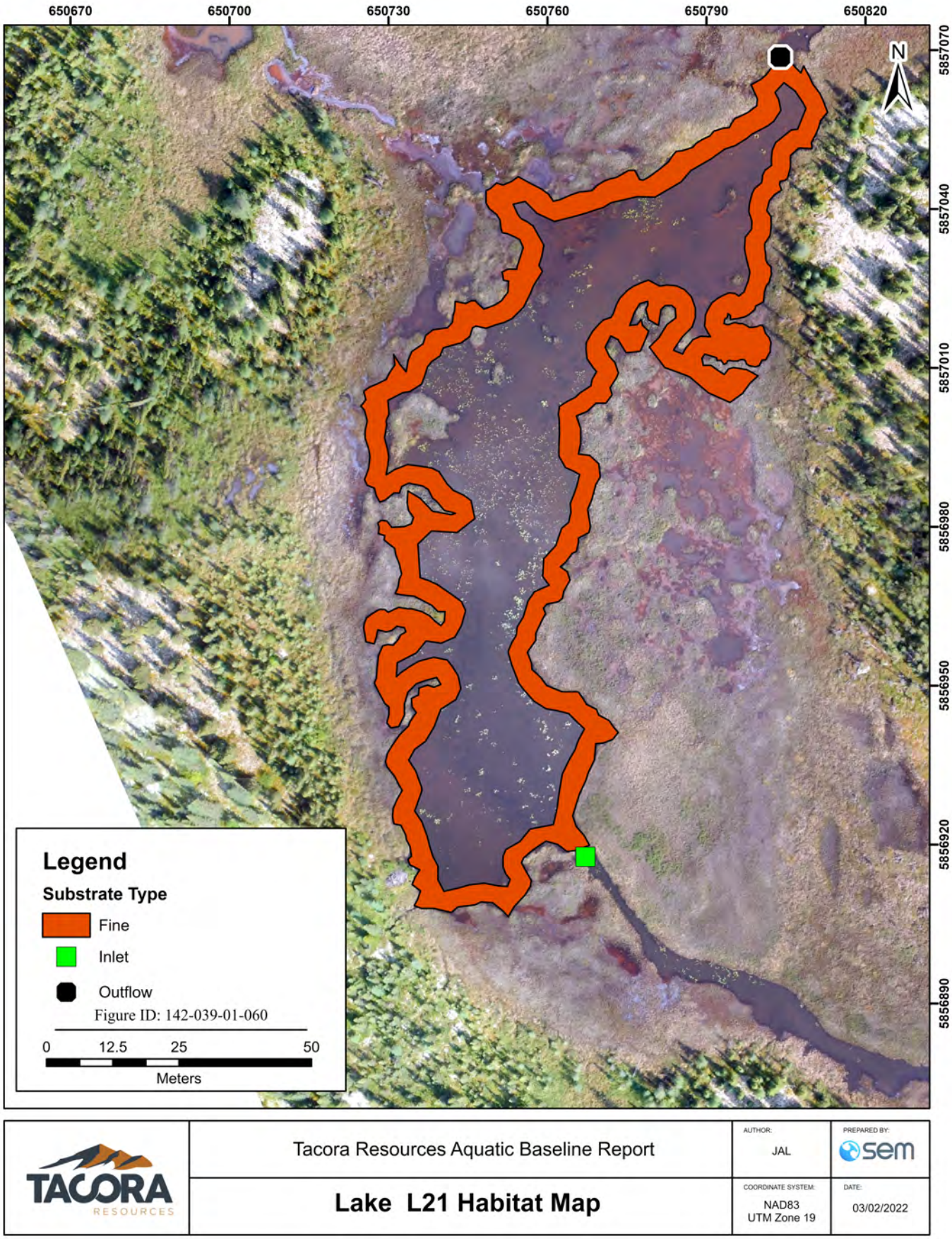


Figure 3.67 Lake L21 Habitat Map.

3.21.3 Lake L21 Water Quality

The water quality data for Lake L21 is provided in Appendix C. Many metals in Lake L21 were below detection limits, while aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus, lead, and copper were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, with undetected levels of nitrate, nitrite, and their sum (i.e., nitrate + nitrite). Chlorophyll 'a', as an indicator of primary productivity, measured 0.46 µg/L and was typical of an oligotrophic lake.

Field water quality parameters were measured at one depth in Lake L21 (0.4 m) and are shown in Appendix C. The temperature measured 17.6°C, while pH, dissolved oxygen, conductivity, and ORP showed values of 7.42, 9.95 mg/L (or 90.4% saturation), 103.6 µS/cm, and 48.8 mV, respectively.

3.21.4 Lake L21 Sediment Quality

The sediment quality data for Lake L21 is provided in Appendix C. Several metals were detected in the sediment while antimony, arsenic, beryllium, bismuth, boron, cadmium, lithium, mercury, rubidium, selenium, silver, thallium, and tin were undetected. Iron was very high and measured 63,000 mg/kg. Total organic carbon in the sediment of L21 measured 88 g/kg. The sediment particle size was mainly clay (62%), with some silt (32%) and lesser amounts of sand (6%; Appendix C).

3.21.5 Lake L21 Fish Population Assessment

3.21.5.1 Fish Community

The fish community in Lake L21 was primarily composed of white sucker (91.3%), while northern pike (8.7%) was prevalent to a lesser extent (Figure 3.68).

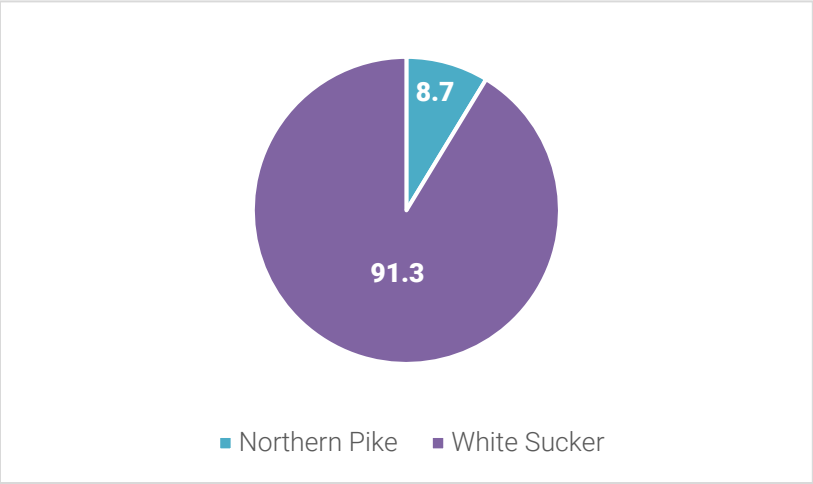


Figure 3.68 Fish Community Composition (% Abundance) for Lake L21.

3.21.5.2 Fishing Effort and Catch

Fishing of Lake L21 was conducted using fyke nets. Sampling locations were provided in Figure 3.66. A summary of the fyke net fishing effort, fish catches and CPUE is provided in Table 3.58.

Fyke netting was conducted August 21-23, 2021, with three nets set on August 21, then decreasing to two nets on August 22. The total net nights fished was nine, ranging from two to three nets per night (averaging two nets per night). Two fish species were captured: white sucker (n=42) and northern pike (n=4). White sucker CPUE was highest on the first day (i.e., 8.7 fish/net night) of fishing and lowest on the second day (i.e., one fish/net night). Similarly, northern pike CPUE was highest on the first day and lowest on the second day (i.e., 1 and 0.3 fish/net night, respectively).

Table 3.58 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L21.

Set Date	Haul Date	No. Of Nets[1]	Net Nights	Northern Pike	White Sucker	CPUE[2]			
				Total	Total	Brook Trout	Northern Pike	Lake Chub	White Sucker
Aug. 21	Aug. 22	3(3)	3	3	26	0.0	1.0	0.0	8.7
Aug.21	Aug.23	2(2)	4	1	4	0.0	0.3	0.0	1.0
Aug. 22	Aug. 23	2(2)	2	0	12	0.0	0.0	0.0	6.0
Totals			9	4	42	0.0	0.4	0.0	4.7

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night.

3.21.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L21 are summarized in Table 3.59. The length of white sucker ranged from 135 to 287 mm and averaged 213.8 mm (std. dev. = ± 29.5). White sucker weight ranged from 29 to 276 g, averaging 123.4 g (std. dev. = ± 52.1). Condition factor for white sucker captured in L21 ranged from 1.0 to 1.4, averaging 1.2 (std. dev. = ± 0.1). The length of northern pike ranged from 240 to 300 mm (mean = 270.5 mm), and weight ranged from 89 to 184 g (mean = 134.8 g; std. dev. = ± 34.4). Northern pike condition factor ranged from 0.6 to 0.7 (mean = 0.7)

Table 3.59 Summary of Meristic Data for Fish Caught in Lake L21.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Northern pike	Length (mm)	270.5	240.0	300.0	21.2
	Weight (g)	134.8	89.0	184.0	34.4
	Condition (K)	0.7	0.6	0.7	0.04
White sucker	Length (mm)	213.8	135.0	287.0	29.5
	Weight (g)	123.4	29.0	276.0	52.1
	Condition (K)	1.2	1.0	1.4	0.1

3.21.6 Benthic Community

Lake L21 benthic macroinvertebrate community had a total abundance of one and taxon richness of one. The density of macroinvertebrates at Lake L21 was 33 individuals per square meter. The only family present in Lake L21 was Pisidiidae (100%).

3.21.7 Phytoplankton

A phytoplankton sample was collected at one station in Lake L21 on July 22, 2021 (Figure 3.66). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L21 was 540 mg/m^3 and the <10 µm and 10-30 µm size class were co-dominant with a biomass of 259 and 281 mg/m^3, respectively. The > 30 µm size class was absent.

3.21.8 Zooplankton

A zooplankton sample was collected at one station in Lake L21 on July 22, 2021 (Figure 3.66). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods, Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3) for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 2.48, 22.69 and 0.02 respectively, and total biomass was 25.18 mg/m^3. *Bosmina* was the largest genus at 9.33 mg/m^3 followed by *Ceriodaphnia* at 8.79 mg/m^3. Cladocerans were the dominant taxonomic group.

3.22 Lake L22

3.22.1 General Overview Description

Lake L22 was a small water body situated north of the main body of Lake L20 and southwest of Lake L23. This lake was not connected to any nearby water bodies by streams and during the survey of the area no inlet or outlet streams could be identified. The water level of this lake dropped off to near maximum depth at the shoreline. ATV/snowmobile and hunting trails were not present near the lake and the lake was accessed via a short walk from Lake L20. The shoreline of Lake L22 consisted entirely of wetland, other than a few small black spruce trees that were sparsely present. Lake substrate contained no variation and instead was completely composed of mobile organics. The locations of fishing nets are provided in Figure 3.69. Fish were sampled using a gill net (n=1) set from end to end across the pond to determine presence or absence of fish. There were no fish present in Lake L22 and as such further assessment of the fish habitat was not completed.

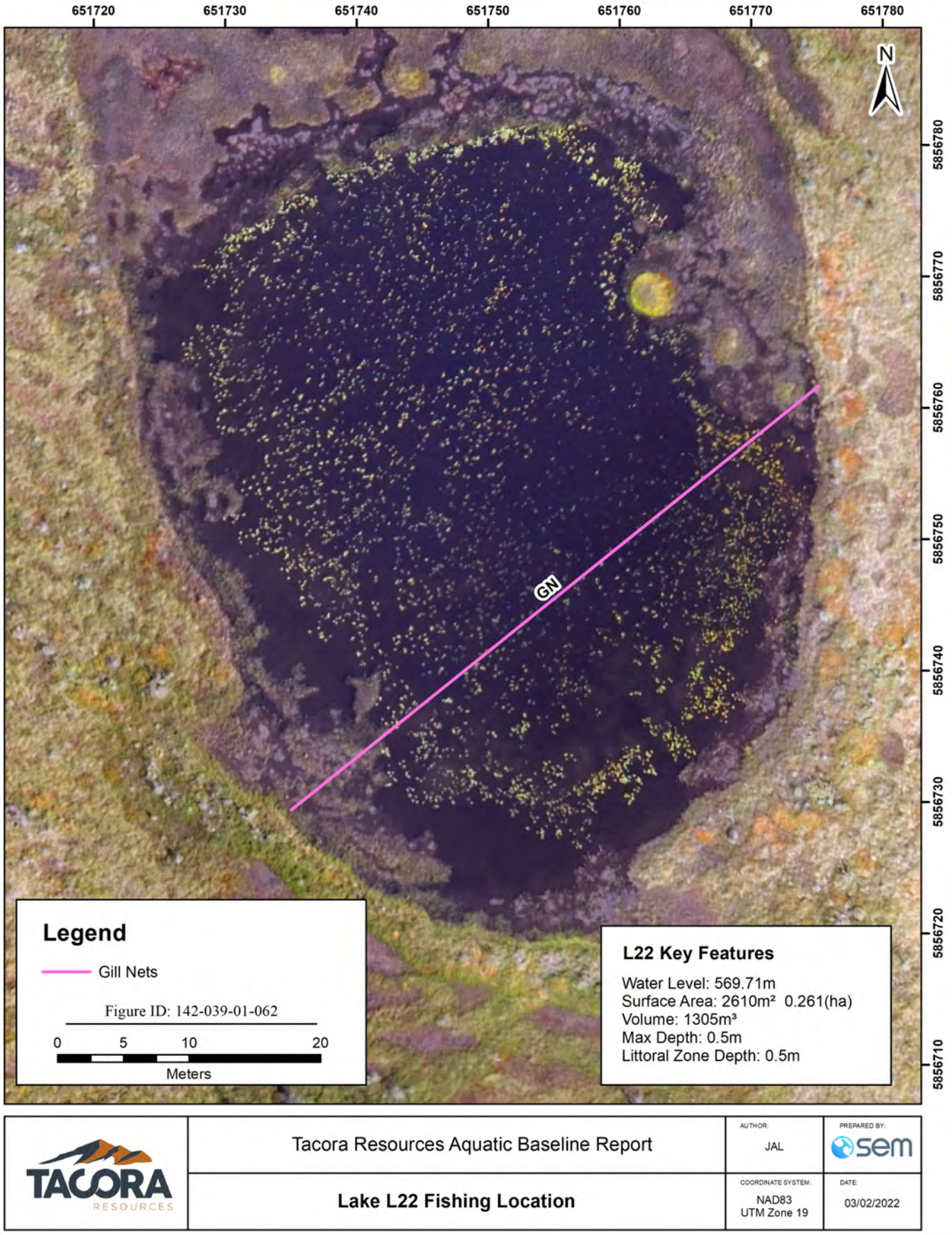


Figure 3.69 Lake L22 Fishing Location.

3.22.2 Lake Habitat Assessment

3.22.2.1 Habitat Mapping

A survey of habitat in Lake L22 identifying substrate and vegetation was conducted on July 7, 2021 (Figure 3.70). The entire lake was composed of littoral zone and due to the shallow characteristics of L22 and the Secchi depth (i.e., 0.5 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.60.

Table 3.60 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L22.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
2,610	1,305	Fine	With vegetation	150
			No vegetation	2,460
			Total	2,610

3.22.3 Benthic Community

Lake L22 benthic macroinvertebrate community had a total abundance of one and taxon richness of one. The density of macroinvertebrates at Lake L22 was 33 individuals/m^2. The only family present in Lake L22 was Pisidiidae (100%).

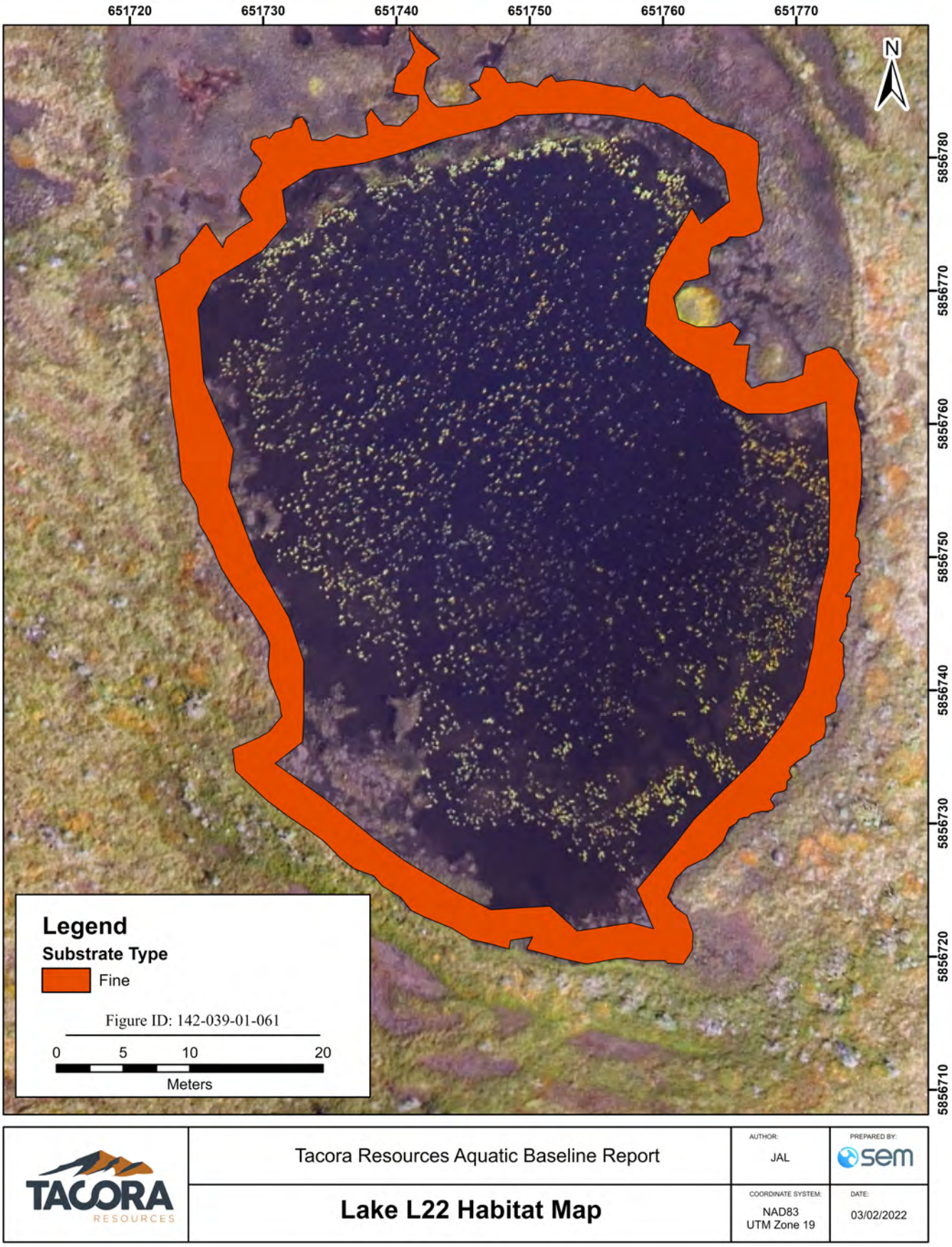


Figure 3.70 Lake L22 Habitat Map.

3.23 Lake L23

3.23.1 General Overview Description

Lake L23 was situated north of the main body of Lake L20 and connected to Lake L20 by an outlet stream flowing east. This was the main and only outlet of L23 and is described in more detail as Stream S15. The lake had gentle sloped shores for most of its perimeter other than some sections of the western side where the water depth underwent a steep drop off near shore. No inlet stream could be identified for Lake L23, however there was a wetland to the southwest that appeared to drain into the lake. ATV/snowmobile and hunting trails were not present near this area and the lake was accessed by portaging on the east side from Lake L20. The shoreline of Lake L23 consisted mainly of mature black spruce intermixed with some sections of alder, with wetland primarily present at the north and south ends. Lake substrate contained little variety of substrate types with mobile organics covering most of the lake bottom with some large boulders present. These boulders were only present near the shore extending to approximately 8 meters, beyond which the deeper areas contained predominantly fines. The location of fishing nets and where the other various data and samples were collected are provided in Figure 3.71. Fish were sampled using fyke nets (n=8), minnow traps (n=6) and gill net (n=1).

3.23.2 Lake Habitat Assessment

3.23.2.1 Bathymetry

Bathymetric studies were completed on Lake L23 on July 9, 2021, using sonar and GPS. Transects were spaced approximately 40 m apart and oriented in an east-west direction. A total of 23 transect lines were processed to generate a detailed bathymetric map for the lake (Figure 3.71). The surface area of the lake was 130,248 m^2 and the lake volume was 105,992 m^3. The western shoreline of the lake was the deepest, where there was a trench measuring 2.6 m deep. There were areas mainly located in the southern half of the lake that measured between 1 and 2 m depth, however a large portion of the lake was less than 1 m in depth.

3.23.2.2 Habitat Mapping

A survey of habitat in Lake L23 identifying substrate and vegetation was conducted on July 2, 2021 (Figure 3.72). The entire lake was composed of littoral zone and due to the shallow characteristics of L23 and the Secchi depth (i.e., 2.6 m), no profundal zone existed. The lake habitat further from the shoreline (i.e., interior of the colored sections) was composed of fines. The shoreline survey of L23 identified the substrate classes coarse and fine. The majority of the lake substrate was fines, comprising 93% of the total littoral zone, while coarse comprised 7% of the total. Basin characteristics (i.e., area, volume) and area of each substrate class are provided in Table 3.61.

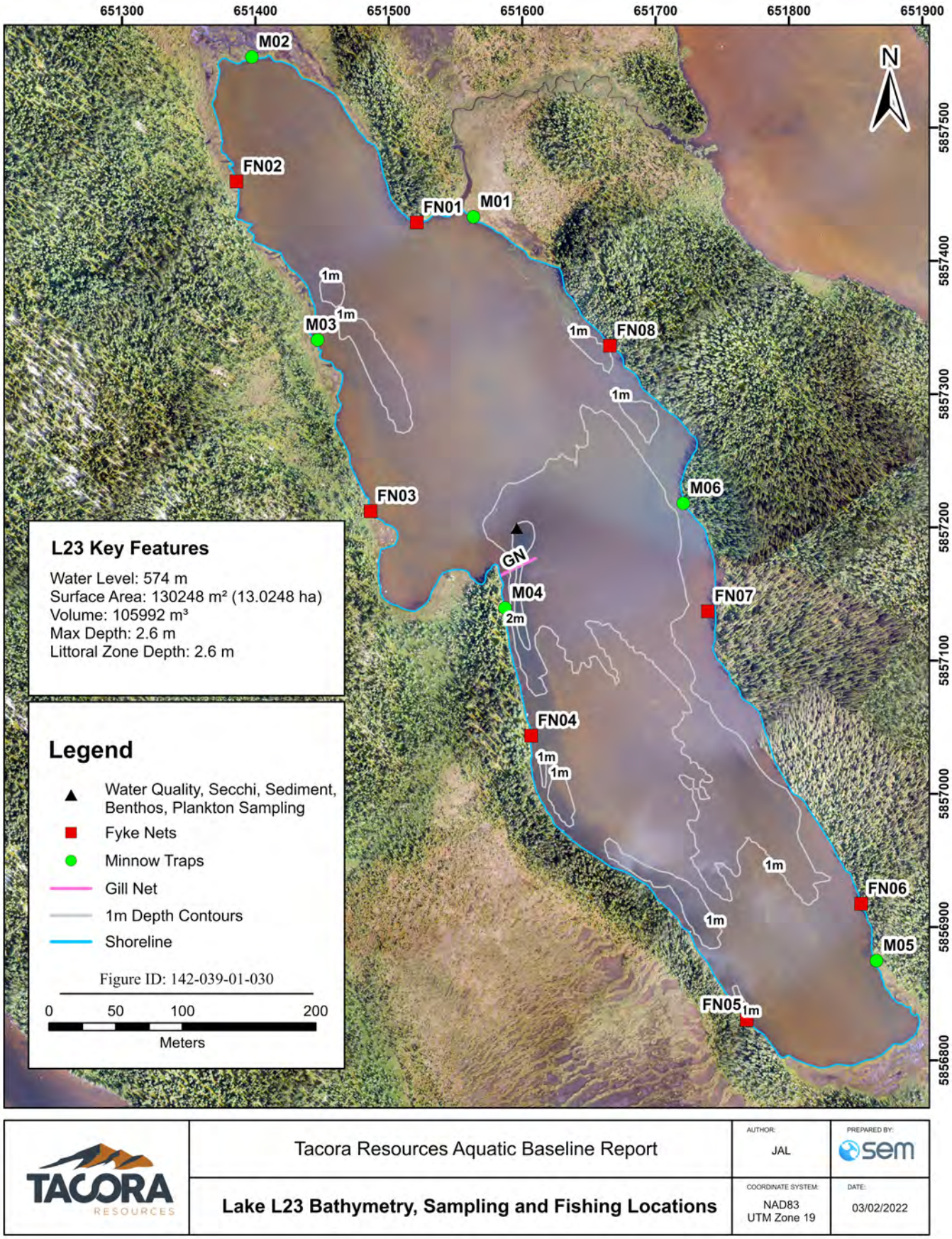


Figure 3.71 Lake L23 Bathymetry, Sampling and Fishing Locations.

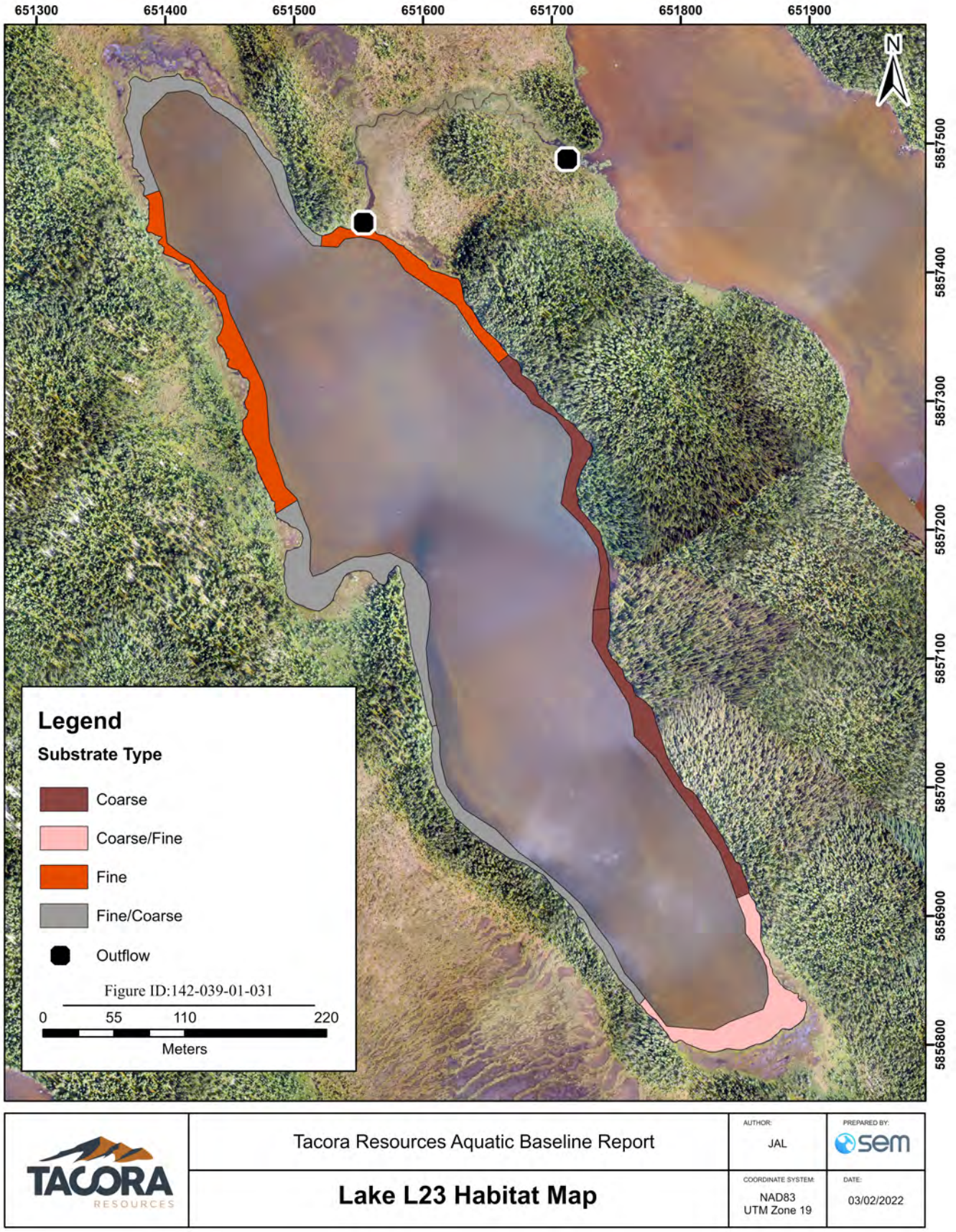


Figure 3.72 Lake L23 Habitat Map.

Table 3.61 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L23.

Basin Area (m^2)	Basin Volume (m^3)	Habitat Type		Total Habitat Area (m^2)
		Substrate	Vegetation	
130,248	105,992	Fine	With vegetation	285
			No vegetation	120,248
		Coarse	With vegetation	15
			No vegetation	9,700
			Total	130,248

3.23.3 Lake L23 Water Quality

The water quality data for Lake L23 is provided in Appendix C. Most metals in Lake L23 were below detection limits, while aluminum, barium, cadmium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Phosphorus and lead were undetected. This lake had pH near neutral, low alkalinity, conductivity and turbidity, with undetected levels of nitrite, and dissolved chloride. Chlorophyll 'a', as an indicator of primary productivity, measured 1.86 µg/L (Appendix C).

Field water quality parameters were measured at two depths in Lake L23 (i.e., 1 and 1.9 m) and are provided in Appendix C. There was no temperature difference between 1 m and 1.9 m (measured 16°C). Dissolved oxygen showed a decrease at 1.9 m (8.12 mg/L or 83.0% saturation) from 1 m (to 8.34 mg/L or 86.0% saturation). pH, conductivity, and ORP levels were comparable and ranged from 7.66 (at 1 m) to 7.81 (at 1.9 m), 62.5 (at 1 m) to 84.0 µS/cm (at 1.9 m), and 59.0 (at 1 m) to 63.0 mV (at 1.9 m), respectively (Appendix C).

3.23.4 Lake L23 Sediment Quality

The sediment quality data for Lake L23 is provided in Appendix C. Many metals were detected in the sediment while antimony, arsenic, beryllium, bismuth, boron, cadmium, mercury, rubidium, silver, and tin were undetected. Iron was very high and measured 40,000 mg/kg. Total organic carbon in the sediment of Lake L23 measured 110 g/kg. The sediment particle size was mainly clay (38%), with some silt (35%) and lesser amounts of sand (27%; Appendix C).

3.23.5 Lake L23 Fish Population Assessment

3.23.5.1 Fish Community

The fish community in Lake L23 was primarily composed of white sucker (93.8%), while northern pike (3.4%) and burbot (2.8%) were prevalent to a lesser extent (Figure 3.73).

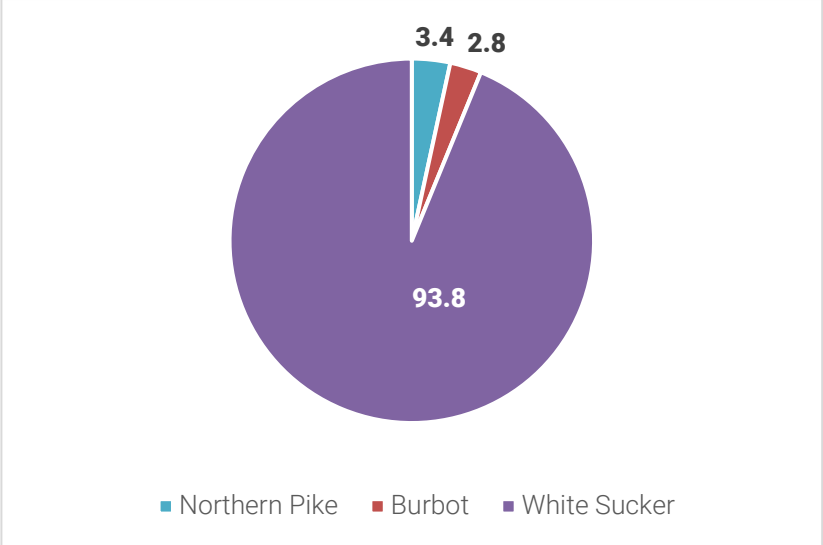


Figure 3.73 Fish Community Composition (% Abundance) for Lake L23.

3.23.5.2 Fishing Effort and Catch

Fishing of Lake L23 was conducted using fyke nets, minnow traps and a gill net. Sampling locations were provided in Figure 3.71. A summary of fishing effort, fish catches and CPUE is provided in Table 3.62. Fyke netting was conducted July 1-6, 2021, with eight nets set on July 1. The total net nights fished was 34, ranging from two to eight nets per night (averaged six nets per night). Not all nets captured fish each night, and the number of nets capturing fish ranged from two to four nets each night, averaging three nets. Three fish species were captured: white sucker (n=166), burbot (n=5) and northern pike (n=3). CPUE for white sucker ranged from 1.0 to 11.3 to fish/net night (averaged 4.9 fish/net). Minnow traps were also placed near fyke nets for the duration of fyke net fishing and captured no fish. Gill netting of L23 was completed on July 2 and captured one northern pike (Table 3.62).

3.23.5.3 Characteristics of the Fish Population

The length, weight and condition factor for fish captured in Lake L23 are summarized in Table 3.63. The length of white sucker ranged from 160 to 380 mm and averaged 268.5 mm (std. dev. = ± 49.9). White sucker weight ranged from 48 to 740 g, averaging 282.0 g (std. dev. = ± 161.8). Condition factor for white sucker captured in L23 ranged from 0.9 to 1.4, averaging 1.3 (std. dev. = ± 0.1). The length of northern pike ranged from 140 to 325 mm (mean = 210.2 mm), while burbot had a length range of 165 – 230 mm (mean = 198.0 mm). Northern pike weight ranged from 16.0 to 202 g (mean = 102.5 g), while burbot weight showed a range of 27 to 52 g (mean = 42 g). Northern pike had a condition factor of 0.7 (Table 3.63).

Table 3.62 Summary of Fishing Effort, Fish Catches, and Catch per Unit of Effort for Fyke Netting of Lake L23.

Set Date	Haul Date	No. Of Nets[1]	Net/Trap Nights/Hours	Burbot	White Sucker	Northern Pike	CPUE[2]		
				Total	Total	Total	Burbot	White Sucker	Northern Pike
Fyke Nets									
Jul. 1	Jul. 2	8(3)	8	2	90	0	0.3	11.3	0.0
Jul. 2	Jul. 3	2(2)	2	0	2	0	0.0	1.0	0.0
Jul. 3	Jul. 6	8(4)	24	3	74	3	0.1	3.1	0.1
Totals			34	5	166	3	0.1	4.9	0.1
Minnow Traps									
Jul. 1	Jul. 2	6(0)	6	0	0	0	0	0	0
Jul. 2	Jul. 3	6(0)	6	0	0	0	0	0	0
Jul. 3	Jul. 6	6(0)	18	0	0	0	0	0	0
Totals			30	0	0	0	0	0	0
Gill Net									
Jul. 2	Jul. 2	2(1)	4	0	0	1	0	0.0	0.3

[1] Number of nets that caught fish are in brackets.
[2] Catch per Unit of Effort (CPUE), fish per net night for fyke nets and minnow traps. Fish per hour for gill nets.

Table 3.63 Summary of Meristic Data for Fish Caught in Lake L23.

Species	Parameter	Mean	Minimum	Maximum	Std. Dev.
Northern pike	Length (mm)	210.2	140.0	325.0	77.0
	Weight (g)	102.5	16.0	202.0	78.0
	Condition (K)	0.7	0.65	0.68	0.01
Burbot	Length (mm)	198.0	165.0	230.0	21.6
	Weight (g)	42.0	27.0	52.0	10.1
White sucker	Length (mm)	268.5	160.0	380.0	49.9
	Weight (g)	282.0	48.0	740.0	161.8
	Condition (K)	1.3	0.9	1.4	0.1

3.23.6 Phytoplankton

A phytoplankton sample was collected at one station in Lake L23 on July 9, 2021 (Figure 3.71). The phytoplankton biomass was determined for each of three size fractions (<10, 10-30, >30 µm, Appendix C). Phytoplankton biomass in Lake L23 was 564 mg/m^3 and the <10 µm and 10-30 µm size class were co-dominant with a biomass of 285 and 279 mg/m^3, respectively. The > 30 µm size class was absent.

3.23.7 Zooplankton

A zooplankton sample was collected at one station in Lake L23 on July 22, 2021 (Figure 3.71). The zooplankton biomass data were analyzed in three functional/taxonomic categories as follows: Copepods,

Cladocerans, and Rotifers. A summary of zooplankton biomass, by major taxonomic group and dominant organisms in each group, is provided in Appendix C. Zooplankton biomass (mg/m^3) for each major taxonomic group of Copepods, Cladocerans, and Rotifers were 148.04, 20.37 and 0.71 respectively, and total biomass was 169.12 mg/m^3. Calanoids were the largest group at 141.70 mg/m^3 followed by *Daphnia* at 17.61 mg/m^3. Copepods were the dominant taxonomic group.

3.24 Lake L24

3.24.1 General Overview Description

Lake L24 was a small lake situated north of the right arm of Lake L20 and east of Lake L18. This lake was not connected to any nearby water bodies by streams and during the survey of the area no inlet or outlet streams could be identified. The water level of this lake dropped off to near maximum depth at the shoreline. ATV/snowmobile and hunting trails were not present in this area and the lake was accessed via a short walk from Lake L20. The shoreline of Lake L24 consisted entirely of wetland, other than a few small black spruce trees that were sparsely present. Lake substrate contained no variation and instead was completely composed of mobile organics. The location of the fishing net is provided in Figure 3.74. Lake L24 was sampled using a gill net (n=1) set from end to end across the pond to determine presence or absence of fish. There were no fish present in Lake L24 and as such further assessment of the fish habitat was not completed.

3.24.2 Lake Habitat Assessment

3.24.2.1 Habitat Mapping

A survey of habitat in Lake L24 identifying substrate and vegetation was conducted on August 22, 2021 (Figure 3.75). The entire lake was composed of littoral zone and due to the shallow characteristics of L24 and the Secchi depth (i.e., 0.5 m), no profundal zone existed. The lake habitat away from the shoreline (i.e., interior of the colored sections) and at the shoreline was composed of 100% fines. Basin characteristics (i.e., area, volume) and area of fines with and without vegetation are provided in Table 3.64.

Table 3.64 Basin Characteristics and Substrate Composition of the Littoral Zone in Lake L24.

Basin Area (m²)	Basin Volume (m³)	Habitat Type		Total Habitat Area (m²)
		Substrate	Vegetation	
2,061	1,031	Fine	With vegetation	31
			No vegetation	2,030
			Total	2,061

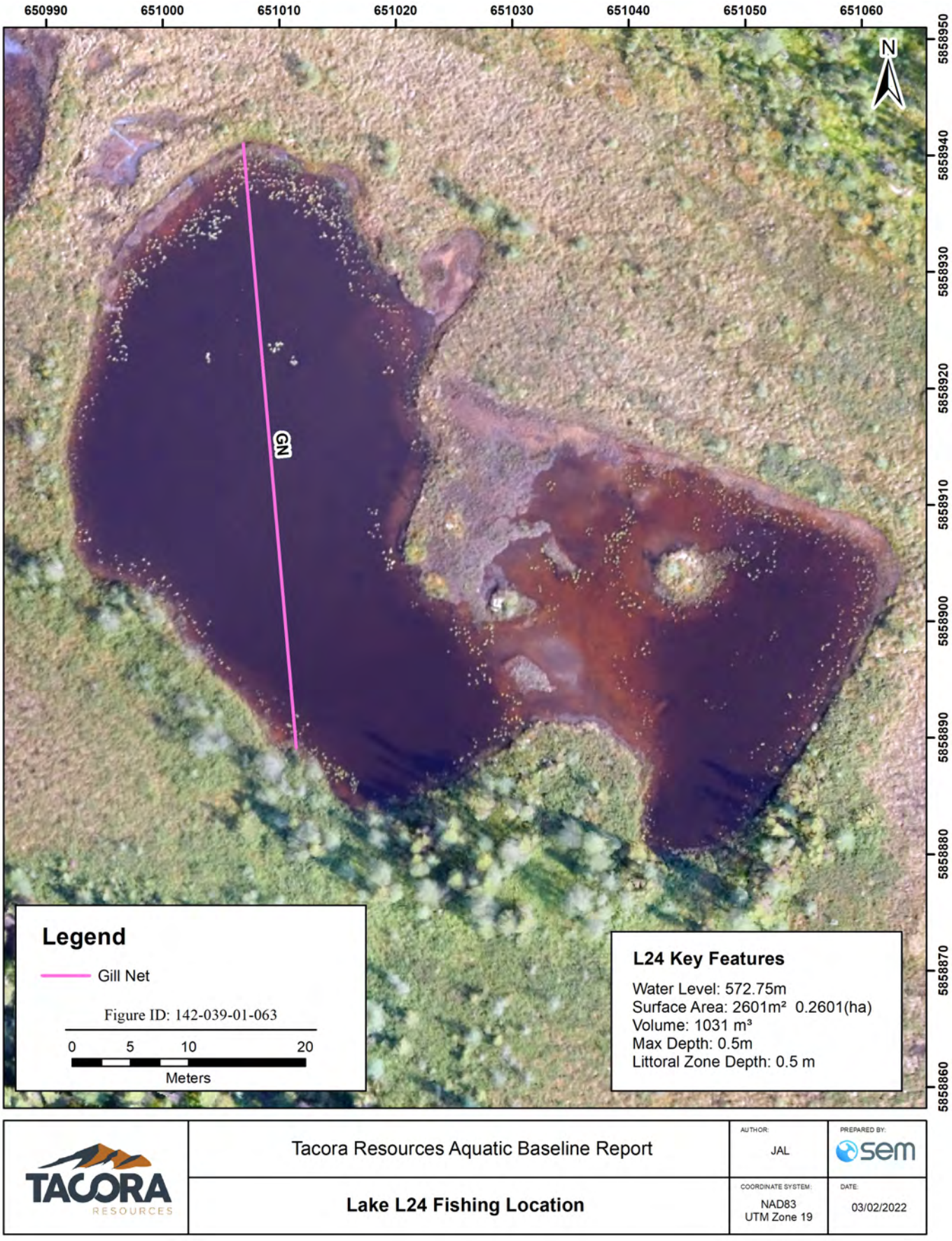


Figure 3.74 Lake L24 Fishing Location.

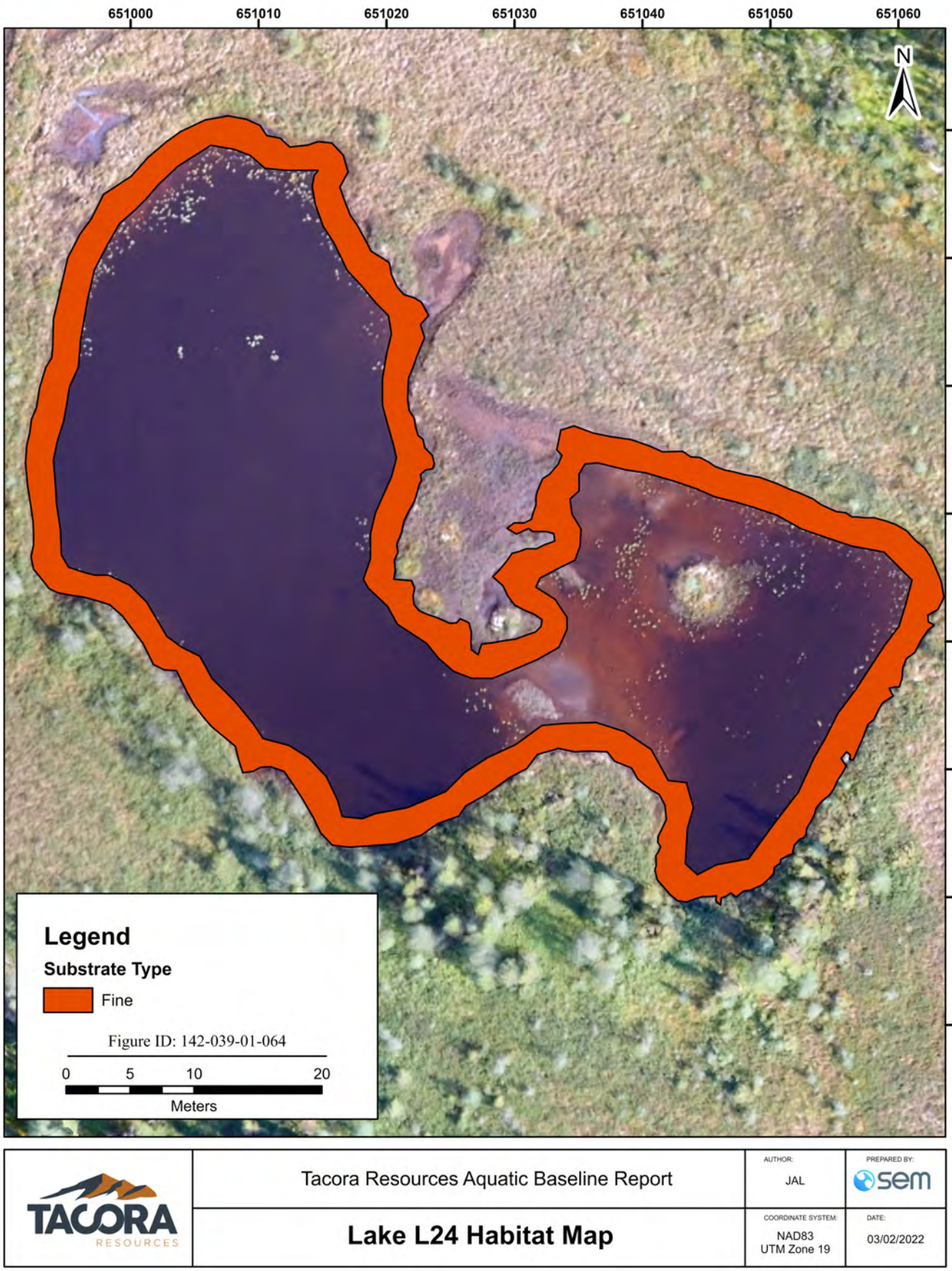


Figure 3.75 Lake L24 Habitat Map.

4.0 Stream Survey Results

4.1 Stream S1

4.1.1 General Overview Description

Stream S1 was approximately 4 km long and flowed from a higher elevation wetland into the eastern side of Flora South Basin. This stream contained diverse habitats throughout with varying shape, velocity and vegetation. The stream transitioned from riffle/run habitat with hard bottom near the flow into Flora South Basin to a winding, slow velocity, organic bottomed stream through the wetland. Stream S1 was fed from wetland runoff and drainage. The origin of this stream was difficult to identify since there was no obvious headwater. Evidence indicated that as the wetlands surrounding Stream S1 transitioned back and forth from saturated to dryer states, and the stream reflected this and shortened when dry and increased in length to channel additional water during wetter periods. Dried up trenches were visible indicating past flowing sections. The only access noted to the stream was via boat from Flora South Basin. No trails were noted nearby such as the ATV or hunting trails. It is possible there was snowmobile traffic in the area during the winter months as there was a snowmobile trail observed on the northeastern side of Lake L18 nearby. A map showing the various sections surveyed with representative photos of Stream S1 is provided in Figure 4.1.

4.1.2 Stream Habitat Assessment

A habitat survey of Stream S1 was completed on August 21 and August 23, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. Stream S1 sections were between 1.4 and 3.4 m wide and between 100 and 1,001 m in length and averaged 2.6 m width and 382 m length. The stream total length was 3,825 m (Table 4.1). The mean habitat type was comprised primarily of runs and steadies, followed by riffles and pools (39.5, 39, 20.5 and 1%, respectively).

The mean substrate type was composed primarily of muck or clay (45.5%) and rubble (26.8%), with some cobble and boulder (14 and 11.2%, respectively; Table 4.2). Small amounts of sand and gravel were also present (1.5 and 1%, respectively). Mean overhanging cover was predominant (33%) with some instream cover (15%), and small proportions of canopy cover (3%). No eroding banks were observed with the exception of section 8 (<5% on each side), while undercut banks were more prevalent (ranged from <5 to 70% and averaged 40%, Appendix D).

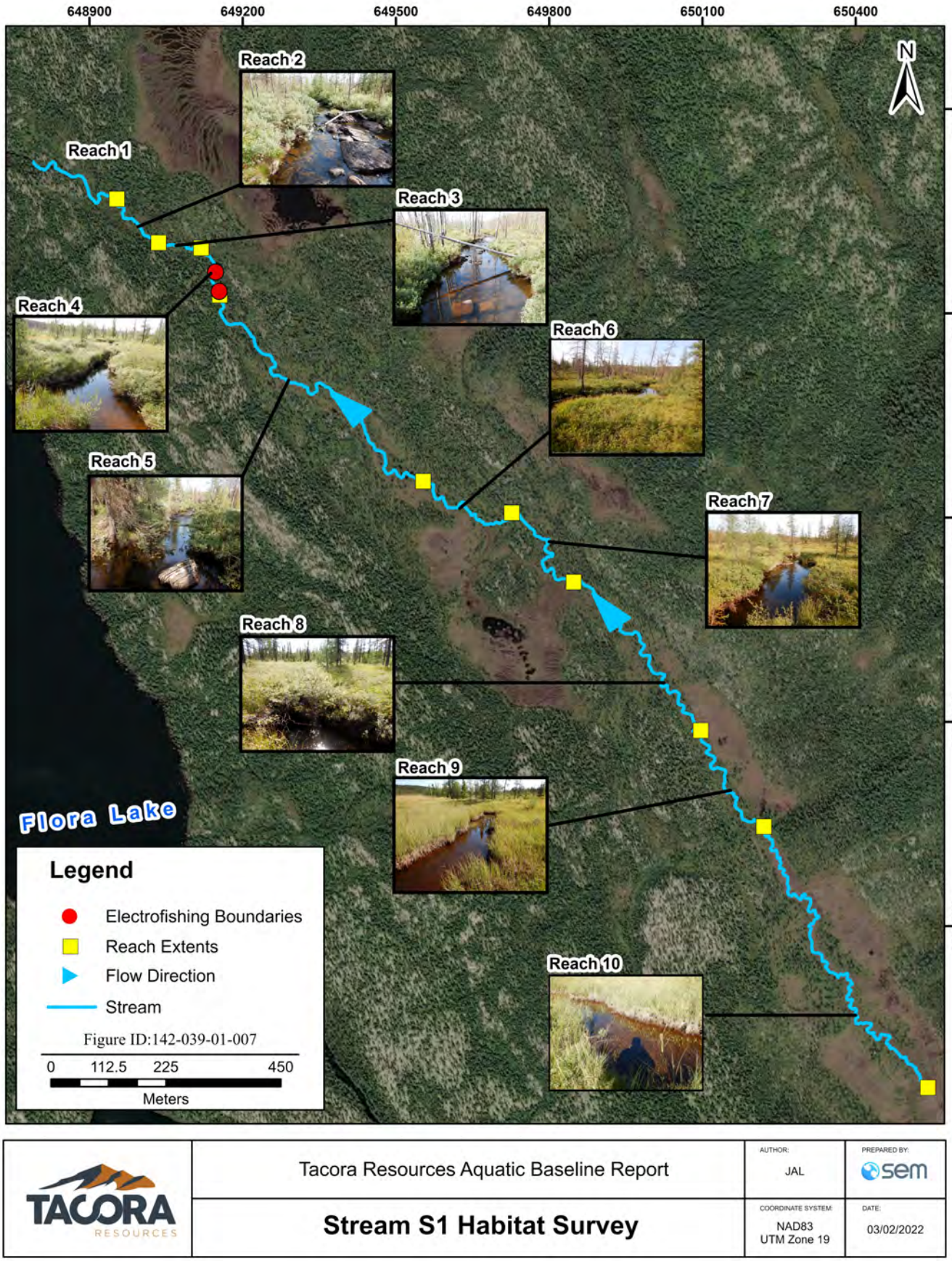


Figure 4.1 Stream S1 Habitat Survey Locations.

Table 4.1 Site Characteristics of Surveyed Sections in Stream S1.

	Start Location		Finish Location		Habitat Type (%)				Habitat Dimensions		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	(Flora)		5861339	649036	10	90	0	0	261	3.2	703
2	5861339	649036	5861330	649120	50	0	50	0	153	2.9	455
3	5861330	649120	5861236	649156	10	0	90	0	100	2.5	227
4	5861236	649156	5860874	649555	5	90	0	5	117	3.4	241
5	5860874	649555	5860812	649727	10	80	5	5	745	3.1	2,236
6	5860812	649727	5860674	649848	50	30	20	0	283	2.0	670
7	5860674	649848	5860410	650080	60	30	10	0	274	2.1	534
8	5860388	650098	5860197	650222	60	10	30	0	549	2.6	866
9	5860197	650222	5859686	650542	90	10	0	0	342	2.7	413
10	5859686	650542	5859395	650714	50	50	0	0	1,001	1.4	1,147
Mean					39.5	39	20.5	1	382	2.6	749
Total									3,825	25.8	7,492
NAD83 UTM Zone 19											

Table 4.2 Substrate Proportions of Surveyed Sections in Stream S1.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	85	5	5	0	3	2
2	10	0	0	10	60	20
3	5	0	5	10	60	20
4	70	0	0	10	10	10
5	40	0	0	30	25	5
6	15	0	0	30	40	15
7	20	0	0	20	30	30
8	10	10	0	30	40	10
9	100	0	0	0	0	0
10	100	0	0	0	0	0
Mean	45.5	1.5	1	14	26.8	11.2

4.1.3 Stream Water Quality

The water quality data for Stream S1 is provided in Appendix D. Many metals in Stream S1 were below detection limits, but aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Stream S1 had pH near neutral, low alkalinity, conductivity and turbidity. Nitrogen, nitrate, nitrite, their sum (i.e., nitrate + nitrite), and dissolved chloride were all undetected (Appendix D).

Field water quality data for S1 is provided in Appendix D. The temperature measured 14.7°C, while pH, dissolved oxygen, conductivity and ORP showed values of 8.11, 11.83 mg/L (or 113.6% saturation), 71.3 µS/cm and 82.3 mV, respectively.

4.1.4 Stream Flow

The flow regime for S1 was characterized by a mean discharge of 0.016 m^3/s and average velocity of 0.09 m/s. Depth ranged from 0.06 to 0.12 m (averaged 0.09 m), while velocity had ranges of 0 to 0.14 m/s. Average depth and total width of S1 were 0.09 m and 1.7 m, respectively (Appendix D).

4.1.5 Stream Fish Population Assessment

4.1.5.1 Fishing Effort and Catch

Quantitative electrofishing was performed at one site in Stream S1 on August 21, 2021 (Table 4.3). Coordinates of the two boundaries and details related to the electrofishing site (i.e., width, length, and area) are shown in Table 4.3. Fishing effort (seconds) in each run (sweep) and summary of brook trout catches are provided in Table 4.4. Brook trout were the only species caught in Stream S1. The removal pattern was good with number of fish caught declining from 18 (in the two first runs) to four (in the last two runs).

Table 4.3 Site Characteristics of Electrofishing Site in Stream S1 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
649154	5861243	649147	5861281	2.3	44	101.2
NAD83 UTM Zone 19						

Table 4.4 Summary of Catch and Effort for Electrofishing in Stream S1 in 2021.

Effort (seconds)				Catch (No. of Brook Trout)				
Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Total
183	209	304	223	18	18	4	4	44

4.1.5.2 Fish Meristic Characteristics

The length, weight and condition factor of brook trout captured by electrofishing in Stream S1 are summarized in Table 4.5. Fish ranged in length from 35 to 190 mm (Figure 4.2) and averaged 93.4 mm (std. dev. = ± 36.8) while weight ranged from 3 to 57 g and averaged 14.1 g (std. dev. = ± 11.5). Condition factor of fish ranged from 0.59 to 1.2 and averaged 0.97 (std. dev. = ± 0.12), with 66% of the population having a condition factor equal or greater than 1.0.

Table 4.5 Summary of Brook Trout Meristic Characteristics Captured by Electrofishing in Stream S1 in 2021.

Parameter	Min	Max	Mean	Std. Dev.
Length (mm)	35.0	190.0	93.4	36.8
Weight (g)	3.0	57.0	14.1	11.5
Condition (K)	0.59	1.20	0.97	0.12

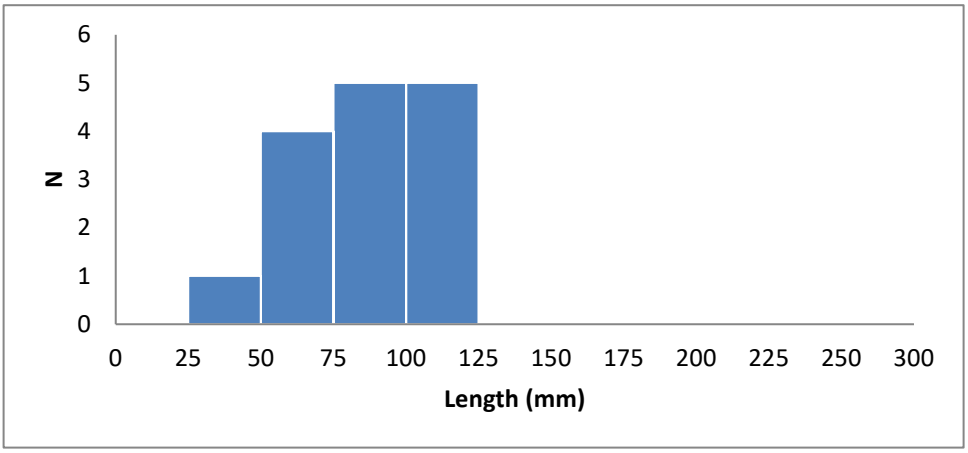


Figure 4.2 Length Frequency Distribution of Brook Trout Captured in Stream S1.

4.1.5.3 Fish Population Estimate

A population estimate was determined for brook trout in Stream S1. Population and biomass estimates the electrofishing site were 48 fish (95% confidence interval of 40-56) and 563.2 g (95% confidence interval of 469.4-657.1), respectively. The population estimate and biomass estimate, adjusted per unit of habitat (100 m^2), were 47 fish (95% confidence interval of 40-55) and 556.5 g (95% confidence interval of 463.8-649.3), respectively (Table 4.6). Field photos can be found in Appendix D.

Table 4.6 Fish Population and Biomass Estimates from Electrofishing of Stream S1 in 2021.

Species	Total Catch	Total Weight (g)	Population Estimate	Lower 95% CI	Upper 95% CI	Biomass Estimate (g)		
						Total weight	Lower 95% CI	Upper 95% CI
Brook trout	Actual Catch							
	44	516.3	48	40	56	563.2	469.4	657.1
	Per Habitat Unit (100 m^2)							
	43	510.2	47	40	55	556.5	463.8	649.3

4.1.6 Benthic Macroinvertebrate Community

Stream S1 exhibited two benthic macroinvertebrates, one Leptophlebiidae (Order: Ephemeroptera) and one Rhyacophilidae (Order: Trichoptera), resulting in a taxon richness of two and density (number of individuals/m^2) of eight. Both organisms identified in the Stream S1 sample consisted of taxonomic groups that are sensitive to environmental stressors, also known as bioindicators. Taxonomic identification results can be found in Appendix D.

4.2 Stream S2

4.2.1 General Overview Description

Stream S2 flowed from a higher elevation wetland west into Stream S1. This stream transitioned from a slow-moving steady to a primarily riffle and run habitat, before slowing back down at the confluence with S1, and maintaining a predominantly hard bottom of rubble, cobble and gravels throughout. This stream was not fed by any large water body but was supplied from wetland runoff and drainage. The origin of this stream was not identified as the stream appeared to extend several kilometers beyond the study area. No trails were noted nearby such as the ATV or hunting trails that were apparent in other areas. A map showing the various sections surveyed with representative photos of Stream S2 is provided in Figure 4.3.

4.2.2 Stream Habitat Assessment

A habitat survey of Stream S2 was completed on August 23, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. Stream S2 sections were between 1.9 and 2.7 m wide and between 83 and 152 m in length and averaged 2.3 m width and 116 m length. The stream total length was 463 m (Table 4.7). The mean habitat type was comprised primarily of riffles (60%), followed by runs (35%) with a small proportion of steadies (5%).

The mean substrate types were composed primarily of rubble (33.8%), with some boulder (21.3%), muck/clay (18.8%) and gravel (12.5%). Small amounts of sand and cobble were also present (7.5 and 6.3%, respectively; Table 4.8). Mean overhanging cover was predominant (100%) with some instream cover (33%), and small proportions of canopy cover (4%). No eroding banks were observed, while undercut banks were more prevalent (ranged from 10 to 95% and averaged 35%; Appendix D).

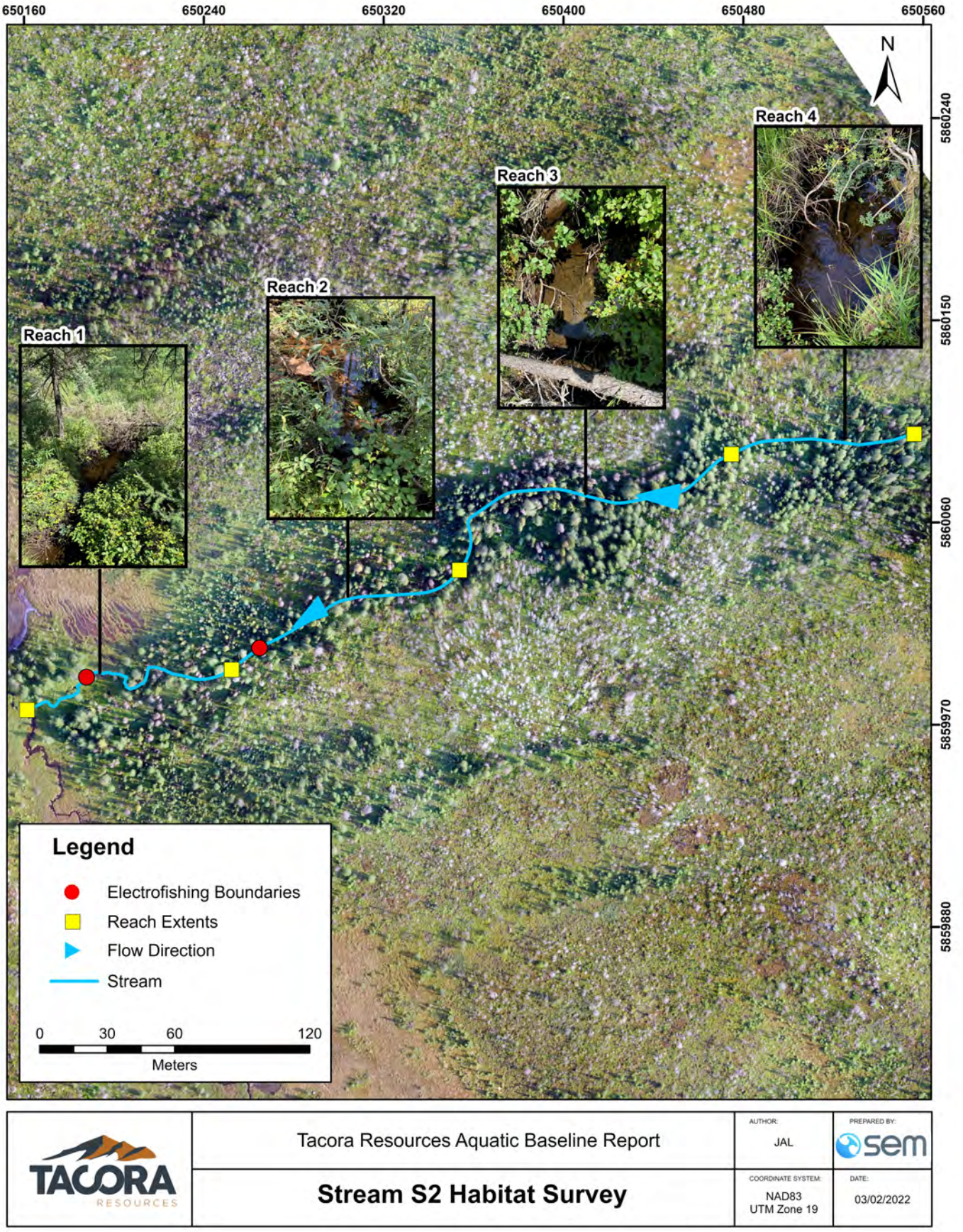


Figure 4.3 Stream S2 Habitat Survey Locations.

Table 4.7 Site Characteristics of Surveyed Sections in Stream S2.

	Start Location		Finish Location		Habitat Type (%)				Habitat Dimensions		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	5860194	650223	5860212	650314	50	0	50	0	114	1.9	202
2	5860212	650314	5860257	650415	0	0	100	0	114	2.7	257
3	5860257	650415	5860308	650536	40	0	60	0	152	2.3	343
4	5860308	650536	5860317	650617	50	20	30	0	83	2.3	241
Mean					35	5	60	0	116	2.3	260
Total									463	9.2	1,043
NAD83 UTM Zone 19											

Table 4.8 Substrate Proportions of Surveyed Sections in Stream S2.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	30	30	10	15	15	0
2	5	0	5	10	40	40
3	15	0	15	0	40	30
4	25	0	20	0	40	15
Mean	18.8	7.5	12.5	6.3	33.8	21.3

4.2.3 Stream Water Quality

The water quality data for Stream S2 is provided in Appendix D. Many metals in Stream S2 were below detection limits, but aluminum, barium, calcium, magnesium, manganese, potassium, sodium, and strontium were detected. This stream had pH near neutral, low alkalinity, conductivity, and turbidity. Nitrogen, nitrite, and dissolved chloride were all undetected (Appendix D).

Field water quality data for S2 is shown in Appendix D. The temperature measured 15.3°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.87, 10.8 mg/L (or 100.1% saturation), 72.3 µS/cm and 71.0 mV, respectively.

4.2.4 Stream Flow

The flow regime for Stream S2 was characterized by a mean discharge of 0.01 m^3/s and average velocity of 0.28 m/s. Depth and velocity ranged from 0 to 0.17 m (averaged 0.10 m) and from 0 to 0.52 m/s (averaged 0.21 m/s), respectively. Average depth and total width of S2 were 0.10 m and 0.6 m, respectively (Appendix D).

4.2.5 Stream Fish Population Assessment

4.2.5.1 Fishing Effort and Catch

Index electrofishing was performed at one site in Stream S2 on August 23, 2021 (Table 4.9). Coordinates of the two boundaries and details related to the electrofishing site (i.e., width, length, and area) are provided in Table 4.9. One run (sweep) was performed, and the fishing effort was 326 seconds. Brook trout was the only species caught in Stream S2.

Table 4.9 Site Characteristics of Electrofishing Site in Stream S2 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
650249	5860209	650326	5860222	1.5	94.1	194.2
NAD83 UTM Zone 19						

4.2.5.2 Fish Meristic Characteristics

The length, weight, and condition factor of brook trout captured by electrofishing in Stream S2 are summarized in Table 4.10. Fish ranged in length from 50 to 130 mm (Figure 4.4) and averaged 102.9 mm (std. dev. = ± 24) while weight ranged from 4 to 24 g and averaged 14.9 g (std. dev. = ± 7.1). Condition factor of fish ranged from 0.90 to 1.22 and averaged 1.06 (std. dev. = ± 0.11), with 64% of the population having a condition factor equal or greater than 1.0. The total number of fish caught in S2 was 14 and total biomass was 209 g.

Table 4.10 Summary of Brook Trout Meristic Characteristics Captured by Electrofishing in Stream S2 in 2021.

Parameter	Min	Max	Mean	Std. Dev.
Length (mm)	50	130	102.9	24
Weight (g)	4	24	14.9	7.1
Condition (K)	0.90	1.22	1.06	0.11

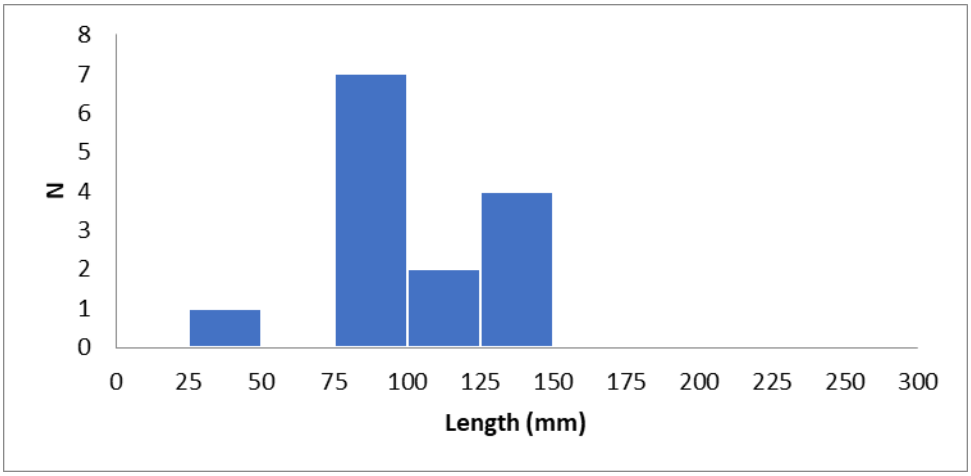


Figure 4.4 Length Frequency Distribution of Brook Trout Captured in Stream S2.

4.2.6 Benthic Macroinvertebrate Community

Stream S2 sample exhibited three benthic macroinvertebrates of the same family, Cholorperlidae (Order: Plecoptera) resulting in a taxon richness of one and density of 12 individuals/m^2 (Appendix D). Cholorperlidae are commonly known as "green stoneflies", omnivorous aquatic organisms that indicate good water quality and are found in rocky riverine habitats. Green stoneflies are commonly used as bait by anglers as they are an excellent food source for salmonids.

4.3 Stream S3

4.3.1 General Overview Description

Stream S3 flowed from Lake L3 into Flora South Basin. The stream was dammed at the outlet of Lake L3 that likely created a barrier to fish movement, however fish were abundant in this stream. This stream contained productive and consistent habitat throughout with varying shape and velocity. The stream had many riffles and runs with varying amounts of gravels, sands, and cobble making up the substrate. Stream S3 was shaded approximately 30% when the sun was at its highest due mainly to the mature trees throughout the area. There were also areas of alders and small trees along the banks in certain sections, which provided more complete cover of the stream. The only access noted to the stream was via boat from Flora South Basin. No trails were noted nearby such as the ATV or hunting trails that were apparent in other areas, however with the trail to Lake L3, it was only a short walk to the stream. A map showing the various sections surveyed with representative photos of Stream S3 is provided in Figure 4.5.

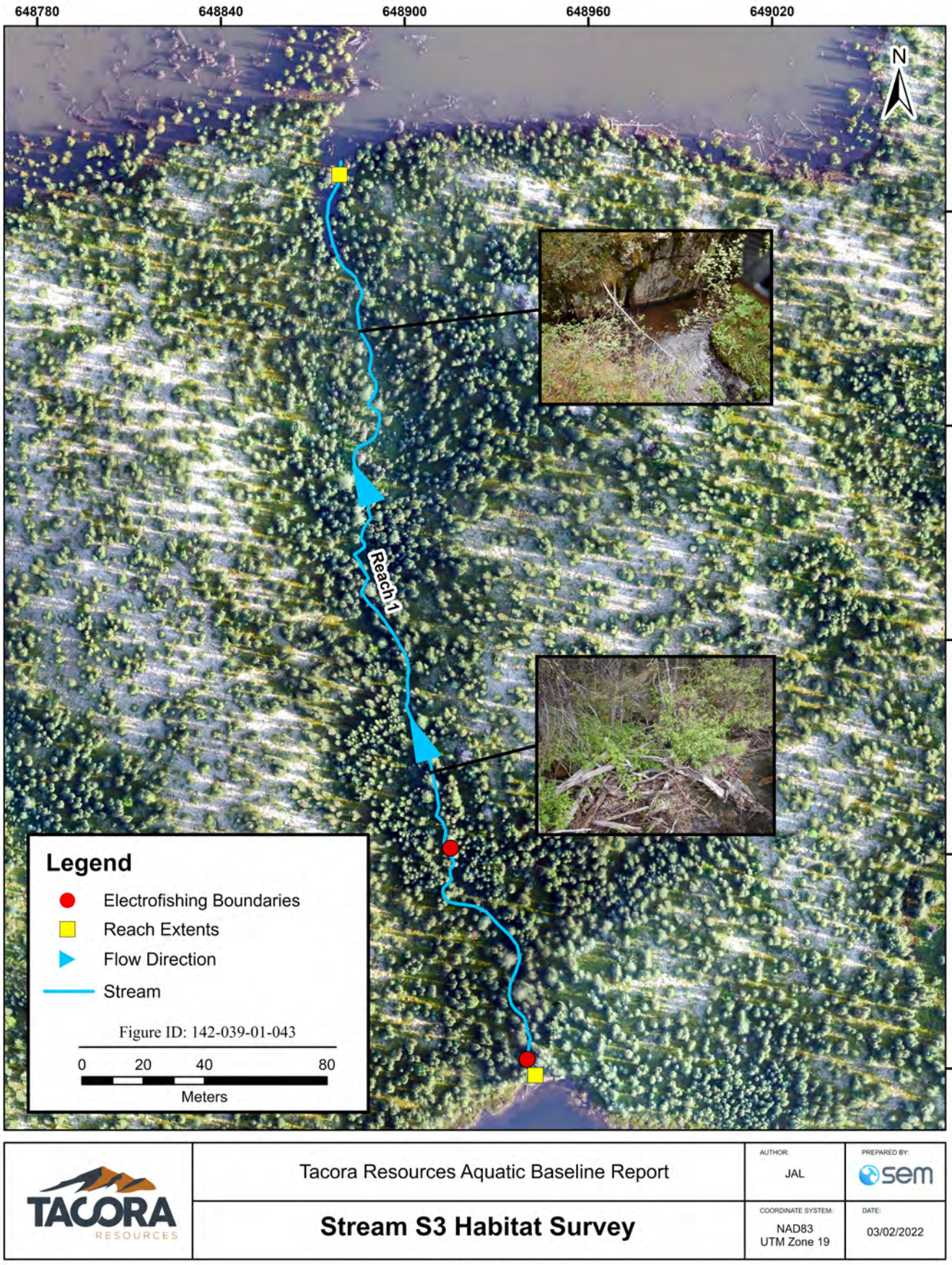


Figure 4.5 Stream S3 Habitat Survey Locations.

4.3.2 Stream Habitat Assessment

A habitat survey of Stream S3 was completed on June 21, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. The surveyed section of S3 was 2.5 m wide and 329 m in length (Table 4.11). The habitat was comprised primarily of riffles and runs (80% and 20%, respectively), with no steady or pool mesohabitat present.

The substrate was composed primarily of gravel (35%) and rubble (30%), with some cobble and sand (20% and 10%, respectively; Table 4.12). Small amounts of muck/clay were also present (5%). Overhanging cover was predominant (50%) with some canopy cover (30%), and small proportions of instream cover (10%). Small amounts of eroding banks were observed (5%), while undercut banks were slightly more prevalent (10%; Appendix D)

Table 4.11 Site Characteristics of Surveyed Sections in Stream S3.

		Start Location		Finish Location		Habitat Type (%)				Habitat Size		
Stream ID	Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
S3	1	5859950	648879	5859681	648952	20	0	80	0	329	2.5	884
NAD83 UTM Zone 19												

Table 4.12 Substrate Proportions of Surveyed Sections in Stream S3.

Stream ID	Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
S3	1	5	10	35	20	30	0

4.3.3 Stream Water Quality

The water quality data including metals, inorganics, calculated parameters, and chlorophyll 'a' for Stream S3 are provided in Appendix D. Many metals in S3 were below detection limits, and aluminum, barium, calcium, iron, magnesium, manganese, molybdenum, potassium, sodium, and strontium were detected. This stream had pH near neutral, and low alkalinity, conductivity, and turbidity. Nitrogen, nitrate, nitrite, and dissolved chloride were all undetected.

Field water quality data for S3 is provided in Appendix D. The temperature measured 16.7°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.42, 8.5 mg/L (or 87.4% saturation), 82.6 µS/cm and 46.6 mV, respectively.

4.3.4 Stream Flow

The flow regime for S3 was characterized by a mean discharge of 0.01 m^3/s and average velocity of 0.08 m/s. Depth and velocity ranged from 0.06 to 0.14 m and 0.04 to 0.18 m/s, respectively. Stream width remained constant at 0.30 m. Average depth and total width of S3 were 0.11 and 1.52 m, respectively (Appendix D).

4.3.5 Stream Fish Population Assessment

4.3.5.1 Fishing Effort and Catch

Quantitative electrofishing was performed at one survey site in Stream S3 on July 30, 2021. Coordinates of the two boundaries and details related to the electrofishing site (i.e., width, length, and area) are shown in Table 4.13. The number of runs (sweeps) and the fishing effort is provided in Table 4.14. Brook trout were the dominant species in Stream S3, with low catch rates for other species (i.e., white sucker, longnose dace and burbot). The removal rate was favourable for population estimates with number of fish caught declining from 85 (in the first run) to eight (in the last run) for brook trout and from three (in the first run) to zero (in the last two runs) for white sucker.

Table 4.13 Site Characteristics of Electrofishing Site in Stream S3 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
648940	5859683	648915	5859752	1.1	90	102
NAD83 UTM Zone 19						

Table 4.14 Summary of Catch and Effort for Electrofishing in Stream S3 in 2021.

Effort (seconds)				Catch (No. of Brook Trout)				
Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Total
1,281	860	574	576	85	34	22	8	149
Effort (seconds)				Catch (No. of White Sucker)				
Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Total
1,281	860	574	576	3	2	0	0	5

4.3.5.2 Fish Meristic Characteristics

The length, weight, and condition factor of fish captured by electrofishing in Stream S3 are summarized in Table 4.15. Brook trout ranged in length from 60.0 to 130.0 mm (Figure 4.6) and averaged 86 mm (std. dev. = ± 23.6) while weight ranged from 1.6 to 24.0 g and averaged 7.2 g (std. dev. = ± 6.3). Condition factor of brook trout ranged from 0.72 to 1.21 and averaged 0.85 (std. dev. = ± 0.16).

Table 4.15 Summary of Fish Meristic Characteristics Captured by Electrofishing in Stream S3 in 2021.

Species	Parameter	Mean	Min	Max	Std. Dev.
Brook trout	Length (mm)	86	60.0	130.0	23.6
	Weight (g)	7.2	1.6	24.0	6.3
	Condition (K)	0.85	0.72	1.21	0.16
White sucker	Length (mm)	68	62.0	77.0	6.0
	Weight (g)	3.1	2.6	4.0	0.5
	Condition (K)	1.01	0.84	1.11	0.14

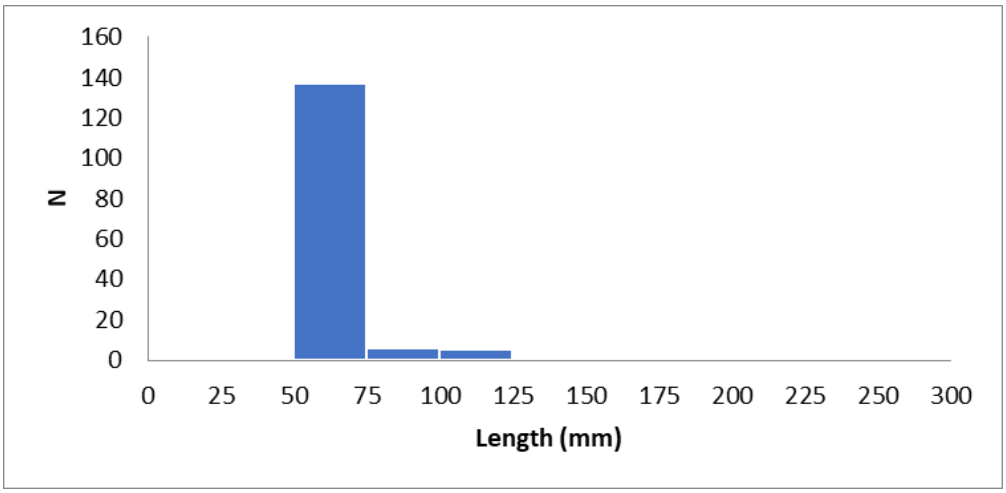


Figure 4.6 Length Frequency Distribution of Brook Trout Captured in Stream S3.

Captured YoY brook trout length ranged from 57.0 to 65 mm, averaging 63 mm (std. dev. = ± 3.5). YoY brook trout weight ranged from 1.3 to 2.1 g, averaging 63 g (std. dev. = ± 0.3). White sucker ranged in length from 62.0 to 77.0 mm and averaged 68 mm (std. dev. = ± 6.0) while weight ranged from 2.6 g to 4.0 g and averaged 3.1 g (std. dev. = ± 0.5). Condition factor for white sucker ranged from 0.84 to 1.11 and averaged 1.01 (std. dev. = ± 0.14; Table 4.15), with 60% of the population having a condition factor equal to or greater than 1.0. One burbot was captured with a length of 55 mm and weight of 1.14 g while one longnose dace had a length of 3 mm and weight of 73 g.

4.3.5.3 Fish Population Estimate

Population estimates were determined for brook trout and all fish species combined in Stream S3. Brook trout population and biomass estimates in the electrofishing site were 156 fish (95% confidence interval of 148-164) and 407.6 g (95% confidence interval of 382.0-423.3), respectively. The brook trout population estimate and biomass estimate, adjusted per unit of habitat (100 m^2), was 153 fish (95% confidence interval of 145-161) and 399.6 g (95% confidence interval of 374.5-415.0), respectively (Table 4.16).

A population estimate for all species combined in Stream S3 was 163 fish (95% confidence interval of 155-171) and the biomass estimate was 422.9 g (95% confidence interval of 401.9-443.4; Table 4.16). The population estimate and biomass estimate, adjusted per unit of habitat (100 m^2), were 160 fish (95% confidence interval of 152-168) and 414.6 g (95% confidence interval of 394.0-434.7), respectively (Table 4.16).

Table 4.16 Fish Population and Biomass Estimates from Electrofishing of Stream S3 in 2021.

Species	Total Catch	Total Weight (g)	Population Estimate	Lower 95% CI	Upper 95% CI	Biomass Estimate (g)		
						Total Weight	Lower 95% CI	Upper 95% CI
Brook trout	Actual Catch							
	149	384.6	156	148	164	407.6	382.0	423.3
	Per Habitat Unit (100 m^2)							
	146	377.1	153	145	161	399.6	374.5	415.0
All species	Actual Catch							
	156	404.5	163	155	171	422.9	401.9	443.4
	Per Habitat Unit (100 m^2)							
	153	396.6	160	152	168	414.6	394.0	434.7

4.3.6 Benthic Macroinvertebrate Community

Stream S3 had a total abundance of 119 benthic macroinvertebrate organisms, the highest abundance (on average 22 times higher) compared to all stream sites. The sample was also characterized by the highest level of taxon richness (eight) and density (476 individuals/m^2). The dominant family found in Stream S3 was Pisidiidae (Order: Pelecypoda) representing 89% of the individual organisms identified in the sample (Appendix D). The remaining consisted of Rhyacophilidae (6%), Elmidae (1%), Tipulidae (1%), Simuliidae (1%), Chironomidae (1%) and Hyalellidae (1%). Pisidiidae are a type of freshwater mussel that typically reside in sandy aquatic meso-habitats that are conducive to their life cycle requirements. If found within a riverine habitat, it is likely that they will target low flow areas that have suspended detritus and organic matter to feed on without being smothered. Other dominant benthic macroinvertebrates presented in Stream S3 consisted of seven Rhyacophilids, three of which were in pupa form and four in larval form. Stream S3 also had the highest abundance of Rhyacophilids and Pisidiidae compared to all other streams.

4.4 Stream S4

4.4.1 General Overview Description

Stream S4 flowed from Lake L16 into Lake L3. Prior to surveying it was believed that this stream also had a tributary originating from Lake L5, however this section was not located *in situ* and may only exist during conditions of spring freshet. The stream began as a brief slow steady at the outlet of Lake L7, before

transitioning to a narrow fast flowing riffle down a small valley where it then transitioned back to a gravel bottom run through a wetland. Due to the small size and depth this stream was not conducive to electrofishing, however one sweep of index electrofishing was conducted and one sculpin was observed during the survey. The stream had many riffles and runs with varying amounts of gravels, sands, and cobble making up the bottom and a short rapid or near cascade section near its center. Stream S4 had very shaded sections through mature trees and alder beds as well as completely unprotected areas through wetland. Access to this stream was particularly easy as a cabin access trail crossed it via a man-made wooden bridge. A map showing the various sections surveyed with representative photos of Stream S4 is provided in Figure 4.7.

4.4.2 Stream Habitat Assessment

A habitat survey of Stream S4 was completed on August 12, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. The S4 section was 1.1 m wide and 90 m in length (Table 4.17). The habitat was comprised primarily of riffles and runs (averaging 80% and 10% respectively), with small amounts of steadies and rapids (averaging 5% each) and no pools present.

The substrate was composed primarily of rubble (averaging 40%), with small amounts of cobble, gravel, sand, and muck/clay (mean of 15% each; Table 4.18). Canopy cover was slightly predominant (averaging 10%) with some overhanging cover (averaging 5%). No eroding banks were observed, while undercut banks were slightly prevalent (averaged 10%; Appendix D).

Table 4.17 Site Characteristics of Surveyed Sections in Stream S4.

		Start Location		Finish Location		Habitat Type (%)				Habitat Size		
Stream ID	Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
S4	1	5858911	649262	5859269	649188	10	5	80	0	90	1.1	65
Five percent of the total habitat surveyed was composed of rapids. NAD83 UTM Zone 19												

Table 4.18 Substrate Proportions of Surveyed Sections in Stream S4.

Stream ID	Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
S4	1	15	15	15	15	40	0

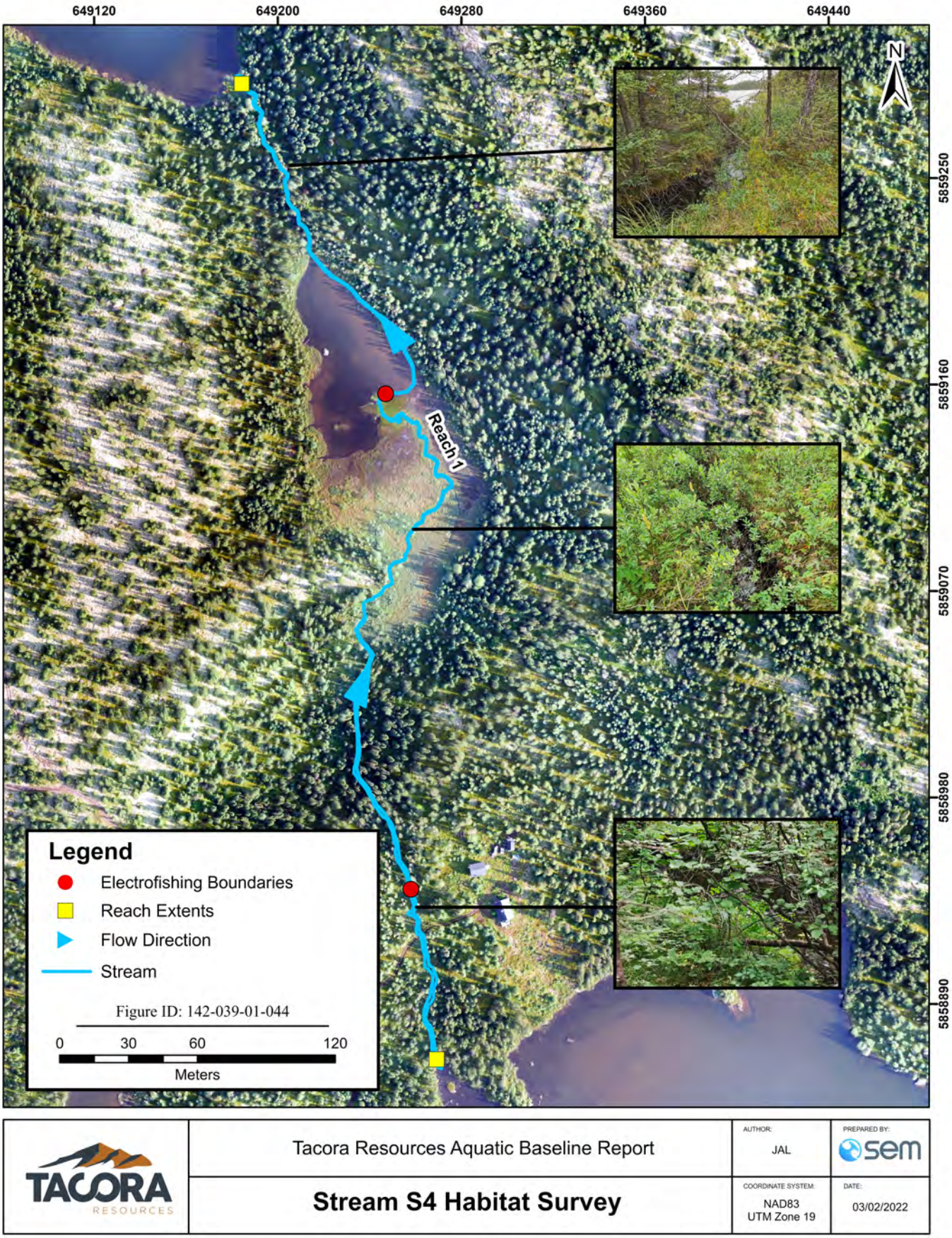


Figure 4.7 Stream S4 Habitat Survey Locations.

4.4.3 Stream Water Quality

The water quality data including metals, inorganics, calculated parameters and chlorophyll 'a' for Stream S4 are provided Appendix D. Most metals in Stream S4 were below detection limits, with the exception of aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium. Additionally, this stream had pH near neutral, low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected.

Field water quality data for Stream S4 is shown in Appendix D. The temperature measured 21.2°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.44, 5.9 mg/L (or 78.5% saturation), 1,227 µS/cm and 44.4 mV, respectively.

4.4.4 Stream Flow

The flow regime for Stream S4 was characterized by a mean discharge of 0.003 m^3/s and average velocity of 0.054 m/s. Depth and velocity ranged from 0.07 to 0.103 m and 0.03 to 0.07 m/s, respectively. Stream width remained constant at 0.15 m/s. Average depth and total width of S4 were 0.087 m and 0.6 m, respectively (Appendix D).

4.4.5 Stream Fish Population Assessment

4.4.5.1 Fishing Effort and Catch

Electrofishing was performed at one survey site in the Stream S4 on August 12, 2021 (Table 4.19). Coordinates of the two boundaries and details of the survey site (i.e., width, length, and area) are shown in Table 4.19. The stream was narrow and had minimal flow, running intermittently further upstream. As stated previously, electrofishing in this site was not favourable (i.e., depth and width restrictions), however, electrofishing effort was still employed at the site. No fish were captured after one run with a sweep time of 298 seconds. However, one sculpin was observed during the survey.

Table 4.19 Site Characteristics of Electrofishing Site in Stream S4 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
649258	5858940	649247	5859156	0.63	260	164.67
NAD83 UTM Zone 19						

4.4.6 Stream Benthic Community

Stream S4 had a total of four benthic macroinvertebrates with a taxon richness of three (Appendix D). The sample comprised of the families Rhyacophilidae (50%), Nematoda (25%) and Pisidiidae (25%). The total density of benthic macroinvertebrates at Stream S4 was 16 individuals/m^2.

4.5 Stream S5

4.5.1 General Overview Description

Stream S5 was observed on 1:50,000 scale maps and shown to flow from Lake L6 to Lake L5. In the field, this stream showed limited flow near Lake L5 then quickly transitioned into wetland with no defined stream channel (Figure 4.8). There was no evidence of this stream at Lake L6 and the connection to Lake L6 observed on a topographic map occurred at a cliff. Due to the fact that there was no defined stream channel identified at Stream S5, the following assessments were not possible for completion: stream habitat, flow, fish characterization or benthic macroinvertebrates community. Water quality was collected from Stream S5.

4.5.2 Stream Water Quality

The water quality data including metals, inorganics, calculated parameters and chlorophyll 'a' for Stream S5 is provided in Appendix D. Most metals in Stream S5 were below detection limits, but aluminum, barium, cadmium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Additionally, this stream had pH near neutral, low alkalinity, conductivity, and turbidity. Nitrate, nitrite, and Nitrate + Nitrite, were all undetected.

Field water quality data for S5 is shown in Appendix D. The temperature measured 17.0°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.26, 8.9 mg/L (or 91.4% saturation), 48.8 µS/cm and 32.5 mV, respectively

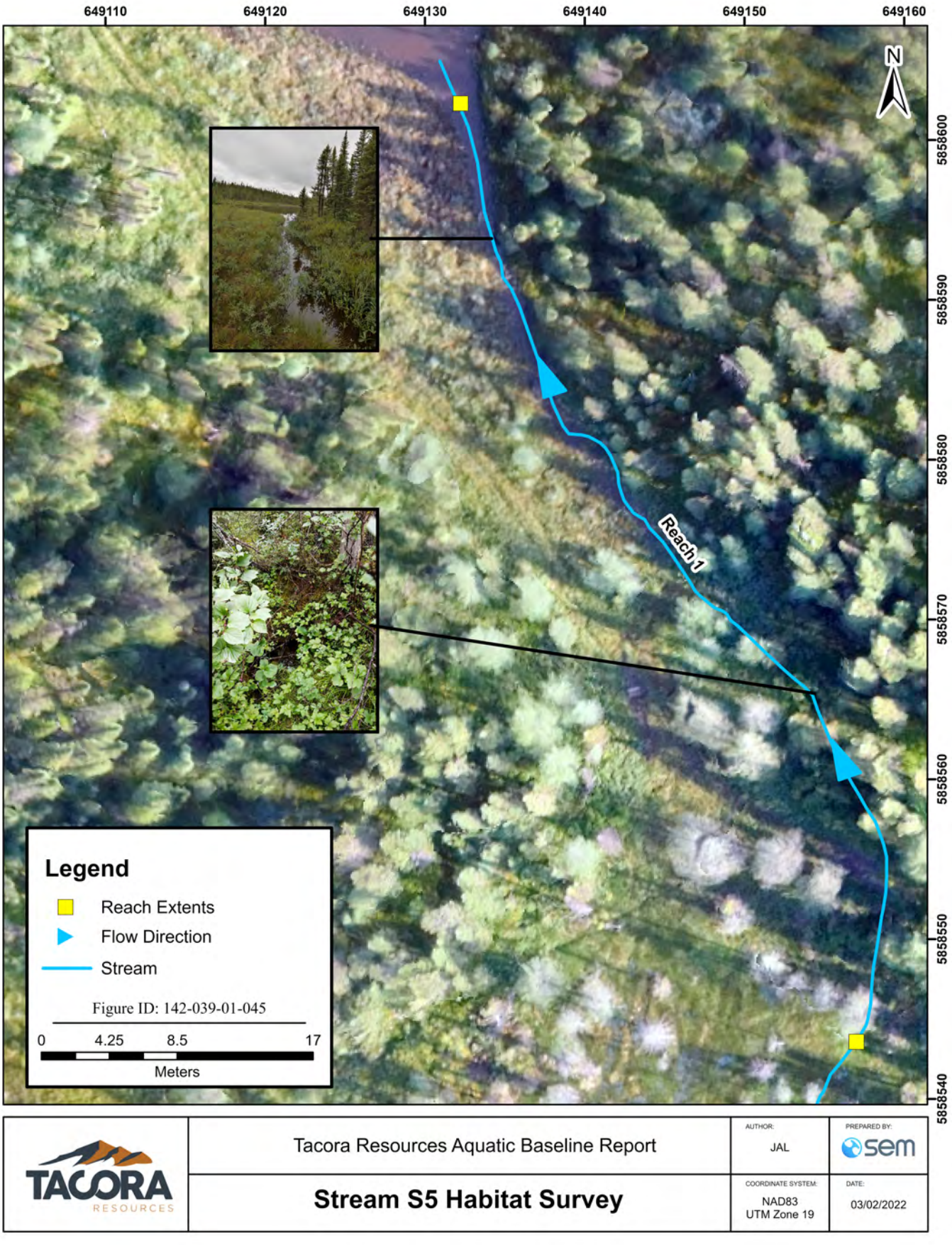


Figure 4.8 Stream S5 Habitat Survey Locations.

4.6 Stream S6

4.6.1 General Overview Description

Stream S6 flowed from Lake L18 into Flora South Basin. This stream had a much larger channel and more flow than the surrounding streams in the area. It was part of a network that flowed from the outlet of the larger Lake L20 to Flora South Basin. During the assessment, beavers were witnessed working on a dam at the outlet of L18. This dam was possibly a barrier to fish migration into and out of Stream S6 and L18. Past this dam the stream was wide with mainly riffle sections with sands, gravels, and rubble. After a short distance, the stream then narrowed slightly, with sections of large boulders and pools. From here the stream transitioned back and forth between a variety of riffle and run sections with medium to coarse substrate. The last section of the stream was a wide (>20 m) steady because of flooding in Flora South Basin. This stream was well suited for electrofishing, with many brook trout captured. Due to the width of Stream S6, the center did not experience much shaded area, however, the black spruce, alders, and boulders present along the shoreline provided cover and shade to many areas. Access to this stream was completed from boat at both ends, either from Lake L18 or Flora South Basin since it was several kilometers away from the ATV trails in the area. A map showing the various sections surveyed with representative photos of Stream S6 is provided in Figure 4.9.

4.6.2 Stream Habitat Assessment

A habitat survey of Stream S6 was completed on July 20, 2021. A UAV survey of this stream was also completed in July to provide high resolution imagery and topography of the area. Stream S6 sections were between 12 and 20 m wide and between 120 and 200 m long and averaged 15 m wide and 173 m long. The stream total length and width were 520 and 44 m, respectively, and had a total area of 7,200 m^2 (Table 4.20.) The habitat was comprised primarily of pools, followed by rapids, runs, steadies, and riffles (averaging 36.7, 26.7, 18.3, 8.3 and 6.7%, respectively).

The substrate was composed primarily of boulder, with some rubble, bedrock and cobble (averaging 65, 22.5, 7.5 and 5%, respectively; Table 4.21). Overhanging cover was predominant (averaging 35%) with some instream substrate/logs (<5%), and instream vegetation (<5%). No eroding banks were observed, while undercut banks were more prevalent (ranging from <5 to 20% and averaging 11%; Appendix D).

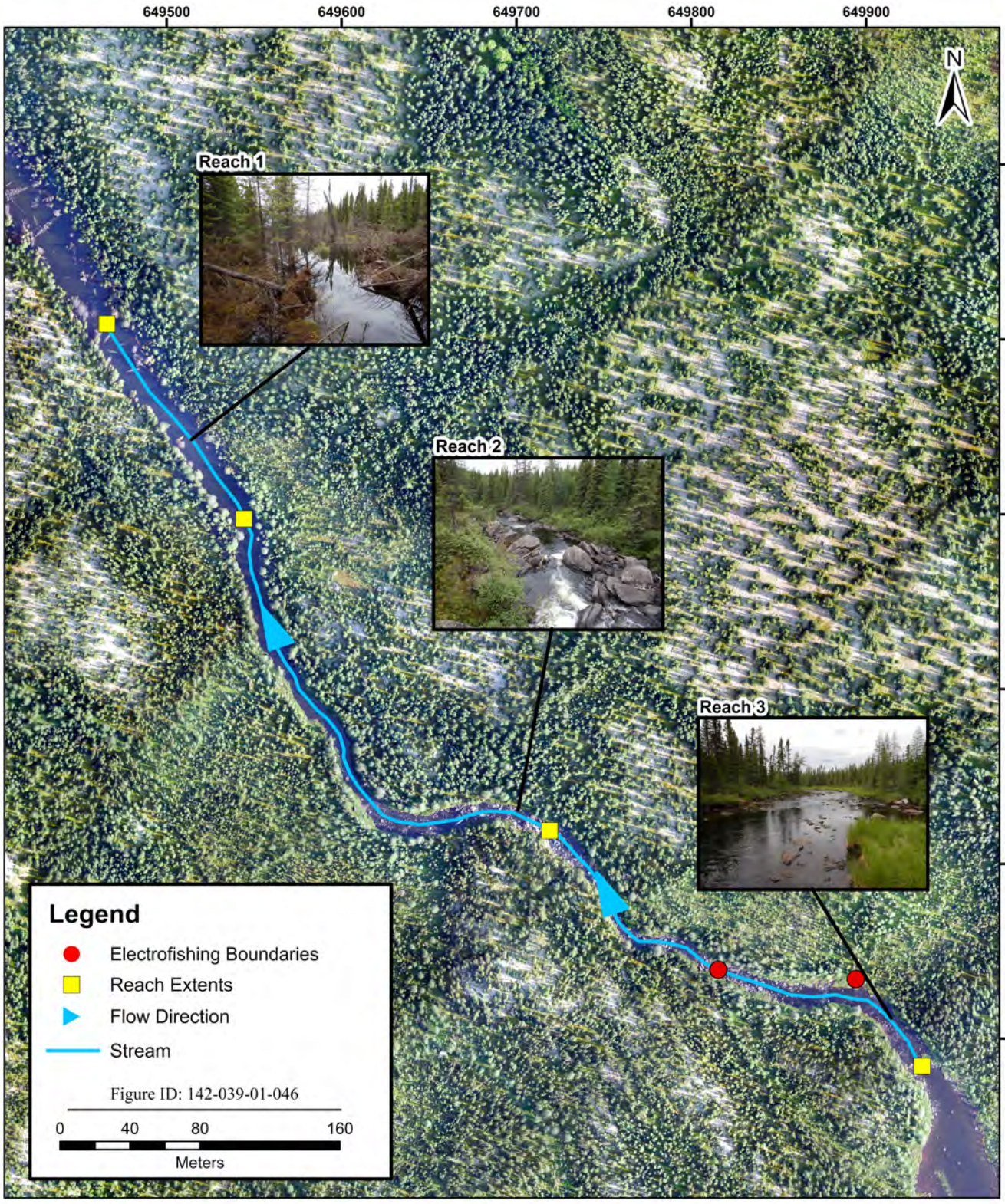


Figure 4.9 Stream S6 Habitat Survey Sections.

Table 4.20 Site Characteristics of Surveyed Sections in Stream S6.

	Start Location		Finish Location		Habitat Type (%)					Habitat Size		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m²)
1	5859189	649936	5859319	649719	25	5	5	5	50	200	12	2,400
2	5859319	649719	5859496	649542	30	20	15	5	30	200	12	2,400
3	5859496	649542	5859602	649459	0	0	0	100	0	120	20	2,400
Mean					18.3	8.3	6.7	36.7	26.7	173	15	2,400
Total										520	44	7,200

10% of the surveyed habitat in section one consisted of falls and cascades, while these habitat types were 3.3% of the mean for stream S6.
NAD83 UTM Zone 19

Table 4.21 Substrate Characteristics of Surveyed Sections in Stream S6.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
1	0	0	0	0	20	80	0
2	0	0	0	10	25	50	15
3	-	-	-	-	-	-	-
Mean	0	0	0	5	22.5	65	7.5

4.6.3 Stream Water Quality

Water quality data for Stream S6 is provided in Appendix D. Most metals in Stream S6 were below detection limits, with the exception of aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium which were detectable. Additionally, this stream had pH near neutral, low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected (Appendix D).

Field water quality data for Stream S6 is shown in Appendix D. The temperature measured 17.6°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.34, 9.68 mg/L (or 97.4% saturation), 56.7 µS/cm and 37.5 mV, respectively.

4.6.4 Stream Flow

The flow regime for Stream S6 was characterized by a mean discharge of 0.48 m^3/s and average velocity of 0.25 m/s. Depth ranged from 0.05 to 0.41 m (averaged 0.23 m), while width and velocity had ranges of 0.3 to 1.4 m and 0 to 0.64 m/s, respectively (Appendix D).

4.6.5 Stream Fish Population Assessment

4.6.5.1 Fishing Effort and Catch

Quantitative electrofishing was performed at one site in the Stream S6 on July 19, 2021. Coordinates of the two boundaries and details related to the electrofished site (i.e., width, length, and area) are shown in Table 4.22. Fishing effort (seconds) in each run (sweep) and summary of fish catches are provided in Table 4.23.

Table 4.22 Site Characteristics of Electrofishing Site in Stream S6 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
649894	5859234	649880	5859233	10.0	10.0	100.0
NAD83 UTM Zone 19						

Table 4.23 Summary of Catch and Effort for Electrofishing in Stream S6 in 2021.

	Effort (seconds)			Catch (No. of fish)			
Species	Sweep 1	Sweep 2	Sweep 3	Sweep 1	Sweep 2	Sweep 3	Total
Brook trout	1,089	726	294	2	1	0	3
Lake chub	1,089	726	294	2	1	0	3
Burbot	1,089	726	294	1	1	0	2
White sucker	1,089	726	294	3	1	3	7

4.6.5.2 Fish Meristic Characteristics

The length, weight, and condition factor of brook trout, white sucker and lake chub captured by electrofishing in Stream S6 are summarized in Table 4.24. Captured brook trout ranged in length from 57 to 220 mm (Figure 4.10), averaging 131 mm (std. dev. = ± 82.6). Brook trout weight ranged from 2.7 to 126 g, averaging 48.2 g (std. dev. = ± 67.7). Condition factor of captured fish ranged from 1.1 to 1.2, averaging 1.1 (std. dev. = ± 0.1), with 100% of the population having a condition factor equal or greater than 1.0. Captured white sucker ranged in length from 55 to 84 mm, averaging 70 mm (std. dev. = ± 10.5). White sucker weight ranged from 1.8 to 7 g, averaging 4.5 g (std. dev. = ± 1.9). Condition factor of captured fish ranged from 1.1 to 1.4, averaging 1.2 (std. dev. = ± 0.1), with 100% of the population having a condition factor equal or greater than 1.0. Lake chub ranged in length from 25 to 97 mm, averaging 69 mm (std. dev. = ± 38.6). Their weight ranged from 0.2 to 11 g, averaging 6.1 g (std. dev. = ± 15.4). Two burbot were also caught in Stream S6 and their mean length and weight was 82.5 mm (std. dev. = ± 67.1) and 8.2 g (std. dev. = ± 11.1), respectively.

Table 4.24 Summary of Brook Trout and White Sucker Meristic Characteristics Captured by Electrofishing in Stream S6 in 2021.

Species	Parameter	Mean	Min	Max	Std. Dev.
Brook trout	Length (mm)	131	57	220	82.6
	Weight (g)	48.2	2.7	126	67.7
	Condition (K)	1.1	1.1	1.2	0.1
White sucker	Length (mm)	70	55	84	10.5
	Weight (g)	4.5	1.8	7	1.9
	Condition (K)	1.2	1.1	1.4	0.1
Lake chub	Length (mm)	69	25	97	38.6
	Weight (g)	6.1	0.2	11.0	5.4

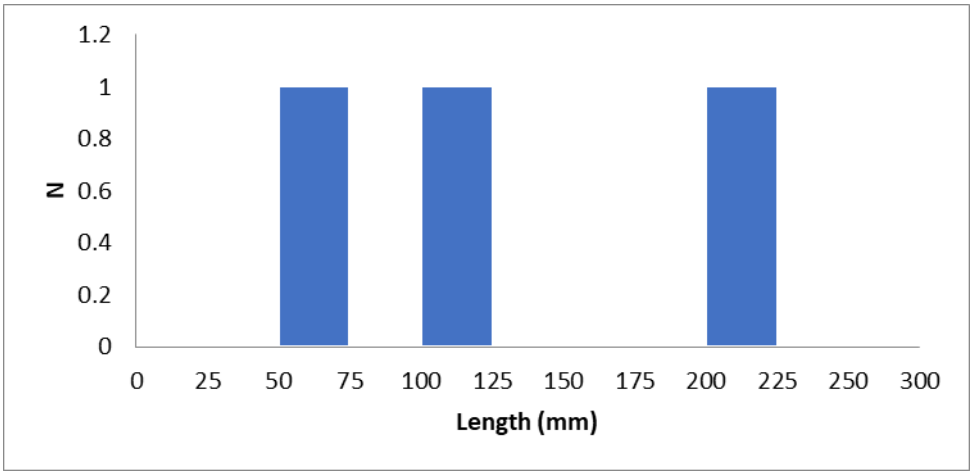


Figure 4.10 Length Frequency Distribution of Brook Trout Captured in Stream S6.

4.6.5.3 Fish Population Estimate

Population estimates were determined for brook trout and all fish species combined in Stream S6. Brook trout population and biomass estimates in the electrofishing site were three fish (95% confidence interval of 2-4) and 144.7 g (95% confidence interval of 96.5 – 192.9), respectively. The fished area size was 100 m^2 and thus population and biomass estimates reflected the unit of habitat (i.e., 100 m^2; Table 4.25).

Population estimates for all species combined in Stream S6 was 17 fish (95% confidence interval of 10-24) and biomass estimate was 227.7 g (95% confidence interval of 140.1-336.2; Table 4.25).

Table 4.25 Fish Population and Biomass Estimates[a] from Electrofishing of Stream S6 in 2021.

Species	Total Catch	Total Weight (g)	Population Estimate	Lower 95% CI	Upper 95% CI	Biomass Estimate (g)		
						Total weight	Lower 95% CI	Upper 95% CI
Brook trout	Actual Catch							
	3	144.7	3	2	4	144.7	96.5	192.9
All species	Actual Catch							
	15	210.1	17	10	24	227.7	140.1	336.2

[a] Actual fished area size was 100 m^2 and thus population and biomass estimates were equal to one habitat unit.

4.6.6 Stream Benthic Community

There were no benthic macroinvertebrates recovered from the sample collected at Stream S6.

4.7 Stream S7

4.7.1 General Overview Description

Stream S7 flowed from Lake L12 into Lake L18 which had two tributaries connected to it from the western side. One tributary originated from Lake L10 and a second further downstream from Lake L16. Stream S7 began at Lake L12 as a winding steady through wetland but quickly narrowed to faster flowing run-type stream morphology. The stream then slowly gained more overhanging vegetation cover, flowing through black spruce areas where the stream habitat transitioned to areas with riffles. From here the stream transitioned back to slower moving steady and then back to riffle prior to entering Lake L18. This stream possessed many sections of varying levels of diverse substrates. Sections of fines were prevalent where the stream had slower water and more coarse areas ranging from sand to boulders in areas of higher water velocity. This stream was also very narrow and not easily fished, it was however frequented by fish as determined by visual observations. Access to this stream was completed via ATV trail, as there was an ATV trail with a log bridge crossing the stream near its mid-point. A map showing the various sections surveyed with representative photos of stream S7 is provided in Figure 4.11.

4.7.2 Stream Habitat Assessment

A habitat survey of Stream S7 was completed on June 18, 2021. A UAV survey of this stream was also completed in June to provide high resolution imagery and topography of the area.

Stream S7 sections were between 0.8 and 1.5 m wide and between 96 and 700 m long, while averaging 1.1 m wide and 406 m long. The stream total length and width were 1,625 and 4.4 m, respectively, and total area of 1,602 m^2 (Table 4.26). The habitat was comprised of runs followed by riffles and steadies (averaging 47.5, 38.7, and 12.5%, respectively).

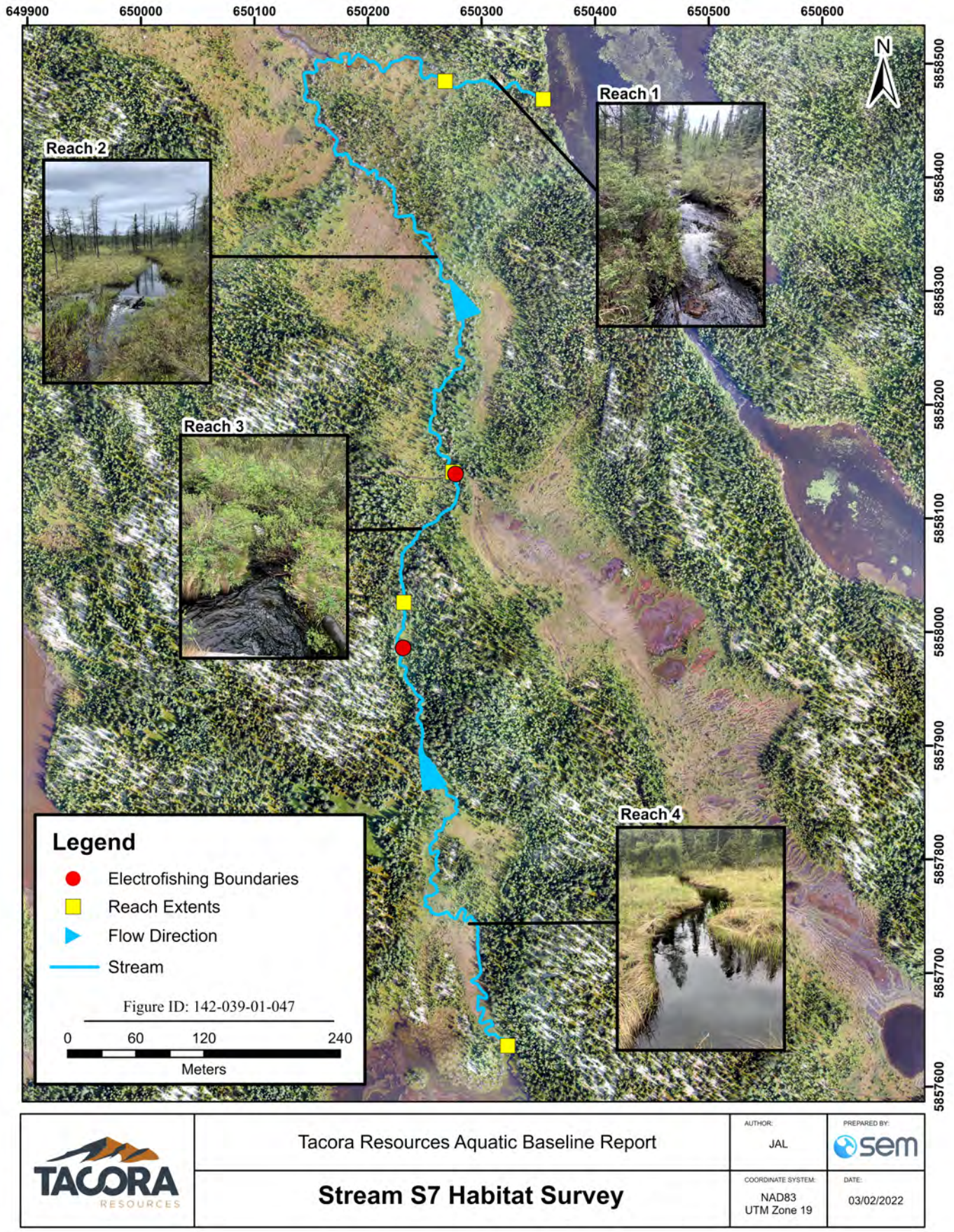


Figure 4.11 Stream S7 Habitat Survey Locations.

Table 4.26 Site Characteristics of Surveyed Sections in Stream S7.

	Start Location		Finish Location		Habitat Type (%)			Habitat Size		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Length (m)	Width (m)	Area (m²)
1	5858466	650353	5858488	650271	10	0	85	96	1.5	145
2	5858488	650271	5858141	650277	60	35	5	700	0.8	560
3	5858141	650277	5858026	650232	40	0	60	147	1.0	147
4	5858026	650232	5857636	650323	80	15	5	682	1.1	750
Mean					47.5	12.5	38.7	406	1.1	401
Total								1,625	4.4	1,602

5% of the surveyed habitat in section one consisted of falls and cascades, while these habitat types were 1.3% of the mean for stream S7.
NAD83 UTM Zone 19

The substrate was composed primarily of rubble, with some muck/clay, cobble, gravel (averaging 48.8, 31.2, 11.2 and 6.2%, respectively), and small levels of sand and boulder (averaging 1.2 and 1.3%; Table 4.27). Instream substrate/logs was the predominant cover (averaging 40%) with some instream vegetation and overhanging vegetation (20 and 17%, respectively), and small amount of canopy cover (averaging 2%). No eroding banks and small proportions of undercut banks were observed (ranged from 0 to <5%; Appendix D).

Table 4.27 Substrate Characteristics of Surveyed Sections in Stream S7.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	0	5	5	15	70	5
2	95	0	0	0	5	0
3	0	0	10	20	70	0
4	30	0	10	10	50	0
Mean	31.2	1.2	6.2	11.2	48.8	1.3

4.7.3 Stream Water Quality

The water quality data for Stream S7 is provided in Appendix D. Most metals in Stream S7 were below detection limits, but aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Additionally, this stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected.

Field water quality data for Stream S7 is shown in Appendix D. The temperature measured 9.7°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.26, 9.56 mg/L (or 83.4% saturation), 143.1 µS/cm and 36.1 mV, respectively.

4.7.4 Stream Flow

The flow regime for Stream S7 was characterized by a mean discharge of 0.01 m^3/s and average velocity of 0.14 m/s. Depth ranged from 0.02 to 0.07 m (averaged 0.04 m), while the width of each section was 0.2 m and velocity ranged from 0 to 0.28 m/s. Speed ranged from 0.01 to 0.25 m/s and averaged 0.12 m/s (Appendix D).

4.7.5 Stream Fish Population Assessment

4.7.5.1 Fishing Effort and Catch

Index electrofishing was performed at one site in Stream S7 on June 18, 2021 (Table 4.28). Coordinates of the two boundaries and details related to the electrofished site (i.e., width, length, and area) are shown in Table 4.29. One sweep was performed on Stream S7 of 281 seconds, capturing three brook trout (Table 4.29), one white sucker and one lake chub.

Table 4.28 Site Characteristics of Electrofishing Site in Stream S7 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
650231	5857986	650277	5858139	0.9	186.1	167.4
NAD83 UTM Zone 19						

Table 4.29 Summary of Catch and Effort for Electrofishing in Stream S7 in 2021.

Species	Sweep 1 (seconds)	Sweep 1 (No. of Fish)
Brook trout	281	3
Lake chub	281	1
White sucker	281	1

4.7.5.2 Fish Meristic Characteristics

The length, weight, and condition factor of brook trout captured by electrofishing in Stream S7 are summarized in Table 4.30. Brook trout length ranged from 35 to 120 mm (Figure 4.12) averaging 65 mm (std. dev. = ± 47.7). Brook trout weight had a large variation from 0.7 to 17.3 g, averaging 6.4 g (std. dev. = ± 9.5), and condition factor from 1.0 to 1.7, averaging 1.4 (std. dev. = ± 0.4). The lake chub had a length of 100 mm and weight of 10.7 g, and the white sucker was 80 mm long and weighed 5.7 g. The total number of fish caught in Stream S7 was five and total biomass was 35.5 g.

Table 4.30 Summary of Brook Trout Meristic Characteristics Captured by Electrofishing in S7.

Parameter	Min	Max	Mean	Std. Dev.
Length (mm)	35.0	120.0	65.0	47.7
Weight (g)	0.7	17.3	6.4	9.5
Condition (K)	1.0	1.7	1.4	0.4

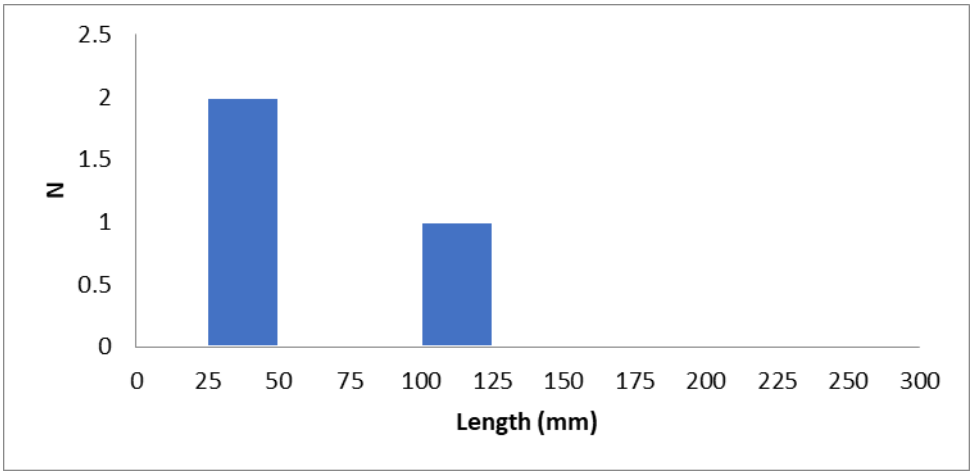


Figure 4.12 Length Frequency Distribution of Brook Trout Captured in Stream S7.

4.7.5.3 Stream Benthic Community

The benthic macroinvertebrate community at Stream S7 consisted of one family, Rhyacophilidae (commonly referred to as, "Caddisflies"), exhibiting a taxon richness of one and density of 24 individuals/m^2.

4.8 Stream S8

4.8.1 General Overview Description

Stream S8 flowed from south of the assessment area through a wetland before flowing into Lake L12. The entire stream observed was a slow, meandering steady. At the time of surveying flow could not be measured due to low water velocity. Canopy cover was not uniform for Stream S8; most of the stream ran through wetland and did not have complete cover, however there were trees and other vegetation sparsely located along the stream banks. Stream S8 exhibited little variance in substrate type. Throughout the length of the stream, substrate was almost entirely composed of loose and easily disturbed organics, with small pockets of gravels and rubble being observed (approximately 5%). This stream was not easily fished due to low flow and high organic matter. However, fish were observed during the survey. Access to this stream was completed via ATV trail, as there was an existing ATV trail to the west and the largely spaced

trees in the area allowed access to the lake. A map showing the various sections surveyed with representative photos of Stream S8 is provided in Figure 4.13.

4.8.2 Stream Habitat Assessment

A habitat survey of Stream S8 was completed on June 21 and June 22, 2021. A UAV survey of this stream was completed in August to provide high resolution imagery and topography of the area. Stream S8 sections were between 0.85 and 0.98 m wide and between 302 and 918 m in length with a mean of 0.92 m wide and 610 m long. The stream total length was 1,220 m (Table 4.31). The habitat was comprised primarily of runs and steadies (mean of 37.5% and 62.5% respectively) with no riffles or pools.

The substrate was composed primarily of muck or clay (mean of 95%), with some gravel and rubble (mean of 2.5% each; Table 4.32). Overhanging cover was predominant (mean of 25%), with small proportions of canopy cover and instream substrate (mean of 5% each). No eroding or undercut banks were observed (Appendix D).

Table 4.31 Site Characteristics of Surveyed Sections in Stream S8.

	Start Location		Finish Location		Habitat Type (%)				Habitat Dimensions		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	5857348	650334	5857138	650346	5	95	0	0	302	0.98	132
2	5857138	650346	5856440	650510	70	30	0	0	918	0.85	525
Mean					37.5	62.5	0	0	610	0.92	329
Total									1,220	1.83	657
NAD83 UTM Zone 19											

Table 4.32 Substrate Proportions of Surveyed Sections in Stream S8.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	95	0	5	0	0	0
2	95	0	0	0	5	0
Mean	95	0	2.5	0	2.5	0

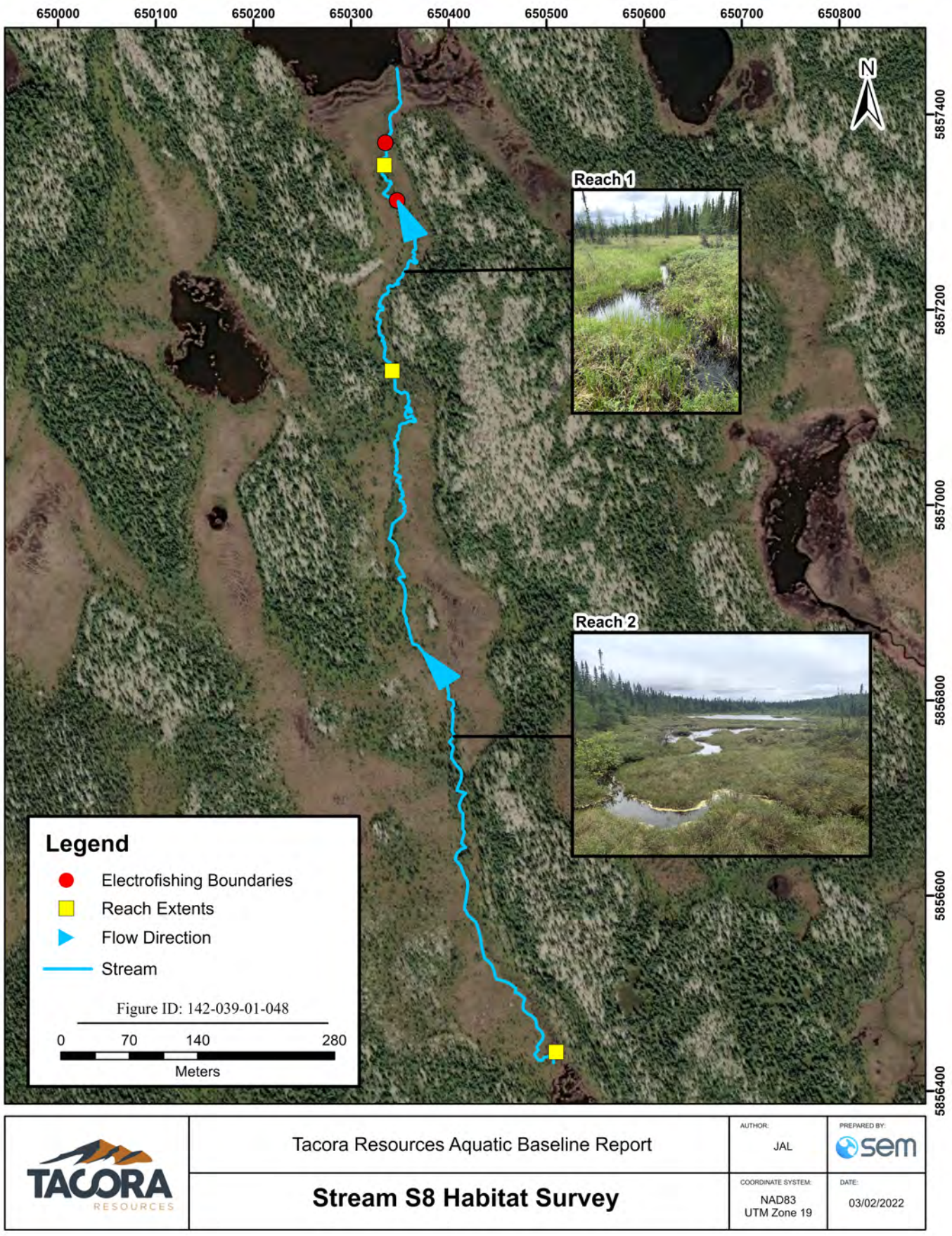


Figure 4.13 Stream S8 Habitat Survey Locations.

4.8.3 Stream Water Quality

The water quality data for Stream S8 is provided in Appendix D. Most metals in S8 were below detection limits, but barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Additionally, this stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrite was undetected (Appendix D).

Field water quality data for Stream S8 is shown in Appendix D. The temperature measured 11.6°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.66, 13.72 mg/L (or 122.5% saturation), 273.2 µS/cm and 58.4 mV, respectively.

4.8.4 Stream Flow

Flow in Stream S8 was stagnant (0.0 m/s).

4.8.5 Stream Fish Population Assessment

4.8.5.1 Fishing Effort and Catch

Index electrofishing was performed at one site in Stream S8 on July 20, 2021 (Table 4.33). Coordinates of the two boundaries and details related to the electrofished site (i.e., width, length, and area) are shown in Table 4.33. Fishing effort (seconds) in each run (sweep) and summary of fish catches are provided in Table 4.34. Brook trout, burbot and lake chub were caught in Stream S8.

Table 4.33 Site Characteristics of Electrofishing in Stream S8 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
650347	5857312	650335	5857371	0.83	85.7	71.1
NAD83 UTM Zone 19						

Table 4.34 Summary of Catch and Effort for Electrofishing in Stream S8 in 2021.

Effort (seconds)		Catch (No. of fish)	
Species	Sweep 1	Sweep 1	Total
Brook trout	336	1	1
Burbot	336	2	2
Lake chub	336	1	1

4.8.5.2 Fish Meristic Characteristics

The brook trout captured in Stream S8 had a length of 75 mm, weight of 4 g, and condition factor of 0.9. Burbot had a mean length and weight of 140 mm and 16 g, respectively. Captured lake chub had a length

of 70 g, weight of 4 g and a condition factor of 1.2. The total number of fish caught in Stream S8 was four and total biomass was 40 g.

4.8.6 Stream Benthic Community

The total abundance of benthic macroinvertebrates in Stream S8 was two and was represented by the family Valvidae (taxon richness of one). Due to substrate and flow characteristics at Stream S8, the Petite Ponar grab sampler was used to collect the benthic macroinvertebrates. The extrapolated total density of benthic macroinvertebrates per square meter was 67. Results of the taxonomic identification can be found in Appendix D.

4.9 Stream S9

4.9.1 General Overview Description

Stream S9 flowed from Lake L19 into Lake L18. Stream S9 was a short, robust stream and approximately 100 m in length. This stream flowed from L19 at a dam, where it quicky changed to fast flowing run and rapids for the remainder of its length. Riparian vegetation mainly consisted of mature black spruce, with some sections of grasses and alders. Stream S9 did not show a high variability in substrates. The start of the stream had low amounts of gravel and cobble near the beaver dam which then quickly transitioned to rubble and boulders. The high flows of Stream S9 created difficulty placing nets for electrofishing, however, it was successfully electrofished. Access to this stream was completed via ATV trail, as there was an ATV trail located approximately 230 m to the west. In this 230 m gap, a trail was cut to gain access to Stream S9, Lake L18 and Lake L19. A map showing the various sections surveyed with representative photos of Stream S9 is provided in Figure 4.14.

4.9.2 Stream Habitat Assessment

A habitat survey of Stream S9 was completed on July 18, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. Stream S9 section was 10 m wide and 97 m in length (Table 4.35). The habitat was comprised primarily of runs and rapids (mean of 80 and 20%, respectively).

The substrate was composed primarily of boulder (mean of 70%) and rubble (mean of 20%), with some cobble (mean of 10%; Table 4.36). No stream cover was present. No eroding banks were observed, while undercut banks were slightly prevalent (mean of 5%; Appendix D).

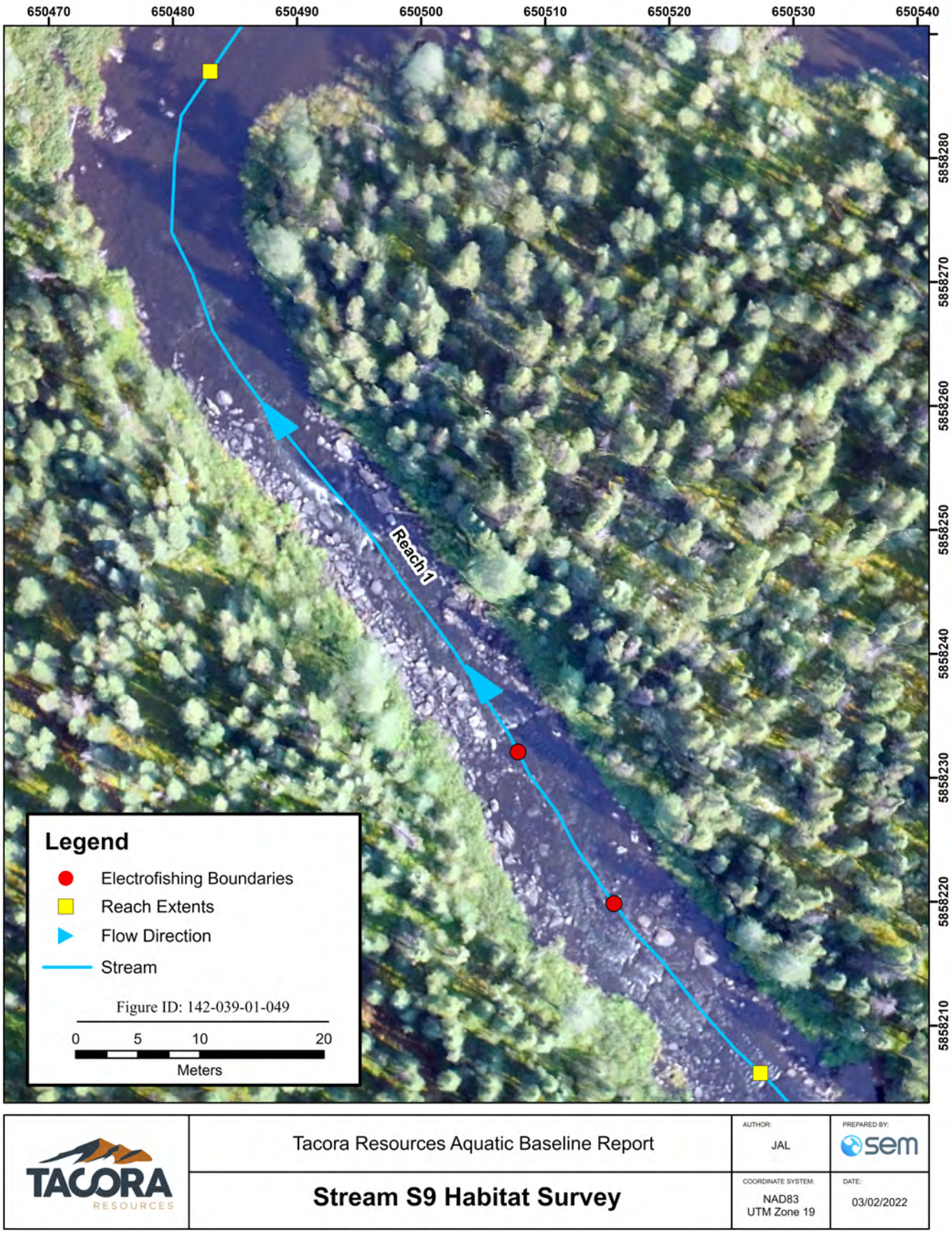


Figure 4.14 Stream S9 Habitat Survey Locations.

Table 4.35 Site Characteristics of Surveyed Sections in Stream S9.

	Start Location		Finish Location		Habitat Type (%)				Habitat Size		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Rapids	Pool	Length (m)	Width (m)	Area (m^2)
1	5858201	650519	5858287	650483	80	0	20	0	97	10	1,154
NAD83 UTM Zone 19											

Table 4.36 Substrate Proportions of Surveyed Sections in Stream S9.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	0	0	0	10	20	70

4.9.3 Stream Water Quality

The water quality data for Stream S9 is provided in Appendix D. Most metals in S9 were below detection limits, but aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Additionally, this stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected. Field water quality data for Stream S9 is shown in Appendix D. The temperature measured 18.5°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.27, 9.46 mg/L (or 108% saturation), 55.7 µS/cm and 35.7 mV, respectively.

4.9.4 Stream Flow

The flow regime for Stream S9 was characterized by a mean discharge of 0.975 m^3/s and average velocity of 0.445 m/s. Depth and velocity ranged from 0.06 to 0.44 m and 0.09 to 1.01 m/s, respectively. The average depth of Stream S9 was 0.20 m (Appendix D).

4.9.5 Stream Fish Population Assessment

4.9.5.1 Fishing Effort and Catch

Quantitative electrofishing was performed at one site in the Stream S9 on July 18, 2021 (Table 4.37). Coordinates of the two boundaries and details related to the electrofished site (i.e., width, length, and area) are shown in Table 4.37. Fishing effort (seconds) in each run (sweep) and summary of fish catches are provided in Table 4.38. The removal pattern was good with number of fish caught declining from five (first run) to zero (last run) for brook trout and seven (first run) to three (last run) for white sucker. One burbot and one sculpin were also captured in the first run but not in the second.

Table 4.37 Site Characteristics of Electrofishing Site in Stream S9 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
650510	5858218	650499	5858227	15	15	225
NAD83 UTM Zone 19						

Table 4.38 Summary of Catch and Effort for Electrofishing in Stream S9 in 2021.

Effort (seconds)			Catch (No. of fish)		
Species	Run 1	Run 2	Run 1	Run 2	Total
Brook trout	923	923	5	0	5
White sucker	923	923	7	3	10
Burbot	923	923	1	0	1
Sculpin	923	923	1	0	1

4.9.5.2 Fish Meristic Characteristics

The length, weight, and condition factor of brook trout captured by electrofishing in Stream S9 are summarized in Table 4.39. Brook trout length ranged from 50 to 65 mm (Figure 4.15) averaging 57 mm (std. dev. = ± 5.7). Brook trout weight ranged from 2 to 3 g, averaging 2.6 g (std. dev. = ± 0.4). Condition factor of captured brook trout ranged from 1.1 to 1.4, averaging 1.2 (std. dev. = ± 0.21), with 100% of the population having a condition factor equal or greater than 1.0. The length, weight, and condition factor of white sucker captured by electrofishing in Stream S9 are summarized in Table 4.39. White sucker length ranged from 70 to 123 mm, averaging 97 mm (std. dev. = ± 16.6). White sucker weight ranged from 3 to 21 g, averaging 10.9 g (std. dev. = ± 5.6). Condition factor of captured white sucker ranged from 0.9 to 1.4, averaging 1.11 (std. dev. = ± 0.1), with 90% of the population having a condition factor equal or greater than 1.0. The captured sculpin had a length of 60 mm and a weight of 3 g, while the burbot had a length of 125 mm and a weight of 14 g.

Table 4.39 Summary of Fish Meristic Characteristics Captured by Electrofishing in Stream S9 in 2021.

Species	Parameter	Min	Max	Mean	Std. Dev.
Brook trout	Length (mm)	50.0	65.0	57	5.7
	Weight (g)	2.0	3.0	2.6	0.4
	Condition (K)	1.1	1.4	1.2	0.2
White sucker	Length (mm)	70.0	123.0	97	16.6
	Weight (g)	3.0	21.0	10.9	5.6
	Condition (K)	0.9	1.4	1.1	0.1

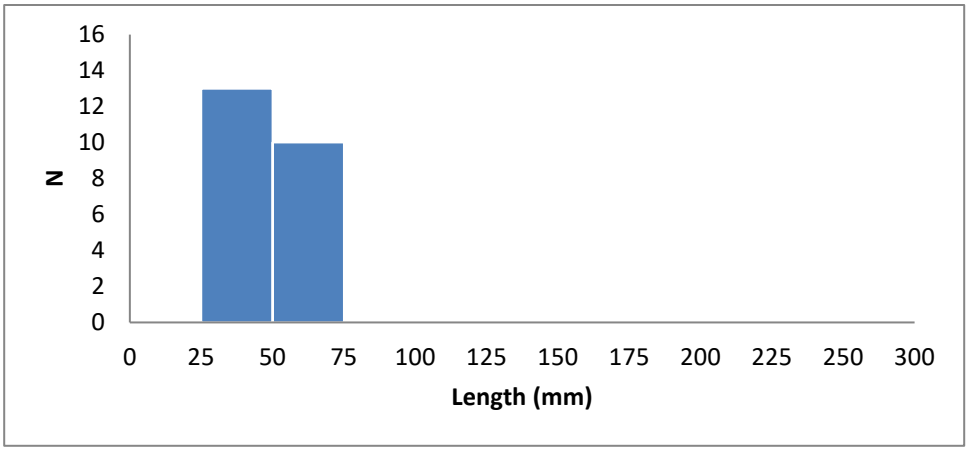


Figure 4.15 Length Frequency Distribution of Brook Trout Captured in Stream S9.

4.9.5.3 Fish Population Estimate

A population estimate was determined for all species combined in Stream S9. Population and biomass estimates in the electrofishing site were 17 fish (95% confidence interval of 15-19) and 138.9 g (95% confidence interval of 122.6-155.3), respectively. The population estimate and biomass estimate, adjusted per unit of habitat (100 m^2), were eight fish (95% confidence interval of 7-8) and 61.7 g (95% confidence interval of 54.5-69.0), respectively (Table 4.40).

Table 4.40 Fish Population and Biomass Estimates from Electrofishing of Stream S9.

Species	Total Catch	Total Weight (g)	Population Estimate	Lower 95% CI	Upper 95% CI	Biomass Estimate (g)		
						Total weight	Lower 95% CI	Upper 95% CI
All species	Actual Catch							
	17	138.9	17	15	19	138.9	122.6	155.3
	Per Habitat Unit (100 m^2)							
	8	61.8	8	7	8	61.7	54.5	69.0

4.9.6 Stream Benthic Community

Stream S9 exhibited a benthic macroinvertebrate density of 60 individuals/m^2. Taxonomic families represented in Stream S9 consisted of Pisidiidae (67%), Baetidae (6.6%), Heptageniidae (6.6%), Hydropsychidae (6.6%), Lepidostomatidae (6.6%) and Chironomidae (6.6%) for a total taxon richness of six and total abundance of 15. Stream S9 was the second most diverse stream for benthic macroinvertebrates compared to all other streams.

4.10 Stream S10

4.10.1 General Overview Description

Stream S10 flowed from Lake L21 into the western shores of Lake L20. This stream began as a winding slow moving steady through wetland before slowly gaining canopy cover as it flowed away from Lake L21. The stream then transitioned between sections of sparse tree cover and areas of complete shade beneath alder thickets. Habitat in the stream was composed of mainly steady type mesohabitat mixed with small sections of runs and riffles. This stream possessed many sections of varying levels of a variety of substrates. Sections of fines were prevalent where the stream had slower moving water and more coarse areas with cobbles and boulders were present in areas of higher velocity. This stream was very narrow and not easily electrofished, however, fish frequented it. Access to this stream was completed via ATV trail, with a log bridge crossing the stream near its mid-point, as well as a second trail terminating nearby the stream's connection to Lake L20. A map showing the various sections surveyed with representative photos of Stream S10 is provided in Figure 4.16.

4.10.2 Stream Habitat Assessment

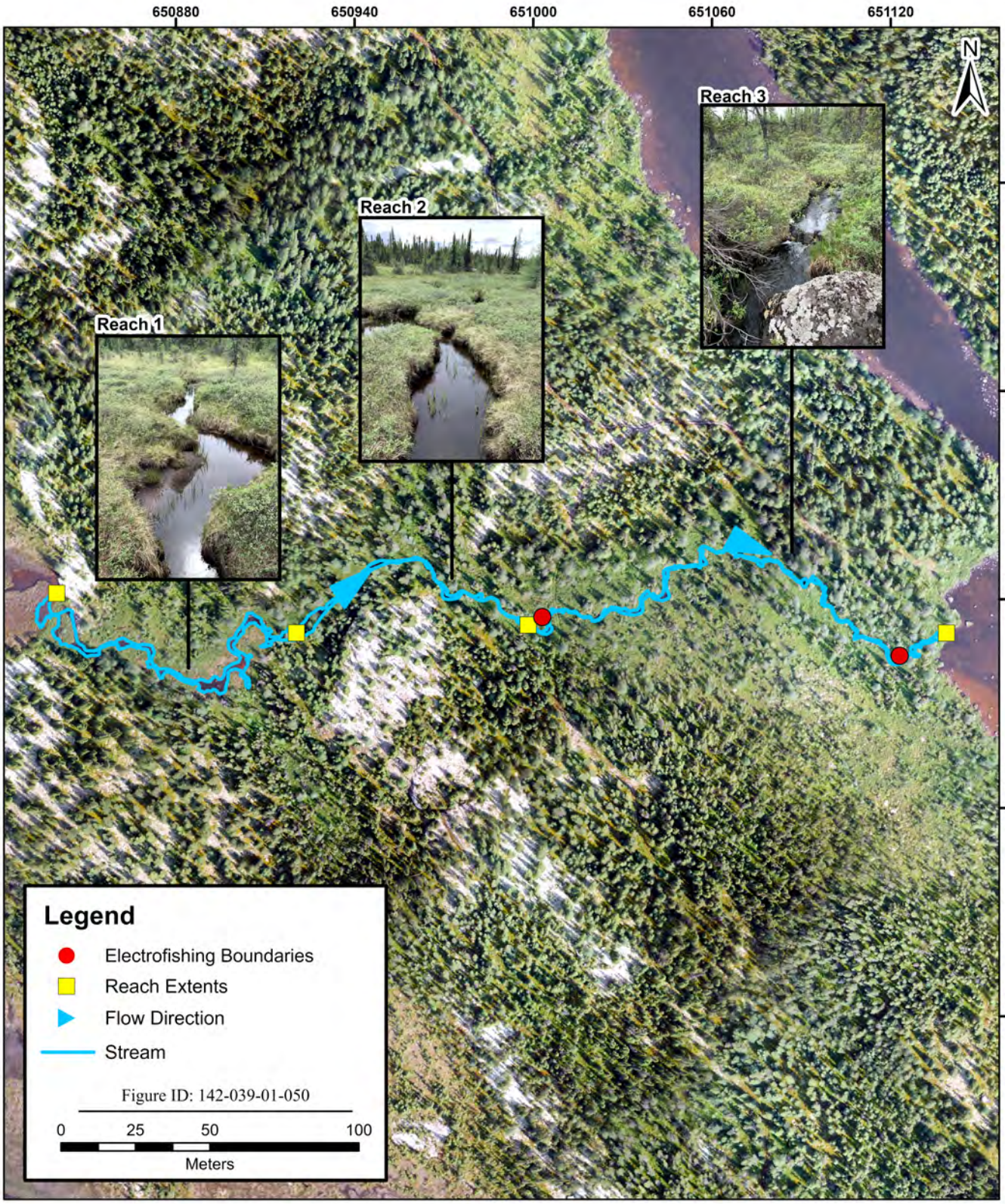
A habitat survey of Stream S10 was completed on June 19, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. Stream S10 sections were between 1.1 and 2.8 m wide and between 101 and 202 m in length, with a mean of 1.8 m width and 146 m length. The stream total length was 437 m (Table 4.41). The habitat was comprised primarily of steadies and runs, followed by riffles and rapids (mean of 70, 23, 5 and 2%, respectively).

The substrate was composed primarily of muck or clay (mean of 53%) and boulder (mean of 22%), with some cobble, gravel and rubble (mean of 20, 3, and 2%, respectively; Table 4.42). Overhanging cover was predominant (mean of 47%) with some canopy cover (mean of 5%). No eroding banks were observed, while undercut banks were more prevalent (ranged from 45 to 60% and a mean of 50%; Appendix D).

Table 4.41 Site Characteristics of Surveyed Sections in Stream S10.

	Start Location		Finish Location		Habitat Type (%)				Habitat Size		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Rapids	Length (m)	Width (m)	Area (m²)
1	5857040	650840	5857073	650919	19	75	5	0	134	2.8	269
2	5857073	650919	5857077	651008	20	75	5	0	101	1.6	112
3	5857077	651008	5857105	651143	30	59	5	5	202	1.1	140
Mean					23	70	5	2	146	1.8	174
Total									437	5.5	521

1% of the surveyed habitat in sections one and three consisted of falls and cascades, while these habitat types were <1% of the mean for stream S10.
NAD83 UTM Zone 19



TACORA RESOURCES	Tacora Resources Aquatic Baseline Report	AUTHOR: JEL	PREPARED BY: sem
	Stream S10 Habitat Survey	COORDINATE SYSTEM: NAD83 UTM Zone 19	DATE: 03/02/2022

Figure 4.16 Stream S10 Habitat Survey Locations.

Table 4.42 Substrate Proportions of Surveyed Sections in Stream S10.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	60	0	10	25	0	5
2	50	0	0	30	0	20
3	50	0	0	5	5	40
Mean	53	0	3	20	2	22

4.10.3 Stream Water Quality

The water quality data (inorganics, calculated parameters, and chlorophyll 'a') for Stream S10 is provided in Appendix D. Most metals in Stream S10 were below detection limits, with the exception of aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium which were detectable. Additionally, this stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected (Appendix D).

Field water quality data for Stream S10 is shown in Appendix D. The temperature measured 16.7°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.24, 9.50 mg/L (or 101% saturation), 165 µS/cm and 35.11 mV, respectively.

4.10.4 Stream Flow

The flow regime for Stream S10 was characterized by a mean discharge of 0.033 m^3/s and average velocity of 0.405 m/s. Depth ranged from 0.00 to 0.10 m, while velocity ranged from 0.00 to 0.55 m/s. Average depth of Stream S10 was 0.063 m (Appendix D).

4.10.5 Stream Fish Population Assessment

4.10.5.1 Fishing Effort and Catch

Index electrofishing was performed at one site in Stream S10 on July 10, 2021 (Table 4.43). Coordinates of the two boundaries and details related to the electrofished site (i.e., width, length, and area) are shown in Table 4.43. Fishing effort (seconds) in each run (sweep) and summary of fish catches are provided in Table 4.44. One brook trout and two sculpins were captured in Stream S10.

Table 4.43 Site Characteristics of Electrofishing Site in Stream S10 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
651123	5857061	651003	5857074	1	176	176
NAD83 UTM Zone 19						

Table 4.44 Summary of Catch and Effort for Electrofishing in Stream S10 in 2021.

Effort (seconds)		Catch (No. of fish)	
Species	Run 1	Run 1	Total
Brook trout	300	1	1
Sculpin	300	2	2

4.10.5.2 Fish Meristic Characteristics

The length, weight, and condition factor of the brook trout captured by electrofishing in Stream S10 were 45 mm, 1.5 g, and 1.7, respectively. The mean length, weight, and condition factor of the sculpin captured by electrofishing in Stream S10 were 73 mm, 3.5 g, and 1.4, respectively. A total of three fish were caught in Stream S10 and total biomass was 8.5 g.

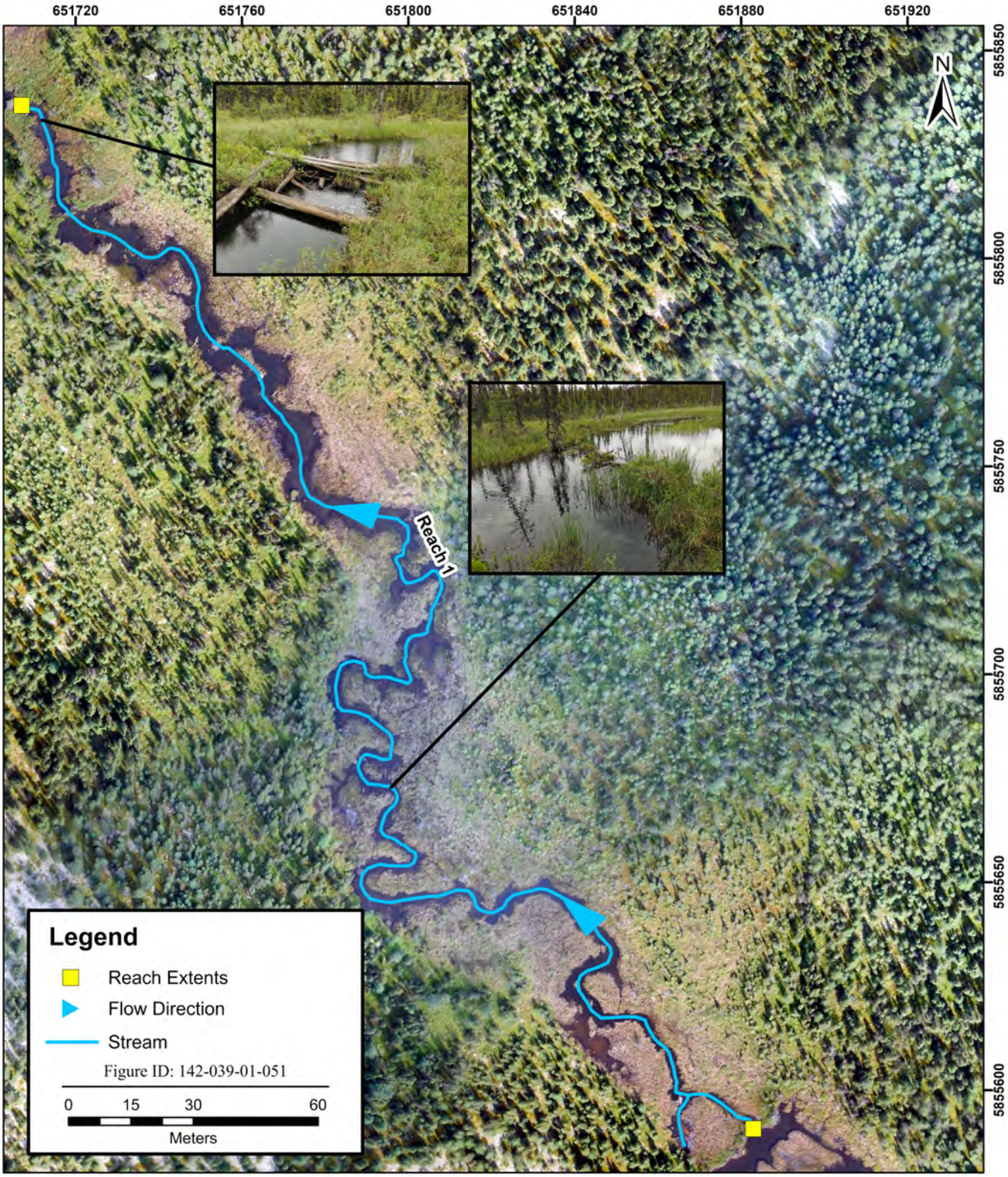
4.10.6 Stream Benthic Community

Stream S10 exhibited a total abundance of three consisting of two taxon, Rhyacophilidae (66%) and Chironomidae (33%). Total taxon richness is therefore two with a total density of 12 individuals/m^2.

4.11 Stream S11

4.11.1 General Overview Description

Stream S11 flowed north from an unnamed pond outside of the assessment area into the southwest cove of Lake L20. This entire stream consisted of slow steady from start to end. The stream also flowed through a narrow strip of wetland for its entirety. Canopy cover for this stream was confined to a small number of trees that provided some shade in their vicinity. Substrate in the stream was composed of fines. Organic fines filled the entire stream bottom with sparce boulders visible in some locations. Due to the near stagnant water this stream was not electrofished, however fish were observed. Access to this stream was completed via ATV trail, as there was an ATV trail with a log bridge crossing the stream near its end at Lake L20. This log bridge had fallen apart and created a dam in Stream S11, raising its water level and contributing to its flooded steady habitat. This dammed area could have impacted fish movement in the stream. A map showing the various sections surveyed with representative photos of Stream S11 is provided in Figure 4.17.



TACORA RESOURCES	Tacora Resources Aquatic Baseline Report	AUTHOR: JAL	PREPARED BY: sem
	Stream S11 Habitat Survey	COORDINATE SYSTEM: NAD83 UTM Zone 19	DATE: 03/02/2022

Figure 4.17 Stream S11 Habitat Survey Locations.

4.11.2 Stream Habitat Assessment

A habitat survey of Stream S11 was completed on June 24, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. The Stream S11 section was 4.6 m wide and 484 m in length (Table 4.45). The habitat was comprised primarily of steadies and pools (mean of 96 and 4%, respectively).

The substrate was composed primarily of muck/clay (mean of 60%) and boulder (mean of 30%), with some cobble (mean of 10%; Table 4.46). Small amounts of overhanging and instream cover were present (mean of 1 and 2%, respectively). No eroding banks were observed, while undercut banks were more prevalent (mean of 10%; Appendix D).

Table 4.45 Site Characteristics of Surveyed Sections in Stream S11.

	Start Location		Finish Location		Habitat Type (%)				Habitat Size		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	5855835	651704	5855593	651886	0	96	0	4	484	4.6	2,226
NAD83 UTM Zone 19											

Table 4.46 Substrate Proportions of Surveyed Sections in Stream S11.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	60	0	0	10	0	30

4.11.3 Stream Water Quality

The water quality data for Stream S11 is provided in Appendix D. Most metals in Stream S11 were below detection limits, except aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detectable. Additionally, this stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected was undetected (Appendix D).

Field water quality data for Stream S11 is shown in Appendix D. The temperature measured 14.9°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.16, 8.24 mg/L (or 81.0% saturation), 110.9 µS/cm and 30.0 mV, respectively.

4.11.4 Stream Flow

The flow regime for Stream S11 was characterized by a mean discharge of 0.026 m^3/s and average velocity of 0.013 m/s. Depth and velocity ranged from 0.35 to 0.96 m and 0 to 0.02 m/s, respectively. Average depth of Stream S11 was 0.73 m (Appendix D).

4.11.5 Stream Benthic Community

Three benthic macroinvertebrates were collected in Stream S11 via Petite Ponar grab sampler due to the substratum and flow characteristics of the site. The two families (taxon richness of two) present in Stream S11 were Valvatidae (67%) and Pisidiidae (33%). Total density at Stream S11 was 100 individuals/m^2.

4.12 Stream S12

4.12.1 General Overview Description

The northern extent of Stream S12 flowed into Lake L20 and the aquatic assessment was limited to the 786 m section of the stream within the project area boundaries. However, the stream did continue for 10 km south of the project area, which was not assessed. This stream had a first order inlet, near the end of the surveyed extents, which originated from wetland drainage. Stream S12 was wide and slow with mainly steady habitat. The assessed area for Stream S12 began through open wetland but canopy cover quickly changed to a more forested environment. Black spruce trees, alders and grasses made up the majority of riparian vegetation for Stream S12, providing varying amounts of cover. This stream possessed localized areas of different substrate. The majority of the stream was comprised of boulders having fines fill up the space between. There were however other sections with sands, gravels, cobbles and rubble; typically, where there were brief increases to the water velocity. This stream was moderately suited to electrofishing, with multiple species caught. Although not caught in the area chosen for fishing, small northern pike were observed in the stream during surveying. Access to this stream was completed via boat from Lake L20. A small boat was used to traverse upstream to the location of electrofishing from Lake L20. A map showing the various sections surveyed with representative photos of Stream S12 is provided in Figure 4.18.

4.12.2 Stream Habitat Assessment

A habitat survey of Stream S12 was completed on June 28, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. Stream S12 sections were between 10.3 and 21.3 m wide and between 387 and 399 m in length and averaged 15.8 m wide and 393 m long. The stream total length was 463 m (Table 4.47). The habitat was comprised primarily of steadies and runs (mean of 80 and 20%, respectively).

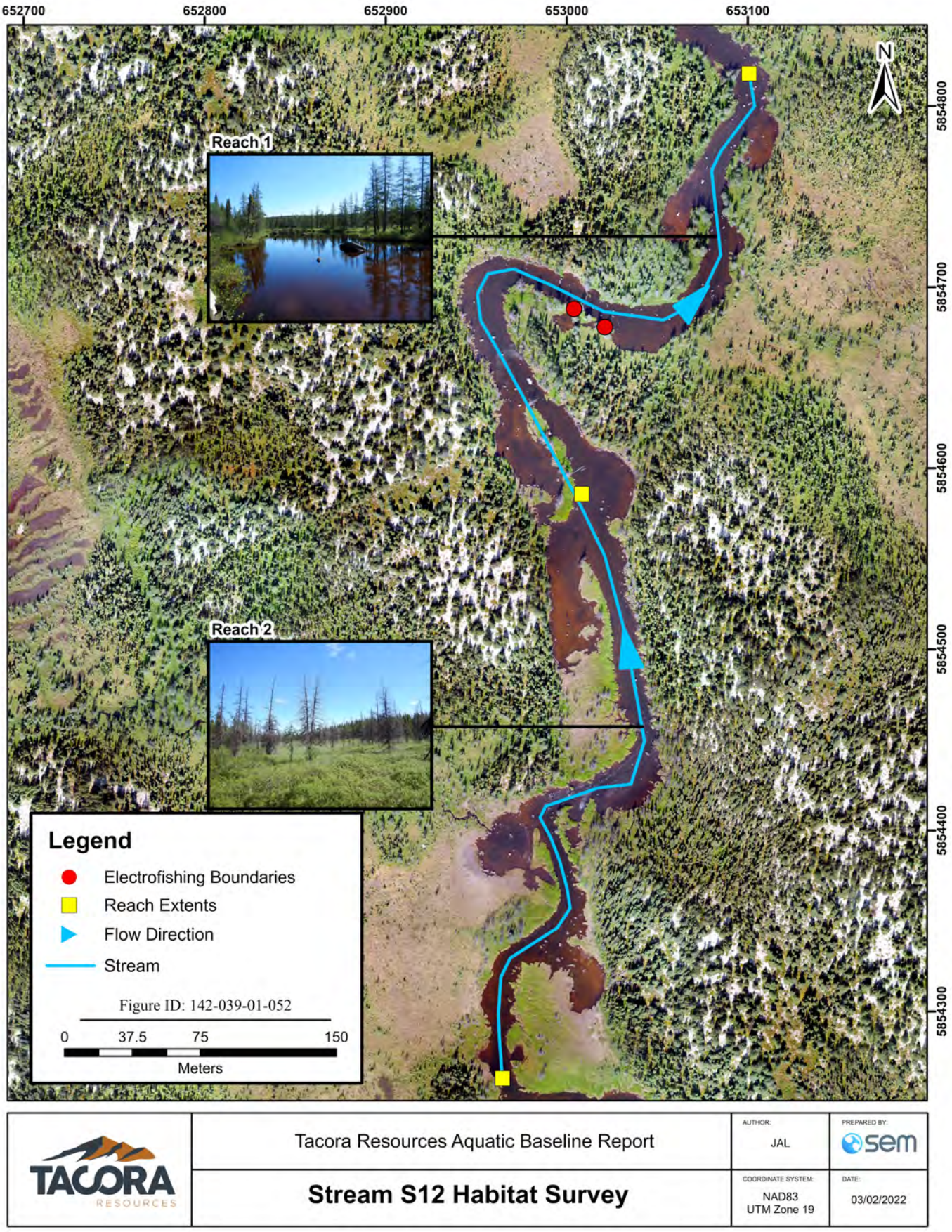


Figure 4.18 Stream S12 Habitat Survey Locations.

The substrate was composed primarily of muck/clay (mean of 60%) and boulder (mean of 30%), with some cobble (mean of 10%; Table 4.48). There were small amounts of overhanging, instream, and canopy cover (a mean of 5, 1, 5%, respectively). Small amounts of eroding banks were observed (mean of 5%), while undercut banks were more prevalent (mean of 40%; Appendix D).

Table 4.47 Site Characteristics of Surveyed Sections in Stream S12.

	Start Location		Finish Location		Habitat Type (%)				Habitat Size		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	5854815	653092	5854586	652983	10	90	0	0	399	10.3	8,927
2	5854586	652983	5854272	652967	30	70	0	0	387	21.3	9,567
Mean					20	80	0	0	393	15.8	9,247
Total									786	31.6	18,494
NAD83 UTM Zone 19											

Table 4.48 Substrate Proportions of Surveyed Sections in Stream S12.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	60	0	0	10	0	30
2	60	0	0	10	0	30
Mean	60	0	0	10	0	30

4.12.3 Stream Water Quality

The water quality data for Stream S12 is provided in Appendix D. Most metals in Stream S12 were below detection limits, except aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium which were detectable. Additionally, this stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected (Appendix D).

Field water quality data for Stream S12 is shown in Appendix D. The temperature measured 13.7°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.20, 10.5 mg/L (or 105% saturation), 106 µS/cm and 33.6 mV, respectively.

4.12.4 Stream Flow

The flow regime for Stream S12 is characterized by a mean discharge of 0.704 m^3/s and average velocity of 0.083 m/s. Depth and velocity ranged from 0.26 to 0.82 m and 0 to 0.80 m/s, respectively. Average depth of Stream S12 was 0.55 m (Appendix D).

4.12.5 Stream Fish Population Assessment

4.12.5.1 Fishing Effort and Catch

Quantitative electrofishing was performed at one site in Stream S12 on July 10, 2021 (Table 4.49). Coordinates of the two boundaries and details related to the electrofished site (i.e., width, length, and area) are shown in Table 4.49. Fishing effort (seconds) in each run (sweep) and summary of fish catches are provided in Table 4.50.

Table 4.49 Site Characteristics of Electrofishing Site in Stream S12 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
653004	5854688	653021	5854678	15.0	14.3	215
NAD83 UTM Zone 19						

Table 4.50 Summary of Catch and Effort for Electrofishing in Stream S12 in 2021.

	Effort (seconds)				Catch (No. of fish)				
Species	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Total
Lake Chub	330	217	233	244	8	1	4	0	13
Burbot	330	217	233	244	0	2	1	2	5
Sculpin	330	217	233	244	4	1	0	0	5
Longnose Dace	330	217	233	244	0	1	0	0	1

4.12.5.2 Fish Meristic Characteristics

Meristic characteristics of lake chub, burbot and sculpin captured by electrofishing in Stream S12 are summarized in Table 4.51. Captured lake chub ranged in length from to 53 to 83 mm, averaging 70 mm (std. dev. = ± 11.0). Lake chub weight ranged from 1.9 to 6 g, averaging 4.1 g (std. dev. = ± 1.5). Their condition factor ranged from 1.0 to 1.3, averaging 1.1 (std. dev. = ± 0.1). Burbot ranged in length from 110 to 180 mm, averaging 135 mm (std. dev. = ± 27.0). Burbot weight ranged from 9 to 33 g, averaging 15.8 g (std. dev. = ± 9.9). Sculpin length ranged from 44 to 70 mm, averaging 52.6 mm (std. dev. = ± 11.9), and weight ranged from 1.8 to 4 g, averaging 2.5 g (std. dev. = ± 1.0). Their condition factor ranged from 1.2 to 1.4, averaging 1.3 (std. dev. = ± 0.2). One longnose dace was also captured in Stream S12, with length, weight and condition factor of 58 mm, 3 g and 1.5, respectively.

Table 4.51 Summary of Fish Meristic Characteristics Captured by Electrofishing in Stream S12 in 2021.

Species	Parameter	Min	Max	Mean	Std. Dev.
Lake chub	Length (mm)	53.0	83.0	70.0	11.0
	Weight (g)	1.9	6.0	4.1	1.5
	Condition (K)	1.0	1.3	1.1	0.1
Burbot	Length (mm)	110.0	180.0	135.0	27.0
	Weight (g)	9.0	33.0	15.8	9.9
Sculpin	Length (mm)	44.0	70.0	52.6	11.9
	Weight (g)	1.8	4.0	2.5	1.0
	Condition (K)	1.2	1.4	1.3	0.2
Condition factor was not calculated for burbot due to its dissimilar length-weight relationship.					

4.12.5.3 Fish Population Estimate

A population estimate was determined for all species combined in Stream S12. Population and biomass estimates in the electrofishing site were 26 fish (95% confidence interval of 20-32) and 199.1 g (95% confidence interval of 135.9-217.5), respectively. The population estimate and biomass estimate, adjusted per unit of habitat (100 m^2), were 12 fish (95% confidence interval of 9-15) and 92.6 g (95% confidence interval of 63.2-101.2), respectively (Table 4.52).

Table 4.52 Fish Population and Biomass Estimates from Electrofishing of Stream S12 in 2021.

Species	Total Catch	Total Weight (g)	Population Estimate	Lower 95% CI	Upper 95% CI	Biomass Estimate (g)		
						Total weight	Lower 95% CI	Upper 95% CI
All species	Actual Catch							
	24	142.7	26	20	32	199.1	135.9	217.5
	Per Habitat Unit (100 m^2)							
	11.2	66.4	12	9	15	92.6	63.2	101.2

4.12.6 Stream Benthic Community

There was a total abundance of five benthic macroinvertebrates identified at Stream S12. Families represented in the sample consisted of Leuctridae (40%), Rhyacophilidae (40%) and Chironomidae (20%). Taxonomic richness of three and density of 20 individuals/m^2 represented Stream S12.

4.13 Stream S13

4.13.1 General Overview Description

Stream S13 originated at a small pond to the east of Lake L20. The stream flowed west into the eastern side of L20 with wide, shallow, and fast flowing water. The length of Stream S13 consisted of alders dominating the riparian vegetation with black spruce immediately behind, providing ample canopy cover over the stream. Rapids were the primary mesohabitat type for this fast-flowing stream; only differing sections where rougher cascades, along with a brief run at the confluence of Stream S13 and Lake L20. This stream possessed localized areas of different substrate. The main substrates present were larger boulders and rubble, however there were pockets of gravels and cobbles; typically near the bottom of a cascade section. This stream's water velocity was too high to secure barrier nets for electrofishing, however spot electrofishing proved the presence of fish with multiple species caught. Access to this stream was completed via boat from Lake L20. A map showing the various sections surveyed with representative photos of Stream S13 is provided in Figure 4.19.

4.13.2 Stream Habitat Assessment

A habitat survey of Stream S13 was completed on June 28, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. The Stream S13 section was 5.3 m wide and 284 m in length (Table 4.53). The habitat was comprised primarily of rapids and cascades (mean of 80 and 20%, respectively).

The substrate was composed primarily of boulder (mean of 60%) and rubble (mean of 20%), with some cobble and gravel (mean of 15 and 5%, respectively; Table 4.54). Small amounts of overhanging, instream and canopy cover were present (mean of 5, 1, 4%, respectively). No eroding banks were observed, while undercut banks were slightly more prevalent (mean of 4%; Appendix D).

Table 4.53 Site Characteristics of Surveyed Sections in Stream S13.

	Start Location		Finish Location		Habitat Type (%)				Habitat Size		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Rapids	Cascades	Length (m)	Width (m)	Area (m^2)
1	5856134	652824	5856158	653066	0	0	80	20	284	5.3	1,306
NAD83 UTM Zone 19											

Table 4.54 Substrate Proportions of Surveyed Sections in Stream S13.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	0	0	5	15	20	60

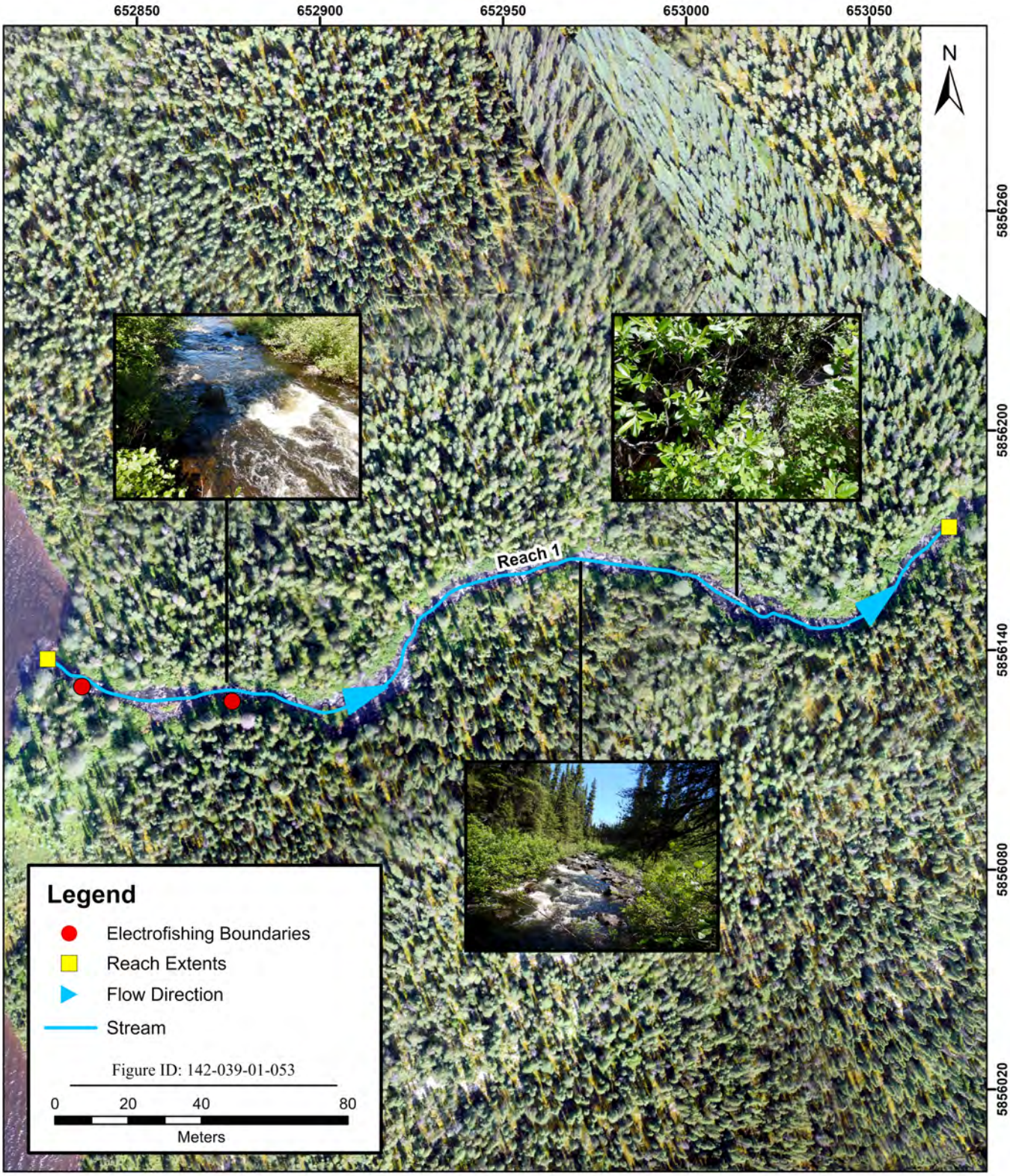


Figure 4.19 Stream S13 Habitat Survey Locations.

4.13.3 Stream Water Quality

The water quality data for Stream S13 is provided in Appendix D. Most metals in Stream S13 were below detection limits, but aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Additionally, this stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite and dissolved chloride were all undetected (Appendix D).

Field water quality data for S13 is shown in Appendix D. The temperature measured 13.3°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.23, 11.0 mg/L (or 108.7% saturation), 98.7 µS/cm and 34.8 mV, respectively.

4.13.4 Stream Flow

The flow regime for Stream S13 was characterized by a mean discharge of 0.106 m^3/s and average velocity of 0.221 m/s. Depth and velocity ranged from 0.00 to 0.31 m and 0 to 0.52 m/s, respectively. Average depth of Stream S13 was 0.087 m (Appendix D).

4.13.5 Stream Fish Population Assessment

4.13.5.1 Fishing Effort and Catch

Index electrofishing was performed at one site in Stream S13 on July 11, 2021 (Table 4.55). Coordinates of the two boundaries and details related to the electrofished site (i.e., width, length, and area) are shown in Table 4.56. Fishing effort (seconds) in each run (sweep) and summary of fish catches are provided in Table 4.56. Brook trout, burbot, longnose dace, lake chub and white sucker were caught in Stream S13.

Table 4.55 Site Characteristics of Electrofishing Site in Stream S13 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
652876	5856126	652835	5856130	4.5	46	207
NAD83 UTM Zone 19						

Table 4.56 Summary of Catch and Effort for Electrofishing in Stream S13 in 2021.

Effort (seconds)		Catch (No. of fish)	
Species	Sweep 1	Sweep 1	Total
Brook trout	250	3	3
Burbot	250	4	4
Longnose dace	250	1	1
Lake chub	250	1	1
White sucker	250	1	1

4.13.5.2 Fish Meristic Characteristics

Captured brook trout ranged in length from 80 to 155 mm (Figure 4.20), averaging 119 mm (std. dev. = ± 37.6, Table 4.57). Brook trout weight ranged from 5 to 40 g, averaging 21.7 g (std. dev. = ± 17.6). Condition factor of captured brook trout ranged from 1.0 to 1.1, averaging 1.1 (std. dev. = ± 0.1), with 66.7% of the population having a condition factor equal or greater than 1.0. Captured burbot length ranged from 105 to 185 mm, averaging 135.0 mm (std. dev. = ± 43.6). Burbot weight ranged from 6 to 30 g, averaging 15.0 g (std. dev. = ± 13.1). The longnose dace had a length of 62 mm, weight of 2.6 g, and condition factor of 1.1, while the lake chub showed a length, weight and condition factor of 70 mm, 3 g, and 0.9, respectively. Finally, the white sucker length, weight and condition factor were 82 mm, 5 g, and 0.9, respectively. The total number of fish caught in S13 was ten and total biomass was 130.6 g.

Table 4.57 Summary of Brook Trout and Burbot Meristic Characteristics Captured by Electrofishing in Stream S13.

Species	Parameter	Min	Max	Mean	Std. Dev.
Brook trout	Length (mm)	80.0	155.0	119.0	37.6
	Weight (g)	5.0	40.0	21.7	17.6
	Condition (K)	1.0	1.1	1.1	0.1
Burbot	Length (mm)	105.0	185.0	135.0	43.6
	Weight (g)	6.0	30.0	15.0	13.1
Condition factor was not calculated for burbot due to its dissimilar length-weight relationship.					

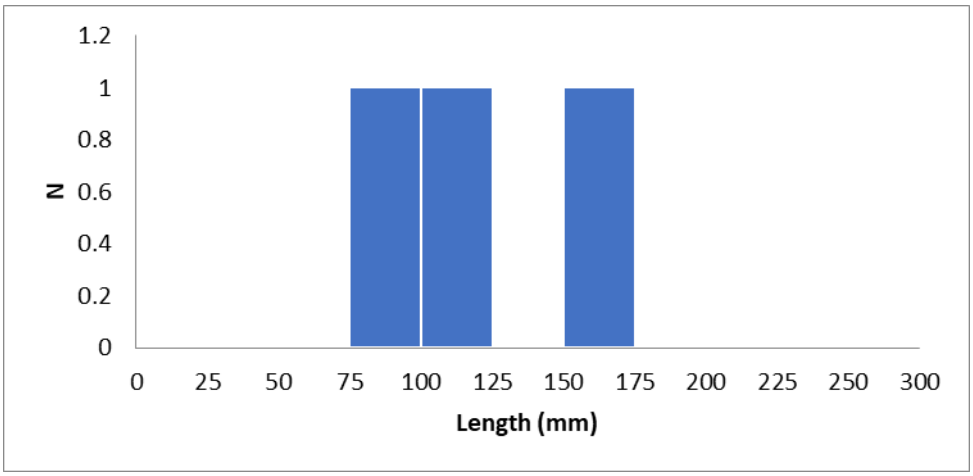


Figure 4.20 Length Frequency Distribution of Brook Trout Captured in Stream S13.

4.13.6 Stream Benthic Community

Total abundance of benthic macroinvertebrates at Stream 13 was 13, taxonomic richness was six and density (individuals/m^2) was 52. Families represented in Stream 13 were Chironomidae (46%), Ephemerellidae (15%), Leuctridae (15%), Heptageniidae (8%), Rhyacophilidae (8%) and Empididae (8%).

4.14 Stream S14

4.14.1 General Overview Description

Stream S14 flowed west into Lake L20, originating east of the assessment area. This stream began as a winding stream with varying habitat types. The stream transitions back and forth from sections of riffle, run, and steady throughout its length, with many fallen trees and logs in the stream. There were no barriers to fish movement however as these logs did not form complete blockages. Cover for this stream was relatively uniform with tall black spruce canopy and grasses along stream banks. This stream possessed many sections of varying levels of many substrates. Sections of fines are prevalent where the stream had slower moving water and more coarse areas ranging from sand all the way to boulders in areas of higher velocity. This stream was not easily electrofished due to the volume of fallen trees in the stream, fish however frequented it. Access to this stream was completed via boat from Lake L20. A map showing the various sections surveyed with representative photos of Stream S14 is provided in Figure 4.21.

4.14.2 Stream Habitat Assessment

A habitat survey of Stream S14 was completed on July 11, 2021. A UAV survey of this stream was also completed in August to provide high resolution imagery and topography of the area. The Stream S14 section was 3.5 m wide and 304 m in length (Table 4.58). The habitat was comprised primarily of riffles, runs and steadies (mean of 40, 30, and 30%, respectively).

The substrate was composed primarily of boulder (mean of 50%) and muck/clay, sand, gravel, cobble and rubble (mean of 10% each; Table 4.59). In-stream substrate cover was predominant (mean of 10%) with some canopy cover (mean of 5%) and small proportions of overhanging cover (mean of 3%). No eroding banks were observed, while undercut banks were more prevalent (mean of 80%; Appendix D).

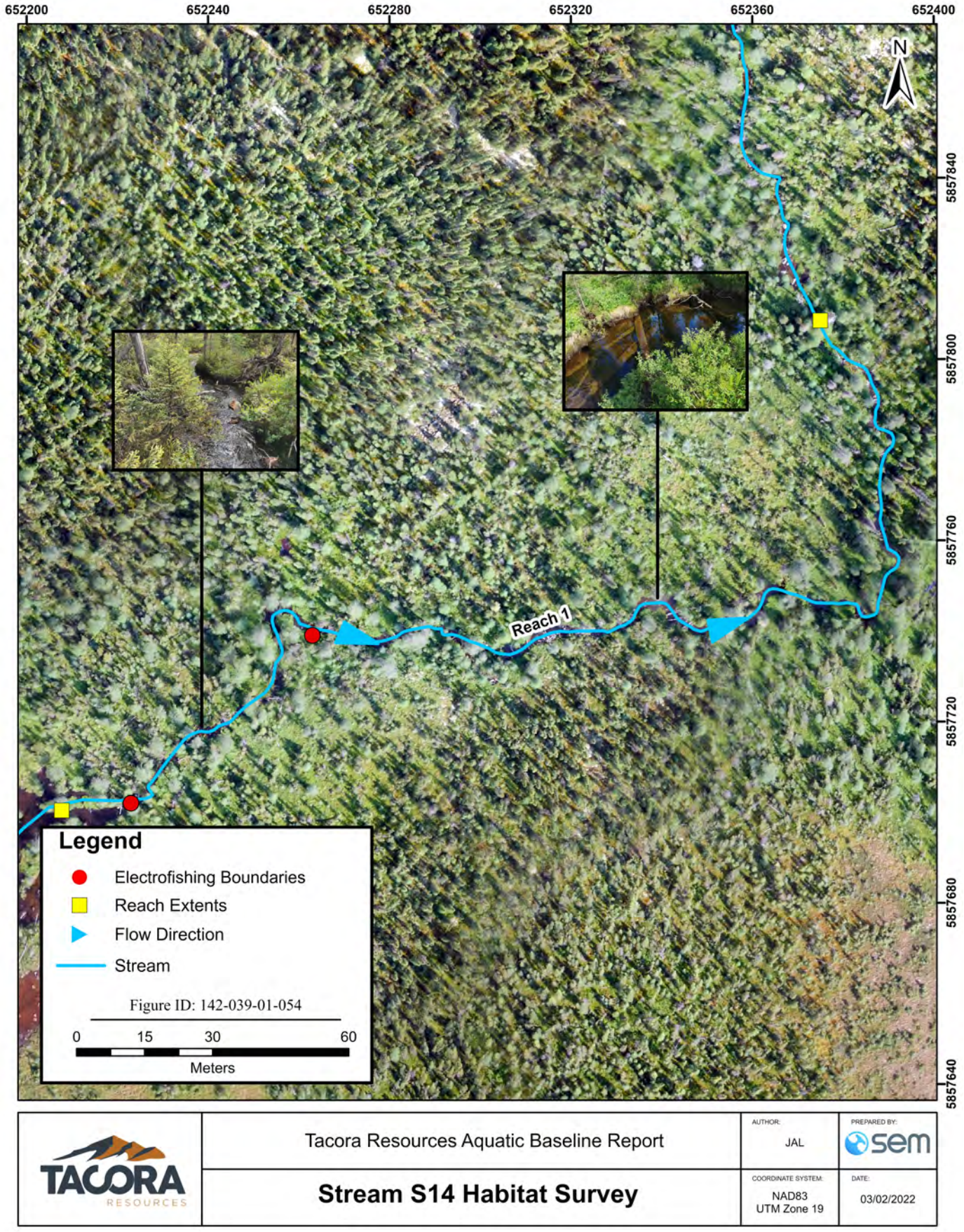


Figure 4.21 Stream S14 Habitat Survey Location.

Table 4.58 Site Characteristics of Surveyed Sections in Stream S14.

	Start Location		Finish Location		Habitat Type (%)				Habitat Dimensions		
Section No.	Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	5857711	652204	5857808	652374	30	30	40	0	304	3.5	641
NAD83 UTM Zone 19											

Table 4.59 Substrate Proportions of Surveyed Sections in Stream S14.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	10	10	10	10	10	50

4.14.3 Stream Water Quality

The water quality data for Stream S14 is provided in Appendix D. Many metals in Stream S14 were below detection limits with the exception of aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium which were detected. This stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrite and dissolved chloride were undetected.

Field water quality data for Stream S14 is provided in Appendix D. The temperature measured 7.0°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.60, 12.8 mg/L (or 107% saturation), 94.5 µS/cm and 52.0 mV, respectively.

4.14.4 Stream Flow

The flow regime for Stream S14 was characterized by a mean discharge of 0.017 m^3/s and average velocity of 0.067 m/s. Depth ranged from 0.00 to 0.34 m, while velocity ranged from 0 to 0.09 m/s. Average depth of S14 was 0.15 m (Appendix D).

4.14.5 Stream Fish Population Assessment

4.14.5.1 Fishing Effort and Catch

Index electrofishing was performed at one site in the Stream S14 on July 11, 2021. Coordinates for the two boundaries of the electrofished site are shown in Table 4.60. Stream S14 has a width 2.5 m, length 64.6 m and an area of 161.5 m^2. Fishing effort (seconds) in each run (sweep) and summary of fish catches are provided in Table 4.61.

Table 4.60 Site Characteristics of Electrofishing Site in Stream S14 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
652263	5857739	652223	5857702	2.5	64.6	161.5
NAD83 UTM Zone 19						

Table 4.61 Summary of Catch and Effort for Electrofishing in Stream S14 in 2021.

Effort (seconds)		Catch (No. of fish)	
Species	Sweep 1	Sweep 1	Total
Brook trout	232	3	3
Burbot	232	2	2

4.14.5.2 Fish Meristic Characteristics

Captured brook trout in Stream S14 ranged in length from 65 to 163 mm (Figure 4.22), averaging 101 mm (std. dev. = ± 53.9, Table 4.62). Brook trout weight ranged from 3 to 43 g, averaging 16.7 g (std. dev. = ± 22.8). Condition factor of captured brook trout ranged from 0.9 to 1.1, averaging 1.0 (std. dev. = ± 0.1), with 33% of the population having a condition factor equal or greater than 1.0. The two caught burbot had mean length and weight of 112.5 mm (std. dev. = ± 0.7) and 7.5 g (std. dev. = ± 0.7), respectively. A total of five fish were captured in Stream S14 and total biomass was 65 g.

Table 4.62 Summary of Brook Trout and Burbot Meristic Characteristics Captured by Electrofishing in Stream S14 in 2021.

Species	Parameter	Min	Max	Mean	Std. Dev.
Brook trout	Length (mm)	65.0	163.0	101	53.9
	Weight (g)	3.0	43.0	16.7	22.8
	Condition (K)	0.9	1.1	1.0	0.1

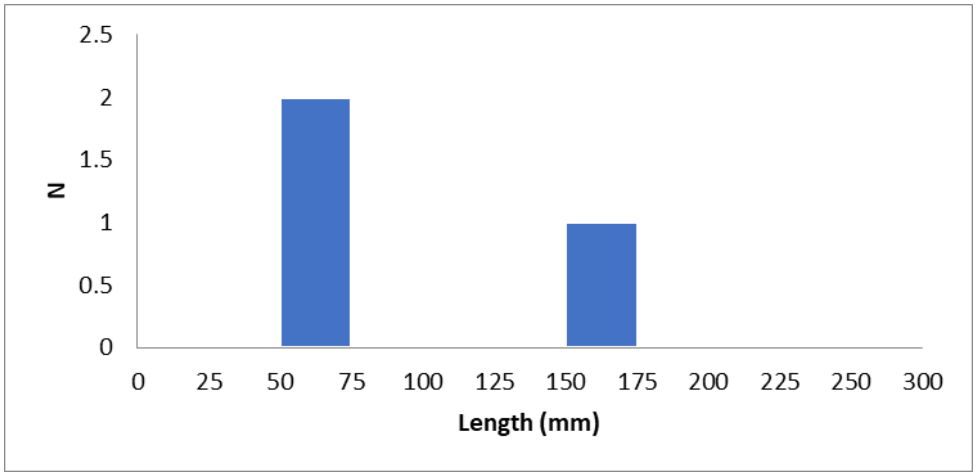


Figure 4.22 Length Frequency Distribution of Brook Trout Captured in Stream S14.

4.14.6 Stream Benthic Community

Stream S14 had a total abundance of five with a taxon richness of two and density of 20 individuals/m^2. The two families represented in Stream S14 were Empididae (80%) and Rhyacophilidae (20%), the second most common benthic macroinvertebrate family found in all sites.

4.15 Stream S15

4.15.1 General Overview Description

Stream S15 flowed from Lake L23 east into Lake L20. This entire stream was a homogenous, slow-moving steady from start to end, winding through an area of wetland for its entirety. Canopy cover for this stream was limited as there were no trees along the riparian zone. The banks of this stream were instead mostly covered by grasses and sedge. Organic fines filled the entire stream bottom with sparse boulders visible in some locations. Due to the near-stagnant water, this stream was not easily electrofished, fish however frequented it to some degree, as small northern pike were seen near the L20 end of the stream during surveying. Access to this stream was completed via boat from Lake L20, as there are no trails in the vicinity. There is also a possible barrier to fish movement into Stream S15 as there is a small area of branches and dead tree limbs across a section. This barrier did not appear to be holding water but could impact fish movement in the stream. A map showing the various sections surveyed with representative photos of Stream S15 is provided in Figure 4.23.

4.15.2 Stream Habitat Assessment

A habitat survey of Stream S15 was completed on July 1, 2021. A UAV survey of the stream was also completed in August to provide high resolution imagery and topography of the area. Stream S15 section was 1.8 m wide and 289 m in length (Table 4.63). The entire habitat was comprised of steadies.

The substrate was composed primarily of muck or clay (mean of 99%, Table 4.64). Small amounts of boulder were also present (mean of 1%). There were no forms of cover present along the stream section. No eroding banks were observed, while undercut banks were slightly more prevalent (5%) (Appendix D).

Table 4.63 Site Characteristics of Surveyed Sections in Stream S15.

	Start Location		Finish Location		Habitat Type (%)				Habitat Dimensions		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	5857729	651684	5857655	651552	0	100	0	0	289	1.8	267
NAD83 UTM Zone 19											

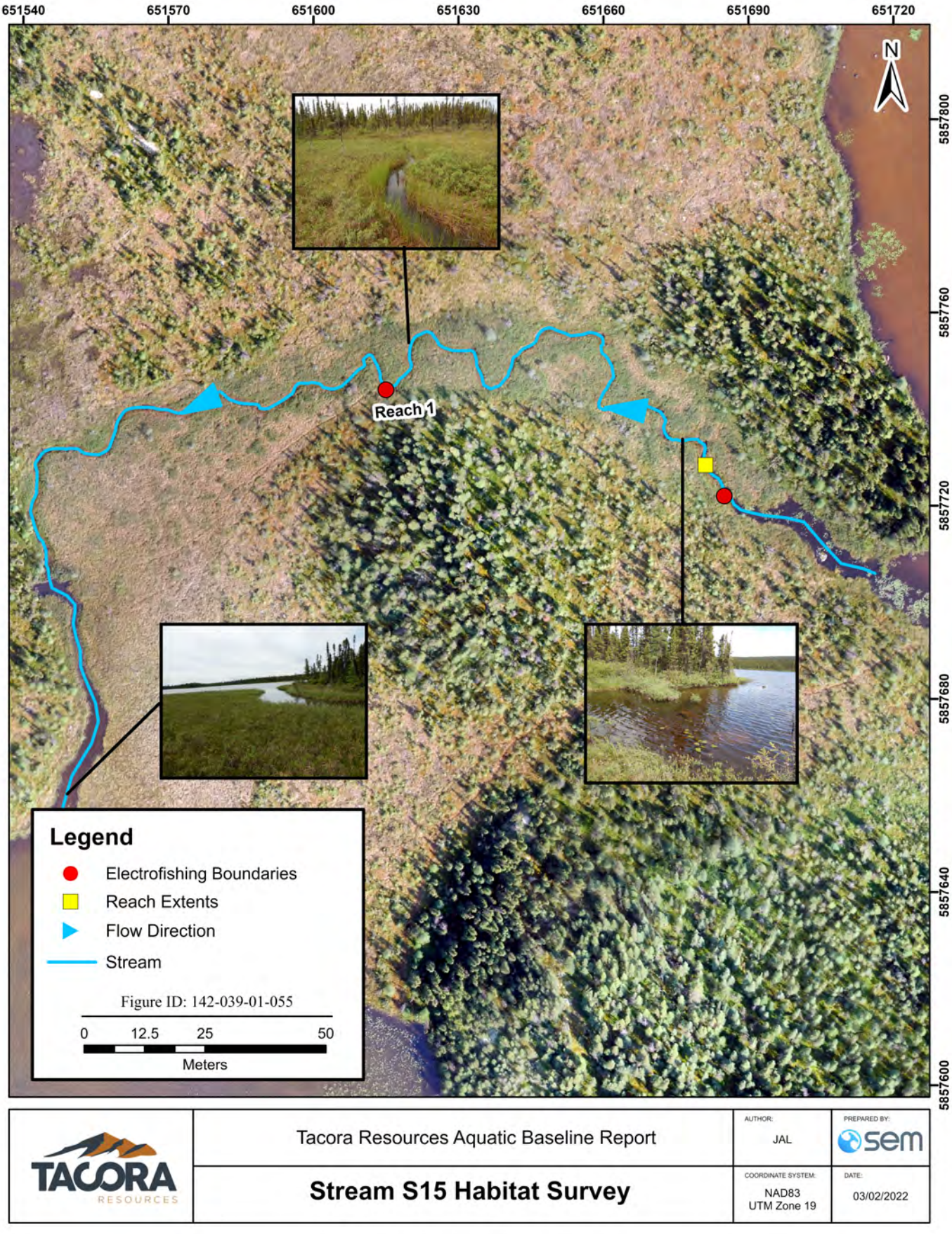


Figure 4.23 Stream S15 Habitat Survey Location.

Table 4.64 Substrate Proportions of Surveyed Sections in Stream S15.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	99	0	0	0	0	1

4.15.3 Stream Water Quality

The water quality data for Stream S15 is provided in Appendix D. Many metals in Stream S15 were below detection limits, but aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected (Appendix D). This stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected (Appendix D).

Field water quality data for Stream S15 is provided in Appendix D. The temperature measured 15.7°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.44, 7.70 mg/L (or 77.0% saturation), 72.2 µS/cm and 45.0 mV, respectively.

4.15.4 Stream Flow

The flow regime for Stream S15 was characterized by a mean discharge of 0.002 m^3/s and average velocity of 0.023 m/s. Depth ranged from 0.00 to 0.24 m, while velocity ranged from 0.00 to 0.03 m/s. Average depth of S15 was 0.13 m (Appendix D).

4.15.5 Stream Fish Population Assessment

4.15.5.1 Fishing Effort and Catch

Electrofishing was performed at one site in Stream S15 on July 1, 2021 (Table 4.65). Coordinates of the two boundaries related to the electrofished site are shown in Table 4.65. Stream S15 had a length of 120 m, width 0.5 m and an area of 60 m^2. The site was electrofished for one sweep for a total 324 seconds and no fish were captured.

Table 4.65 Site Characteristics of Electrofishing Site in Stream S15 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
651615	5857744	651685	5857722	0.5	120	60
NAD83 UTM Zone 19						

4.15.6 Stream Benthic Community

Stream S15 had a total abundance of five, with a taxon richness of three and density of 167 individuals/m^2. The most dominant family at Stream S15 was Chironomidae (60%) followed by Libellulidae (20%) and Naididae (20%).

4.16 Stream S16

4.16.1 General Overview Description

Stream S16 flowed from Lake L20 into Lake L19. This was the main and only outlet of Lake L20 and formed part of the main lake and river system that flowed into Flora South Basin. Stream S16 began at Lake L20 with fast flowing waters and coarse substrate, with habitat types consisting of a mixture of riffle, run and rapids before quickly slowing to a wide steady dominated by fine substrate. The stream repeated these features along its length exhibiting fast flowing water in between slower steady sections as can be seen from Figure 4.24. Sections of fines were prevalent where the stream had slower-moving water and more coarse areas ranging from sand to boulders in areas of higher velocity. This stream was successfully electrofished with barrier nets and multiple fish species were caught.

Access to this stream was completed via ATV trail, as there was an ATV trail terminating at S16. A map showing the various sections surveyed with representative photos of Stream S16 is provided in Figure 4.24.

4.16.2 Stream Habitat Assessment

A habitat survey of Stream S16 was completed on June 18, 2021. A UAV survey of this stream was also completed in August, 2021 to provide high resolution imagery and topography of the area. Stream S16 sections were between 0.2 and 1.2 m wide and between 218 and 253 m in length and averaged 0.7 m width and 236 m length. The stream total length was 471 m (Table 4.66). The habitat was comprised primarily of steadies, followed by runs and riffles (mean of 50%, 25% and 25%, respectively).

The substrate was composed primarily of muck/clay (mean of 70%), with some gravel, cobble, and rubble (mean of 10% each; Table 4.67). Overhanging cover was predominant (mean of 21%) with some instream and canopy cover (mean of 3% each). No eroding banks were observed, while undercut banks were slightly more prevalent (mean of 5%; Appendix D).

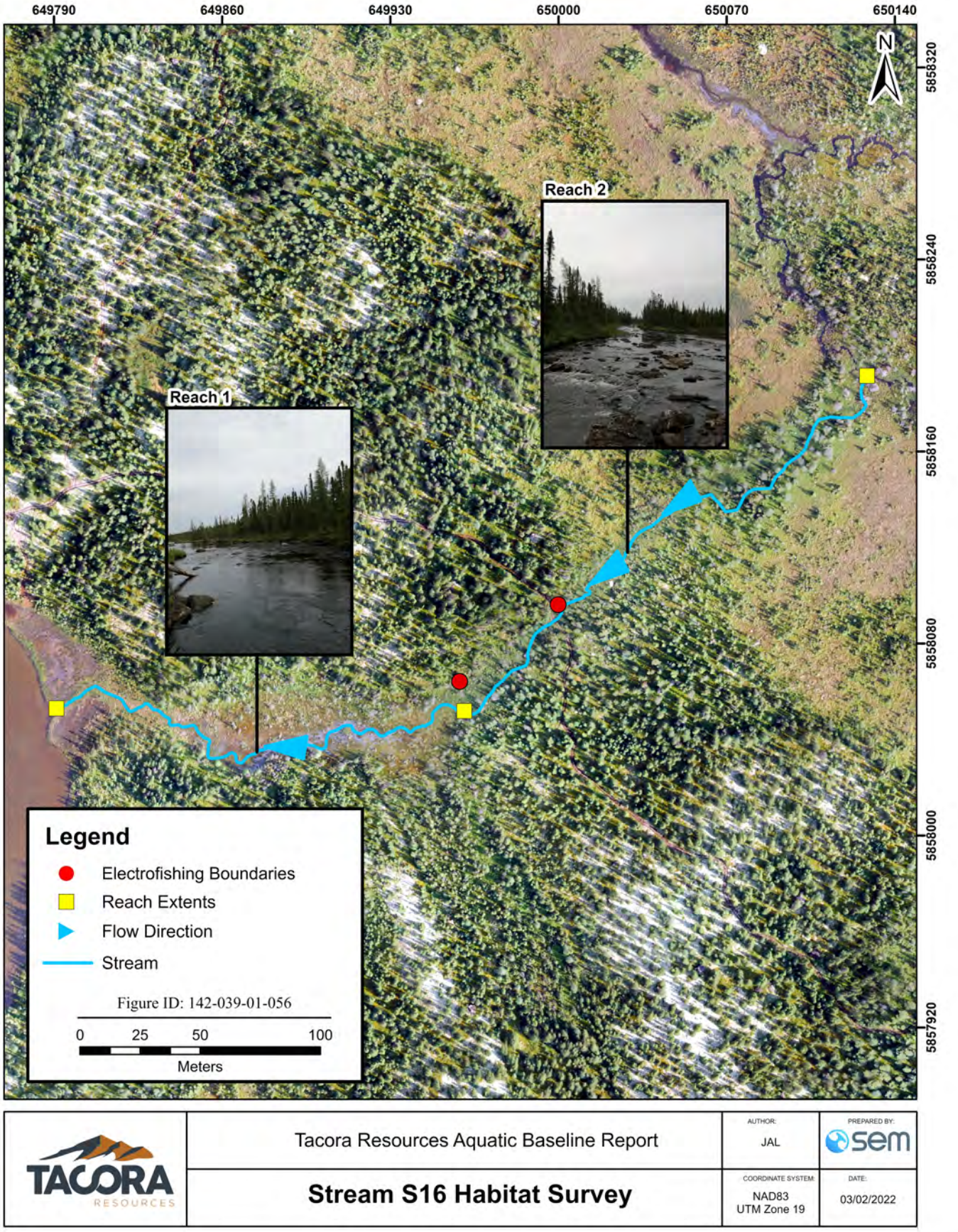


Figure 4.24 Stream S16 Habitat Survey Location.

Table 4.66 Site Characteristics of Surveyed Sections in Stream S16.

	Start Location		Finish Location		Habitat Type (%)				Habitat Dimensions		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Pool	Length (m)	Width (m)	Area (m^2)
1	5858277	649855	5858282	650021	0	100	0	0	253	0.2	72
2	5858282	650021	5858396	650185	50	0	50	0	218	1.2	94
Mean					25	50	25	0	236	0.7	83
Total									471	1.4	166
NAD83 UTM Zone 19											

Table 4.67 Substrate Proportions of Surveyed Sections in Stream S16.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	100	0	0	0	0	0
2	40	0	20	20	20	0
Mean	70	0	10	10	10	0

4.16.3 Stream Water Quality

The water quality data for Stream S16 is provided in Appendix D. Many metals in Stream S16 were below detection limits, but aluminum, barium, calcium, iron, magnesium, manganese, molybdenum, potassium, sodium and strontium were detected. This stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected.

Field water quality data for Stream S16 is provided in Appendix D. The temperature measured 20.6°C, while pH, dissolved oxygen, conductivity and ORP showed values of 7.43, 8.58 mg/L (or 95.9% saturation), 57.1 µS/cm and 44.7 mV, respectively.

4.16.4 Stream Flow

The flow regime for Stream S16 was characterized by a mean discharge of 0.010 m^3/s and average velocity of 0.14 m/s. Depth and velocity ranged from 0.00 to 0.07 m and 0 to 0.28 m/s, respectively. Average depth of Stream S16 was 0.046 m (Appendix D).

4.16.5 Stream Fish Population Assessment

4.16.5.1 Fishing Effort and Catch

Quantitative electrofishing was performed at one site in Stream S16 on July 14, 2021 (Table 4.68). Coordinates of the two boundaries and details related to the electrofished site are shown in Table 4.68. Stream S16 had a length of 12.1 m, width of 13.2 m and area of 159.7 m^2. Fishing effort (seconds) in each

run (sweep) and summary of fish catches are provided in Table 4.69. Lake chub, longnose dace and burbot were caught in Stream S16.

Table 4.68 Site Characteristics of Electrofishing Site in Stream S16 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
650872	5857745	650874	5857758	13.2	12.1	159.7
NAD83 UTM Zone 19						

Table 4.69 Summary of Catch and Effort for Electrofishing in Stream S16 in 2021.

Effort (seconds)					Catch (No. of fish)				
Species	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Sweep 1	Sweep 2	Sweep 3	Sweep 4	Total
Lake chub	200	205	329	249	1	0	0	0	1
Longnose dace	200	205	329	249	2	2	2	3	9
Burbot	200	205	329	249	0	2	2	1	5

4.16.5.2 Fish Meristic Characteristics

The length, weight and condition factor of longnose dace and burbot captured by electrofishing in Stream S16 are summarized in Table 4.70. Longnose dace ranged in length from 52 to 68 mm, averaging 62.6 mm (std. dev. = ± 5.3) and weight ranged from 1.9 to 3.0 g, averaging 2.7 g (std. dev. = ± 0.6). Condition factor for longnose dace ranged from 1.0 to 1.4, averaging 1.1 (std. dev. = ± 0.1) with 100% of the population having a condition factor equal to or greater than 1.0. Burbot had a length range of 35 to 220 mm, averaging 135.8 mm (std. dev. = ± 60.3). Burbot weight ranged from 0.3 to 61 g, averaging 23.9 g (std. dev. = ± 20.7). One lake chub was captured with a length of 75 mm, weight of 7 g and condition factor of 1.7. Population and biomass estimates for all species combined could not be generated for Stream S16 due to the non-descending nature of the removal pattern in the stream (i.e., 3, 4, 5, 4). The total number of fish caught in this stream was 15 and total biomass was 157.5 g.

Table 4.70 Summary of Longnose Dace and Burbot Meristic Characteristics Captured by Electrofishing in Stream S16 in 2021.

Species	Parameter	Min	Max	Mean	Std. Dev.
Longnose dace	Length (mm)	52.0	68.0	62.6	5.3
	Weight (g)	1.9	3.0	2.7	0.6
	Condition (K)	1.0	1.4	1.1	0.1
Burbot	Length (mm)	35.0	220.0	135.8	60.3
	Weight (g)	0.3	61.0	23.9	20.7
Condition factor was not calculated for burbot due it's dissimilar length-weight relationship.					

4.16.6 Stream Benthic Community

Stream S16 had a total abundance of 21 organisms. Taxon richness at this site was eight with a density of 700 individuals/m^2 (the highest of any stream site). The most dominant family found at this site where Rhyacophilidae (33%) followed by Hydropsychidae (19%) with Chironomidae, Elmidae, Perlidae, Ephemerellidae, Baetidae and Pisidiidae comprising the remaining (48%) families present at this site.

4.17 Stream S17

4.17.1 General Overview Description

Stream S17 was one of two tributaries flowing into Stream S7. Originating from the eastern side of Lake L10. This stream began at Lake L10 as a winding steady through wetland gradually narrowing and gaining cover. This stream possessed many sections of varying levels of many substrates. The initial section of the stream through wetland was entirely organic bottom while the sections closer to Stream S7 contained a variety of gravels, cobbles, and other coarse substrates. This stream was very narrow and not easily electrofished, it was however frequented by lake chub, brook trout and white suckers. Access to this stream was completed via an ATV trail as there was access with a log bridge crossing the stream near its mid-point. A map showing the various sections surveyed with representative photos of Stream S17 is provided in Figure 4.25.

4.17.2 Stream Habitat Assessment

A habitat survey of Stream S17 was completed on June 22 and July 14, 2021. A UAV survey of this stream was also completed in August 2021 to provide high resolution imagery and topography of the area. Stream S17 sections were between 7.9 and 37.6 m wide and between 79 and 173 m in length and averaged 22.5 m wide and 137 m long. The stream total length was 820 m (Table 4.71). The habitat was comprised primarily of rapids and steadies (mean of 26.7% each), followed by runs and riffles (mean of 24.7 and 22%, respectively).

The substrate was composed primarily of boulder (mean of 43.3%), with some muck/clay and rubble (mean of 20 and 15%, respectively; Table 4.72). Small amounts of cobble, gravel and sand were also present (mean of 11.7, 3.3, and 6.7%, respectively). Small amounts of overhanging, instream and canopy cover were present (mean of 3, 4, and 3%, respectively). Eroding and undercut banks were present (10%) (Appendix D).

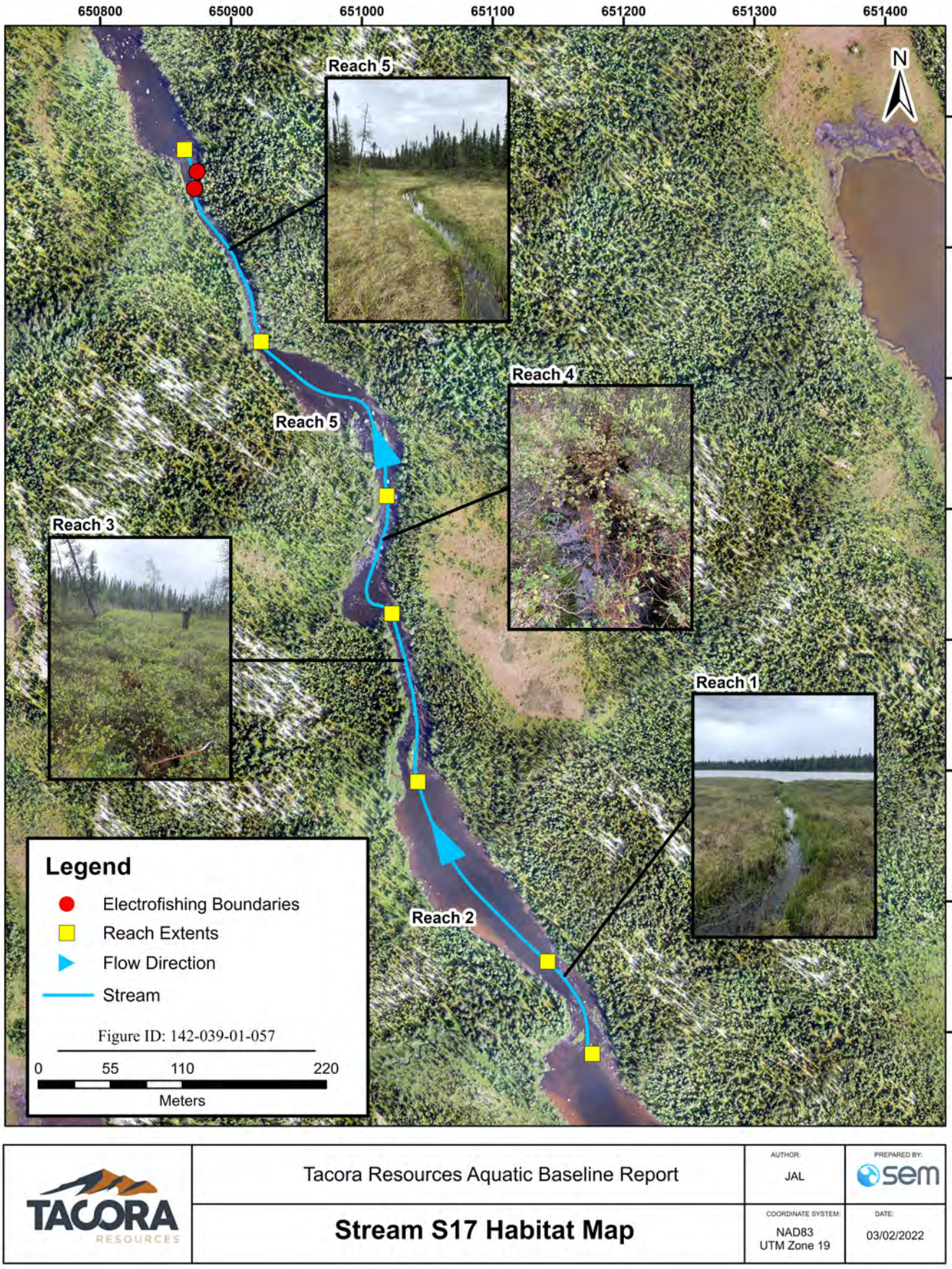


Figure 4.25 Stream S17 Habitat Survey Locations.

Table 4.71 Site Characteristics of Surveyed Sections in Stream S17.

	Start Location		Finish Location		Habitat Type (%)				Habitat Dimensions		
Section No.	Northing	Easting	Northing	Easting	Run	Steady	Riffle	Rapids	Length (m)	Width (m)	Area (m^2)
1	5857129	651158	5857100	651159	30	0	70	0	173	37.6	7,834
2	5857154	651142	5857290	651034	38	60	2	0	161	7.9	1,612
3	5857290	651034	5857510	651018	0	10	20	70	170	22.3	4,290
4	5857510	651019	5857628	650923	10	40	0	50	105	22.3	2,209
5	5857628	650923	5857775	650864	20	0	40	40	132	16.5	2,135
6	5857775	650864	5858033	650720	50	50	0	0	79	28.3	1,991
Mean					24.7	26.7	22	26.7	137	22.5	3,345
Total									820	134.9	20,071
NAD83 UTM Zone 19											

Table 4.72 Substrate Proportions of Surveyed Sections in Stream S17.

Section No.	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder
1	0	0	0	10	60	30
2	40	0	0	40	0	20
3	10	0	0	0	0	90
4	40	10	0	0	0	50
5	0	0	0	20	30	50
6	30	30	20	0	0	20
Mean	20	6.7	3.3	11.7	15	43.3

4.17.3 Stream Water Quality

The water quality data for Stream S17 is provided in Appendix D. Many metals in S17 were below detection limits but aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium were detected. This stream had pH near neutral and low alkalinity, conductivity, and turbidity. Nitrate, nitrite, Nitrate + Nitrite, and dissolved chloride were all undetected.

4.17.4 Stream Flow

The flow regime for Stream S17 was characterized by a mean discharge of 0.372 m^3/s and average velocity of 0.11 m/s. Depth and velocity ranged from 0.00 to 0.44 m and 0 to 0.35m/s, respectively. Average depth of Stream S17 was 0.228 m (Appendix D).

4.17.5 Stream Fish Population Assessment

4.17.5.1 Fishing Effort and Catch

Index electrofishing was performed at one site in Stream S17 on June 19, 2021 (Table 4.73). Stream S17 had an average width of 1.0 m, length of 55.6 m and area of 55.6 m^2. Fishing effort (seconds) in the run (sweep) and summary of fish catches are provided in Table 4.74. Lake chub, brook trout and white sucker were caught in Stream S17.

Table 4.73 Site Characteristics of Electrofishing Site in Stream S17 in 2021.

Upper Boundary		Lower Boundary		Width (m)	Length (m)	Area (m^2)
Easting	Northing	Easting	Northing			
650020	5858282	650061	5858314	1.0	55.6	55.6
NAD83 UTM Zone 19						

Table 4.74 Summary of Catch and Effort for Electrofishing in Stream S17 in 2021.

Effort (seconds)		Catch (No. of fish)
Species	Run 1	Total
Brook trout	198	4
Lake chub	198	8
White sucker	198	1

4.17.5.2 Fish Meristic Characteristics

The length, weight and condition factor of lake chub and brook trout captured by electrofishing in Stream S17 are summarized in Table 4.75. Captured lake chub ranged in length from 65 to 205 mm, averaging 98.1 mm (std. dev. = ± 46). Lake chub weight ranged from 3.2 to 77.9 g, averaging 15.8 g (std. dev. = ± 25.4). Condition factor of captured lake chub ranged from 0.9 to 1.2, averaging 1.1 (std. dev. = ± 0.1), with 89% of the population having a condition factor equal or greater than 1.0. Brook trout captured had a length range of 90 to 95 mm (Figure 4.26), averaging 92.5 mm (std. dev. = ± 3.5). Brook trout weight ranged from 8.3 to 9.5 g, averaging 8.9 g (std. dev. = ± 0.9), while condition factor was 1.1 (std. dev. = ± 0.02). One white sucker was captured with a length of 100 mm, weight of 11.2 g and condition factor of 1.1. The total number of fish caught in Stream S17 was 13 and total biomass was 157.1 g.

Table 4.75 Summary of Lake Chub and Brook Trout Meristic Characteristics Captured by Electrofishing in Stream S17 in 2021.

Species	Parameter	Min	Max	Mean	Std. Dev.
Lake chub	Length (mm)	65.0	205.0	98.1	46.0
	Weight (g)	3.2	77.9	15.8	25.4
	Condition (K)	0.9	1.2	1.1	0.1
Brook trout	Length (mm)	90.0	95.0	92.5	3.5
	Weight (g)	8.3	9.5	8.9	0.9
	Condition (K)	1.1	1.1	1.1	0.02

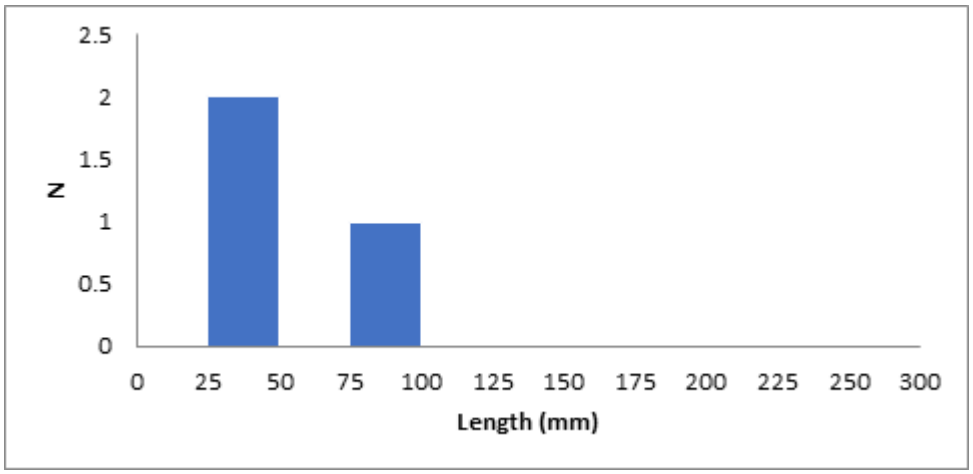


Figure 4.26 Length Frequency Distribution of Brook Trout Captured in Stream S17.

4.17.6 Stream Benthic Community

The Stream S17 benthic macroinvertebrate community had a total abundance of five and taxon richness of one. The density of macroinvertebrates at Stream S17 was 166 individuals/m^2. The only family present in Stream S17 was Rhyacophilidae (100%).

5.0 Summary

5.1 Lakes

The Tailings Expansion Project requires use of natural, fish-frequented water bodies for the disposal of mine waste beyond the currently approved TIA as described in Schedule 2 of the MDMER. In 2021 SEM completed a detailed aquatic baseline study of fish and fish habitats that will be affected in order to determine the amount of habitat that would be required for offsetting as per Section 35 of the *Fisheries Act*. Aquatic assessments were performed on a total of 24 lakes in the project area.

Aquatic assessments included quantification and classification of fish habitat (i.e., bathymetry, shoreline surveys, water and sediment quality), determination of fish populations and characterization of supporting biological communities in the lakes (i.e., phytoplankton, zooplankton and benthic community). Summary tables showing lake morphology, habitat characteristics (e.g., substrate classification, water quality), fish catches and macroinvertebrate metrics for all 24 lakes are shown below (Tables 5.1 to 5.7).

Lake L20 was the largest (1,631,690 m^2) and deepest lake (max depth of 4.8 m) compared to all other lakes in the project area (Table 5.1). Lake L17 was the smallest lake in the project area (1,801 m^2). Six of the 24 lakes had a maximum depth of 0.5 m or less and the average maximum depth of all lakes was 1.7 m. Due to this shallow lake characteristics, it was determined that all lakes contained only a littoral zone habitat. Average surface area of all lakes was 97 ha (97,007 m^2) and, after removing Lake L20 average surface area was 30 ha (30,282 m^2). The total surface area for all lakes was 2,328 ha (2,328,177 m^2; Table 5.1).

Shoreline surveys indicated that the most common substrate class in the lakes was fines, while coarse and medium were less common substrates (total area of all lakes combined was 800,446 m^2, 125,765 m^2 and 81,967 m^2, respectively; Table 5.2). Most lakes only had fines (i.e., 17 lakes), while lakes L3, L7, L9, L18, L19 and L20 showed fines, coarse and medium substrate types. Total vegetated area of all lakes combined was smaller (i.e., 22,666 m^2) when compared to total area with no vegetation (i.e., 985,512 m^2; Table 5.2).

Table 5.1 Lake Morphology Summary.

Lake #	Area (m^2)	Volume (m^3)	Maximum Depth (m)
L1	9,162	3,913	0.5
L2	20,743	17,418	1.5
L3	43,299	110,277	4.5
L4	8,897	7,344	1.5
L5	21,217	12,922	1.3
L6	22,095	17,573	2.5
L7	96,032	165,030	4.1
L8	27,577	18,577	1.3
L9	38,282	38,895	1.6
L10	63,096	29,181	0.5
L11	26,776	18,151	1.7
L12	23,932	17,449	1.3
L13	9,360	3,153	0.6
L14	8,272	5,782	1.7
L15	2,406	1,446	0.5
L16	2,660	1,330	0.5
L17	1,801	901	0.5
L18	113,165	103,294	2.8
L19	16,916	9,347	1.9
L20	1,631,690	2,697,541	4.8
L21	5,880	2,569	0.5
L22	2,610	1,305	0.5
L23	13,0248	105,992	2.6
L24	2,061	1,031	0.5
Total	2,328,177	3,391,570	-

Table 5.2 Lake Habitat Summary.

Lake #	Basin and Substrate Characteristics (m^2)					
	No Vegetation			Vegetation		
	Coarse	Medium	Fine	Coarse	Medium	Fine
L1	0	0	8,865	0	0	297
L2	0	0	20,295	0	0	448
L3	2,194	2,009	39,096	0	0	0
L4	0	0	8,897	0	0	0
L5	0	0	20,695	0	0	522
L6	0	0	22,095	0	0	0
L7	4,501	3,684	87,847	0	0	0
L8	0	0	27,577	0	0	0
L9	154	770	37,218	7	34	100
L10	0	0	63,096	0	0	0
L11	0	0	26,776	0	0	0
L12	0	0	23,857	0	0	75
L13	0	0	9,360	0	0	0
L14	0	0	7,982	0	0	290
L15	0	0	2,349	0	0	57
L16	0	0	2,660	0	0	0
L17	0	0	1,801	0	0	0
L18	12,085	6,617	77,833	434	414	15,782
L19	2,592	445	12,927	4	4	944
L20	93,675	67,616	147,767	404	374	1,854
L21	0	0	5,739	0	0	141
L22	0	0	2,460	0	0	150
L23	9,700	0	120,248	15	0	285
L24	0	0	2,030	0	0	31
Total	**124,901**	**81,141**	**779,470**	**864**	**826**	**20,976**

All lakes had a near neutral pH (ranged from 6.8 to 8.6; Table 5.3). Lake L17 had the lowest pH (i.e., 6.8) and Lake L10 had the highest pH (i.e., 8.6). The warmest lake in the project area was Lake L5 (21.8°C), and the coldest lake was Lake L8 (14°C; Table 5.3). The examined lakes generally had low alkalinity (ranging from 6.3 to 96 mg/L), conductivity (from 15.6 to 136.6 µS/cm) and turbidity (from 0.6 to 2.9 NTU). The most and least turbid lakes were Lake L21 and L11, respectively. Most lakes had undetected levels of nitrate, nitrite, nitrate + nitrite and dissolved chloride (Appendix C). Dissolved oxygen levels in the examined lakes ranged from 64.7% (or 6.04 mg/L) to 100% saturation (or 9.63 mg/L; Table 5.3). Chlorophyll 'a' is an indicator of primary productivity and had a range of 0.08 to 3.46 µg/L which is typical of oligotrophic lakes. Total organic carbon in the examined lakes ranged from 2.4 to 7.1 mg/L (Table 5.3).

Table 5.3 Lake Water Quality.

Lake #	Depths Sampled	Average Field Parameters						Laboratory Parameters											
		Temperature	pH	Dissolved Oxygen	Dissolved Oxygen	Conductivity	ORP	Alkalinity ($CaCO_3$)	TDS	Hardness ($CaCO_3$)	Color	Total Organic Carbon	Turbidity	Chlorophyll ' a'	Aluminum[1]	Calcium[1]	Iron[1]	Magnesium[1]	Potassium[1]
Units	N	°C	-	%	mg/L	µS/cm	mV	mg/L	mg/L	mg/L	TCU	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
L1	1	19.5	7.44	89.6	8.23	51.1	-49.6	34	33	28	25	6.7	1.1	0.354	18	6,800	490	2,600	470
L2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L3	4	16.5	7.48	74.3	7.48	81.2	-51.5	50	54	46	6.4	2.4	0.93	1.06	5.7	11,000	ND	4,700	1,200
L4	1	20.3	7.64	92.9	8.35	99.3	-61.0	62	69	58	8.3	3.0	0.98	0.226	5.6	14,000	240	5,600	1,700
L5	1	21.8	7.38	91.0	8.11	44.0	-46.9	29	32	26	15	5.5	1.0	0.631	6.9	6,100	270	2,600	750
L6	2	17.6	8.16	91.4	8.55	117.7	-89.95	66	68	61	9.5	4.3	1.4	0.333	5.6	13,000	210	6,600	970
L7	4	17.5	7.78	82.7	7.56	112.3	-67.95	56	58	49	ND	3.1	1.1	1.12	ND	11,000	ND	5,100	1,200
L8	1	14.0	7.96	90.5	9.19	117.2	-66.0	56	56	53	19	4.5	0.97	0.304	9.2	11,000	190	6,000	720
L9	1	15.4	7.50	100.0	9.63	67.0	-43.8	43	41	40	12	3.6	1.1	0.08	5.6	8,900	140	4,300	690
L10	1	20.2	8.60	84.8	7.56	109.6	-104.6	53	54	47	11	4.3	0.79	0.716	6.7	11,000	110	4,800	1,000
L11	2	18.6	8.24	98.0	9.08	74.6	-92.45	56	53	49	8.5	4.1	0.56	0.559	ND	11,000	110	5,100	940
L12	2	18.3	7.36	64.7	6.04	72.0	-35.85	55	54	51	17	5.3	0.72	0.817	5.6	12,000	150	5,100	980
L13	1	15.7	8.15	89.4	9.6	136.6	-86.3	96	100	95	13	4.5	1.2	0.41	6.4	22,000	130	9,500	1,900
L14	2	16.9	8.35	83.7	8.1	15.9	-96.9	6.3	6	3.6	24	4.5	1.2	1.56	10	870	640	360	ND
L15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L16	1	15.24	6.87	90.2	9.31	72.7	-17.8	43	51	40	26	4.5	0.88	0.747	8.9	9,400	270	3,900	1,200
L17	1	15.6	6.80	83.8	8.71	61.0	-14.0	36	49	33	36	4.7	0.94	0.765	11	7,700	300	3,300	960
L18	2	17.0	7.28	84.5	8.1	71.0	-34.8	27	34	26	22	5.2	1.4	3.46	12	6,100	120	2,600	800
L19	2	15.5	7.18	91.1	9.22	54.8	-30.5	29	33	24	22	5.3	1.2	0.895	12	5,600	92	2,500	590
L20-1	5	16.3	7.83	82.2	8.2	89.7	-42.8	24	29	23	29	5.7	1.4	1.04	21	5,300	140	2,400	620
L21	1	17.6	7.42	90.4	9.95	103.6	-48.8	77	79	72	34	5.7	2.9	0.461	7.6	17,000	800	7,000	1,200

Table 5.3 Lake Water Quality. (Cont'd)

Lake #	Depths Sampled	Average Field Parameters						Laboratory Parameters											
		Temperature	pH	Dissolved Oxygen	Dissolved Oxygen	Conductivity	ORP	Alkalinity ($CaCO_3$)	TDS	Hardness ($CaCO_3$)	Color	Total Organic Carbon	Turbidity	Chlorophyll 'a'	Aluminum[1]	Calcium[1]	Iron[1]	Magnesium[1]	Potassium[1]
Units	N	°C	-	%	mg/L	µS/cm	mV	mg/L	mg/L	mg/L	TCU	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
L22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L23	2	16.0	7.81	84.5	8.23	73.3	-61	21	21	19	17	7.1	1.4	1.86	16	4,300	170	1,900	600
L24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Min	**1**	**14.0**	**6.80**	**64.7**	**6.04**	**15.9**	**-104.6**	**6.3**	**6**	**3.6**	**6.4**	**2.4**	**0.56**	**0.08**	**5.6**	**870**	**92**	**360**	**470**
Max	**5**	**21.8**	**8.60**	**100.0**	**9.95**	**136.6**	**-14.0**	**96.0**	**100**	**95**	**36**	**7.1**	**2.9**	**3.46**	**21**	**22,000**	**800**	**9,500**	**1,900**
Mean	**2**	**17.3**	**7.66**	**87.0**	**8.50**	**81.2**	**-57.1**	**46.0**	**48.7**	**42.2**	**18.7**	**4.7**	**1.2**	**0.9**	**9.6**	**9,703.5**	**254**	**4,298**	**973.2**

1. Metals were measured as total metals (µg/L).
ND – Not detected.
TDS – Total dissolved solids.
There were no fish caught in lakes L2, L15, L22 and L24 , and thus water chemistry analyses were not completed (labelled with '-').

The sediment quality of lakes in the project area was also examined (Table 5.4). Clay was the most dominant substrate type in the sediment of 85% of the lakes, while silt was the second most dominant substrate type in 10% of lakes, and sand in the remaining 5% of all lakes. Iron and manganese were highest in Lake L3 sediment, measuring 240,000 mg/kg and 3,800 mg/kg, respectively (Table 5.4). When detected (50% of lakes), mercury concentrations ranged from 0.10 mg/kg (L11) to 0.18 mg/kg (L20-1) in lakes where it was detectable. Lake L4 showed the lowest levels of sediment aluminum (260 mg/kg), iron (5700 mg/kg), lead (0.7 mg/kg), mercury (ND) and zinc (13 mg/kg) compared to all other lakes. Total organic carbon in the sediment was highest in Lake L10 (12,000 g/kg) and lowest in Lake L13 (50 g/kg; Table 5.4).

There were five lakes that were deemed fishless (Lakes L2, L14, L15, L22, and L24; Table 5.5). The most common fish species in all lakes was brook trout, present in 14 of the 19 lakes that were considered fish habitat. The most abundant fish species in all lakes was lake chub (17,431 total caught). The least common fish species in the lakes were sculpin (16 fish, present only in Lake L20), longnose sucker (9 fish, present only in Lake L3) and longnose dace (10 fish, present only in Lake L20). Lake 20 had the most diverse fish community with seven species total (Table 5.5). Lake L1 had the largest population estimate of brook trout (460 fish), while Lake L9 had the smallest population estimate (75 fish) of brook trout when compared to other lakes (Table 5.6). Due to low catch rates and the lack of recaptures population estimates for brook trout could not be performed for some lakes in the project area.

Finally, benthic macroinvertebrate taxon richness in the examined lakes ranged from one to nine (Table 5.7). The most diverse benthic macroinvertebrate community was identified at Lake L7 (taxon richness of nine) and the least diverse were in lakes L8, L13, L20-1, L21, and L23 (taxon richness of one). Benthic macroinvertebrate abundance in the examined lakes ranged from one to 107 individuals and Lake L7 had the highest abundance. Benthic macroinvertebrate density in the project lakes with identified organisms ranged from 33 to 3567 individuals/m^2 and Lake L7 also had the highest density of all the lakes. No benthic organisms were identified in Lake L11 and Lakes L4, L8, L21 and L23 showed the lowest density (i.e., 33 individuals/m^2; Table 5.7).

Table 5.4 Lake Sediment Quality.

Lake #	Particle Size				Laboratory Parameters							
	Gravel	Sand	Silt	Clay	Aluminum[1]	Copper[1]	Iron[1]	Lead[1]	Manganese[1]	Mercury[1]	Zinc[1]	Total Organic Carbon
Unit	%	%	%	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
L1	ND	6.1	31	63	5,600	28	13,000	2.2	670	0.15	48	140 (0.60)
L2	-	-	-	-	-	-	-	-	-	-	-	-
L3	ND	2	23	75	5,100	14	240,000	24	3,800	0.14	66	220 (0.60)
L4	ND	3.4	51	45	260	3.6	5,700	0.7	2,100	ND	13	150
L5	ND	4.5	17	78	1,500	5.8	17,000	18	400	0.11	54	350 (1.3)
L6	ND	9	28	63	2,000	7.9	29,000	18	280	0.11	47	260 (0.60)
L7	ND	9.3	26	65	2,500	12	37,000	25	750	0.13	57	300 (1.1)
L8	ND	7.7	20	73	1,500	7.6	12,000	14	210	ND	42	380
L9	ND	5.1	31	63	900	4.3	26,000	8.1	270	ND	24	350
L10	ND	13	63	24	13,000	25	46,000	7.4	720	ND	54	12,000
L11	ND	8.1	3.7	88	930	5.2	17,000	9.2	350	0.1	58	450 (1.2)
L12	ND	7.8	18	74	18,000	28	88,000	6.8	3,200	0.15	200	160
L13	0.14	11	80	8.7	6,500	15	56,000	4	2,800	ND	30	50
L14	ND	8.7	28	63	3,400	18	25,000	7.2	240	0.11	110	440 (1.3)
L15	-	-	-	-	-	-	-	-	-	-	-	-
L16	7.8	29	ND	64	730	10	8,200	1.1	390	ND	28	430 (2.5)
L17	ND	5.3	22	73	1,700	9.9	15,000	8.7	290	ND	31	330 (1.3)
L18	ND	26	23	51	2,800	13	23,000	3.9	450	0.11	63	300
L19	25	71	1.9	2.8	3,300	3	19,000	1.4	2,800	ND	36	11,000
L20-1	ND	9.4	31	60	16,000	31	82,000	7.3	1,500	0.18	150	190
L21	ND	5.5	32	62	2,000	3.7	63,000	2.2	2,400	ND	55	88 (1.3)
L22	-	-	-	-	-	-	-	-	-	-	-	-
L23	ND	27	35	38	12,000	45	40,000	8.1	810	ND	77	110
L24	-	-	-	-	-	-	-	-	-	-	-	-

[1] - Metals were measured as acid extractable metals (mg/kg)
ND – Non detected.
There were no fish caught in lakes L2, L15, L22 and L24, and thus sediment analyses were not completed (labelled with '-').

Table 5.5 Lake Fish Catches.

Lake #	Brook Trout	Sculpin	Northern Pike	White Sucker	Longnose Sucker	Lake Chub	Longnose Dace	Burbot
L1	85	-	-	-	-	-	-	-
L2	Not fish habitat							
L3	135	-	-	49	9	720	-	135
L4	42	-	-	-	-	-	-	-
L5	-	-	-	-	-	5,004	-	-
L6	21	-	-	-	-	1,750	-	-
L7	97	-	-	4	-	1,375	-	130
L8	5	-	-	-	-	444	-	19
L9	54	-	-	-	-	-	-	-
L10	49	-	-	11	-	424	-	87
L11	2	-	-	-	-	6,694	-	-
L12	35	-	-	40	-	592	-	18
L13	4	-	-	22	-	137	-	12
L14	Not fish habitat							
L15	Not fish habitat							
L16	3	-	-	21	-	120	-	3
L17	3	-	-	1	-	165	-	1
L18	-	-	8	20	-	-	-	3
L19	-	-	6	4	-	-	-	-
L20	3	16	14	17	-	6	10	13
L21	-	-	4	42	-	-	-	-
L22	Not fish habitat							
L23	-	-	6	166	-	-	-	5
L24	Not fish habitat							
Total	**538**	**16**	**38**	**397**	**9**	**17,431**	**10**	**426**

Table 5.6 Brook Trout Population Estimates of Lakes.

Lake #	Total Population (#)	Upper 95% CI (#)	Lower 95% CI (#)
L1	460	533	405
L3	411	561	325
L4	106	157	80
L6	103	577	56
L7	282	328	247
L8	No recatch		
L9	75	82	68
L10	154	685	87
L11	No recatch		
L13	No recatch		
L16	No recatch		
L17	No recatch		
L20	No recatch		

Table 5.7 Lake Benthic Macroinvertebrate Metrics.

Lake #	Abundance (n)	Taxon Richness (n)	Density (individuals/m²)
L3	39	4	1,300
L4	1	2	33
L5	3	3	100
L6	4	2	133
L7	107	9	3,567
L8	1	1	33
L9	3	2	100
L10	2	2	67
L11	0	0	0
L12	3	3	100
L13	2	1	67
L14	2	2	67
L18	6	2	200
L19	5	2	167
L20-1	13	1	433
L20-2	14	3	467
L20-3	2	2	67
L21	1	1	33
L23	1	1	33
Min	**0**	**0**	**0**
Max	**107**	**9**	**3,567**
Mean	**11**	**2**	**367**

5.2 Streams

The longest stream in the project area was Stream S1 (total length of 3,825 m), while the shortest stream was Stream S4 (total length of 90 m; Table 5.8). The widest stream was Stream S17 (mean width of 22.5 m), and the narrowest stream was Stream S16 (mean width of 0.7 m). The largest stream was Stream S17 (20,071 m^2) and the smallest stream was Stream S4 (65 m^2). Discharge was greatest in Stream S12 (0.704 m^3/s) and lowest in Stream S8 (0.0 m^3/s). The deepest stream was Stream S11 (0.73 m), conversely, Stream S7 was the shallowest (0.04 m; Table 5.8).

Run and steady mesohabitat types were the most common and present in 13 of the 17 streams surveyed, while riffles were present in 10 of the 17 streams (Table 5.9). Rapids and pools were present in five and three of the streams, respectively. The most dominant mesohabitat type for all streams was steady followed by runs and riffles, representing an average of 36.6, 25.7 and 23.6%, respectively. The remaining stream mesohabitat types consisted of rapids (10%), pools (2.9%) and falls and cascade (1.5%; Table 5.9).

The most common substrate type characterized for streams in the project area was cobble (characterized in 14 of the 16 surveyed streams) followed by rubble and muck/clay (characterized in 13 streams). On average, the most dominant substrate type was muck/clay with an average of 36.4%, and bedrock was the least dominant substrate type (0.5%; Table 5.10).

The warmest stream in the project area was Stream S4 (21.2°C), while the coldest stream was Stream S14 (7.0°C; Table 5.11). Further, pH for all streams was near neutral and ranged from to 7.16 (Stream S11) to 8.11 (Stream S1). Dissolved oxygen was lowest in Stream S4 (5.9 mg/L or 78.5%) and highest in Stream S8 (13.72 mg/L or 122.5%). Conductivity was highest in Stream S4 (1227 µS/cm) and lowest in Stream S5 (48.8 µS/cm). ORP was highest in Stream S1 (82.3 mV) and lowest in Stream S11 (30.0 mV; Table 5.11). Further, nitrate, nitrite, nitrate + nitrite and dissolved chloride were all undetected in most streams (Appendix D).

The most abundant (230 fish total) and common (present in 11 of the 16 streams surveyed) fish species for streams in the project area was brook trout (Table 5.12). The least abundant and common species was sculpin (total of eight fish, present in three streams). Stream S3 had the highest fish catch rates (n=156) compared to all other streams, followed by Stream S1 and Stream S12 (n=44 and n=24, respectively). Stream S13 had the highest diversity compared to all other streams with five different fish species present (i.e., brook trout, white sucker, longnose dace, burbot, and lake chub; Table 5.12).

Table 5.8 Summary of Stream Characteristics and Flow.

Stream ID	Average Width (m)	Total Length (m)	Total Area (m^2)	Discharge (m^3/s)	Velocity (m/s)	Average Depth (m)
S1	2.6	3,825	7,492	0.016	0.09	0.09
S2	2.3	463	1,043	0.01	0.28	0.1
S3	2.5	329	884	0.01	0.08	0.1
S4	1.1	90	65	0.003	0.054	0.09
S5	No Survey (Not a stream)					
S6	15.0	520	7,200	0.48	0.25	0.2
S7	1.1	1,625	1,602	0.01	0.14	0.04
S8	0.9	1,220	657	0.0	0.0	N/A
S9	10.0	97	1,154	0.98	0.45	0.2
S10	1.8	437	521	0.033	0.41	0.06
S11	4.6	484	2,226	0.026	0.013	0.73
S12	15.8	786	18,494	0.704	0.083	0.55
S13	5.3	284	1,306	0.106	0.221	0.09
S14	3.5	304	641	0.017	0.067	0.15
S15	1.8	289	267	0.002	0.023	0.13
S16	0.7	471	166	0.010	0.14	0.05
S17	22.5	820	20,071	0.372	0.11	0.23

Table 5.9 Summary of Stream Mesohabitat Types.

Stream ID	Mean Habitat Type (%)					
	Pool	Riffle	Run	Steady	Rapids	Other
S1	1	20.5	39.5	39	0	0
S2	0	60	35	5	0	0
S3	0	80	20	0	0	0
S4	0	80	10	5	5	0
S5	No Survey (Not a stream)					
S6	36.7	6.7	18.3	8.3	26.7	3.3
S7	0	38.7	47.5	12.5	0	1.3
S8	0	0	37.5	62.5	0	0
S9	0	0	80	0	20	0
S10	0	5	23	70	2	0
S11	4	0	0	96	0	0
S12	0	0	20	80	0	0
S13	0	0	0	0	80	20 (cascade)
S14	0	40	30	30	0	0
S15	0	0	0	100	0	0
S16	0	25	25	50	0	0
S17	0	22	24.7	26.7	26.7	0

Table 5.10 Summary of Stream Substrate Types.

Stream ID	Mean Substrate Type (%)						
	Muck/Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
S1	45.5	1.5	1	14	26.8	11.2	0
S2	18.8	7.5	12.5	6.3	33.8	21.3	0
S3	5	10	35	20	30	0	0
S4	15	15	15	15	40	0	0
S5	No Survey (Not a stream)						
S6	0	0	0	5	22.5	65	7.5
S7	31.2	1.2	6.2	11.2	48.8	1.3	0
S8	95	0	2.5	0	2.5	0	0
S9	0	0	0	10	20	70	0
S10	53	0	3	20	2	22	0
S11	60	0	0	10	0	30	0
S12	60	0	0	10	0	30	0
S13	0	0	5	15	20	60	0
S14	10	10	10	10	10	50	0
S15	99	0	0	0	0	1	0
S16	70	0	10	10	10	0	0
S17	20	6.7	3.3	11.7	15	43.3	0

Table 5.11 Summary of Stream Field Water Quality.

Stream ID	Field Water Quality Parameter					
	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Conductivity (µS/cm)	ORP (mV)
S1	14.7	8.11	11.83	113.6	71.3	82.3
S2	15.3	7.87	10.80	100.1	72.3	71.0
S3	16.7	7.42	8.50	87.4	82.6	46.6
S4	21.2	7.44	5.90	78.5	1227	44.4
S5	17.0	7.26	8.90	91.4	48.8	32.5
S6	17.6	7.34	9.68	97.4	56.7	37.5
S7	9.7	7.26	9.56	83.4	143.1	36.1
S8	11.6	7.66	13.72	122.5	273.3	58.4
S9	18.5	7.27	9.46	108.0	55.7	35.7
S10	16.7	7.24	9.50	101.0	165.0	35.1
S11	14.9	7.16	8.24	81.0	110.9	30.0
S12	13.7	7.20	10.50	105.0	106.0	33.6
S13	13.3	7.23	11.00	108.7	98.7	34.8
S14	7.0	7.60	12.80	107.0	94.5	52.0
S15	15.7	7.44	7.70	77.0	72.2	45.0
S16	20.6	7.43	8.58	95.9	57.1	44.7
S17	-	-	-	-	-	-
Min	**7.0**	**7.16**	**5.90**	**77.0**	**48.8**	**30.0**
Max	**21.2**	**8.11**	**13.72**	**122.5**	**1,227.0**	**82.3**
Mean	**15.3**	**7.43**	**9.79**	**97.4**	**170.9**	**45.0**

Table 5.12 Summary of Stream Fishing Results.

Stream ID	Brook Trout	White Sucker	Longnose Dace	Burbot	Lake Chub	Sculpin
S1	44					
S2	14					
S3	149	5	1	1		
S4	No catch					
S5	Not a stream					
S6	3	7		2	3	
S7	3	1			1	
S8	1			1	1	
S9	5	10		1		1
S10	1					2
S12			1	5	13	5
S13	3	1	1	4	1	
S14	3			2		
S16			9	5	1	
S17	4	1			8	
Total	**230**	**25**	**12**	**21**	**28**	**8**

Stream S3 had the largest population estimate of brook trout (n=156) and all species combined (n=163) when compared to all other streams (Table 5.13). Stream S6 had the smallest population estimate of brook trout (n=3) when compared to other streams. Streams S6 and S9 had the lowest population estimates of all species combined (n=17 in each). Biomass estimates for the examined streams ranged from 138.9 g (Stream S9) to 563.2 g (Stream S1; Table 5.13). Stream population estimates were generated for the actual electrofishing site, as well as adjusted per unit of habitat (100 m^2).

Stream S3 had the highest abundance of benthic macroinvertebrates (119 organisms), however Stream S16 had the highest density (700 individuals/m^2; Table 5.14) due to differing sampling methodology between these two streams (Surber sampler *vs.* Petit Ponar grab). Stream S1 and Stream S8 had the lowest abundance (two organisms in each) compared to all streams with identified benthic organisms. Both Stream S3 and Stream S16 showed the greatest diversity with a taxon richness of eight. Stream S2 and Stream S17 were the least diverse with only one major taxon represented in each. Stream S1 was the least dense compared to all other sites (8 individuals/m^2; Table 5.14).

Table 5.13 Summary of Stream Fish Population Estimates.

Stream ID	Species	Population (n)	Lower 95% Confidence Interval (%)	Upper 95% Confidence Interval (%)	Biomass (g)
S1	Brook trout	48	40	56	563.2
S3	Brook trout	156	148	164	407.6
S3	All species	163	155	171	422.9
S6	Brook trout	3	2	4	144.7
S6	All species	17	10	24	227.7
S9	All species	17	15	19	138.9
S12	All species	26	20	32	199.1

Table 5.14 Summary of Stream Benthic Macroinvertebrate Communities.

Stream ID	Total Abundance	Taxon Richness	Density (individuals/m^2)
S1	2	2	8
S2	3	1	12
S3	119	8	476
S4	4	3	16
S7	6	4	24
S8	2	4	67
S9	15	6	60
S10	3	2	12
S11	3	2	100
S12	5	3	20
S13	13	6	52
S14	5	2	20
S15	5	3	167
S16	21	8	700
S17	5	1	167

6.0 Closing Remarks

As stated in Section 1.0, the tailings expansion project requires use of natural, fish-bearing water bodies for the disposal of mine waste, and as such the completion of an aquatic baseline study of fish and fish habitat was required to support the EA and all applicable regulatory approvals. This aquatic baseline report included quantification and classification of effected habitat outlined in the EA Registration Report and consisted of lakes (232.8 ha) and streams (7.3 ha) for a total of 240.1 ha. Aquatic assessments included: fish community and fish populations; benthic macroinvertebrate community; phytoplankton; zooplankton; chlorophyll 'a'; water and sediment quality; bathymetry; and habitat mapping. The results indicated that the examined lakes generally had low alkalinity, conductivity and turbidity. Further, concentrations of nitrogen and chlorophyll 'a' were low and typical for an oligotrophic lake. Streams provided connectivity to the numerous waterbodies in the project area and the majority contained brook trout.

This report also included several appendices with source data tables of analyses for all waterbodies examined (e.g., phytoplankton and zooplankton community, benthic invertebrate community, water, and sediment quality, as well as flow regimes). This report satisfies the commitments made within the EA registration document, Section 4.1.4 "*Tacora will undertake detailed baseline studies in 2021 to characterize and quantify the fish habitat and fish community associated with these potentially affected water bodies.*"

The findings of this report, in conjunction with ELOM tailings deposition planning, will be used as the basis to determine the extent of harmful alteration, disruption, and destruction of fish habitat. In order to gain authorization from DFO to proceed with the project, an offsetting plan that follows the *Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat under the Fisheries Act* will be required. Further, this aquatic baseline report will support the rationale of a preferred offsetting plan as per *Authorization Concerning Fish and Fish Habitat Protection Regulations* for applying measures to offset adverse effects on fish and fish habitat and to aid in discussion with Environment and Climate Change Canada (ECCC).

7.0 References

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Appendix A

Laboratory Data

Your Project #: 142-039
Your C.O.C. #: 367270

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/07/20
Report #: R6727963
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1I2905
Received: 2021/07/02, 09:26

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals Solids Acid Extr. ICPMS	1	2021/07/09	2021/07/12	ATL SOP 00058	EPA 6020B R2 m
Particle size in solids (pipette&sieve) (1)	1	N/A	2021/07/20	ATL SOP 00012	MSAMS'78/WREP-125R3m
Total Organic Carbon in Soil	1	2021/07/09	2021/07/09	ATL SOP 00044	LECO203601224 1991 m

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate, Bicarbonate and Hydroxide	6	N/A	2021/07/07	N/A	SM 23 4500-CO2 D
Alkalinity	4	N/A	2021/07/07	ATL SOP 00013	EPA 310.2 R1974 m
Alkalinity	2	N/A	2021/07/08	ATL SOP 00013	EPA 310.2 R1974 m
Chloride	4	N/A	2021/07/07	ATL SOP 00014	SM 23 4500-Cl- E m
Chloride	2	N/A	2021/07/08	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	4	N/A	2021/07/07	ATL SOP 00020	SM 23 2120C m
Colour	2	N/A	2021/07/09	ATL SOP 00020	SM 23 2120C m
Conductance - water	6	N/A	2021/07/07	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	6	N/A	2021/07/07	ATL SOP 00048	Auto Calc
Metals Water Total MS	1	2021/07/06	2021/07/06	ATL SOP 00058	EPA 6020B R2 m
Metals Water Total MS	5	2021/07/06	2021/07/07	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	4	N/A	2021/07/08	N/A	Auto Calc.
Ion Balance (% Difference)	2	N/A	2021/07/09	N/A	Auto Calc.
Anion and Cation Sum	6	N/A	2021/07/08	N/A	Auto Calc.
Nitrogen Ammonia - water	6	N/A	2021/07/08	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	4	N/A	2021/07/07	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrate + Nitrite	2	N/A	2021/07/08	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	4	N/A	2021/07/07	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrite	2	N/A	2021/07/08	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	4	N/A	2021/07/08	ATL SOP 00018	ASTM D3867-16
Nitrogen - Nitrate (as N)	2	N/A	2021/07/09	ATL SOP 00018	ASTM D3867-16
pH (3)	6	N/A	2021/07/07	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	4	N/A	2021/07/07	ATL SOP 00021	SM 23 4500-P E m

Your Project #: 142-039
Your C.O.C. #: 367270

Attention: Kathryn Dawe

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79 Mew's Place
Second Floor
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CANADA A1B 4N2

Report Date: 2021/07/20
Report #: R6727963
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1I2905
Received: 2021/07/02, 09:26

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Phosphorus - ortho	2	N/A	2021/07/08	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	4	N/A	2021/07/08	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C)	2	N/A	2021/07/09	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	4	N/A	2021/07/08	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	2	N/A	2021/07/09	ATL SOP 00049	Auto Calc.
Reactive Silica	4	N/A	2021/07/07	ATL SOP 00022	EPA 366.0 m
Reactive Silica	2	N/A	2021/07/08	ATL SOP 00022	EPA 366.0 m
Sulphate	4	N/A	2021/07/07	ATL SOP 00023	ASTM D516-16 m
Sulphate	2	N/A	2021/07/08	ATL SOP 00023	ASTM D516-16 m
Chlorophyll A (Sub from Bedford) (2)	2	2021/07/09	2021/07/09		
Total Dissolved Solids (TDS calc)	4	N/A	2021/07/08	N/A	Auto Calc.
Total Dissolved Solids (TDS calc)	2	N/A	2021/07/09	N/A	Auto Calc.
Organic carbon - Total (TOC) (4)	6	N/A	2021/07/08	ATL SOP 00203	SM 23 5310B m
Turbidity	6	N/A	2021/07/07	ATL SOP 00011	EPA 180.1 R2 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

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Your Project #: 142-039
Your C.O.C. #: 367270

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/07/20
Report #: R6727963
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1I2905

Received: 2021/07/02, 09:26

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.

(2) This test was performed by Dalhousie Dept of Oceanography

(3) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(4) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Melissa DiPinto, Project Manager
Email:
Phone# (902)420-0203 Ext:233

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BV Labs Job #: C1I2905
Report Date: 2021/07/20

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SOIL

BV Labs ID		PZM496		
Sampling Date		2021/06/25 14:00		
COC Number		367270		
	UNITS	L8 (SEDIMENT)	RDL	QC Batch
Inorganics				
Organic Carbon (TOC)	g/kg	380	0.50	7453143
< -1 Phi (2 mm)	%	100	0.10	7444081
< 0 Phi (1 mm)	%	100	0.10	7444081
< +1 Phi (0.5 mm)	%	99	0.10	7444081
< +2 Phi (0.25 mm)	%	97	0.10	7444081
< +3 Phi (0.12 mm)	%	95	0.10	7444081
< +4 Phi (0.062 mm)	%	92	0.10	7444081
< +5 Phi (0.031 mm)	%	85	0.10	7444081
< +6 Phi (0.016 mm)	%	86	0.10	7444081
< +7 Phi (0.0078 mm)	%	75	0.10	7444081
< +8 Phi (0.0039 mm)	%	73	0.10	7444081
< +9 Phi (0.0020 mm)	%	63	0.10	7444081
Gravel	%	ND	0.10	7444081
Sand	%	7.7	0.10	7444081
Silt	%	20	0.10	7444081
Clay	%	73	0.10	7444081

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

BV Labs ID		PZM496		
Sampling Date		2021/06/25 14:00		
COC Number		367270		
	UNITS	L8 (SEDIMENT)	RDL	QC Batch
Metals				
Acid Extractable Aluminum (Al)	mg/kg	1500	10	7453582
Acid Extractable Antimony (Sb)	mg/kg	ND	2.0	7453582
Acid Extractable Arsenic (As)	mg/kg	ND	2.0	7453582
Acid Extractable Barium (Ba)	mg/kg	70	5.0	7453582
Acid Extractable Beryllium (Be)	mg/kg	ND	2.0	7453582
Acid Extractable Bismuth (Bi)	mg/kg	ND	2.0	7453582
Acid Extractable Boron (B)	mg/kg	ND	50	7453582
Acid Extractable Cadmium (Cd)	mg/kg	0.41	0.30	7453582
Acid Extractable Chromium (Cr)	mg/kg	8.1	2.0	7453582
Acid Extractable Cobalt (Co)	mg/kg	1.8	1.0	7453582
Acid Extractable Copper (Cu)	mg/kg	7.6	2.0	7453582
Acid Extractable Iron (Fe)	mg/kg	12000	50	7453582
Acid Extractable Lead (Pb)	mg/kg	14	0.50	7453582
Acid Extractable Lithium (Li)	mg/kg	ND	2.0	7453582
Acid Extractable Manganese (Mn)	mg/kg	210	2.0	7453582
Acid Extractable Mercury (Hg)	mg/kg	ND	0.10	7453582
Acid Extractable Molybdenum (Mo)	mg/kg	5.2	2.0	7453582
Acid Extractable Nickel (Ni)	mg/kg	8.1	2.0	7453582
Acid Extractable Rubidium (Rb)	mg/kg	3.0	2.0	7453582
Acid Extractable Selenium (Se)	mg/kg	1.7	0.50	7453582
Acid Extractable Silver (Ag)	mg/kg	ND	0.50	7453582
Acid Extractable Strontium (Sr)	mg/kg	12	5.0	7453582
Acid Extractable Thallium (Tl)	mg/kg	ND	0.10	7453582
Acid Extractable Tin (Sn)	mg/kg	1.2	1.0	7453582
Acid Extractable Uranium (U)	mg/kg	2.2	0.10	7453582
Acid Extractable Vanadium (V)	mg/kg	5.8	2.0	7453582
Acid Extractable Zinc (Zn)	mg/kg	42	5.0	7453582

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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BV Labs Job #: C1I2905
Report Date: 2021/07/20

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF WATER

BV Labs ID		PZM492			PZM494			PZM494		
Sampling Date		2021/06/19 15:30			2021/06/19 10:54			2021/06/19 10:54		
COC Number		367270			367270			367270		
	UNITS	S7	RDL	QC Batch	L8 (WATER)	RDL	QC Batch	L8 (WATER) Lab-Dup	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	0.850	N/A	7440718	1.17	N/A	7440718			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	42	1.0	7440715	55	1.0	7440715			
Calculated TDS	mg/L	42	1.0	7440723	56	1.0	7440723			
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7440715	ND	1.0	7440715			
Cation Sum	me/L	0.810	N/A	7440718	1.10	N/A	7440718			
Hardness (CaCO3)	mg/L	38	1.0	7440716	53	1.0	7440716			
Ion Balance (% Difference)	%	2.41	N/A	7440717	3.08	N/A	7440717			
Langelier Index (@ 20C)	N/A	-0.950		7440721	-0.880		7440721			
Langelier Index (@ 4C)	N/A	-1.20		7440722	-1.13		7440722			
Nitrate (N)	mg/L	ND	0.050	7440719	ND	0.050	7441731			
Saturation pH (@ 20C)	N/A	8.72		7440721	8.52		7440721			
Saturation pH (@ 4C)	N/A	8.98		7440722	8.77		7440722			
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	42	5.0	7448070	56	5.0	7448070			
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7448071	ND	1.0	7448071			
Colour	TCU	15	5.0	7448074	19	5.0	7448074			
Nitrate + Nitrite (N)	mg/L	ND	0.050	7448076	ND	0.050	7448076			
Nitrite (N)	mg/L	ND	0.010	7448077	ND	0.010	7448077			
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7448396	ND	0.050	7448396			
Total Organic Carbon (C)	mg/L	4.5	0.50	7450646	4.5	0.50	7450646			
Orthophosphate (P)	mg/L	ND	0.010	7448075	ND	0.010	7448075			
pH	pH	7.77		7448135	7.64		7448141	7.70		7448141
Reactive Silica (SiO2)	mg/L	2.0	0.50	7448073	1.1	0.50	7448073			
Dissolved Sulphate (SO4)	mg/L	ND	2.0	7448072	2.5	2.0	7448072			
Turbidity	NTU	0.56	0.10	7448308	0.97	0.10	7448312			
Conductivity	uS/cm	75	1.0	7448133	96	1.0	7448140	97	1.0	7448140
Subcontracted Analysis										
Subcontract Parameter	N/A				ATTACHED	N/A	7454472			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected

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BV Labs Job #: C1I2905
Report Date: 2021/07/20

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF WATER

BV Labs ID		PZM498			PZM498			PZM499		
Sampling Date		2021/06/19 15:42			2021/06/19 15:42			2021/06/19 15:00		
COC Number		367270			367270			367270		
	UNITS	L9	RDL	QC Batch	L9 Lab-Dup	RDL	QC Batch	L10-SO	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	0.870	N/A	7440718				0.710	N/A	7440718
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	43	1.0	7440715				36	1.0	7440715
Calculated TDS	mg/L	41	1.0	7440723				34	1.0	7440723
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7440715				ND	1.0	7440715
Cation Sum	me/L	0.830	N/A	7440718				0.690	N/A	7440718
Hardness (CaCO3)	mg/L	40	1.0	7440716				33	1.0	7440716
Ion Balance (% Difference)	%	2.35	N/A	7440717				1.43	N/A	7440717
Langelier Index (@ 20C)	N/A	-0.809		7440721				-1.39		7440721
Langelier Index (@ 4C)	N/A	-1.06		7440722				-1.64		7440722
Nitrate (N)	mg/L	ND	0.050	7441731				ND	0.050	7441731
Saturation pH (@ 20C)	N/A	8.72		7440721				8.86		7440721
Saturation pH (@ 4C)	N/A	8.97		7440722				9.12		7440722
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	43	5.0	7449058	43	5.0	7449058	36	5.0	7448070
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7449077	ND	1.0	7449077	ND	1.0	7448071
Colour	TCU	12	5.0	7449081	10	5.0	7449081	9.0	5.0	7448074
Nitrate + Nitrite (N)	mg/L	ND	0.050	7449083	ND	0.050	7449083	ND	0.050	7448076
Nitrite (N)	mg/L	ND	0.010	7449084	ND	0.010	7449084	ND	0.010	7448077
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7448400				ND	0.050	7448400
Total Organic Carbon (C)	mg/L	3.6	0.50	7450646				3.5	0.50	7450646
Orthophosphate (P)	mg/L	ND	0.010	7449082	ND	0.010	7449082	ND	0.010	7448075
pH	pH	7.91		7448135				7.48		7448141
Reactive Silica (SiO2)	mg/L	0.88	0.50	7449079	0.83	0.50	7449079	0.90	0.50	7448073
Dissolved Sulphate (SO4)	mg/L	ND	2.0	7449078	ND	2.0	7449078	ND	2.0	7448072
Turbidity	NTU	1.1	0.10	7448312				0.46	0.10	7448312
Conductivity	uS/cm	75	1.0	7448133				63	1.0	7448140
Subcontracted Analysis										
Subcontract Parameter	N/A	ATTACHED	N/A	7454472						

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ND = Not detected

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BV Labs Job #: C1I2905
Report Date: 2021/07/20

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF WATER

BV Labs ID		PZM500			PZM500			PZM501		
Sampling Date		2021/06/20 14:00			2021/06/20 14:00			2021/06/21 15:48		
COC Number		367270			367270			367270		
	UNITS	S10	RDL	QC Batch	S10 Lab-Dup	RDL	QC Batch	S3	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	0.790	N/A	7440718				0.980	N/A	7440718
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	36	1.0	7440715				45	1.0	7440715
Calculated TDS	mg/L	39	1.0	7440723				49	1.0	7440723
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7440715				ND	1.0	7440715
Cation Sum	me/L	0.670	N/A	7440718				0.880	N/A	7440718
Hardness (CaCO3)	mg/L	31	1.0	7440716				41	1.0	7440716
Ion Balance (% Difference)	%	8.22	N/A	7440717				5.38	N/A	7440717
Langelier Index (@ 20C)	N/A	-1.43		7440721				-1.02		7440721
Langelier Index (@ 4C)	N/A	-1.68		7440722				-1.27		7440722
Nitrate (N)	mg/L	ND	0.050	7441731				ND	0.050	7441731
Saturation pH (@ 20C)	N/A	8.86		7440721				8.67		7440721
Saturation pH (@ 4C)	N/A	9.11		7440722				8.92		7440722
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	37	5.0	7449089	35	5.0	7449089	46	5.0	7448070
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7449096	ND	1.0	7449096	ND	1.0	7448071
Colour	TCU	44	5.0	7449099	42	5.0	7449099	ND	5.0	7448074
Nitrate + Nitrite (N)	mg/L	ND	0.050	7449101	ND	0.050	7449101	ND	0.050	7448076
Nitrite (N)	mg/L	ND	0.010	7449102	ND	0.010	7449102	ND	0.010	7448077
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7448400				ND	0.050	7448400
Total Organic Carbon (C)	mg/L	6.0	0.50	7450646				3.3	0.50	7450646
Orthophosphate (P)	mg/L	0.010	0.010	7449100	ND	0.010	7449100	ND	0.010	7448075
pH	pH	7.44		7448141				7.65		7448141
Reactive Silica (SiO2)	mg/L	2.1	0.50	7449098	2.0	0.50	7449098	2.8	0.50	7448073
Dissolved Sulphate (SO4)	mg/L	2.7	2.0	7449097	ND	2.0	7449097	3.1	2.0	7448072
Turbidity	NTU	1.3	0.10	7448312				1.3	0.10	7448312
Conductivity	uS/cm	61	1.0	7448140				82	1.0	7448140

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ELEMENTS BY ICP/MS (WATER)

BV Labs ID		PZM492	PZM494	PZM498	PZM499	PZM500	PZM501		
Sampling Date		2021/06/19 15:30	2021/06/19 10:54	2021/06/19 15:42	2021/06/19 15:00	2021/06/20 14:00	2021/06/21 15:48		
COC Number		367270	367270	367270	367270	367270	367270		
	UNITS	S7	L8 (WATER)	L9	L10-SO	S10	S3	RDL	QC Batch
Metals									
Total Aluminum (Al)	ug/L	5.4	9.2	5.6	5.3	11	18	5.0	7450538
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7445456
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7445456
Total Barium (Ba)	ug/L	13	8.4	18	15	17	17	1.0	7445456
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7445456
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7445456
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	7445456
Total Cadmium (Cd)	ug/L	ND	0.012	ND	ND	ND	ND	0.010	7445456
Total Calcium (Ca)	ug/L	9000	11000	8900	7600	7500	9600	100	7445456
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7445456
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	0.40	7445456
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	0.50	7445456
Total Iron (Fe)	ug/L	150	190	140	150	290	200	50	7445456
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	7445456
Total Magnesium (Mg)	ug/L	3900	6000	4300	3300	3000	4100	100	7445456
Total Manganese (Mn)	ug/L	29	14	8.3	40	37	200	2.0	7445456
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	2.7	2.0	7445456
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7445456
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	7445456
Total Potassium (K)	ug/L	780	720	690	690	600	1000	100	7445456
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	0.50	7445456
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	7445456
Total Sodium (Na)	ug/L	370	330	270	320	340	470	100	7445456
Total Strontium (Sr)	ug/L	9.5	9.6	6.9	8.1	10	12	2.0	7445456
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	7445456
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7445456
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7445456
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	0.10	7445456
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7445456
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	ND	5.0	7445456

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QC Batch = Quality Control Batch
ND = Not detected

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.0°C

Sample PZM500 [S10] : ortho-Phosphate > Phosphorus: Both values fall within the method uncertainty for duplicates and are likely equivalent. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample PZM501 [S3] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample PZM492, Metals Water Total MS: Test repeated.
Sample PZM494, Metals Water Total MS: Test repeated.
Sample PZM498, Metals Water Total MS: Test repeated.
Sample PZM499, Metals Water Total MS: Test repeated.
Sample PZM500, Metals Water Total MS: Test repeated.
Sample PZM501, Metals Water Total MS: Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7444081	KLE	RPD	Gravel	2021/07/14	3.3		%	35
			Sand	2021/07/14	4.1		%	35
			Silt	2021/07/14	2.4		%	35
			Clay	2021/07/14	0.29		%	35
7445456	BAN	Matrix Spike [PZM492-02]	Total Antimony (Sb)	2021/07/06		107	%	80 - 120
			Total Arsenic (As)	2021/07/06		95	%	80 - 120
			Total Barium (Ba)	2021/07/06		95	%	80 - 120
			Total Beryllium (Be)	2021/07/06		96	%	80 - 120
			Total Bismuth (Bi)	2021/07/06		98	%	80 - 120
			Total Boron (B)	2021/07/06		93	%	80 - 120
			Total Cadmium (Cd)	2021/07/06		98	%	80 - 120
			Total Calcium (Ca)	2021/07/06		98	%	80 - 120
			Total Chromium (Cr)	2021/07/06		95	%	80 - 120
			Total Cobalt (Co)	2021/07/06		97	%	80 - 120
			Total Copper (Cu)	2021/07/06		97	%	80 - 120
			Total Iron (Fe)	2021/07/06		100	%	80 - 120
			Total Lead (Pb)	2021/07/06		99	%	80 - 120
			Total Magnesium (Mg)	2021/07/06		102	%	80 - 120
			Total Manganese (Mn)	2021/07/06		98	%	80 - 120
			Total Molybdenum (Mo)	2021/07/06		101	%	80 - 120
			Total Nickel (Ni)	2021/07/06		97	%	80 - 120
			Total Phosphorus (P)	2021/07/06		103	%	80 - 120
			Total Potassium (K)	2021/07/06		99	%	80 - 120
			Total Selenium (Se)	2021/07/06		99	%	80 - 120
			Total Silver (Ag)	2021/07/06		98	%	80 - 120
			Total Sodium (Na)	2021/07/06		96	%	80 - 120
			Total Strontium (Sr)	2021/07/06		98	%	80 - 120
			Total Thallium (Tl)	2021/07/06		98	%	80 - 120
			Total Tin (Sn)	2021/07/06		102	%	80 - 120
			Total Titanium (Ti)	2021/07/06		97	%	80 - 120
			Total Uranium (U)	2021/07/06		105	%	80 - 120
			Total Vanadium (V)	2021/07/06		96	%	80 - 120
			Total Zinc (Zn)	2021/07/06		97	%	80 - 120
7445456	BAN	Spiked Blank	Total Antimony (Sb)	2021/07/06		104	%	80 - 120
			Total Arsenic (As)	2021/07/06		95	%	80 - 120
			Total Barium (Ba)	2021/07/06		94	%	80 - 120
			Total Beryllium (Be)	2021/07/06		95	%	80 - 120
			Total Bismuth (Bi)	2021/07/06		98	%	80 - 120
			Total Boron (B)	2021/07/06		94	%	80 - 120
			Total Cadmium (Cd)	2021/07/06		97	%	80 - 120
			Total Calcium (Ca)	2021/07/06		98	%	80 - 120
			Total Chromium (Cr)	2021/07/06		95	%	80 - 120
			Total Cobalt (Co)	2021/07/06		98	%	80 - 120
			Total Copper (Cu)	2021/07/06		98	%	80 - 120
			Total Iron (Fe)	2021/07/06		99	%	80 - 120
			Total Lead (Pb)	2021/07/06		98	%	80 - 120
			Total Magnesium (Mg)	2021/07/06		101	%	80 - 120
			Total Manganese (Mn)	2021/07/06		99	%	80 - 120
			Total Molybdenum (Mo)	2021/07/06		99	%	80 - 120
			Total Nickel (Ni)	2021/07/06		97	%	80 - 120
			Total Phosphorus (P)	2021/07/06		102	%	80 - 120
			Total Potassium (K)	2021/07/06		99	%	80 - 120
			Total Selenium (Se)	2021/07/06		99	%	80 - 120
			Total Silver (Ag)	2021/07/06		95	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Sodium (Na)	2021/07/06		97	%	80 - 120
			Total Strontium (Sr)	2021/07/06		101	%	80 - 120
			Total Thallium (Tl)	2021/07/06		98	%	80 - 120
			Total Tin (Sn)	2021/07/06		100	%	80 - 120
			Total Titanium (Ti)	2021/07/06		99	%	80 - 120
			Total Uranium (U)	2021/07/06		105	%	80 - 120
			Total Vanadium (V)	2021/07/06		96	%	80 - 120
			Total Zinc (Zn)	2021/07/06		97	%	80 - 120
7445456	BAN	Method Blank	Total Antimony (Sb)	2021/07/06	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2021/07/06	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2021/07/06	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2021/07/06	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Boron (B)	2021/07/06	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2021/07/06	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2021/07/06	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2021/07/06	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2021/07/06	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2021/07/06	ND, RDL=0.50		ug/L	
			Total Iron (Fe)	2021/07/06	ND, RDL=50		ug/L	
			Total Lead (Pb)	2021/07/06	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2021/07/06	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2021/07/06	ND, RDL=100		ug/L	
			Total Potassium (K)	2021/07/06	ND, RDL=100		ug/L	
			Total Selenium (Se)	2021/07/06	ND, RDL=0.50		ug/L	
			Total Silver (Ag)	2021/07/06	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2021/07/06	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2021/07/06	ND, RDL=0.10		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2021/07/06	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2021/07/06	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2021/07/06	ND, RDL=5.0		ug/L	
7445456	BAN	RPD	Total Antimony (Sb)	2021/07/06	NC		%	20
			Total Arsenic (As)	2021/07/06	1.8		%	20
			Total Barium (Ba)	2021/07/06	0.70		%	20
			Total Boron (B)	2021/07/06	NC		%	20
			Total Cadmium (Cd)	2021/07/06	NC		%	20
			Total Calcium (Ca)	2021/07/06	0.20		%	20
			Total Chromium (Cr)	2021/07/06	NC		%	20
			Total Copper (Cu)	2021/07/06	NC		%	20
			Total Iron (Fe)	2021/07/06	NC		%	20
			Total Lead (Pb)	2021/07/06	NC		%	20
			Total Magnesium (Mg)	2021/07/06	0.37		%	20
			Total Manganese (Mn)	2021/07/06	1.4		%	20
			Total Nickel (Ni)	2021/07/06	NC		%	20
			Total Phosphorus (P)	2021/07/06	NC		%	20
			Total Selenium (Se)	2021/07/06	NC		%	20
			Total Sodium (Na)	2021/07/06	0.92		%	20
			Total Strontium (Sr)	2021/07/06	1.0		%	20
			Total Uranium (U)	2021/07/06	1.8		%	20
			Total Zinc (Zn)	2021/07/06	NC		%	20
7448070	EMT	Matrix Spike	Total Alkalinity (Total as CaCO3)	2021/07/07		NC	%	80 - 120
7448070	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/07		105	%	80 - 120
7448070	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/07	ND, RDL=5.0		mg/L	
7448070	EMT	RPD	Total Alkalinity (Total as CaCO3)	2021/07/07	1.1		%	20
7448071	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2021/07/07		99	%	80 - 120
7448071	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/07		98	%	80 - 120
7448071	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/07/07	ND, RDL=1.0		mg/L	
7448071	EMT	RPD	Dissolved Chloride (Cl-)	2021/07/07	0.53		%	20
7448072	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2021/07/07		NC	%	80 - 120
7448072	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/07		111	%	80 - 120
7448072	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/07/07	ND, RDL=2.0		mg/L	
7448072	EMT	RPD	Dissolved Sulphate (SO4)	2021/07/07	2.8		%	20
7448073	EMT	Matrix Spike	Reactive Silica (SiO2)	2021/07/07		NC	%	80 - 120
7448073	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/07/07		96	%	80 - 120
7448073	EMT	Method Blank	Reactive Silica (SiO2)	2021/07/07	ND, RDL=0.50		mg/L	
7448073	EMT	RPD	Reactive Silica (SiO2)	2021/07/07	0.49		%	20
7448074	EMT	Spiked Blank	Colour	2021/07/07		100	%	80 - 120
7448074	EMT	Method Blank	Colour	2021/07/07	ND, RDL=5.0		TCU	
7448074	EMT	RPD	Colour	2021/07/07	NC		%	20
7448075	EMT	Matrix Spike	Orthophosphate (P)	2021/07/07		81	%	80 - 120
7448075	EMT	Spiked Blank	Orthophosphate (P)	2021/07/07		97	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7448075	EMT	Method Blank	Orthophosphate (P)	2021/07/07	ND, RDL=0.010		mg/L	
7448075	EMT	RPD	Orthophosphate (P)	2021/07/07	NC		%	20
7448076	EMT	Matrix Spike	Nitrate + Nitrite (N)	2021/07/07		90	%	80 - 120
7448076	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/07/07		95	%	80 - 120
7448076	EMT	Method Blank	Nitrate + Nitrite (N)	2021/07/07	ND, RDL=0.050		mg/L	
7448076	EMT	RPD	Nitrate + Nitrite (N)	2021/07/07	2.1		%	20
7448077	EMT	Matrix Spike	Nitrite (N)	2021/07/07		99	%	80 - 120
7448077	EMT	Spiked Blank	Nitrite (N)	2021/07/07		92	%	80 - 120
7448077	EMT	Method Blank	Nitrite (N)	2021/07/07	ND, RDL=0.010		mg/L	
7448077	EMT	RPD	Nitrite (N)	2021/07/07	NC		%	20
7448133	SHW	Spiked Blank	Conductivity	2021/07/07		104	%	80 - 120
7448133	SHW	Method Blank	Conductivity	2021/07/07	ND, RDL=1.0		uS/cm	
7448133	SHW	RPD	Conductivity	2021/07/07	0.24		%	10
7448135	SHW	Spiked Blank	pH	2021/07/07		100	%	97 - 103
7448135	SHW	RPD	pH	2021/07/07	0.55		%	N/A
7448140	SHW	Spiked Blank	Conductivity	2021/07/07		103	%	80 - 120
7448140	SHW	Method Blank	Conductivity	2021/07/07	ND, RDL=1.0		uS/cm	
7448140	SHW	RPD [PZM494-01]	Conductivity	2021/07/07	0.66		%	10
7448141	SHW	Spiked Blank	pH	2021/07/07		100	%	97 - 103
7448141	SHW	RPD [PZM494-01]	pH	2021/07/07	0.88		%	N/A
7448308	SHW	QC Standard	Turbidity	2021/07/07		105	%	80 - 120
7448308	SHW	Spiked Blank	Turbidity	2021/07/07		105	%	80 - 120
7448308	SHW	Method Blank	Turbidity	2021/07/07	ND, RDL=0.10		NTU	
7448308	SHW	RPD	Turbidity	2021/07/07	15		%	20
7448312	SHW	QC Standard	Turbidity	2021/07/07		103	%	80 - 120
7448312	SHW	Spiked Blank	Turbidity	2021/07/07		105	%	80 - 120
7448312	SHW	Method Blank	Turbidity	2021/07/07	ND, RDL=0.10		NTU	
7448312	SHW	RPD	Turbidity	2021/07/07	NC		%	20
7448396	EMT	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2021/07/08		110	%	80 - 120
7448396	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2021/07/08		109	%	80 - 120
7448396	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2021/07/08	ND, RDL=0.050		mg/L	
7448396	EMT	RPD	Nitrogen (Ammonia Nitrogen)	2021/07/08	NC		%	20
7448400	EMT	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2021/07/08		107	%	80 - 120
7448400	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2021/07/08		107	%	80 - 120
7448400	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2021/07/08	ND, RDL=0.050		mg/L	
7448400	EMT	RPD	Nitrogen (Ammonia Nitrogen)	2021/07/08	NC		%	20
7449058	EMT	Matrix Spike [PZM498-01]	Total Alkalinity (Total as CaCO3)	2021/07/08		NC	%	80 - 120
7449058	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/08		112	%	80 - 120
7449058	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/08	ND, RDL=5.0		mg/L	
7449058	EMT	RPD [PZM498-01]	Total Alkalinity (Total as CaCO3)	2021/07/08	1.2		%	20
7449077	EMT	Matrix Spike [PZM498-01]	Dissolved Chloride (Cl-)	2021/07/08		99	%	80 - 120
7449077	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/08		100	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7449077	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/07/08	ND, RDL=1.0		mg/L	
7449077	EMT	RPD [PZM498-01]	Dissolved Chloride (Cl-)	2021/07/08	NC		%	20
7449078	EMT	Matrix Spike [PZM498-01]	Dissolved Sulphate (SO4)	2021/07/08		110	%	80 - 120
7449078	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/08		109	%	80 - 120
7449078	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/07/08	ND, RDL=2.0		mg/L	
7449078	EMT	RPD [PZM498-01]	Dissolved Sulphate (SO4)	2021/07/08	NC		%	20
7449079	EMT	Matrix Spike [PZM498-01]	Reactive Silica (SiO2)	2021/07/08		91	%	80 - 120
7449079	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/07/08		97	%	80 - 120
7449079	EMT	Method Blank	Reactive Silica (SiO2)	2021/07/08	ND, RDL=0.50		mg/L	
7449079	EMT	RPD [PZM498-01]	Reactive Silica (SiO2)	2021/07/08	6.4		%	20
7449081	EMT	Spiked Blank	Colour	2021/07/09		106	%	80 - 120
7449081	EMT	Method Blank	Colour	2021/07/09	ND, RDL=5.0		TCU	
7449081	EMT	RPD [PZM498-01]	Colour	2021/07/09	14		%	20
7449082	EMT	Matrix Spike [PZM498-01]	Orthophosphate (P)	2021/07/08		93	%	80 - 120
7449082	EMT	Spiked Blank	Orthophosphate (P)	2021/07/08		96	%	80 - 120
7449082	EMT	Method Blank	Orthophosphate (P)	2021/07/08	ND, RDL=0.010		mg/L	
7449082	EMT	RPD [PZM498-01]	Orthophosphate (P)	2021/07/08	NC		%	20
7449083	EMT	Matrix Spike [PZM498-01]	Nitrate + Nitrite (N)	2021/07/08		96	%	80 - 120
7449083	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/07/08		94	%	80 - 120
7449083	EMT	Method Blank	Nitrate + Nitrite (N)	2021/07/08	ND, RDL=0.050		mg/L	
7449083	EMT	RPD [PZM498-01]	Nitrate + Nitrite (N)	2021/07/08	NC		%	20
7449084	EMT	Matrix Spike [PZM498-01]	Nitrite (N)	2021/07/08		93	%	80 - 120
7449084	EMT	Spiked Blank	Nitrite (N)	2021/07/08		102	%	80 - 120
7449084	EMT	Method Blank	Nitrite (N)	2021/07/08	ND, RDL=0.010		mg/L	
7449084	EMT	RPD [PZM498-01]	Nitrite (N)	2021/07/08	NC		%	20
7449089	EMT	Matrix Spike [PZM500-01]	Total Alkalinity (Total as CaCO3)	2021/07/08		70 (1)	%	80 - 120
7449089	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/08		106	%	80 - 120
7449089	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/08	ND, RDL=5.0		mg/L	
7449089	EMT	RPD [PZM500-01]	Total Alkalinity (Total as CaCO3)	2021/07/08	3.4		%	20
7449096	EMT	Matrix Spike [PZM500-01]	Dissolved Chloride (Cl-)	2021/07/08		100	%	80 - 120
7449096	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/08		99	%	80 - 120
7449096	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/07/08	ND, RDL=1.0		mg/L	
7449096	EMT	RPD [PZM500-01]	Dissolved Chloride (Cl-)	2021/07/08	NC		%	20
7449097	EMT	Matrix Spike [PZM500-01]	Dissolved Sulphate (SO4)	2021/07/08		105	%	80 - 120
7449097	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/08		108	%	80 - 120
7449097	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/07/09	ND, RDL=2.0		mg/L	
7449097	EMT	RPD [PZM500-01]	Dissolved Sulphate (SO4)	2021/07/08	NC		%	20

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7449098	EMT	Matrix Spike [PZM500-01]	Reactive Silica (SiO2)	2021/07/08		93	%	80 - 120
7449098	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/07/08		96	%	80 - 120
7449098	EMT	Method Blank	Reactive Silica (SiO2)	2021/07/08	ND, RDL=0.50		mg/L	
7449098	EMT	RPD [PZM500-01]	Reactive Silica (SiO2)	2021/07/08	4.1		%	20
7449099	EMT	Spiked Blank	Colour	2021/07/09		103	%	80 - 120
7449099	EMT	Method Blank	Colour	2021/07/09	ND, RDL=5.0		TCU	
7449099	EMT	RPD [PZM500-01]	Colour	2021/07/09	4.6		%	20
7449100	EMT	Matrix Spike [PZM500-01]	Orthophosphate (P)	2021/07/08		65 (1)	%	80 - 120
7449100	EMT	Spiked Blank	Orthophosphate (P)	2021/07/08		101	%	80 - 120
7449100	EMT	Method Blank	Orthophosphate (P)	2021/07/08	ND, RDL=0.010		mg/L	
7449100	EMT	RPD [PZM500-01]	Orthophosphate (P)	2021/07/08	2.0		%	20
7449101	EMT	Matrix Spike [PZM500-01]	Nitrate + Nitrite (N)	2021/07/08		63 (1)	%	80 - 120
7449101	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/07/08		99	%	80 - 120
7449101	EMT	Method Blank	Nitrate + Nitrite (N)	2021/07/08	ND, RDL=0.050		mg/L	
7449101	EMT	RPD [PZM500-01]	Nitrate + Nitrite (N)	2021/07/08	NC		%	20
7449102	EMT	Matrix Spike [PZM500-01]	Nitrite (N)	2021/07/08		99	%	80 - 120
7449102	EMT	Spiked Blank	Nitrite (N)	2021/07/08		97	%	80 - 120
7449102	EMT	Method Blank	Nitrite (N)	2021/07/08	ND, RDL=0.010		mg/L	
7449102	EMT	RPD [PZM500-01]	Nitrite (N)	2021/07/08	NC		%	20
7450538	MLB	Matrix Spike [PZM498-02]	Total Aluminum (Al)	2021/07/08		102	%	80 - 120
7450538	MLB	Spiked Blank	Total Aluminum (Al)	2021/07/08		104	%	80 - 120
7450538	MLB	Method Blank	Total Aluminum (Al)	2021/07/08	ND, RDL=5.0		ug/L	
7450538	MLB	RPD	Total Aluminum (Al)	2021/07/08	0.91		%	20
7450646	NGI	Matrix Spike	Total Organic Carbon (C)	2021/07/08		93	%	85 - 115
7450646	NGI	Spiked Blank	Total Organic Carbon (C)	2021/07/08		97	%	80 - 120
7450646	NGI	Method Blank	Total Organic Carbon (C)	2021/07/08	ND, RDL=0.50		mg/L	
7450646	NGI	RPD	Total Organic Carbon (C)	2021/07/08	11		%	15
7453143	BBD	QC Standard	Organic Carbon (TOC)	2021/07/09		103	%	75 - 125
7453143	BBD	Method Blank	Organic Carbon (TOC)	2021/07/09	ND, RDL=0.50		g/kg	
7453143	BBD	RPD	Organic Carbon (TOC)	2021/07/09	1.4		%	35
7453582	BAN	Matrix Spike	Acid Extractable Antimony (Sb)	2021/07/09		103	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/09		103	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/09		94	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/09		101	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/09		100	%	75 - 125
			Acid Extractable Boron (B)	2021/07/09		93	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/09		97	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/09		92	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/09		97	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/09		100	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/09		100	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/09		109	%	75 - 125

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Manganese (Mn)	2021/07/09		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/09		94	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/09		103	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/09		90	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/09		100	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/09		98	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/09		101	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/09		NC	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/09		100	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/09		103	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/09		103	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/09		107	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/09		100	%	75 - 125
7453582	BAN	Spiked Blank	Acid Extractable Antimony (Sb)	2021/07/09		107	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/09		93	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/09		94	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/09		92	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/09		94	%	75 - 125
			Acid Extractable Boron (B)	2021/07/09		94	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/09		91	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/09		90	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/09		91	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/09		91	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/09		92	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/09		102	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/09		93	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/09		98	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/09		95	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/09		93	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/09		93	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/09		93	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/09		93	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/09		95	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/09		94	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/09		94	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/09		91	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/09		95	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/09		96	%	75 - 125
7453582	BAN	Method Blank	Acid Extractable Aluminum (Al)	2021/07/09	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2021/07/09	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2021/07/09	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2021/07/09	ND, RDL=0.30		mg/kg	

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Chromium (Cr)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2021/07/09	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2021/07/09	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2021/07/09	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2021/07/09	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2021/07/09	ND, RDL=0.50		mg/kg	
			Acid Extractable Silver (Ag)	2021/07/09	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2021/07/09	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2021/07/09	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2021/07/09	ND, RDL=1.0		mg/kg	
			Acid Extractable Uranium (U)	2021/07/09	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2021/07/09	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2021/07/09	ND, RDL=5.0		mg/kg	
7453582	BAN	RPD	Acid Extractable Aluminum (Al)	2021/07/09	12		%	35
			Acid Extractable Antimony (Sb)	2021/07/09	NC		%	35
			Acid Extractable Arsenic (As)	2021/07/09	NC		%	35
			Acid Extractable Barium (Ba)	2021/07/09	NC		%	35
			Acid Extractable Beryllium (Be)	2021/07/09	NC		%	35
			Acid Extractable Bismuth (Bi)	2021/07/09	NC		%	35
			Acid Extractable Boron (B)	2021/07/09	NC		%	35
			Acid Extractable Cadmium (Cd)	2021/07/09	NC		%	35
			Acid Extractable Chromium (Cr)	2021/07/09	18		%	35
			Acid Extractable Cobalt (Co)	2021/07/09	29		%	35
			Acid Extractable Copper (Cu)	2021/07/09	NC		%	35
			Acid Extractable Iron (Fe)	2021/07/09	7.9		%	35
			Acid Extractable Lead (Pb)	2021/07/09	7.1		%	35
			Acid Extractable Lithium (Li)	2021/07/09	0.55		%	35
			Acid Extractable Manganese (Mn)	2021/07/09	1.0		%	35
			Acid Extractable Mercury (Hg)	2021/07/09	NC		%	35
			Acid Extractable Molybdenum (Mo)	2021/07/09	NC		%	35
			Acid Extractable Nickel (Ni)	2021/07/09	50 (2)		%	35

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Rubidium (Rb)	2021/07/09	19		%	35
			Acid Extractable Selenium (Se)	2021/07/09	NC		%	35
			Acid Extractable Silver (Ag)	2021/07/09	NC		%	35
			Acid Extractable Strontium (Sr)	2021/07/09	34		%	35
			Acid Extractable Thallium (Tl)	2021/07/09	NC		%	35
			Acid Extractable Tin (Sn)	2021/07/09	NC		%	35
			Acid Extractable Uranium (U)	2021/07/09	18		%	35
			Acid Extractable Vanadium (V)	2021/07/09	20		%	35
			Acid Extractable Zinc (Zn)	2021/07/09	12		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Poor spike recovery due to probable sample matrix interference.

(2) Poor RPD due to sample inhomogeneity. Verified by repeat digestion and analysis.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Colleen Acker, B.Sc, Scientific Service Specialist

Eric Dearman, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

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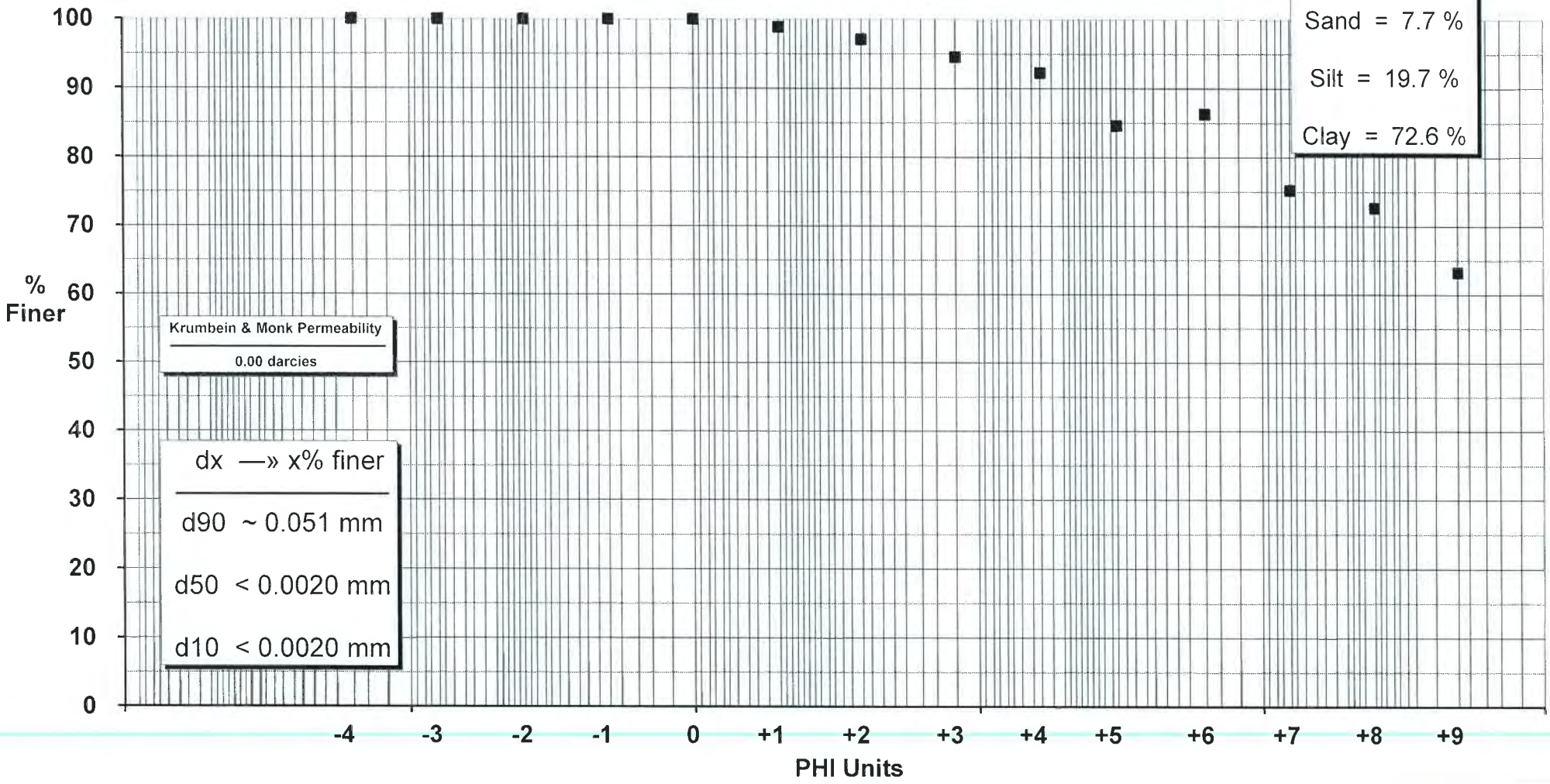
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BV Labs ID: PZM496-01

L8 (SEDIMENT)

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
7.1 %	10.2 %

Wentworth	
Gravel	0.0 %
Sand	7.7 %
Silt	19.7 %
Clay	72.6 %



Krumbein & Monk Permeability

0.00 darcies

dx —» x% finer	
d90	~ 0.051 mm
d50	< 0.0020 mm
d10	< 0.0020 mm

Approved

Your Project #: 142-039
Your C.O.C. #: 373100

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/07/27
Report #: R6738609
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1J4879
Received: 2021/07/13, 12:23

Sample Matrix: Sediment
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals Solids Acid Extr. ICPMS	1	2021/07/16	2021/07/16	ATL SOP 00058	EPA 6020B R2 m
Metals Solids Acid Extr. ICPMS	2	2021/07/19	2021/07/19	ATL SOP 00058	EPA 6020B R2 m
Metals Solids Acid Extr. ICPMS	2	2021/07/20	2021/07/20	ATL SOP 00058	EPA 6020B R2 m
Particle size in solids (pipette&sieve) (1)	5	N/A	2021/07/23	ATL SOP 00012	MSAMS'78/WREP-125R3m
Total Organic Carbon in Soil	4	2021/07/19	2021/07/19	ATL SOP 00044	LECO203601224 1991 m
Total Organic Carbon in Soil	1	2021/07/19	2021/07/20	ATL SOP 00044	LECO203601224 1991 m

Sample Matrix: Surface Water
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate, Bicarbonate and Hydroxide	7	N/A	2021/07/15	N/A	SM 23 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	2	N/A	2021/07/16	N/A	SM 23 4500-CO2 D
Alkalinity	9	N/A	2021/07/19	ATL SOP 00013	EPA 310.2 R1974 m
Chloride	9	N/A	2021/07/19	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	9	N/A	2021/07/19	ATL SOP 00020	SM 23 2120C m
Conductance - water	7	N/A	2021/07/15	ATL SOP 00004	SM 23 2510B m
Conductance - water	2	N/A	2021/07/16	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	9	N/A	2021/07/16	ATL SOP 00048	Auto Calc
Metals Water Total MS	9	2021/07/15	2021/07/15	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	9	N/A	2021/07/20	N/A	Auto Calc.
Anion and Cation Sum	9	N/A	2021/07/16	N/A	Auto Calc.
Nitrogen Ammonia - water	9	N/A	2021/07/16	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	9	N/A	2021/07/19	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	9	N/A	2021/07/19	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	9	N/A	2021/07/20	ATL SOP 00018	ASTM D3867-16
pH (3)	7	N/A	2021/07/15	ATL SOP 00003	SM 23 4500-H+ B m
pH (3)	2	N/A	2021/07/16	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	9	N/A	2021/07/19	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	9	N/A	2021/07/20	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	9	N/A	2021/07/20	ATL SOP 00049	Auto Calc.

Your Project #: 142-039
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CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1J4879
Received: 2021/07/13, 12:23

Sample Matrix: Surface Water
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Reactive Silica	9	N/A	2021/07/19	ATL SOP 00022	EPA 366.0 m
Sulphate	9	N/A	2021/07/19	ATL SOP 00023	ASTM D516-16 m
Chlorophyll A (Sub from Bedford) (2)	4	2021/07/22	2021/07/22		
Total Dissolved Solids (TDS calc)	9	N/A	2021/07/20	N/A	Auto Calc.
Organic carbon - Total (TOC) (4)	1	N/A	2021/07/15	ATL SOP 00203	SM 23 5310B m
Organic carbon - Total (TOC) (4)	8	N/A	2021/07/19	ATL SOP 00203	SM 23 5310B m
Turbidity	8	N/A	2021/07/15	ATL SOP 00011	EPA 180.1 R2 m
Turbidity	1	N/A	2021/07/16	ATL SOP 00011	EPA 180.1 R2 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
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Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.
(2) This test was performed by Dalhousie Dept of Oceanography
(3) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this

Your Project #: 142-039
Your C.O.C. #: 373100

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CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1J4879
Received: 2021/07/13, 12:23

report are reported past the APHA Standard Method holding time.
(4) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Maryann Comeau, Customer Experience Supervisor/PM
Email: Maryann.COMEAU@bureauveritas.com
Phone# (902)420-0203 Ext:298
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RESULTS OF ANALYSES OF SEDIMENT

BV Labs ID		QBZ125			QBZ125			QBZ133		
Sampling Date		2021/07/08 14:40			2021/07/08 14:40			2021/07/07 09:55		
COC Number		373100			373100			373100		
	UNITS	L20-3 - SED	RDL	QC Batch	L20-3 - SED Lab-Dup	RDL	QC Batch	L20-1 - SED	RDL	QC Batch
Inorganics										
Organic Carbon (TOC)	g/kg	180	0.50	7469586	180	0.50	7469586	190	0.50	7469586
< -1 Phi (2 mm)	%	100	0.10	7469805				100	0.10	7469805
< 0 Phi (1 mm)	%	100	0.10	7469805				100	0.10	7469805
< +1 Phi (0.5 mm)	%	100	0.10	7469805				100	0.10	7469805
< +2 Phi (0.25 mm)	%	99	0.10	7469805				100	0.10	7469805
< +3 Phi (0.12 mm)	%	98	0.10	7469805				97	0.10	7469805
< +4 Phi (0.062 mm)	%	95	0.10	7469805				91	0.10	7469805
< +5 Phi (0.031 mm)	%	91	0.10	7469805				86	0.10	7469805
< +6 Phi (0.016 mm)	%	83	0.10	7469805				79	0.10	7469805
< +7 Phi (0.0078 mm)	%	65	0.10	7469805				64	0.10	7469805
< +8 Phi (0.0039 mm)	%	61	0.10	7469805				60	0.10	7469805
< +9 Phi (0.0020 mm)	%	50	0.10	7469805				53	0.10	7469805
Gravel	%	ND	0.10	7469805				ND	0.10	7469805
Sand	%	5.0	0.10	7469805				9.4	0.10	7469805
Silt	%	34	0.10	7469805				31	0.10	7469805
Clay	%	61	0.10	7469805				60	0.10	7469805

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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BV Labs Job #: C1J4879
Report Date: 2021/07/27

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SEDIMENT

BV Labs ID		QBZ134			QBZ134			QBZ135	QBZ136		
Sampling Date		2021/07/07 13:00			2021/07/07 13:00			2021/07/08 16:37	2021/07/09 12:37		
COC Number		373100			373100			373100	373100		
	UNITS	L9 - SED	RDL	QC Batch	L9 - SED Lab-Dup	RDL	QC Batch	L20-2 - SED	L23 - SED	RDL	QC Batch
Inorganics											
Organic Carbon (TOC)	g/kg	350	1.3	7471908	340	1.3	7471908	160	110	0.50	7469586
< -1 Phi (2 mm)	%	100	0.10	7469805				100	100	0.10	7469805
< 0 Phi (1 mm)	%	100	0.10	7469805				100	100	0.10	7469805
< +1 Phi (0.5 mm)	%	99	0.10	7469805				100	98	0.10	7469805
< +2 Phi (0.25 mm)	%	98	0.10	7469805				99	95	0.10	7469805
< +3 Phi (0.12 mm)	%	96	0.10	7469805				98	83	0.10	7469805
< +4 Phi (0.062 mm)	%	95	0.10	7469805				97	73	0.10	7469805
< +5 Phi (0.031 mm)	%	74	0.10	7469805				86	68	0.10	7469805
< +6 Phi (0.016 mm)	%	88	0.10	7469805				76	59	0.10	7469805
< +7 Phi (0.0078 mm)	%	90	0.10	7469805				63	43	0.10	7469805
< +8 Phi (0.0039 mm)	%	63	0.10	7469805				59	38	0.10	7469805
< +9 Phi (0.0020 mm)	%	96	0.10	7469805				51	29	0.10	7469805
Gravel	%	ND	0.10	7469805				ND	ND	0.10	7469805
Sand	%	5.1	0.10	7469805				3.4	27	0.10	7469805
Silt	%	31	0.10	7469805				37	35	0.10	7469805
Clay	%	63	0.10	7469805				59	38	0.10	7469805

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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ELEMENTS BY ATOMIC SPECTROSCOPY (SEDIMENT)

BV Labs ID		QBZ125	QBZ133		QBZ134		QBZ135		
Sampling Date		2021/07/08 14:40	2021/07/07 09:55		2021/07/07 13:00		2021/07/08 16:37		
COC Number		373100	373100		373100		373100		
	UNITS	L20-3 - SED	L20-1 - SED	QC Batch	L9 - SED	QC Batch	L20-2 - SED	RDL	QC Batch
Metals									
Acid Extractable Aluminum (Al)	mg/kg	6700	16000	7471690	900	7469597	12000	10	7466255
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	7471690	ND	7469597	ND	2.0	7466255
Acid Extractable Arsenic (As)	mg/kg	ND	2.5	7471690	ND	7469597	2.6	2.0	7466255
Acid Extractable Barium (Ba)	mg/kg	93	190	7471690	200	7469597	120	5.0	7466255
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	7471690	ND	7469597	ND	2.0	7466255
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	7471690	ND	7469597	ND	2.0	7466255
Acid Extractable Boron (B)	mg/kg	ND	ND	7471690	ND	7469597	ND	50	7466255
Acid Extractable Cadmium (Cd)	mg/kg	0.36	0.50	7471690	ND	7469597	0.48	0.30	7466255
Acid Extractable Chromium (Cr)	mg/kg	24	53	7471690	6.3	7469597	36	2.0	7466255
Acid Extractable Cobalt (Co)	mg/kg	4.3	9.3	7471690	1.7	7469597	7.0	1.0	7466255
Acid Extractable Copper (Cu)	mg/kg	18	31	7471690	4.3	7469597	20	2.0	7466255
Acid Extractable Iron (Fe)	mg/kg	26000	82000	7471690	26000	7469597	61000	50	7466255
Acid Extractable Lead (Pb)	mg/kg	9.7	7.3	7471690	8.1	7469597	13	0.50	7466255
Acid Extractable Lithium (Li)	mg/kg	3.0	5.9	7471690	ND	7469597	4.5	2.0	7466255
Acid Extractable Manganese (Mn)	mg/kg	320	1500	7471690	270	7469597	800	2.0	7466255
Acid Extractable Mercury (Hg)	mg/kg	0.14	0.18	7471690	ND	7469597	0.20	0.10	7466255
Acid Extractable Molybdenum (Mo)	mg/kg	3.8	14	7471690	ND	7469597	7.1	2.0	7466255
Acid Extractable Nickel (Ni)	mg/kg	25	41	7471690	6.3	7469597	25	2.0	7466255
Acid Extractable Rubidium (Rb)	mg/kg	5.1	6.9	7471690	ND	7469597	5.8	2.0	7466255
Acid Extractable Selenium (Se)	mg/kg	0.85	1.3	7471690	0.65	7469597	1.1	0.50	7466255
Acid Extractable Silver (Ag)	mg/kg	ND	ND	7471690	ND	7469597	ND	0.50	7466255
Acid Extractable Strontium (Sr)	mg/kg	13	17	7471690	9.8	7469597	11	5.0	7466255
Acid Extractable Thallium (Tl)	mg/kg	0.11	0.19	7471690	ND	7469597	0.14	0.10	7466255
Acid Extractable Tin (Sn)	mg/kg	ND	1.1	7471690	3.4	7469597	ND	1.0	7466255
Acid Extractable Uranium (U)	mg/kg	2.4	6.9	7471690	1.1	7469597	4.3	0.10	7466255
Acid Extractable Vanadium (V)	mg/kg	16	35	7471690	6.3	7469597	24	2.0	7466255
Acid Extractable Zinc (Zn)	mg/kg	68	150	7471690	24	7469597	120	5.0	7466255

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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ELEMENTS BY ATOMIC SPECTROSCOPY (SEDIMENT)

BV Labs ID		QBZ136		
Sampling Date		2021/07/09 12:37		
COC Number		373100		
	UNITS	L23 - SED	RDL	QC Batch
Metals				
Acid Extractable Aluminum (Al)	mg/kg	12000	10	7469597
Acid Extractable Antimony (Sb)	mg/kg	ND	2.0	7469597
Acid Extractable Arsenic (As)	mg/kg	ND	2.0	7469597
Acid Extractable Barium (Ba)	mg/kg	130	5.0	7469597
Acid Extractable Beryllium (Be)	mg/kg	ND	2.0	7469597
Acid Extractable Bismuth (Bi)	mg/kg	ND	2.0	7469597
Acid Extractable Boron (B)	mg/kg	ND	50	7469597
Acid Extractable Cadmium (Cd)	mg/kg	ND	0.30	7469597
Acid Extractable Chromium (Cr)	mg/kg	64	2.0	7469597
Acid Extractable Cobalt (Co)	mg/kg	12	1.0	7469597
Acid Extractable Copper (Cu)	mg/kg	45	2.0	7469597
Acid Extractable Iron (Fe)	mg/kg	40000	50	7469597
Acid Extractable Lead (Pb)	mg/kg	8.1	0.50	7469597
Acid Extractable Lithium (Li)	mg/kg	9.2	2.0	7469597
Acid Extractable Manganese (Mn)	mg/kg	810	2.0	7469597
Acid Extractable Mercury (Hg)	mg/kg	ND	0.10	7469597
Acid Extractable Molybdenum (Mo)	mg/kg	7.3	2.0	7469597
Acid Extractable Nickel (Ni)	mg/kg	45	2.0	7469597
Acid Extractable Rubidium (Rb)	mg/kg	25	2.0	7469597
Acid Extractable Selenium (Se)	mg/kg	1.7	0.50	7469597
Acid Extractable Silver (Ag)	mg/kg	ND	0.50	7469597
Acid Extractable Strontium (Sr)	mg/kg	22	5.0	7469597
Acid Extractable Thallium (Tl)	mg/kg	0.26	0.10	7469597
Acid Extractable Tin (Sn)	mg/kg	ND	1.0	7469597
Acid Extractable Uranium (U)	mg/kg	6.3	0.10	7469597
Acid Extractable Vanadium (V)	mg/kg	40	2.0	7469597
Acid Extractable Zinc (Zn)	mg/kg	77	5.0	7469597

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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BV Labs Job #: C1J4879
Report Date: 2021/07/27

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QBZ124			QBZ126		QBZ127		
Sampling Date		2021/07/08 14:19			2021/07/08 14:40		2021/07/08 16:37		
COC Number		373100			373100		373100		
	UNITS	S14	RDL	QC Batch	L20-3	QC Batch	L20-2	RDL	QC Batch
Calculated Parameters									
Anion Sum	me/L	0.770	N/A	7461338	0.460	7461338	0.490	N/A	7461338
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	36	1.0	7461334	23	7461334	25	1.0	7461334
Calculated TDS	mg/L	44	1.0	7461344	24	7461344	27	1.0	7461344
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7461334	ND	7461334	ND	1.0	7461334
Cation Sum	me/L	0.730	N/A	7461338	0.490	7461338	0.490	N/A	7461338
Hardness (CaCO3)	mg/L	34	1.0	7461336	23	7461336	22	1.0	7461336
Ion Balance (% Difference)	%	2.67	N/A	7461337	3.16	7461337	0.00	N/A	7461337
Langelier Index (@ 20C)	N/A	-1.31		7461342	-1.68	7461342	-1.66		7461342
Langelier Index (@ 4C)	N/A	-1.56		7461343	-1.93	7461343	-1.92		7461343
Nitrate (N)	mg/L	0.069	0.050	7461339	ND	7461339	ND	0.050	7461339
Saturation pH (@ 20C)	N/A	8.87		7461342	9.21	7461342	9.19		7461342
Saturation pH (@ 4C)	N/A	9.12		7461343	9.46	7461343	9.45		7461343
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	36	5.0	7466960	23	7466960	25	5.0	7466960
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7466970	ND	7466970	ND	1.0	7466970
Colour	TCU	28	5.0	7466976	29	7466976	31	5.0	7466976
Nitrate + Nitrite (N)	mg/L	0.069	0.050	7466986	ND	7466986	ND	0.050	7466986
Nitrite (N)	mg/L	ND	0.010	7466989	ND	7466989	ND	0.010	7466989
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7464876	ND	7464876	ND	0.050	7464876
Total Organic Carbon (C)	mg/L	4.3	0.50	7469696	7.6	7469696	5.7	0.50	7469696
Orthophosphate (P)	mg/L	ND	0.010	7466978	ND	7466978	ND	0.010	7466978
pH	pH	7.56		7466283	7.53	7463860	7.53		7463860
Reactive Silica (SiO2)	mg/L	6.8	0.50	7466975	1.5	7466975	3.3	0.50	7466975
Dissolved Sulphate (SO4)	mg/L	2.3	2.0	7466974	ND	7466974	ND	2.0	7466974
Turbidity	NTU	0.39	0.10	7463889	1.5	7463889	1.7	0.10	7463890
Conductivity	uS/cm	65	1.0	7466282	44	7463858	44	1.0	7463858
Subcontracted Analysis									
Subcontract Parameter	N/A				ATTACHED	7478332	ATTACHED	N/A	7478332

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

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RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QBZ127			QBZ128			QBZ128		
Sampling Date		2021/07/08 16:37			2021/07/08 13:36			2021/07/08 13:36		
COC Number		373100			373100			373100		
	UNITS	L20-2 Lab-Dup	RDL	QC Batch	S15	RDL	QC Batch	S15 Lab-Dup	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L				0.410	N/A	7461338			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				21	1.0	7461334			
Calculated TDS	mg/L				21	1.0	7461344			
Carb. Alkalinity (calc. as CaCO3)	mg/L				ND	1.0	7461334			
Cation Sum	me/L				0.420	N/A	7461338			
Hardness (CaCO3)	mg/L				18	1.0	7461336			
Ion Balance (% Difference)	%				1.20	N/A	7461337			
Langelier Index (@ 20C)	N/A				-2.11		7461342			
Langelier Index (@ 4C)	N/A				-2.36		7461343			
Nitrate (N)	mg/L				ND	0.050	7461339			
Saturation pH (@ 20C)	N/A				9.32		7461342			
Saturation pH (@ 4C)	N/A				9.58		7461343			
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L				21	5.0	7466960			
Dissolved Chloride (Cl-)	mg/L				ND	1.0	7466970			
Colour	TCU				31	5.0	7466976			
Nitrate + Nitrite (N)	mg/L				ND	0.050	7466986			
Nitrite (N)	mg/L				ND	0.010	7466989			
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7464876	0.054	0.050	7464876			
Total Organic Carbon (C)	mg/L				7.3	0.50	7469696			
Orthophosphate (P)	mg/L				ND	0.010	7466978			
pH	pH				7.21		7463860			
Reactive Silica (SiO2)	mg/L				0.86	0.50	7466975			
Dissolved Sulphate (SO4)	mg/L				ND	2.0	7466974			
Turbidity	NTU				1.4	0.10	7463890	1.5	0.10	7463890
Conductivity	uS/cm				37	1.0	7463858			

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BV Labs Job #: C1J4879
Report Date: 2021/07/27

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QBZ129			QBZ129			QBZ130	QBZ131		
Sampling Date		2021/07/08 10:00			2021/07/08 10:00			2021/07/08 11:00	2021/07/08 17:18		
COC Number		373100			373100			373100	373100		
	UNITS	S12	RDL	QC Batch	S12 Lab-Dup	RDL	QC Batch	S13	S11	RDL	QC Batch
Calculated Parameters											
Anion Sum	me/L	0.850	N/A	7461338				0.720	0.780	N/A	7461338
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	40	1.0	7461334				34	39	1.0	7461334
Calculated TDS	mg/L	44	1.0	7461344				39	39	1.0	7461344
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7461334				ND	ND	1.0	7461334
Cation Sum	me/L	0.710	N/A	7461338				0.690	0.790	N/A	7461338
Hardness (CaCO3)	mg/L	33	1.0	7461336				32	37	1.0	7461336
Ion Balance (% Difference)	%	8.97	N/A	7461337				2.13	0.640	N/A	7461337
Langelier Index (@ 20C)	N/A	-1.20		7461342				-1.25	-1.19		7461342
Langelier Index (@ 4C)	N/A	-1.45		7461343				-1.50	-1.44		7461343
Nitrate (N)	mg/L	ND	0.050	7461339				ND	ND	0.050	7461339
Saturation pH (@ 20C)	N/A	8.82		7461342				8.91	8.79		7461342
Saturation pH (@ 4C)	N/A	9.07		7461343				9.16	9.04		7461343
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	40	5.0	7467079	37	5.0	7467079	34	39	5.0	7467033
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7467080	ND	1.0	7467080	ND	ND	1.0	7467047
Colour	TCU	24	5.0	7467084	24	5.0	7467084	23	19	5.0	7467053
Nitrate + Nitrite (N)	mg/L	ND	0.050	7467087	ND	0.050	7467087	ND	ND	0.050	7467058
Nitrite (N)	mg/L	ND	0.010	7467089	ND	0.010	7467089	ND	ND	0.010	7467060
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7464876				ND	ND	0.050	7464876
Total Organic Carbon (C)	mg/L	3.4	0.50	7469696				4.6	4.1	0.50	7469696
Orthophosphate (P)	mg/L	ND	0.010	7467065	ND	0.010	7467065	ND	ND	0.010	7467056
pH	pH	7.62		7463860				7.66	7.61		7463860
Reactive Silica (SiO2)	mg/L	4.7	0.50	7467083	4.8	0.50	7467083	4.1	1.4	0.50	7467052
Dissolved Sulphate (SO4)	mg/L	2.2	2.0	7467081	2.3	2.0	7467081	2.1	ND	2.0	7467050
Turbidity	NTU	1.8	0.10	7463890				1.2	1.9	0.10	7463890
Conductivity	uS/cm	69	1.0	7463858				63	68	1.0	7463858

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RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QBZ132		QBZ137			QBZ137		
Sampling Date		2021/07/07 09:55		2021/07/09 12:37			2021/07/09 12:37		
COC Number		373100		373100			373100		
	UNITS	L20-1	QC Batch	L23	RDL	QC Batch	L23 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Anion Sum	me/L	0.540	7461338	0.420	N/A	7461338			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	24	7461334	21	1.0	7461334			
Calculated TDS	mg/L	29	7461344	21	1.0	7461344			
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	7461334	ND	1.0	7461334			
Cation Sum	me/L	0.500	7461338	0.410	N/A	7461338			
Hardness (CaCO3)	mg/L	23	7461336	19	1.0	7461336			
Ion Balance (% Difference)	%	3.85	7461337	1.20	N/A	7461337			
Langelier Index (@ 20C)	N/A	-1.67	7461342	-1.92		7461342			
Langelier Index (@ 4C)	N/A	-1.93	7461343	-2.17		7461343			
Nitrate (N)	mg/L	ND	7461339	0.063	0.050	7461339			
Saturation pH (@ 20C)	N/A	9.18	7461342	9.33		7461342			
Saturation pH (@ 4C)	N/A	9.43	7461343	9.58		7461343			
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	24	7467033	21	5.0	7467033			
Dissolved Chloride (Cl-)	mg/L	ND	7467047	ND	1.0	7467047			
Colour	TCU	29	7467053	17	5.0	7467053			
Nitrate + Nitrite (N)	mg/L	ND	7467058	0.063	0.050	7467058			
Nitrite (N)	mg/L	ND	7467060	ND	0.010	7467060			
Nitrogen (Ammonia Nitrogen)	mg/L	ND	7464876	0.051	0.050	7464876			
Total Organic Carbon (C)	mg/L	5.7	7469696	7.1	0.50	7463940	6.7	0.50	7463940
Orthophosphate (P)	mg/L	ND	7467056	ND	0.010	7467056			
pH	pH	7.51	7463860	7.41		7466283			
Reactive Silica (SiO2)	mg/L	3.2	7467052	0.71	0.50	7467052			
Dissolved Sulphate (SO4)	mg/L	2.3	7467050	ND	2.0	7467050			
Turbidity	NTU	1.4	7463890	1.4	0.10	7466328			
Conductivity	uS/cm	44	7463858	35	1.0	7466282			
Subcontracted Analysis									
Subcontract Parameter	N/A	ATTACHED	7478332	ATTACHED	N/A	7478332			

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ELEMENTS BY ICP/MS (SURFACE WATER)

BV Labs ID		QBZ124	QBZ126	QBZ127	QBZ128	QBZ129	QBZ130	QBZ131		
Sampling Date		2021/07/08 14:19	2021/07/08 14:40	2021/07/08 16:37	2021/07/08 13:36	2021/07/08 10:00	2021/07/08 11:00	2021/07/08 17:18		
COC Number		373100	373100	373100	373100	373100	373100	373100		
	UNITS	**S14**	**L20-3**	**L20-2**	**S15**	**S12**	**S13**	**S11**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	24	26	17	12	23	12	17	5.0	7463879
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	7463879
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	7463879
Total Barium (Ba)	ug/L	12	8.3	9.4	9.2	15	9.4	17	1.0	7463879
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	7463879
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	7463879
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	50	7463879
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.010	7463879
Total Calcium (Ca)	ug/L	7600	5200	5100	4400	7500	7200	8300	100	7463879
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	7463879
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.40	7463879
Total Copper (Cu)	ug/L	ND	1.1	ND	ND	ND	ND	ND	0.50	7463879
Total Iron (Fe)	ug/L	61	120	120	490	330	260	640	50	7463879
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.50	7463879
Total Magnesium (Mg)	ug/L	3600	2400	2300	1800	3400	3300	3800	100	7463879
Total Manganese (Mn)	ug/L	11	21	11	130	47	25	160	2.0	7463879
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	7463879
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	7463879
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	100	7463879
Total Potassium (K)	ug/L	800	570	550	560	710	640	750	100	7463879
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.50	7463879
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	7463879
Total Sodium (Na)	ug/L	800	490	530	340	670	740	410	100	7463879
Total Strontium (Sr)	ug/L	14	10	9.7	11	15	13	10	2.0	7463879
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	7463879
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	7463879
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	7463879
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	7463879
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	7463879
Total Zinc (Zn)	ug/L	ND	6.6	ND	ND	ND	ND	ND	5.0	7463879

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ELEMENTS BY ICP/MS (SURFACE WATER)

BV Labs ID		QBZ132	QBZ137		
Sampling Date		2021/07/07 09:55	2021/07/09 12:37		
COC Number		373100	373100		
	UNITS	L20-1	L23	RDL	QC Batch
Metals					
Total Aluminum (Al)	ug/L	21	16	5.0	7463879
Total Antimony (Sb)	ug/L	ND	ND	1.0	7463879
Total Arsenic (As)	ug/L	ND	ND	1.0	7463879
Total Barium (Ba)	ug/L	9.8	5.2	1.0	7463879
Total Beryllium (Be)	ug/L	ND	ND	1.0	7463879
Total Bismuth (Bi)	ug/L	ND	ND	2.0	7463879
Total Boron (B)	ug/L	ND	ND	50	7463879
Total Cadmium (Cd)	ug/L	ND	0.013	0.010	7463879
Total Calcium (Ca)	ug/L	5300	4300	100	7463879
Total Chromium (Cr)	ug/L	ND	ND	1.0	7463879
Total Cobalt (Co)	ug/L	ND	ND	0.40	7463879
Total Copper (Cu)	ug/L	ND	0.55	0.50	7463879
Total Iron (Fe)	ug/L	140	170	50	7463879
Total Lead (Pb)	ug/L	ND	ND	0.50	7463879
Total Magnesium (Mg)	ug/L	2400	1900	100	7463879
Total Manganese (Mn)	ug/L	16	17	2.0	7463879
Total Molybdenum (Mo)	ug/L	ND	ND	2.0	7463879
Total Nickel (Ni)	ug/L	ND	ND	2.0	7463879
Total Phosphorus (P)	ug/L	ND	ND	100	7463879
Total Potassium (K)	ug/L	620	600	100	7463879
Total Selenium (Se)	ug/L	ND	ND	0.50	7463879
Total Silver (Ag)	ug/L	ND	ND	0.10	7463879
Total Sodium (Na)	ug/L	530	360	100	7463879
Total Strontium (Sr)	ug/L	9.6	10	2.0	7463879
Total Thallium (Tl)	ug/L	ND	ND	0.10	7463879
Total Tin (Sn)	ug/L	ND	ND	2.0	7463879
Total Titanium (Ti)	ug/L	ND	ND	2.0	7463879
Total Uranium (U)	ug/L	ND	ND	0.10	7463879
Total Vanadium (V)	ug/L	ND	ND	2.0	7463879
Total Zinc (Zn)	ug/L	ND	ND	5.0	7463879

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.0°C

Sample QBZ129 [S12] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7463858	SHW	Spiked Blank	Conductivity	2021/07/15		102	%	80 - 120
7463858	SHW	Method Blank	Conductivity	2021/07/15	ND, RDL=1.0		uS/cm	
7463858	SHW	RPD	Conductivity	2021/07/15	2.4		%	10
7463860	SHW	Spiked Blank	pH	2021/07/15		100	%	97 - 103
7463860	SHW	RPD	pH	2021/07/15	0.0025		%	N/A
7463879	BAN	Matrix Spike	Total Aluminum (Al)	2021/07/15		101	%	80 - 120
			Total Antimony (Sb)	2021/07/15		102	%	80 - 120
			Total Arsenic (As)	2021/07/15		99	%	80 - 120
			Total Barium (Ba)	2021/07/15		NC	%	80 - 120
			Total Beryllium (Be)	2021/07/15		104	%	80 - 120
			Total Bismuth (Bi)	2021/07/15		97	%	80 - 120
			Total Boron (B)	2021/07/15		105	%	80 - 120
			Total Cadmium (Cd)	2021/07/15		102	%	80 - 120
			Total Calcium (Ca)	2021/07/15		NC	%	80 - 120
			Total Chromium (Cr)	2021/07/15		102	%	80 - 120
			Total Cobalt (Co)	2021/07/15		101	%	80 - 120
			Total Copper (Cu)	2021/07/15		103	%	80 - 120
			Total Iron (Fe)	2021/07/15		104	%	80 - 120
			Total Lead (Pb)	2021/07/15		99	%	80 - 120
			Total Magnesium (Mg)	2021/07/15		110	%	80 - 120
			Total Manganese (Mn)	2021/07/15		103	%	80 - 120
			Total Molybdenum (Mo)	2021/07/15		106	%	80 - 120
			Total Nickel (Ni)	2021/07/15		103	%	80 - 120
			Total Phosphorus (P)	2021/07/15		105	%	80 - 120
			Total Potassium (K)	2021/07/15		103	%	80 - 120
			Total Selenium (Se)	2021/07/15		103	%	80 - 120
			Total Silver (Ag)	2021/07/15		101	%	80 - 120
			Total Sodium (Na)	2021/07/15		107	%	80 - 120
			Total Strontium (Sr)	2021/07/15		NC	%	80 - 120
			Total Thallium (Tl)	2021/07/15		101	%	80 - 120
			Total Tin (Sn)	2021/07/15		99	%	80 - 120
			Total Titanium (Ti)	2021/07/15		107	%	80 - 120
			Total Uranium (U)	2021/07/15		107	%	80 - 120
			Total Vanadium (V)	2021/07/15		104	%	80 - 120
			Total Zinc (Zn)	2021/07/15		102	%	80 - 120
7463879	BAN	Spiked Blank	Total Aluminum (Al)	2021/07/15		100	%	80 - 120
			Total Antimony (Sb)	2021/07/15		96	%	80 - 120
			Total Arsenic (As)	2021/07/15		95	%	80 - 120
			Total Barium (Ba)	2021/07/15		94	%	80 - 120
			Total Beryllium (Be)	2021/07/15		101	%	80 - 120
			Total Bismuth (Bi)	2021/07/15		98	%	80 - 120
			Total Boron (B)	2021/07/15		101	%	80 - 120
			Total Cadmium (Cd)	2021/07/15		97	%	80 - 120
			Total Calcium (Ca)	2021/07/15		98	%	80 - 120
			Total Chromium (Cr)	2021/07/15		99	%	80 - 120
			Total Cobalt (Co)	2021/07/15		99	%	80 - 120
			Total Copper (Cu)	2021/07/15		101	%	80 - 120
			Total Iron (Fe)	2021/07/15		104	%	80 - 120
			Total Lead (Pb)	2021/07/15		98	%	80 - 120
			Total Magnesium (Mg)	2021/07/15		106	%	80 - 120
			Total Manganese (Mn)	2021/07/15		101	%	80 - 120
			Total Molybdenum (Mo)	2021/07/15		101	%	80 - 120
			Total Nickel (Ni)	2021/07/15		102	%	80 - 120
			Total Phosphorus (P)	2021/07/15		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Potassium (K)	2021/07/15		97	%	80 - 120
			Total Selenium (Se)	2021/07/15		98	%	80 - 120
			Total Silver (Ag)	2021/07/15		97	%	80 - 120
			Total Sodium (Na)	2021/07/15		104	%	80 - 120
			Total Strontium (Sr)	2021/07/15		95	%	80 - 120
			Total Thallium (Tl)	2021/07/15		98	%	80 - 120
			Total Tin (Sn)	2021/07/15		96	%	80 - 120
			Total Titanium (Ti)	2021/07/15		100	%	80 - 120
			Total Uranium (U)	2021/07/15		104	%	80 - 120
			Total Vanadium (V)	2021/07/15		101	%	80 - 120
			Total Zinc (Zn)	2021/07/15		101	%	80 - 120
7463879	BAN	Method Blank	Total Aluminum (Al)	2021/07/15	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2021/07/15	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2021/07/15	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2021/07/15	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2021/07/15	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Boron (B)	2021/07/15	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2021/07/15	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2021/07/15	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2021/07/15	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2021/07/15	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2021/07/15	ND, RDL=0.50		ug/L	
			Total Iron (Fe)	2021/07/15	ND, RDL=50		ug/L	
			Total Lead (Pb)	2021/07/15	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2021/07/15	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2021/07/15	ND, RDL=100		ug/L	
			Total Potassium (K)	2021/07/15	ND, RDL=100		ug/L	
			Total Selenium (Se)	2021/07/15	ND, RDL=0.50		ug/L	
			Total Silver (Ag)	2021/07/15	ND, RDL=0.10		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Sodium (Na)	2021/07/15	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2021/07/15	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2021/07/15	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2021/07/15	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2021/07/15	ND, RDL=5.0		ug/L	
7463879	BAN	RPD	Total Arsenic (As)	2021/07/15	NC		%	20
7463889	SHW	QC Standard	Turbidity	2021/07/15		105	%	80 - 120
7463889	SHW	Spiked Blank	Turbidity	2021/07/15		107	%	80 - 120
7463889	SHW	Method Blank	Turbidity	2021/07/15	ND, RDL=0.10		NTU	
7463889	SHW	RPD	Turbidity	2021/07/15	3.3		%	20
7463890	SHW	QC Standard	Turbidity	2021/07/15		107	%	80 - 120
7463890	SHW	Spiked Blank	Turbidity	2021/07/15		107	%	80 - 120
7463890	SHW	Method Blank	Turbidity	2021/07/15	ND, RDL=0.10		NTU	
7463890	SHW	RPD [QBZ128-01]	Turbidity	2021/07/15	10		%	20
7463940	NGI	Matrix Spike [QBZ137-05]	Total Organic Carbon (C)	2021/07/15		92	%	85 - 115
7463940	NGI	Spiked Blank	Total Organic Carbon (C)	2021/07/15		99	%	80 - 120
7463940	NGI	Method Blank	Total Organic Carbon (C)	2021/07/15	ND, RDL=0.50		mg/L	
7463940	NGI	RPD [QBZ137-05]	Total Organic Carbon (C)	2021/07/15	5.8		%	15
7464876	EMT	Matrix Spike [QBZ127-03]	Nitrogen (Ammonia Nitrogen)	2021/07/16		108	%	80 - 120
7464876	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2021/07/16		110	%	80 - 120
7464876	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2021/07/16	ND, RDL=0.050		mg/L	
7464876	EMT	RPD [QBZ127-03]	Nitrogen (Ammonia Nitrogen)	2021/07/16	NC		%	20
7466255	BAN	Matrix Spike	Acid Extractable Antimony (Sb)	2021/07/16		95	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/16		100	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/16		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/16		97	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/16		99	%	75 - 125
			Acid Extractable Boron (B)	2021/07/16		88	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/16		95	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/16		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/16		102	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/16		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/16		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/16		106	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/16		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/16		95	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/16		NC	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/16		103	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/16		99	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/16		100	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Silver (Ag)	2021/07/16		97	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/16		108	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/16		96	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/16		NC	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/16		97	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/16		107	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/16		NC	%	75 - 125
7466255	BAN	Spiked Blank	Acid Extractable Antimony (Sb)	2021/07/16		102	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/16		102	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/16		99	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/16		99	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/16		101	%	75 - 125
			Acid Extractable Boron (B)	2021/07/16		103	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/16		99	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/16		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/16		102	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/16		104	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/16		99	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/16		101	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/16		102	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/16		102	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/16		101	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/16		105	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/16		99	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/16		103	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/16		101	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/16		101	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/16		100	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/16		104	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/16		99	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/16		103	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/16		102	%	75 - 125
7466255	BAN	Method Blank	Acid Extractable Aluminum (Al)	2021/07/16	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2021/07/16	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2021/07/16	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2021/07/16	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2021/07/16	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2021/07/16	ND, RDL=2.0		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Iron (Fe)	2021/07/16	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2021/07/16	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2021/07/16	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2021/07/16	ND, RDL=0.50		mg/kg	
			Acid Extractable Silver (Ag)	2021/07/16	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2021/07/16	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2021/07/16	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2021/07/16	ND, RDL=1.0		mg/kg	
			Acid Extractable Uranium (U)	2021/07/16	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2021/07/16	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2021/07/16	ND, RDL=5.0		mg/kg	
7466255	BAN	RPD	Acid Extractable Aluminum (Al)	2021/07/16	4.1		%	35
			Acid Extractable Antimony (Sb)	2021/07/16	16		%	35
			Acid Extractable Arsenic (As)	2021/07/16	9.8		%	35
			Acid Extractable Barium (Ba)	2021/07/16	3.5		%	35
			Acid Extractable Beryllium (Be)	2021/07/16	NC		%	35
			Acid Extractable Bismuth (Bi)	2021/07/16	NC		%	35
			Acid Extractable Boron (B)	2021/07/16	NC		%	35
			Acid Extractable Cadmium (Cd)	2021/07/16	16		%	35
			Acid Extractable Chromium (Cr)	2021/07/16	6.0		%	35
			Acid Extractable Cobalt (Co)	2021/07/16	22		%	35
			Acid Extractable Copper (Cu)	2021/07/16	7.2		%	35
			Acid Extractable Iron (Fe)	2021/07/16	14		%	35
			Acid Extractable Lead (Pb)	2021/07/16	9.7		%	35
			Acid Extractable Lithium (Li)	2021/07/16	7.5		%	35
			Acid Extractable Manganese (Mn)	2021/07/16	24		%	35
			Acid Extractable Mercury (Hg)	2021/07/16	0.047		%	35
			Acid Extractable Molybdenum (Mo)	2021/07/16	1.6		%	35
			Acid Extractable Nickel (Ni)	2021/07/16	5.6		%	35
			Acid Extractable Rubidium (Rb)	2021/07/16	13		%	35
			Acid Extractable Selenium (Se)	2021/07/16	6.8		%	35
			Acid Extractable Silver (Ag)	2021/07/16	NC		%	35
			Acid Extractable Strontium (Sr)	2021/07/16	2.4		%	35
			Acid Extractable Thallium (Tl)	2021/07/16	7.3		%	35
			Acid Extractable Tin (Sn)	2021/07/16	71 (1)		%	35

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Uranium (U)	2021/07/16	1.6		%	35
			Acid Extractable Vanadium (V)	2021/07/16	12		%	35
			Acid Extractable Zinc (Zn)	2021/07/16	9.5		%	35
7466282	SHW	Spiked Blank	Conductivity	2021/07/16		103	%	80 - 120
7466282	SHW	Method Blank	Conductivity	2021/07/16	ND, RDL=1.0		uS/cm	
7466282	SHW	RPD	Conductivity	2021/07/16	0.22		%	10
7466283	SHW	Spiked Blank	pH	2021/07/16		100	%	97 - 103
7466283	SHW	RPD	pH	2021/07/16	0.67		%	N/A
7466328	SHW	QC Standard	Turbidity	2021/07/16		105	%	80 - 120
7466328	SHW	Spiked Blank	Turbidity	2021/07/16		107	%	80 - 120
7466328	SHW	Method Blank	Turbidity	2021/07/16	ND, RDL=0.10		NTU	
7466328	SHW	RPD	Turbidity	2021/07/16	NC		%	20
7466960	MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	2021/07/19		NC	%	80 - 120
7466960	MCN	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/19		106	%	80 - 120
7466960	MCN	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/19	ND, RDL=5.0		mg/L	
7466970	MCN	Matrix Spike	Dissolved Chloride (Cl-)	2021/07/20		NC	%	80 - 120
7466970	MCN	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/20		101	%	80 - 120
7466970	MCN	Method Blank	Dissolved Chloride (Cl-)	2021/07/19	ND, RDL=1.0		mg/L	
7466974	MCN	Matrix Spike	Dissolved Sulphate (SO4)	2021/07/19		NC	%	80 - 120
7466974	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/19		101	%	80 - 120
7466974	MCN	Method Blank	Dissolved Sulphate (SO4)	2021/07/19	ND, RDL=2.0		mg/L	
7466975	MCN	Matrix Spike	Reactive Silica (SiO2)	2021/07/19		97	%	80 - 120
7466975	MCN	Spiked Blank	Reactive Silica (SiO2)	2021/07/19		105	%	80 - 120
7466975	MCN	Method Blank	Reactive Silica (SiO2)	2021/07/19	ND, RDL=0.50		mg/L	
7466976	MCN	Spiked Blank	Colour	2021/07/19		100	%	80 - 120
7466976	MCN	Method Blank	Colour	2021/07/19	ND, RDL=5.0		TCU	
7466978	MCN	Matrix Spike	Orthophosphate (P)	2021/07/19		97	%	80 - 120
7466978	MCN	Spiked Blank	Orthophosphate (P)	2021/07/19		102	%	80 - 120
7466978	MCN	Method Blank	Orthophosphate (P)	2021/07/19	ND, RDL=0.010		mg/L	
7466986	MCN	Matrix Spike	Nitrate + Nitrite (N)	2021/07/19		100	%	80 - 120
7466986	MCN	Spiked Blank	Nitrate + Nitrite (N)	2021/07/19		91	%	80 - 120
7466986	MCN	Method Blank	Nitrate + Nitrite (N)	2021/07/19	ND, RDL=0.050		mg/L	
7466989	MCN	Matrix Spike	Nitrite (N)	2021/07/19		106	%	80 - 120
7466989	MCN	Spiked Blank	Nitrite (N)	2021/07/19		103	%	80 - 120
7466989	MCN	Method Blank	Nitrite (N)	2021/07/19	ND, RDL=0.010		mg/L	
7467033	MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	2021/07/19		NC	%	80 - 120
7467033	MCN	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/19		108	%	80 - 120
7467033	MCN	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/20	ND, RDL=5.0		mg/L	
7467033	MCN	RPD	Total Alkalinity (Total as CaCO3)	2021/07/19	1.9		%	20
7467047	MCN	Matrix Spike	Dissolved Chloride (Cl-)	2021/07/19		89	%	80 - 120
7467047	MCN	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/19		99	%	80 - 120
7467047	MCN	Method Blank	Dissolved Chloride (Cl-)	2021/07/19	ND, RDL=1.0		mg/L	
7467047	MCN	RPD	Dissolved Chloride (Cl-)	2021/07/19	3.4		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7467050	MCN	Matrix Spike	Dissolved Sulphate (SO4)	2021/07/19		88	%	80 - 120
7467050	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/19		98	%	80 - 120
7467050	MCN	Method Blank	Dissolved Sulphate (SO4)	2021/07/19	ND, RDL=2.0		mg/L	
7467050	MCN	RPD	Dissolved Sulphate (SO4)	2021/07/19	9.2		%	20
7467052	MCN	Matrix Spike	Reactive Silica (SiO2)	2021/07/19		89	%	80 - 120
7467052	MCN	Spiked Blank	Reactive Silica (SiO2)	2021/07/19		102	%	80 - 120
7467052	MCN	Method Blank	Reactive Silica (SiO2)	2021/07/19	ND, RDL=0.50		mg/L	
7467052	MCN	RPD	Reactive Silica (SiO2)	2021/07/19	4.3		%	20
7467053	MCN	Spiked Blank	Colour	2021/07/19		97	%	80 - 120
7467053	MCN	Method Blank	Colour	2021/07/19	ND, RDL=5.0		TCU	
7467053	MCN	RPD	Colour	2021/07/19	1.6		%	20
7467056	MCN	Matrix Spike	Orthophosphate (P)	2021/07/19		93	%	80 - 120
7467056	MCN	Spiked Blank	Orthophosphate (P)	2021/07/19		101	%	80 - 120
7467056	MCN	Method Blank	Orthophosphate (P)	2021/07/19	ND, RDL=0.010		mg/L	
7467056	MCN	RPD	Orthophosphate (P)	2021/07/19	NC		%	20
7467058	MCN	Matrix Spike	Nitrate + Nitrite (N)	2021/07/19		80	%	80 - 120
7467058	MCN	Spiked Blank	Nitrate + Nitrite (N)	2021/07/19		89	%	80 - 120
7467058	MCN	Method Blank	Nitrate + Nitrite (N)	2021/07/19	ND, RDL=0.050		mg/L	
7467058	MCN	RPD	Nitrate + Nitrite (N)	2021/07/19	NC		%	20
7467060	MCN	Matrix Spike	Nitrite (N)	2021/07/19		91	%	80 - 120
7467060	MCN	Spiked Blank	Nitrite (N)	2021/07/19		104	%	80 - 120
7467060	MCN	Method Blank	Nitrite (N)	2021/07/19	ND, RDL=0.010		mg/L	
7467060	MCN	RPD	Nitrite (N)	2021/07/19	NC		%	20
7467065	MCN	Matrix Spike [QBZ129-01]	Orthophosphate (P)	2021/07/19		98	%	80 - 120
7467065	MCN	Spiked Blank	Orthophosphate (P)	2021/07/19		98	%	80 - 120
7467065	MCN	Method Blank	Orthophosphate (P)	2021/07/19	ND, RDL=0.010		mg/L	
7467065	MCN	RPD [QBZ129-01]	Orthophosphate (P)	2021/07/19	NC		%	20
7467079	MCN	Matrix Spike [QBZ129-01]	Total Alkalinity (Total as CaCO3)	2021/07/19		95	%	80 - 120
7467079	MCN	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/19		111	%	80 - 120
7467079	MCN	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/19	ND, RDL=5.0		mg/L	
7467079	MCN	RPD [QBZ129-01]	Total Alkalinity (Total as CaCO3)	2021/07/19	8.6		%	20
7467080	MCN	Matrix Spike [QBZ129-01]	Dissolved Chloride (Cl-)	2021/07/19		102	%	80 - 120
7467080	MCN	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/19		100	%	80 - 120
7467080	MCN	Method Blank	Dissolved Chloride (Cl-)	2021/07/19	ND, RDL=1.0		mg/L	
7467080	MCN	RPD [QBZ129-01]	Dissolved Chloride (Cl-)	2021/07/19	NC		%	20
7467081	MCN	Matrix Spike [QBZ129-01]	Dissolved Sulphate (SO4)	2021/07/19		101	%	80 - 120
7467081	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/19		101	%	80 - 120
7467081	MCN	Method Blank	Dissolved Sulphate (SO4)	2021/07/19	ND, RDL=2.0		mg/L	
7467081	MCN	RPD [QBZ129-01]	Dissolved Sulphate (SO4)	2021/07/19	5.4		%	20
7467083	MCN	Matrix Spike [QBZ129-01]	Reactive Silica (SiO2)	2021/07/19		90	%	80 - 120
7467083	MCN	Spiked Blank	Reactive Silica (SiO2)	2021/07/19		99	%	80 - 120
7467083	MCN	Method Blank	Reactive Silica (SiO2)	2021/07/19	ND, RDL=0.50		mg/L	
7467083	MCN	RPD [QBZ129-01]	Reactive Silica (SiO2)	2021/07/19	0.55		%	20
7467084	MCN	Spiked Blank	Colour	2021/07/19		97	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7467084	MCN	Method Blank	Colour	2021/07/19	ND, RDL=5.0		TCU	
7467084	MCN	RPD [QBZ129-01]	Colour	2021/07/19	1.9		%	20
7467087	MCN	Matrix Spike [QBZ129-01]	Nitrate + Nitrite (N)	2021/07/19		78 (2)	%	80 - 120
7467087	MCN	Spiked Blank	Nitrate + Nitrite (N)	2021/07/19		88	%	80 - 120
7467087	MCN	Method Blank	Nitrate + Nitrite (N)	2021/07/19	ND, RDL=0.050		mg/L	
7467087	MCN	RPD [QBZ129-01]	Nitrate + Nitrite (N)	2021/07/19	NC		%	20
7467089	MCN	Matrix Spike [QBZ129-01]	Nitrite (N)	2021/07/19		99	%	80 - 120
7467089	MCN	Spiked Blank	Nitrite (N)	2021/07/19		102	%	80 - 120
7467089	MCN	Method Blank	Nitrite (N)	2021/07/19	ND, RDL=0.010		mg/L	
7467089	MCN	RPD [QBZ129-01]	Nitrite (N)	2021/07/19	NC		%	20
7469586	BBD	QC Standard	Organic Carbon (TOC)	2021/07/19		103	%	75 - 125
7469586	BBD	Method Blank	Organic Carbon (TOC)	2021/07/19	ND, RDL=0.50		g/kg	
7469586	BBD	RPD [QBZ125-01]	Organic Carbon (TOC)	2021/07/19	0.63		%	35
7469597	BAN	Matrix Spike	Acid Extractable Antimony (Sb)	2021/07/19		94	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/19		112	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/19		115	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/19		100	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/19		109	%	75 - 125
			Acid Extractable Boron (B)	2021/07/19		91	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/19		101	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/19		114	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/19		104	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/19		110	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/19		108	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/19		108	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/19		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/19		104	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/19		106	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/19		114	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/19		100	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/19		107	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/19		106	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/19		109	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/19		105	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/19		87	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/19		109	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/19		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/19		NC	%	75 - 125
7469597	BAN	Spiked Blank	Acid Extractable Antimony (Sb)	2021/07/19		108	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/19		105	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/19		103	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/19		101	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/19		104	%	75 - 125
			Acid Extractable Boron (B)	2021/07/19		116	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/19		101	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/19		104	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/19		106	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/19		107	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/19		104	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/19		104	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/19		105	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Mercury (Hg)	2021/07/19		104	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/19		106	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/19		107	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/19		99	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/19		106	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/19		105	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/19		102	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/19		104	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/19		105	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/19		104	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/19		104	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/19		107	%	75 - 125
7469597	BAN	Method Blank	Acid Extractable Aluminum (Al)	2021/07/19	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2021/07/19	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2021/07/19	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2021/07/19	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2021/07/19	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2021/07/19	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2021/07/19	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2021/07/19	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2021/07/19	ND, RDL=0.50		mg/kg	
			Acid Extractable Silver (Ag)	2021/07/19	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2021/07/19	ND, RDL=5.0		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Thallium (Tl)	2021/07/19	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2021/07/19	ND, RDL=1.0		mg/kg	
			Acid Extractable Uranium (U)	2021/07/19	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2021/07/19	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2021/07/19	ND, RDL=5.0		mg/kg	
7469597	BAN	RPD	Acid Extractable Arsenic (As)	2021/07/19	12		%	35
7469696	NGI	Matrix Spike	Total Organic Carbon (C)	2021/07/19		94	%	85 - 115
7469696	NGI	Spiked Blank	Total Organic Carbon (C)	2021/07/19		100	%	80 - 120
7469696	NGI	Method Blank	Total Organic Carbon (C)	2021/07/19	ND, RDL=0.50		mg/L	
7469696	NGI	RPD	Total Organic Carbon (C)	2021/07/19	NC		%	15
7469805	TPE	RPD	Gravel	2021/07/23	5.9		%	35
			Sand	2021/07/23	49 (3)		%	35
			Silt	2021/07/23	5.7		%	35
			Clay	2021/07/23	22		%	35
7471690	BAN	Matrix Spike	Acid Extractable Antimony (Sb)	2021/07/20		97	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/20		99	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/20		102	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/20		98	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/20		99	%	75 - 125
			Acid Extractable Boron (B)	2021/07/20		97	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/20		95	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/20		97	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/20		98	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/20		103	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/20		76	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/20		101	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/20		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/20		98	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/20		110	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/20		100	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/20		97	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/20		102	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/20		99	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/20		99	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/20		101	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/20		102	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/20		99	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/20		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/20		105	%	75 - 125
7471690	BAN	Spiked Blank	Acid Extractable Antimony (Sb)	2021/07/20		103	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/20		102	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/20		100	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/20		102	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/20		101	%	75 - 125
			Acid Extractable Boron (B)	2021/07/20		105	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/20		98	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/20		102	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/20		101	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/20		103	%	75 - 125

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Lead (Pb)	2021/07/20		101	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/20		102	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/20		103	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/20		102	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/20		108	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/20		105	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/20		99	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/20		104	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/20		101	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/20		100	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/20		102	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/20		101	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/20		100	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/20		104	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/20		103	%	75 - 125
7471690	BAN	Method Blank	Acid Extractable Aluminum (Al)	2021/07/20	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2021/07/20	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2021/07/20	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2021/07/20	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2021/07/20	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2021/07/20	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2021/07/20	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2021/07/20	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2021/07/20	ND, RDL=0.50		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Silver (Ag)	2021/07/20	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2021/07/20	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2021/07/20	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2021/07/20	ND, RDL=1.0		mg/kg	
			Acid Extractable Uranium (U)	2021/07/20	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2021/07/20	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2021/07/20	ND, RDL=5.0		mg/kg	
7471690	BAN	RPD	Acid Extractable Aluminum (Al)	2021/07/20	10		%	35
			Acid Extractable Antimony (Sb)	2021/07/20	NC		%	35
			Acid Extractable Arsenic (As)	2021/07/20	15		%	35
			Acid Extractable Barium (Ba)	2021/07/20	1.3		%	35
			Acid Extractable Beryllium (Be)	2021/07/20	NC		%	35
			Acid Extractable Bismuth (Bi)	2021/07/20	NC		%	35
			Acid Extractable Boron (B)	2021/07/20	NC		%	35
			Acid Extractable Cadmium (Cd)	2021/07/20	NC		%	35
			Acid Extractable Chromium (Cr)	2021/07/20	NC		%	35
			Acid Extractable Cobalt (Co)	2021/07/20	9.3		%	35
			Acid Extractable Copper (Cu)	2021/07/20	32		%	35
			Acid Extractable Iron (Fe)	2021/07/20	15		%	35
			Acid Extractable Lead (Pb)	2021/07/20	29		%	35
			Acid Extractable Lithium (Li)	2021/07/20	5.6		%	35
			Acid Extractable Manganese (Mn)	2021/07/20	13		%	35
			Acid Extractable Mercury (Hg)	2021/07/20	NC		%	35
			Acid Extractable Molybdenum (Mo)	2021/07/20	NC		%	35
			Acid Extractable Nickel (Ni)	2021/07/20	NC		%	35
			Acid Extractable Rubidium (Rb)	2021/07/20	NC		%	35
			Acid Extractable Selenium (Se)	2021/07/20	NC		%	35
			Acid Extractable Silver (Ag)	2021/07/20	NC		%	35
			Acid Extractable Strontium (Sr)	2021/07/20	NC		%	35
			Acid Extractable Thallium (Tl)	2021/07/20	NC		%	35
			Acid Extractable Tin (Sn)	2021/07/20	NC		%	35
			Acid Extractable Uranium (U)	2021/07/20	11		%	35
			Acid Extractable Vanadium (V)	2021/07/20	9.9		%	35
			Acid Extractable Zinc (Zn)	2021/07/20	12		%	35
7471908	BBD	QC Standard	Organic Carbon (TOC)	2021/07/20		101	%	75 - 125
7471908	BBD	Method Blank	Organic Carbon (TOC)	2021/07/20	ND, RDL=0.50		g/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7471908	BBD	RPD [QBZ134-01]	Organic Carbon (TOC)	2021/07/20	0.24		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Poor RPD due to sample inhomogeneity verified by repeat digestion and analysis.

(2) Poor spike recovery due to probable sample matrix interference.

(3) Poor duplicate agreement due to sample inhomogeneity.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Eric Dearman, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

Bureau Veritas Proprietary Software
Logiciel Propriétaire de Bureau Veritas

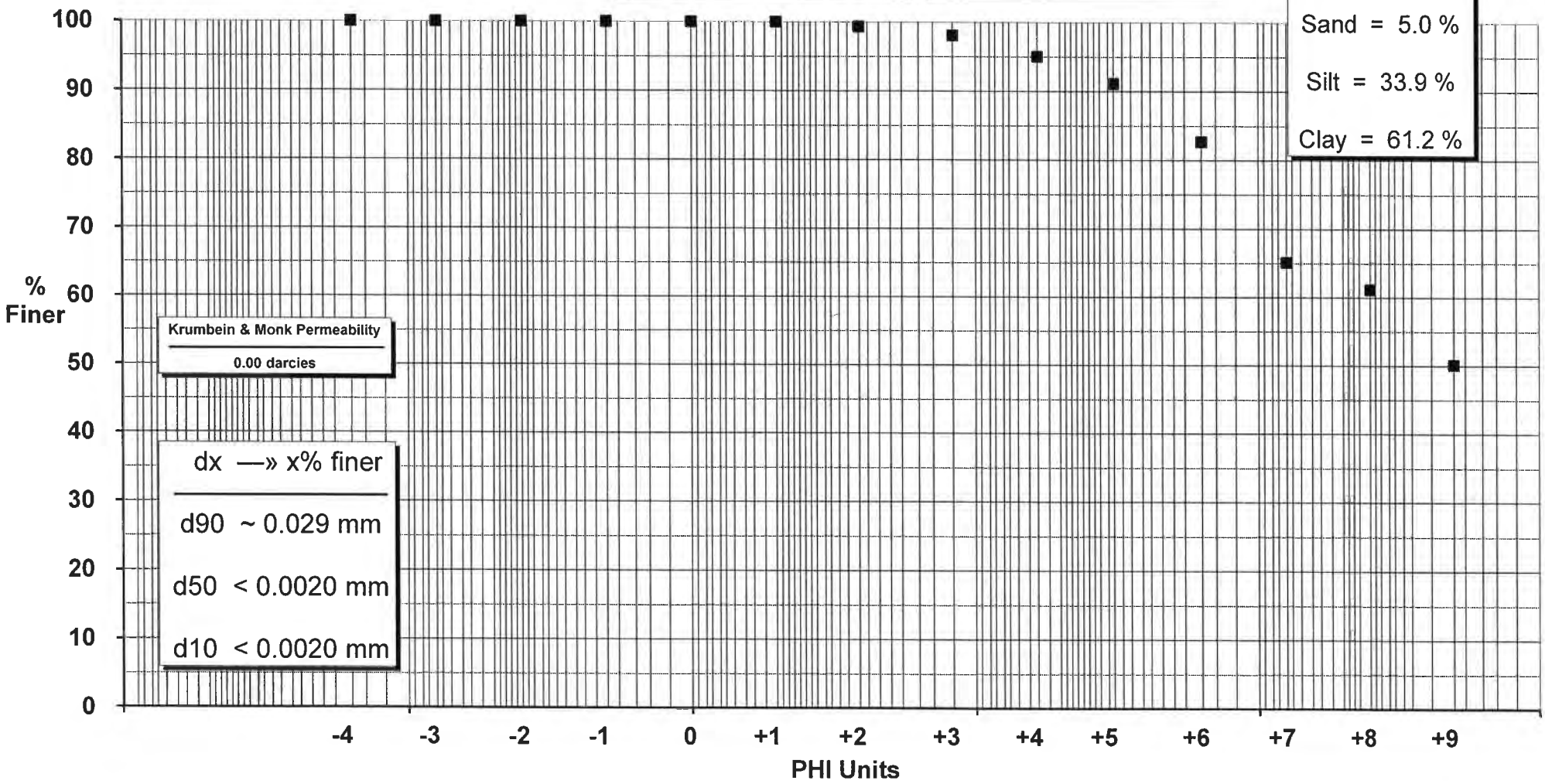
Automated Statchk

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BV Labs ID: QBZ125-01

L20-3 - SED



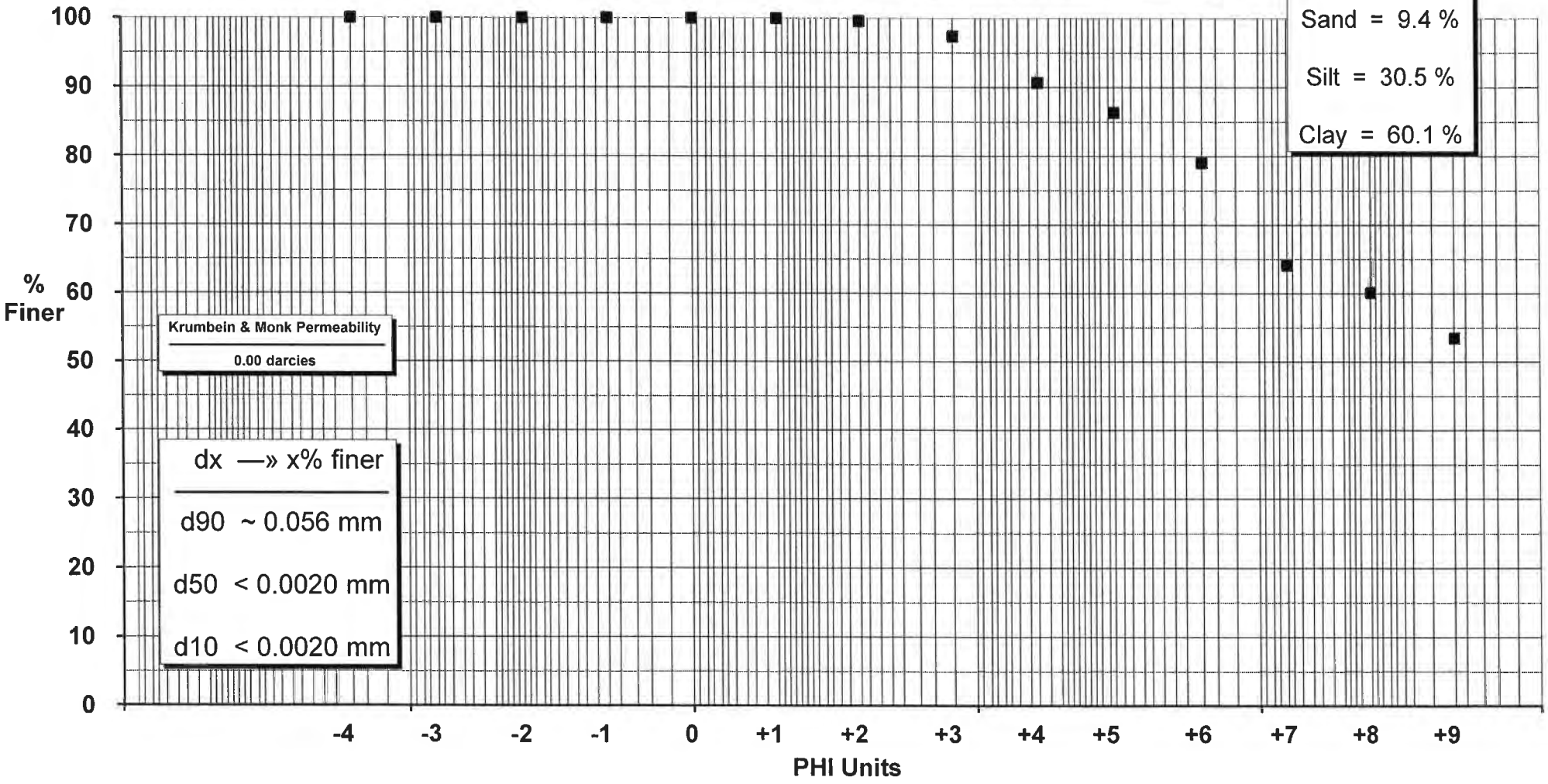
Approved

BV Labs ID: QBZ133-01

L20-1 - SED

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
7.6 %	10.7 %

Wentworth	
Gravel	0.0 %
Sand	9.4 %
Silt	30.5 %
Clay	60.1 %



Krumbein & Monk Permeability

0.00 darcies

dx —» x% finer
d90 ~ 0.056 mm
d50 < 0.0020 mm
d10 < 0.0020 mm

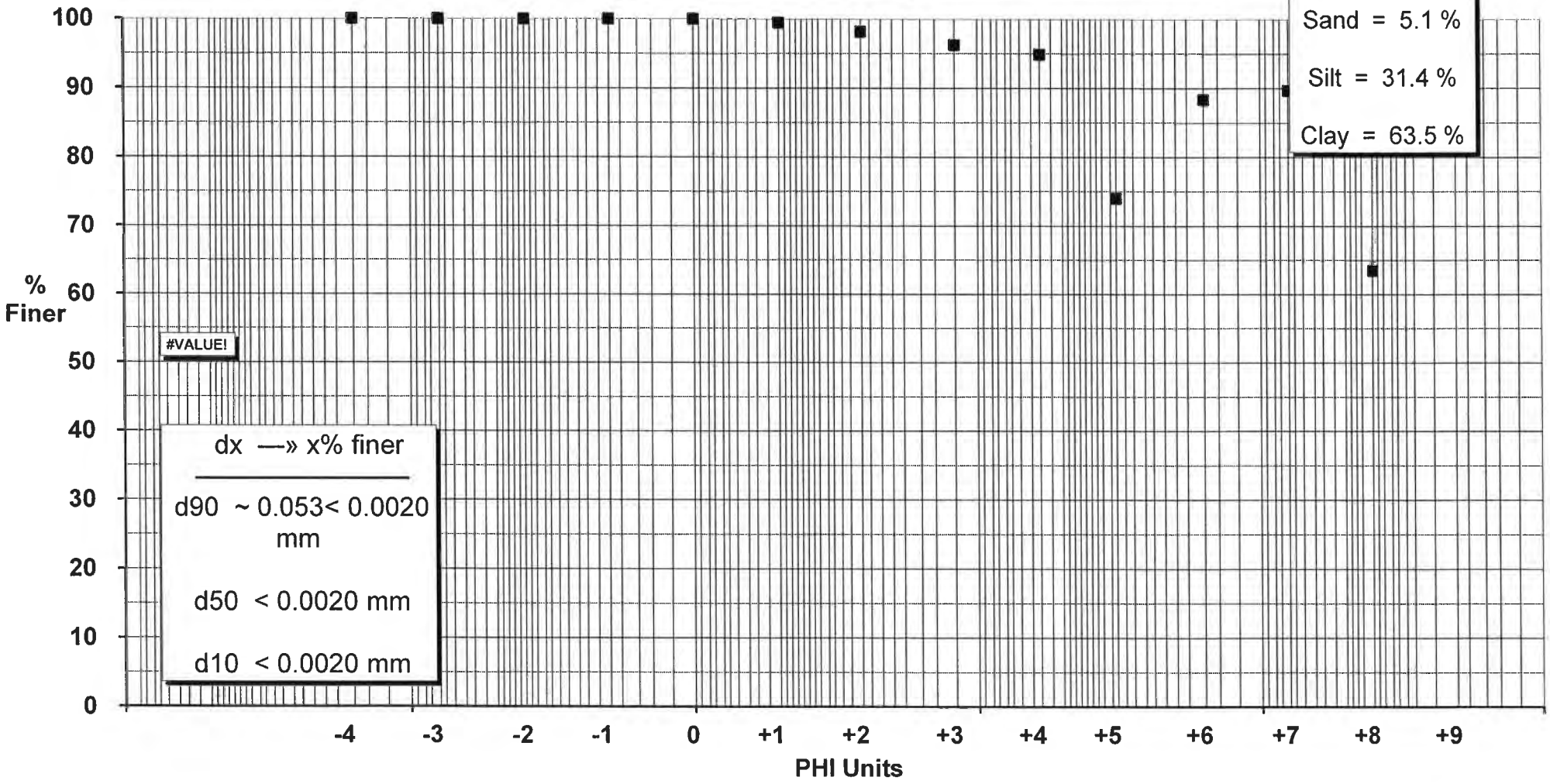
Approved

BV Labs ID: QBZ134-01

L9 - SED

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
—	—
4.8 %	11.9 %

Wentworth	
Gravel	0.0 %
Sand	5.1 %
Silt	31.4 %
Clay	63.5 %



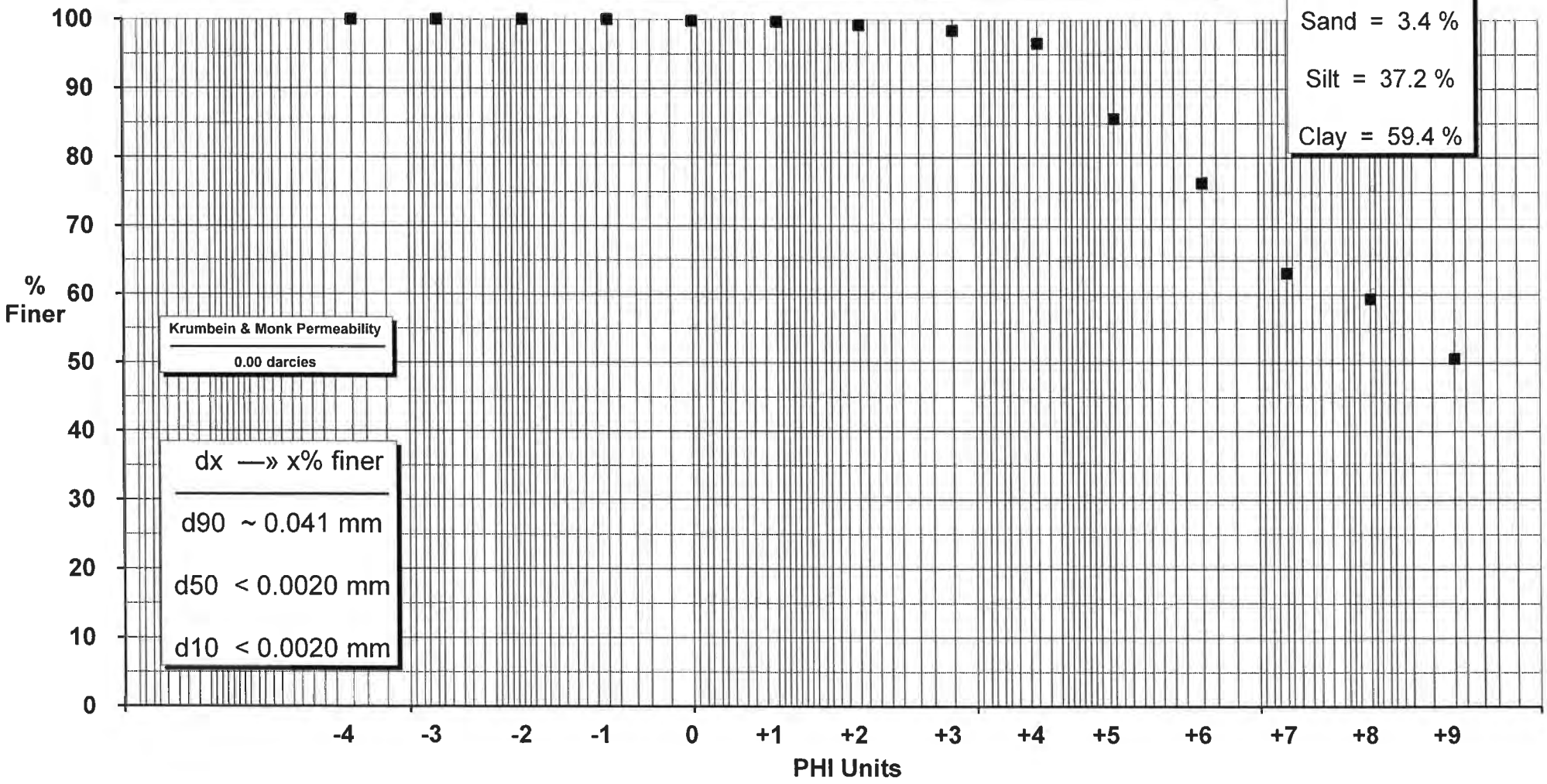
Approved

BV Labs ID: QBZ135-01

L20-2 - SED

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
—	—
2.9 %	6.9 %

Wentworth	
Gravel	0.0 %
Sand	3.4 %
Silt	37.2 %
Clay	59.4 %



Krumbein & Monk Permeability
0.00 darcies

dx —» x% finer
d90 ~ 0.041 mm
d50 < 0.0020 mm
d10 < 0.0020 mm

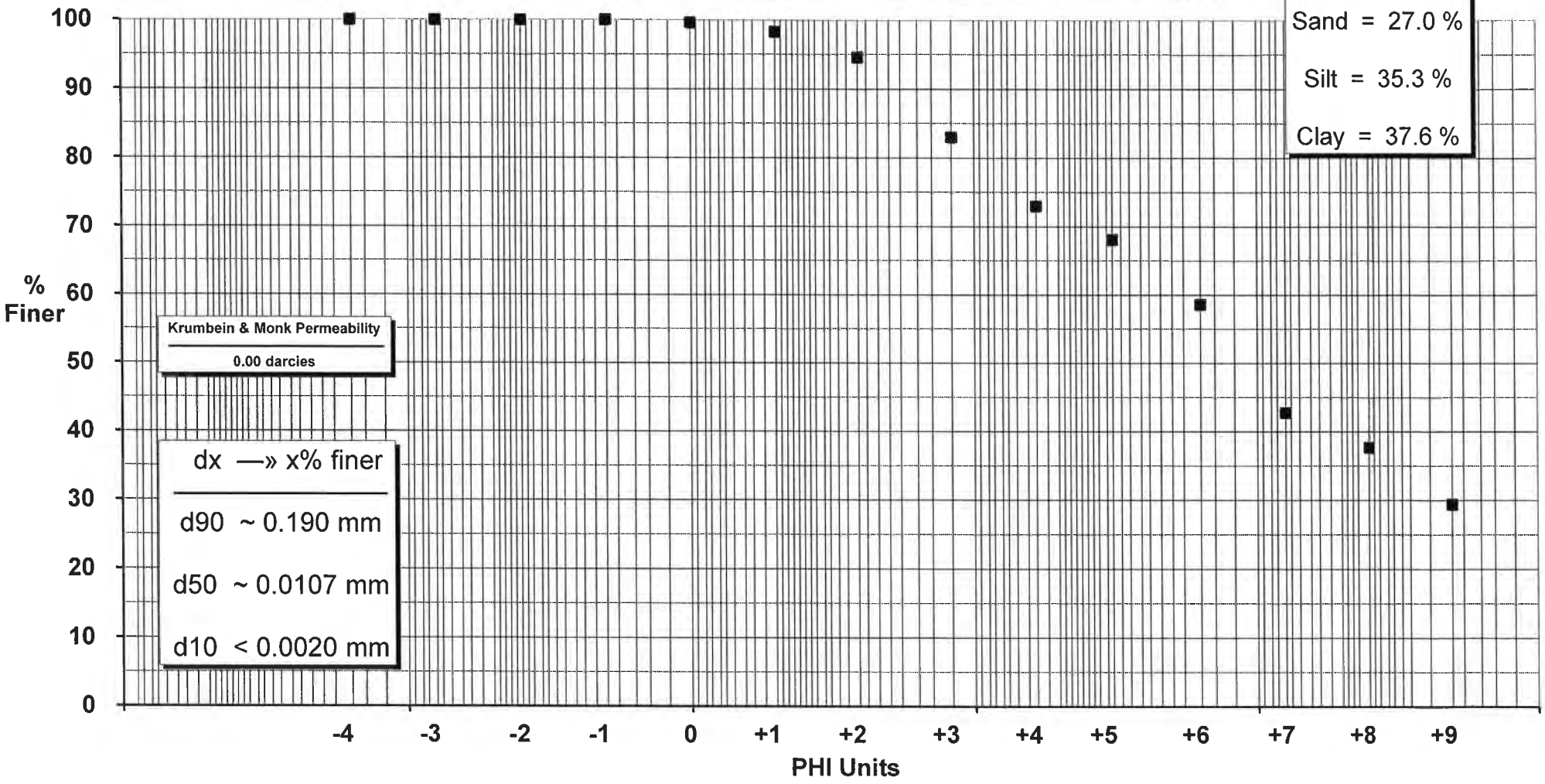
Approved

BV Labs ID: QBZ136-01

L23 - SED

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
—	—
24.4 %	28.6 %

Wentworth	
Gravel	0.0 %
Sand	27.0 %
Silt	35.3 %
Clay	37.6 %



Krumbein & Monk Permeability

0.00 darcies

dx —» x% finer

d90 ~ 0.190 mm

d50 ~ 0.0107 mm

d10 < 0.0020 mm

Approved

Your Project #: 142-039
Your C.O.C. #: 377595

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/08/17
Report #: R6768865
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K3263
Received: 2021/07/21, 12:35

Sample Matrix: Sediment
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals Solids Acid Extr. ICPMS	2	2021/07/26	2021/07/26	ATL SOP 00058	EPA 6020B R2 m
Metals Solids Acid Extr. ICPMS	1	2021/07/26	2021/07/27	ATL SOP 00058	EPA 6020B R2 m
Particle size in solids (pipette&sieve) (1)	1	N/A	2021/08/11	ATL SOP 00012	MSAMS'78/WREP-125R3m
Particle size in solids (pipette&sieve) (1)	2	N/A	2021/08/17	ATL SOP 00012	MSAMS'78/WREP-125R3m
Total Organic Carbon in Soil	3	2021/07/26	2021/07/26	ATL SOP 00044	LECO203601224 1991 m

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate, Bicarbonate and Hydroxide	6	N/A	2021/07/23	N/A	SM 23 4500-CO2 D
Alkalinity	6	N/A	2021/07/26	ATL SOP 00013	EPA 310.2 R1974 m
Chloride	5	N/A	2021/07/26	ATL SOP 00014	SM 23 4500-Cl- E m
Chloride	1	N/A	2021/07/28	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	6	N/A	2021/07/26	ATL SOP 00020	SM 23 2120C m
Conductance - water	6	N/A	2021/07/22	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	6	N/A	2021/07/23	ATL SOP 00048	Auto Calc
Metals Water Total MS	6	2021/07/22	2021/07/22	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	6	N/A	2021/07/27	N/A	Auto Calc.
Anion and Cation Sum	1	N/A	2021/07/23	N/A	Auto Calc.
Anion and Cation Sum	5	N/A	2021/07/27	N/A	Auto Calc.
Nitrogen Ammonia - water	1	N/A	2021/07/23	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen Ammonia - water	5	N/A	2021/07/26	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	6	N/A	2021/07/26	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	6	N/A	2021/07/26	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	6	N/A	2021/07/27	ATL SOP 00018	ASTM D3867-16
pH (3)	6	N/A	2021/07/22	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	6	N/A	2021/07/26	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	6	N/A	2021/07/27	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	6	N/A	2021/07/27	ATL SOP 00049	Auto Calc.

Your Project #: 142-039
Your C.O.C. #: 377595

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/08/17
Report #: R6768865
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K3263
Received: 2021/07/21, 12:35

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Reactive Silica	6	N/A	2021/07/26	ATL SOP 00022	EPA 366.0 m
Sulphate	5	N/A	2021/07/26	ATL SOP 00023	ASTM D516-16 m
Sulphate	1	N/A	2021/07/28	ATL SOP 00023	ASTM D516-16 m
Chlorophyll A (Sub from Bedford) (2)	3	2021/07/23	2021/07/24		
Total Dissolved Solids (TDS calc)	6	N/A	2021/07/27	N/A	Auto Calc.
Organic carbon - Total (TOC) (4)	1	N/A	2021/07/25	ATL SOP 00203	SM 23 5310B m
Organic carbon - Total (TOC) (4)	2	N/A	2021/07/26	ATL SOP 00203	SM 23 5310B m
Organic carbon - Total (TOC) (4)	3	N/A	2021/07/27	ATL SOP 00203	SM 23 5310B m
Turbidity	6	N/A	2021/07/22	ATL SOP 00011	EPA 180.1 R2 m

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
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Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.
(2) This test was performed by Dalhousie Dept of Oceanography

Your Project #: 142-039
Your C.O.C. #: 377595

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/08/17
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CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K3263

Received: 2021/07/21, 12:35

(3) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(4) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Maryann Comeau, Customer Experience Supervisor/PM
Email: Maryann.COMEAU@bureauveritas.com
Phone# (902)420-0203 Ext:298
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BV Labs Job #: C1K3263
Report Date: 2021/08/17

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SEDIMENT

BV Labs ID		QDS728			QDS728			QDS735	QDS736		
Sampling Date		2021/07/12 11:50			2021/07/12 11:50			2021/07/18 13:47	2021/07/15 12:30		
COC Number		377595			377595			377595	377595		
	UNITS	L14 - SED	RDL	QC Batch	L14 - SED Lab-Dup	RDL	QC Batch	L18 - SED	L12 - SED	RDL	QC Batch
Inorganics											
Organic Carbon (TOC)	g/kg	440	1.3	7482659	440	1.3	7482659	300	160	0.50	7482659
< -1 Phi (2 mm)	%	100	0.10	7500101				100	100	0.10	7500101
< 0 Phi (1 mm)	%	100	0.10	7500101				100	100	0.10	7500101
< +1 Phi (0.5 mm)	%	99	0.10	7500101				99	99	0.10	7500101
< +2 Phi (0.25 mm)	%	97	0.10	7500101				97	96	0.10	7500101
< +3 Phi (0.12 mm)	%	94	0.10	7500101				90	94	0.10	7500101
< +4 Phi (0.062 mm)	%	91	0.10	7500101				74	92	0.10	7500101
< +5 Phi (0.031 mm)	%	90	0.10	7500101				70	93	0.10	7500101
< +6 Phi (0.016 mm)	%	95	0.10	7500101				63	90	0.10	7500101
< +7 Phi (0.0078 mm)	%	74	0.10	7500101				53	78	0.10	7500101
< +8 Phi (0.0039 mm)	%	63	0.10	7500101				51	74	0.10	7500101
< +9 Phi (0.0020 mm)	%	70	0.10	7500101				46	68	0.10	7500101
Gravel	%	ND	0.10	7500101				ND	ND	0.10	7500101
Sand	%	8.7	0.10	7500101				26	7.8	0.10	7500101
Silt	%	28	0.10	7500101				23	18	0.10	7500101
Clay	%	63	0.10	7500101				51	74	0.10	7500101

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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ELEMENTS BY ATOMIC SPECTROSCOPY (SEDIMENT)

BV Labs ID		QDS728	QDS735	QDS736		
Sampling Date		2021/07/12 11:50	2021/07/18 13:47	2021/07/15 12:30		
COC Number		377595	377595	377595		
	UNITS	L14 - SED	L18 - SED	L12 - SED	RDL	QC Batch
Metals						
Acid Extractable Aluminum (Al)	mg/kg	3400	2800	18000	10	7482679
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	ND	2.0	7482679
Acid Extractable Arsenic (As)	mg/kg	ND	ND	2.5	2.0	7482679
Acid Extractable Barium (Ba)	mg/kg	90	74	310	5.0	7482679
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	ND	2.0	7482679
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	ND	2.0	7482679
Acid Extractable Boron (B)	mg/kg	ND	ND	ND	50	7482679
Acid Extractable Cadmium (Cd)	mg/kg	0.75	ND	0.65	0.30	7482679
Acid Extractable Chromium (Cr)	mg/kg	11	11	59	2.0	7482679
Acid Extractable Cobalt (Co)	mg/kg	3.8	1.9	15	1.0	7482679
Acid Extractable Copper (Cu)	mg/kg	18	13	28	2.0	7482679
Acid Extractable Iron (Fe)	mg/kg	25000	23000	88000	50	7482679
Acid Extractable Lead (Pb)	mg/kg	7.2	3.9	6.8	0.50	7482679
Acid Extractable Lithium (Li)	mg/kg	ND	ND	7.0	2.0	7482679
Acid Extractable Manganese (Mn)	mg/kg	240	450	3200	2.0	7482679
Acid Extractable Mercury (Hg)	mg/kg	0.11	0.11	0.15	0.10	7482679
Acid Extractable Molybdenum (Mo)	mg/kg	2.4	7.2	12	2.0	7482679
Acid Extractable Nickel (Ni)	mg/kg	22	19	49	2.0	7482679
Acid Extractable Rubidium (Rb)	mg/kg	ND	ND	9.0	2.0	7482679
Acid Extractable Selenium (Se)	mg/kg	1.2	2.7	1.3	0.50	7482679
Acid Extractable Silver (Ag)	mg/kg	ND	ND	ND	0.50	7482679
Acid Extractable Strontium (Sr)	mg/kg	15	12	20	5.0	7482679
Acid Extractable Thallium (Tl)	mg/kg	ND	ND	0.36	0.10	7482679
Acid Extractable Tin (Sn)	mg/kg	ND	ND	1.6	1.0	7482679
Acid Extractable Uranium (U)	mg/kg	0.38	4.2	8.5	0.10	7482679
Acid Extractable Vanadium (V)	mg/kg	7.9	5.1	38	2.0	7482679
Acid Extractable Zinc (Zn)	mg/kg	110	63	200	5.0	7482679

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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RESULTS OF ANALYSES OF WATER

BV Labs ID		QDS727	QDS729			QDS730		
Sampling Date		2021/07/12 11:50	2021/07/15 12:30			2021/07/14 15:00		
COC Number		377595	377595			377595		
	UNITS	L14	L12	RDL	QC Batch	L20 S01	RDL	QC Batch
Calculated Parameters								
Anion Sum	me/L	0.130	1.09	N/A	7474456	0.510	N/A	7474456
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	6.3	54	1.0	7474453	25	1.0	7474453
Calculated TDS	mg/L	6.0	54	1.0	7474463	28	1.0	7474463
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	1.0	7474453	ND	1.0	7474453
Cation Sum	me/L	0.100	1.07	N/A	7474456	0.520	N/A	7474456
Hardness (CaCO3)	mg/L	3.6	51	1.0	7474323	24	1.0	7474323
Ion Balance (% Difference)	%	13.0	0.930	N/A	7474455	0.970	N/A	7474455
Langelier Index (@ 20C)	N/A	-3.92	-0.609		7474459	-1.59		7474459
Langelier Index (@ 4C)	N/A	-4.17	-0.861		7474462	-1.84		7474462
Nitrate (N)	mg/L	ND	ND	0.050	7474457	ND	0.050	7474457
Saturation pH (@ 20C)	N/A	10.5	8.50		7474459	9.14		7474459
Saturation pH (@ 4C)	N/A	10.8	8.75		7474462	9.39		7474462
Inorganics								
Total Alkalinity (Total as CaCO3)	mg/L	6.3	55	5.0	7479746	26	5.0	7479746
Dissolved Chloride (Cl-)	mg/L	ND	ND	1.0	7479908	ND	1.0	7479908
Colour	TCU	24	17	5.0	7479918	24	5.0	7479918
Nitrate + Nitrite (N)	mg/L	ND	ND	0.050	7479921	ND	0.050	7479921
Nitrite (N)	mg/L	ND	ND	0.010	7479924	ND	0.010	7479924
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.050	7482904	ND	0.050	7482904
Total Organic Carbon (C)	mg/L	4.5	5.3	0.50	7482817	5.6	0.50	7479611
Orthophosphate (P)	mg/L	ND	ND	0.010	7479919	ND	0.010	7479919
pH	pH	6.60	7.89		7476912	7.55		7476912
Reactive Silica (SiO2)	mg/L	0.57	2.4	0.50	7479914	3.2	0.50	7479914
Dissolved Sulphate (SO4)	mg/L	ND	ND	2.0	7479912	ND	2.0	7479912
Turbidity	NTU	1.2	0.72	0.10	7476944	1.4	0.10	7476944
Conductivity	uS/cm	7.2	96	1.0	7476911	47	1.0	7476911
Subcontracted Analysis								
Subcontract Parameter	N/A	ATTACHED	ATTACHED	N/A	7479453			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

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BV Labs Job #: C1K3263
Report Date: 2021/08/17

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF WATER

BV Labs ID		QDS730			QDS732			QDS733		
Sampling Date		2021/07/14 15:00			2021/07/13 14:13			2021/07/18 13:47		
COC Number		377595			377595			377595		
	UNITS	L20 S01 Lab-Dup	RDL	QC Batch	S8	RDL	QC Batch	L18	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L				1.81	N/A	7474456	0.640	N/A	7474456
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				85	1.0	7474453	27	1.0	7474453
Calculated TDS	mg/L				91	1.0	7474463	34	1.0	7474463
Carb. Alkalinity (calc. as CaCO3)	mg/L				ND	1.0	7474453	ND	1.0	7474453
Cation Sum	me/L				1.77	N/A	7474456	0.570	N/A	7474456
Hardness (CaCO3)	mg/L				85	1.0	7474323	26	1.0	7474323
Ion Balance (% Difference)	%				1.12	N/A	7474455	5.79	N/A	7474455
Langelier Index (@ 20C)	N/A				-0.219		7474459	-1.50		7474459
Langelier Index (@ 4C)	N/A				-0.470		7474462	-1.76		7474462
Nitrate (N)	mg/L				0.060	0.050	7474457	ND	0.050	7474457
Saturation pH (@ 20C)	N/A				8.11		7474459	9.07		7474459
Saturation pH (@ 4C)	N/A				8.36		7474462	9.33		7474462
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L				85	5.0	7479935	27	5.0	7479935
Dissolved Chloride (Cl-)	mg/L				ND	1.0	7485934	1.8	1.0	7479943
Colour	TCU				14	5.0	7479954	22	5.0	7479954
Nitrate + Nitrite (N)	mg/L				0.060	0.050	7479967	ND	0.050	7479967
Nitrite (N)	mg/L				ND	0.010	7479976	ND	0.010	7479976
Nitrogen (Ammonia Nitrogen)	mg/L				ND	0.050	7482904	ND	0.050	7482904
Total Organic Carbon (C)	mg/L	5.6	0.50	7479611	3.0	0.50	7482831	5.2	0.50	7482831
Orthophosphate (P)	mg/L				ND	0.010	7479959	ND	0.010	7479959
pH	pH				7.89		7476912	7.57		7476912
Reactive Silica (SiO2)	mg/L				4.0	0.50	7479953	3.1	0.50	7479953
Dissolved Sulphate (SO4)	mg/L				4.9	2.0	7485940	2.0	2.0	7479948
Turbidity	NTU				0.97	0.10	7476944	1.4	0.10	7476944
Conductivity	uS/cm				160	1.0	7476911	52	1.0	7476911
Subcontracted Analysis										
Subcontract Parameter	N/A							ATTACHED	N/A	7479453

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected

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RESULTS OF ANALYSES OF WATER

BV Labs ID		QDS734			QDS734		
Sampling Date		2021/07/18 12:30			2021/07/18 12:30		
COC Number		377595			377595		
	UNITS	S9	RDL	QC Batch	S9 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L	0.540	N/A	7474456			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	27	1.0	7474453			
Calculated TDS	mg/L	29	1.0	7474463			
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7474453			
Cation Sum	me/L	0.520	N/A	7474456			
Hardness (CaCO3)	mg/L	24	1.0	7474323			
Ion Balance (% Difference)	%	1.89	N/A	7474455			
Langelier Index (@ 20C)	N/A	-1.57		7474459			
Langelier Index (@ 4C)	N/A	-1.82		7474462			
Nitrate (N)	mg/L	ND	0.050	7474457			
Saturation pH (@ 20C)	N/A	9.11		7474459			
Saturation pH (@ 4C)	N/A	9.36		7474462			
Inorganics							
Total Alkalinity (Total as CaCO3)	mg/L	27	5.0	7479935			
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7479943			
Colour	TCU	22	5.0	7479954			
Nitrate + Nitrite (N)	mg/L	ND	0.050	7479967			
Nitrite (N)	mg/L	ND	0.010	7479976			
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7477408	ND	0.050	7477408
Total Organic Carbon (C)	mg/L	5.0	0.50	7482831			
Orthophosphate (P)	mg/L	ND	0.010	7479959			
pH	pH	7.54		7476912			
Reactive Silica (SiO2)	mg/L	3.1	0.50	7479953			
Dissolved Sulphate (SO4)	mg/L	ND	2.0	7479948			
Turbidity	NTU	0.91	0.10	7476944			
Conductivity	uS/cm	49	1.0	7476911			

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ELEMENTS BY ICP/MS (WATER)

BV Labs ID		QDS727	QDS729	QDS730	QDS732	QDS733	QDS734		
Sampling Date		2021/07/12 11:50	2021/07/15 12:30	2021/07/14 15:00	2021/07/13 14:13	2021/07/18 13:47	2021/07/18 12:30		
COC Number		377595	377595	377595	377595	377595	377595		
	UNITS	L14	L12	L20 S01	S8	L18	S9	RDL	QC Batch
Metals									
Total Aluminum (Al)	ug/L	10	5.6	26	ND	12	11	5.0	7476898
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7476898
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7476898
Total Barium (Ba)	ug/L	2.0	14	9.4	27	11	10	1.0	7476898
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7476898
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7476898
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	7476898
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	0.011	ND	0.010	7476898
Total Calcium (Ca)	ug/L	870	12000	5600	20000	6100	5700	100	7476898
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	1.0	7476898
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	0.40	7476898
Total Copper (Cu)	ug/L	4.1	ND	ND	ND	ND	ND	0.50	7476898
Total Iron (Fe)	ug/L	640	150	110	180	120	110	50	7476898
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	7476898
Total Magnesium (Mg)	ug/L	360	5100	2300	8500	2600	2400	100	7476898
Total Manganese (Mn)	ug/L	12	18	28	100	46	31	2.0	7476898
Total Molybdenum (Mo)	ug/L	ND	ND	8.8	ND	ND	ND	2.0	7476898
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7476898
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	7476898
Total Potassium (K)	ug/L	ND	980	670	1300	800	580	100	7476898
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	0.50	7476898
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	7476898
Total Sodium (Na)	ug/L	120	450	730	590	590	500	100	7476898
Total Strontium (Sr)	ug/L	ND	11	10	17	11	11	2.0	7476898
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	7476898
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7476898
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7476898
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	0.10	7476898
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	7476898
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	ND	5.0	7476898

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.3°C

Sample QDS727 [L14] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample QDS733 [L18] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7476898	BAN	Matrix Spike [QDS729-02]	Total Aluminum (Al)	2021/07/22		102	%	80 - 120
			Total Antimony (Sb)	2021/07/22		105	%	80 - 120
			Total Arsenic (As)	2021/07/22		97	%	80 - 120
			Total Barium (Ba)	2021/07/22		100	%	80 - 120
			Total Beryllium (Be)	2021/07/22		101	%	80 - 120
			Total Bismuth (Bi)	2021/07/22		98	%	80 - 120
			Total Boron (B)	2021/07/22		103	%	80 - 120
			Total Cadmium (Cd)	2021/07/22		99	%	80 - 120
			Total Calcium (Ca)	2021/07/22		97	%	80 - 120
			Total Chromium (Cr)	2021/07/22		100	%	80 - 120
			Total Cobalt (Co)	2021/07/22		100	%	80 - 120
			Total Copper (Cu)	2021/07/22		98	%	80 - 120
			Total Iron (Fe)	2021/07/22		102	%	80 - 120
			Total Lead (Pb)	2021/07/22		98	%	80 - 120
			Total Magnesium (Mg)	2021/07/22		104	%	80 - 120
			Total Manganese (Mn)	2021/07/22		102	%	80 - 120
			Total Molybdenum (Mo)	2021/07/22		103	%	80 - 120
			Total Nickel (Ni)	2021/07/22		100	%	80 - 120
			Total Phosphorus (P)	2021/07/22		102	%	80 - 120
			Total Potassium (K)	2021/07/22		99	%	80 - 120
			Total Selenium (Se)	2021/07/22		101	%	80 - 120
			Total Silver (Ag)	2021/07/22		99	%	80 - 120
			Total Sodium (Na)	2021/07/22		104	%	80 - 120
			Total Strontium (Sr)	2021/07/22		97	%	80 - 120
			Total Thallium (Tl)	2021/07/22		99	%	80 - 120
			Total Tin (Sn)	2021/07/22		101	%	80 - 120
			Total Titanium (Ti)	2021/07/22		100	%	80 - 120
			Total Uranium (U)	2021/07/22		102	%	80 - 120
			Total Vanadium (V)	2021/07/22		102	%	80 - 120
			Total Zinc (Zn)	2021/07/22		100	%	80 - 120
7476898	BAN	Spiked Blank	Total Aluminum (Al)	2021/07/22		101	%	80 - 120
			Total Antimony (Sb)	2021/07/22		107	%	80 - 120
			Total Arsenic (As)	2021/07/22		95	%	80 - 120
			Total Barium (Ba)	2021/07/22		99	%	80 - 120
			Total Beryllium (Be)	2021/07/22		100	%	80 - 120
			Total Bismuth (Bi)	2021/07/22		97	%	80 - 120
			Total Boron (B)	2021/07/22		100	%	80 - 120
			Total Cadmium (Cd)	2021/07/22		98	%	80 - 120
			Total Calcium (Ca)	2021/07/22		99	%	80 - 120
			Total Chromium (Cr)	2021/07/22		99	%	80 - 120
			Total Cobalt (Co)	2021/07/22		100	%	80 - 120
			Total Copper (Cu)	2021/07/22		98	%	80 - 120
			Total Iron (Fe)	2021/07/22		103	%	80 - 120
			Total Lead (Pb)	2021/07/22		98	%	80 - 120
			Total Magnesium (Mg)	2021/07/22		102	%	80 - 120
			Total Manganese (Mn)	2021/07/22		102	%	80 - 120
			Total Molybdenum (Mo)	2021/07/22		103	%	80 - 120
			Total Nickel (Ni)	2021/07/22		101	%	80 - 120
			Total Phosphorus (P)	2021/07/22		102	%	80 - 120
			Total Potassium (K)	2021/07/22		99	%	80 - 120
			Total Selenium (Se)	2021/07/22		99	%	80 - 120
			Total Silver (Ag)	2021/07/22		98	%	80 - 120
			Total Sodium (Na)	2021/07/22		103	%	80 - 120
			Total Strontium (Sr)	2021/07/22		96	%	80 - 120
			Total Thallium (Tl)	2021/07/22		97	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2021/07/22		99	%	80 - 120
			Total Titanium (Ti)	2021/07/22		100	%	80 - 120
			Total Uranium (U)	2021/07/22		102	%	80 - 120
			Total Vanadium (V)	2021/07/22		102	%	80 - 120
			Total Zinc (Zn)	2021/07/22		99	%	80 - 120
7476898	BAN	Method Blank	Total Aluminum (Al)	2021/07/22	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2021/07/22	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2021/07/22	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2021/07/22	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2021/07/22	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Boron (B)	2021/07/22	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2021/07/22	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2021/07/22	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2021/07/22	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2021/07/22	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2021/07/22	ND, RDL=0.50		ug/L	
			Total Iron (Fe)	2021/07/22	ND, RDL=50		ug/L	
			Total Lead (Pb)	2021/07/22	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2021/07/22	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2021/07/22	ND, RDL=100		ug/L	
			Total Potassium (K)	2021/07/22	ND, RDL=100		ug/L	
			Total Selenium (Se)	2021/07/22	ND, RDL=0.50		ug/L	
			Total Silver (Ag)	2021/07/22	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2021/07/22	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2021/07/22	ND, RDL=0.10		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2021/07/22	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2021/07/22	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2021/07/22	ND, RDL=5.0		ug/L	
7476898	BAN	RPD	Total Aluminum (Al)	2021/07/23	6.9		%	20
			Total Antimony (Sb)	2021/07/23	8.4		%	20
			Total Arsenic (As)	2021/07/23	1.4		%	20
			Total Barium (Ba)	2021/07/23	0.38		%	20
			Total Beryllium (Be)	2021/07/23	NC		%	20
			Total Bismuth (Bi)	2021/07/23	NC		%	20
			Total Boron (B)	2021/07/23	NC		%	20
			Total Cadmium (Cd)	2021/07/23	9.4		%	20
			Total Calcium (Ca)	2021/07/23	0.11		%	20
			Total Chromium (Cr)	2021/07/23	NC		%	20
			Total Cobalt (Co)	2021/07/23	1.4		%	20
			Total Copper (Cu)	2021/07/23	1.5		%	20
			Total Iron (Fe)	2021/07/23	0.99		%	20
			Total Lead (Pb)	2021/07/23	2.0		%	20
			Total Magnesium (Mg)	2021/07/23	0.73		%	20
			Total Manganese (Mn)	2021/07/23	0.15		%	20
			Total Molybdenum (Mo)	2021/07/23	6.7		%	20
			Total Nickel (Ni)	2021/07/23	5.7		%	20
			Total Phosphorus (P)	2021/07/23	NC		%	20
			Total Potassium (K)	2021/07/23	0.13		%	20
			Total Selenium (Se)	2021/07/23	NC		%	20
			Total Silver (Ag)	2021/07/23	NC		%	20
			Total Sodium (Na)	2021/07/23	0.56		%	20
			Total Strontium (Sr)	2021/07/23	0.21		%	20
			Total Thallium (Tl)	2021/07/23	NC		%	20
			Total Tin (Sn)	2021/07/23	NC		%	20
			Total Titanium (Ti)	2021/07/23	NC		%	20
			Total Uranium (U)	2021/07/23	0.57		%	20
			Total Vanadium (V)	2021/07/23	NC		%	20
			Total Zinc (Zn)	2021/07/23	NC		%	20
7476911	SHW	Spiked Blank	Conductivity	2021/07/22		100	%	80 - 120
7476911	SHW	Method Blank	Conductivity	2021/07/22	ND, RDL=1.0		uS/cm	
7476912	SHW	Spiked Blank	pH	2021/07/22		100	%	97 - 103
7476944	SHW	QC Standard	Turbidity	2021/07/22		106	%	80 - 120
7476944	SHW	Spiked Blank	Turbidity	2021/07/22		106	%	80 - 120
7476944	SHW	Method Blank	Turbidity	2021/07/22	ND, RDL=0.10		NTU	
7476944	SHW	RPD	Turbidity	2021/07/22	14		%	20
7477408	EMT	Matrix Spike [QDS734-03]	Nitrogen (Ammonia Nitrogen)	2021/07/23		100	%	80 - 120
7477408	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2021/07/23		104	%	80 - 120
7477408	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2021/07/23	ND, RDL=0.050		mg/L	
7477408	EMT	RPD [QDS734-03]	Nitrogen (Ammonia Nitrogen)	2021/07/23	NC		%	20
7479611	NGI	Matrix Spike [QDS730-04]	Total Organic Carbon (C)	2021/07/25		96	%	85 - 115

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7479611	NGI	Spiked Blank	Total Organic Carbon (C)	2021/07/25		100	%	80 - 120
7479611	NGI	Method Blank	Total Organic Carbon (C)	2021/07/25	ND, RDL=0.50		mg/L	
7479611	NGI	RPD [QDS730-04]	Total Organic Carbon (C)	2021/07/25	1.4		%	15
7479746	EMT	Matrix Spike	Total Alkalinity (Total as CaCO3)	2021/07/26		101	%	80 - 120
7479746	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/26		108	%	80 - 120
7479746	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/26	ND, RDL=5.0		mg/L	
7479746	EMT	RPD	Total Alkalinity (Total as CaCO3)	2021/07/26	2.0		%	20
7479908	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2021/07/26		NC	%	80 - 120
7479908	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/26		96	%	80 - 120
7479908	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/07/26	ND, RDL=1.0		mg/L	
7479908	EMT	RPD	Dissolved Chloride (Cl-)	2021/07/26	0.70		%	20
7479912	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2021/07/26		97	%	80 - 120
7479912	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/26		102	%	80 - 120
7479912	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/07/26	ND, RDL=2.0		mg/L	
7479912	EMT	RPD	Dissolved Sulphate (SO4)	2021/07/26	NC		%	20
7479914	EMT	Matrix Spike	Reactive Silica (SiO2)	2021/07/26		NC	%	80 - 120
7479914	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/07/26		102	%	80 - 120
7479914	EMT	Method Blank	Reactive Silica (SiO2)	2021/07/26	ND, RDL=0.50		mg/L	
7479914	EMT	RPD	Reactive Silica (SiO2)	2021/07/26	0.25		%	20
7479918	EMT	Spiked Blank	Colour	2021/07/26		100	%	80 - 120
7479918	EMT	Method Blank	Colour	2021/07/26	ND, RDL=5.0		TCU	
7479918	EMT	RPD	Colour	2021/07/26	NC		%	20
7479919	EMT	Matrix Spike	Orthophosphate (P)	2021/07/26		98	%	80 - 120
7479919	EMT	Spiked Blank	Orthophosphate (P)	2021/07/26		101	%	80 - 120
7479919	EMT	Method Blank	Orthophosphate (P)	2021/07/26	ND, RDL=0.010		mg/L	
7479919	EMT	RPD	Orthophosphate (P)	2021/07/26	NC		%	20
7479921	EMT	Matrix Spike	Nitrate + Nitrite (N)	2021/07/26		94	%	80 - 120
7479921	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/07/26		96	%	80 - 120
7479921	EMT	Method Blank	Nitrate + Nitrite (N)	2021/07/26	ND, RDL=0.050		mg/L	
7479921	EMT	RPD	Nitrate + Nitrite (N)	2021/07/26	NC		%	20
7479924	EMT	Matrix Spike	Nitrite (N)	2021/07/26		97	%	80 - 120
7479924	EMT	Spiked Blank	Nitrite (N)	2021/07/26		107	%	80 - 120
7479924	EMT	Method Blank	Nitrite (N)	2021/07/26	ND, RDL=0.010		mg/L	
7479924	EMT	RPD	Nitrite (N)	2021/07/26	NC		%	20
7479935	EMT	Matrix Spike	Total Alkalinity (Total as CaCO3)	2021/07/26		NC	%	80 - 120
7479935	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/07/26		105	%	80 - 120
7479935	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/07/26	ND, RDL=5.0		mg/L	
7479935	EMT	RPD	Total Alkalinity (Total as CaCO3)	2021/07/26	0.14		%	20
7479943	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2021/07/26		NC	%	80 - 120
7479943	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/26		100	%	80 - 120
7479943	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/07/26	ND, RDL=1.0		mg/L	
7479943	EMT	RPD	Dissolved Chloride (Cl-)	2021/07/26	6.0		%	20
7479948	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2021/07/26		NC	%	80 - 120
7479948	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/26		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7479948	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/07/26	ND, RDL=2.0		mg/L	
7479948	EMT	RPD	Dissolved Sulphate (SO4)	2021/07/26	6.3		%	20
7479953	EMT	Matrix Spike	Reactive Silica (SiO2)	2021/07/26		94	%	80 - 120
7479953	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/07/26		101	%	80 - 120
7479953	EMT	Method Blank	Reactive Silica (SiO2)	2021/07/26	ND, RDL=0.50		mg/L	
7479953	EMT	RPD	Reactive Silica (SiO2)	2021/07/26	NC		%	20
7479954	EMT	Spiked Blank	Colour	2021/07/26		109	%	80 - 120
7479954	EMT	Method Blank	Colour	2021/07/26	ND, RDL=5.0		TCU	
7479954	EMT	RPD	Colour	2021/07/26	NC		%	20
7479959	EMT	Matrix Spike	Orthophosphate (P)	2021/07/26		101	%	80 - 120
7479959	EMT	Spiked Blank	Orthophosphate (P)	2021/07/26		97	%	80 - 120
7479959	EMT	Method Blank	Orthophosphate (P)	2021/07/26	ND, RDL=0.010		mg/L	
7479959	EMT	RPD	Orthophosphate (P)	2021/07/26	19		%	20
7479967	EMT	Matrix Spike	Nitrate + Nitrite (N)	2021/07/26		95	%	80 - 120
7479967	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/07/26		95	%	80 - 120
7479967	EMT	Method Blank	Nitrate + Nitrite (N)	2021/07/26	ND, RDL=0.050		mg/L	
7479967	EMT	RPD	Nitrate + Nitrite (N)	2021/07/26	NC		%	20
7479976	EMT	Matrix Spike	Nitrite (N)	2021/07/26		114	%	80 - 120
7479976	EMT	Spiked Blank	Nitrite (N)	2021/07/26		99	%	80 - 120
7479976	EMT	Method Blank	Nitrite (N)	2021/07/26	ND, RDL=0.010		mg/L	
7479976	EMT	RPD	Nitrite (N)	2021/07/26	NC		%	20
7482659	BBD	QC Standard	Organic Carbon (TOC)	2021/07/26		103	%	75 - 125
7482659	BBD	Method Blank	Organic Carbon (TOC)	2021/07/26	ND, RDL=0.50		g/kg	
7482659	BBD	RPD [QDS728-01]	Organic Carbon (TOC)	2021/07/26	0.33		%	35
7482679	BAN	Matrix Spike	Acid Extractable Antimony (Sb)	2021/07/26		NC	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/26		103	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/26		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/26		109	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/26		112	%	75 - 125
			Acid Extractable Boron (B)	2021/07/26		99	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/26		102	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/26		113	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/26		111	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/26		109	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/26		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/26		109	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/26		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/26		101	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/26		105	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/26		113	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/26		102	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/26		104	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/26		104	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/26		124	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/26		106	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/26		116	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/26		114	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/26		116	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Zinc (Zn)	2021/07/26		NC	%	75 - 125
7482679	BAN	Spiked Blank	Acid Extractable Antimony (Sb)	2021/07/26		103	%	75 - 125
			Acid Extractable Arsenic (As)	2021/07/26		103	%	75 - 125
			Acid Extractable Barium (Ba)	2021/07/26		102	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/07/26		99	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/07/26		101	%	75 - 125
			Acid Extractable Boron (B)	2021/07/26		104	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/07/26		97	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/07/26		101	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/07/26		103	%	75 - 125
			Acid Extractable Copper (Cu)	2021/07/26		103	%	75 - 125
			Acid Extractable Lead (Pb)	2021/07/26		102	%	75 - 125
			Acid Extractable Lithium (Li)	2021/07/26		103	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/07/26		102	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/07/26		103	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/07/26		106	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/07/26		106	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/07/26		100	%	75 - 125
			Acid Extractable Selenium (Se)	2021/07/26		105	%	75 - 125
			Acid Extractable Silver (Ag)	2021/07/26		102	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/07/26		99	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/07/26		102	%	75 - 125
			Acid Extractable Tin (Sn)	2021/07/26		101	%	75 - 125
			Acid Extractable Uranium (U)	2021/07/26		105	%	75 - 125
			Acid Extractable Vanadium (V)	2021/07/26		103	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/07/26		98	%	75 - 125
7482679	BAN	Method Blank	Acid Extractable Aluminum (Al)	2021/07/26	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2021/07/26	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2021/07/26	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2021/07/26	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2021/07/26	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2021/07/26	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2021/07/26	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2021/07/26	ND, RDL=2.0		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Mercury (Hg)	2021/07/26	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2021/07/26	ND, RDL=0.50		mg/kg	
			Acid Extractable Silver (Ag)	2021/07/26	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2021/07/26	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2021/07/26	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2021/07/26	ND, RDL=1.0		mg/kg	
			Acid Extractable Uranium (U)	2021/07/26	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2021/07/26	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2021/07/26	ND, RDL=5.0		mg/kg	
7482679	BAN	RPD	Acid Extractable Aluminum (Al)	2021/07/26	0.045		%	35
			Acid Extractable Antimony (Sb)	2021/07/26	6.4		%	35
			Acid Extractable Arsenic (As)	2021/07/26	NC		%	35
			Acid Extractable Barium (Ba)	2021/07/26	123 (1)		%	35
			Acid Extractable Beryllium (Be)	2021/07/26	NC		%	35
			Acid Extractable Bismuth (Bi)	2021/07/26	NC		%	35
			Acid Extractable Boron (B)	2021/07/26	NC		%	35
			Acid Extractable Cadmium (Cd)	2021/07/26	22		%	35
			Acid Extractable Chromium (Cr)	2021/07/26	0.11		%	35
			Acid Extractable Cobalt (Co)	2021/07/26	29		%	35
			Acid Extractable Copper (Cu)	2021/07/26	4.2		%	35
			Acid Extractable Iron (Fe)	2021/07/26	38 (1)		%	35
			Acid Extractable Lead (Pb)	2021/07/26	2.1		%	35
			Acid Extractable Lithium (Li)	2021/07/26	NC		%	35
			Acid Extractable Manganese (Mn)	2021/07/26	41 (1)		%	35
			Acid Extractable Mercury (Hg)	2021/07/26	8.5		%	35
			Acid Extractable Molybdenum (Mo)	2021/07/26	NC		%	35
			Acid Extractable Nickel (Ni)	2021/07/26	15		%	35
			Acid Extractable Rubidium (Rb)	2021/07/26	3.4		%	35
			Acid Extractable Selenium (Se)	2021/07/26	NC		%	35
			Acid Extractable Silver (Ag)	2021/07/26	NC		%	35
			Acid Extractable Strontium (Sr)	2021/07/26	12		%	35
			Acid Extractable Thallium (Tl)	2021/07/26	NC		%	35
			Acid Extractable Tin (Sn)	2021/07/26	21		%	35
			Acid Extractable Uranium (U)	2021/07/26	2.7		%	35
			Acid Extractable Vanadium (V)	2021/07/26	1.8		%	35
			Acid Extractable Zinc (Zn)	2021/07/26	80 (1)		%	35
7482817	NGI	Matrix Spike	Total Organic Carbon (C)	2021/07/26		95	%	85 - 115
7482817	NGI	Spiked Blank	Total Organic Carbon (C)	2021/07/26		99	%	80 - 120
7482817	NGI	Method Blank	Total Organic Carbon (C)	2021/07/26	ND, RDL=0.50		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7482817	NGI	RPD	Total Organic Carbon (C)	2021/07/26	0.76		%	15
7482831	NGI	Matrix Spike	Total Organic Carbon (C)	2021/07/27		94	%	85 - 115
7482831	NGI	Spiked Blank	Total Organic Carbon (C)	2021/07/27		97	%	80 - 120
7482831	NGI	Method Blank	Total Organic Carbon (C)	2021/07/27	ND, RDL=0.50		mg/L	
7482831	NGI	RPD	Total Organic Carbon (C)	2021/07/27	NC		%	15
7482904	EMT	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2021/07/26		100	%	80 - 120
7482904	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2021/07/26		101	%	80 - 120
7482904	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2021/07/26	ND, RDL=0.050		mg/L	
7482904	EMT	RPD	Nitrogen (Ammonia Nitrogen)	2021/07/26	16		%	20
7485934	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2021/07/28		NC	%	80 - 120
7485934	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/07/28		97	%	80 - 120
7485934	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/07/28	ND, RDL=1.0		mg/L	
7485934	EMT	RPD	Dissolved Chloride (Cl-)	2021/07/28	2.3		%	20
7485940	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2021/07/28		102	%	80 - 120
7485940	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/07/28		98	%	80 - 120
7485940	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/07/28	ND, RDL=2.0		mg/L	
7485940	EMT	RPD	Dissolved Sulphate (SO4)	2021/07/28	4.3		%	20
7500101	NGI	RPD	Gravel	2021/08/11	NC		%	35
			Sand	2021/08/11	1.2		%	35
			Silt	2021/08/11	29		%	35
			Clay	2021/08/11	20		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Poor RPD due to sample inhomogeneity. Verified by repeat digestion and analysis.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Colleen Acker, B.Sc, Scientific Service Specialist

Eric Dearman, Scientific Specialist

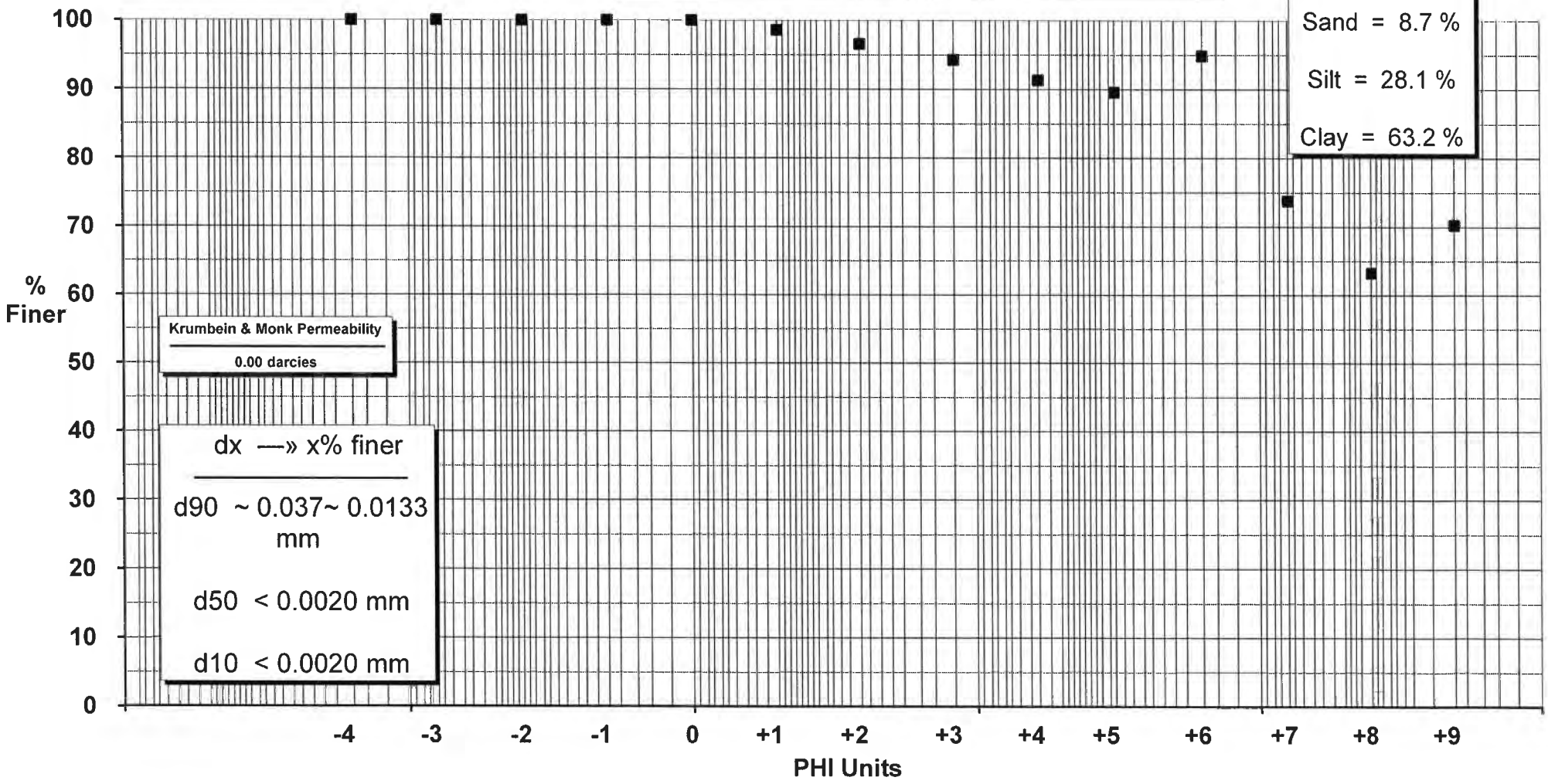
Gina Thompson, Inorganics General Chemistry Supervisor

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

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BV Labs ID: QDS728-01

L14-SED



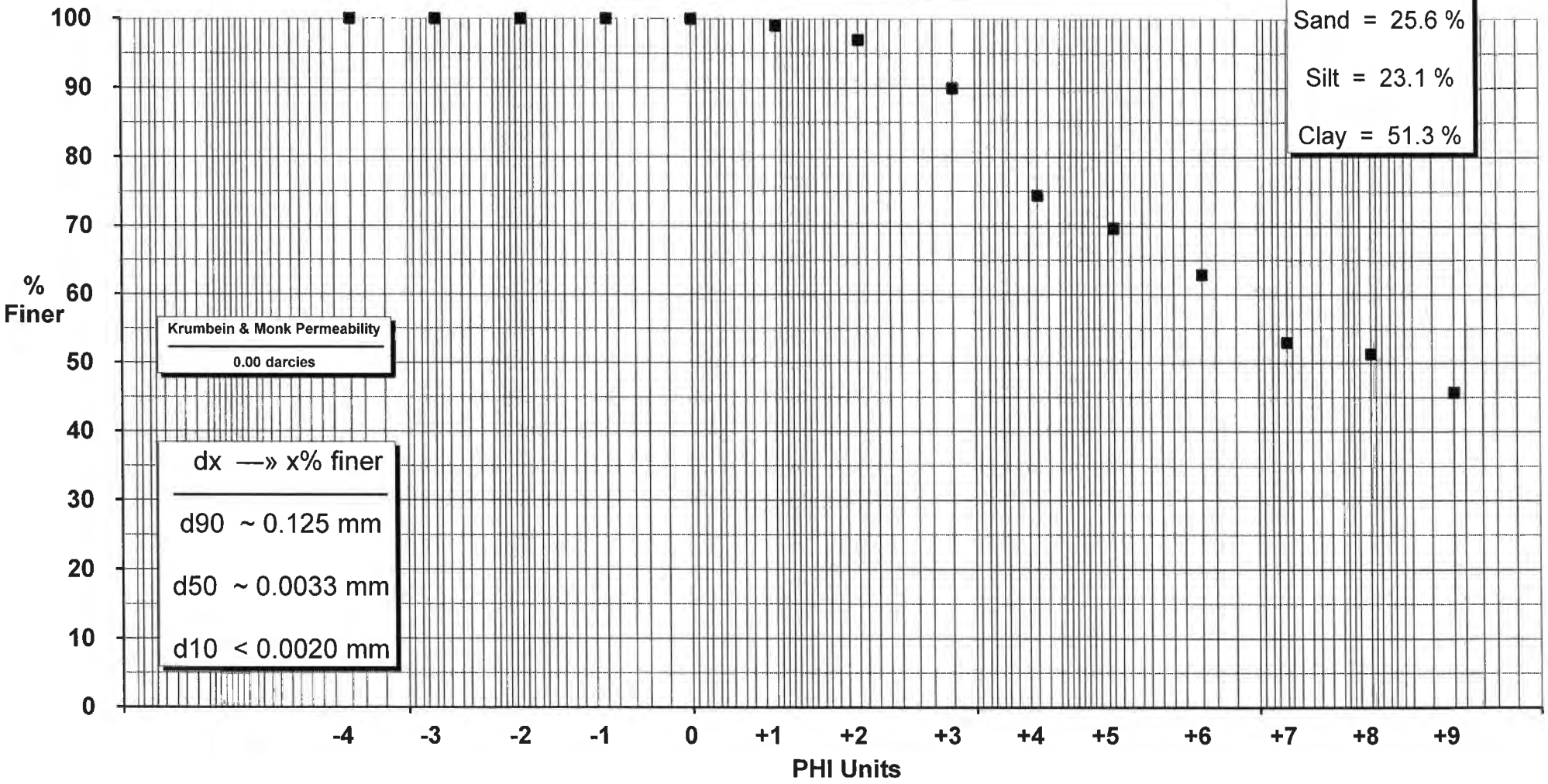
Approved

BV Labs ID: QDS735-01

L18-SED

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
—	—
21.5 %	27.1 %

Wentworth	
Gravel	0.0 %
Sand	25.6 %
Silt	23.1 %
Clay	51.3 %



Krumbein & Monk Permeability

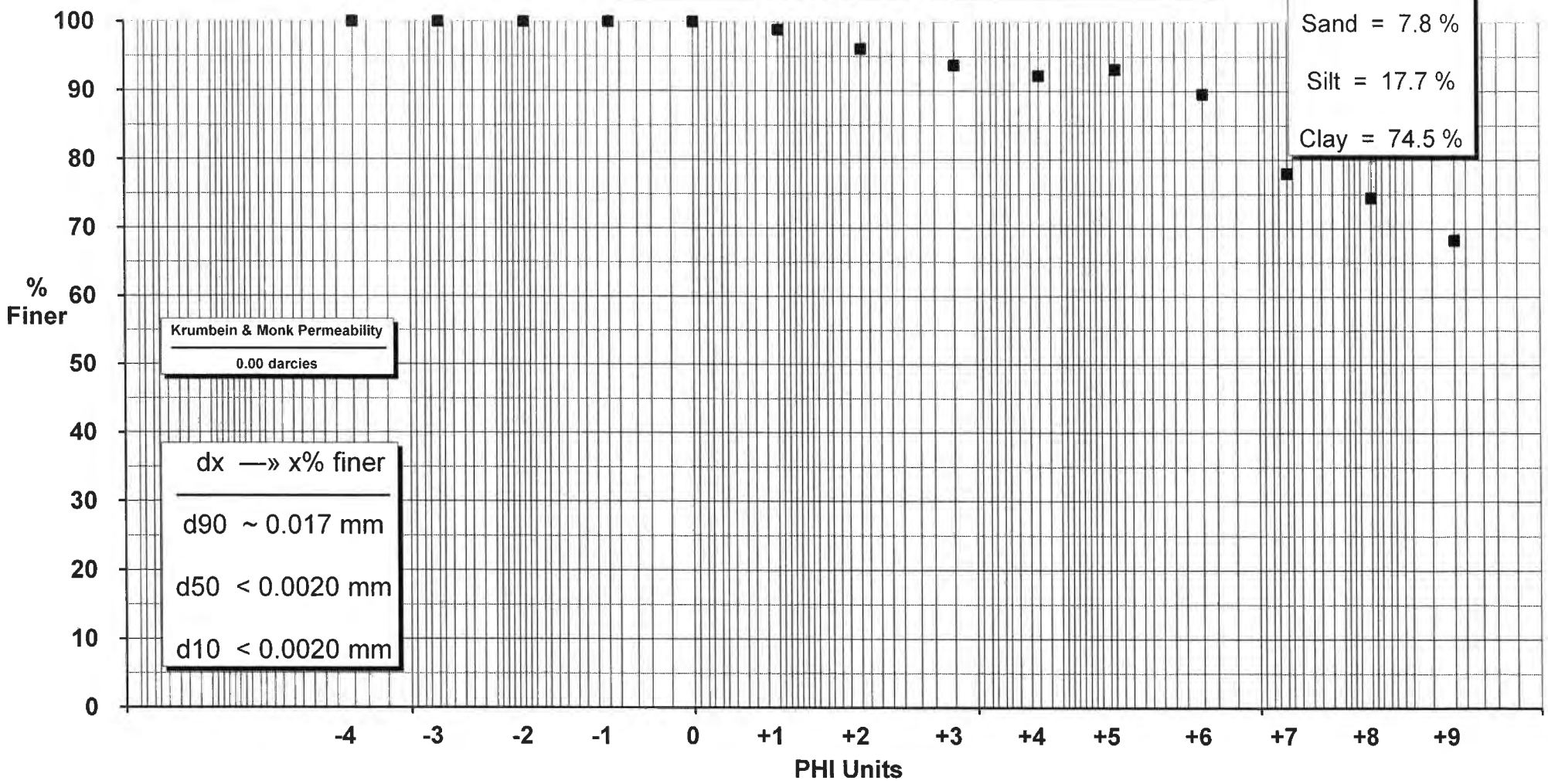
0.00 darcies

dx —» x% finer	
d90	~ 0.125 mm
d50	~ 0.0033 mm
d10	< 0.0020 mm

Approved

BV Labs ID: QDS736-01

L12-SED



Approved

Your Project #: 142-039
Your C.O.C. #: 381421

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/08/19
Report #: R6772107
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1L2900
Received: 2021/07/29, 09:52

Sample Matrix: Sediment
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals Solids Acid Extr. ICPMS	2	2021/08/04	2021/08/04	ATL SOP 00058	EPA 6020B R2 m
Particle size in solids (pipette&sieve) (2)	2	N/A	2021/08/18	ATL SOP 00012	MSAMS'78/WREP-125R3m
Total Organic Carbon in Soil (1)	2	N/A	2021/08/05	CAM SOP-00468	BCMOE TOC Aug 2014

Sample Matrix: Surface Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate, Bicarbonate and Hydroxide	3	N/A	2021/08/04	N/A	SM 23 4500-CO2 D
Alkalinity	3	N/A	2021/08/04	ATL SOP 00013	EPA 310.2 R1974 m
Chloride	3	N/A	2021/08/04	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	3	N/A	2021/08/04	ATL SOP 00020	SM 23 2120C m
Conductance - water	3	N/A	2021/08/04	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	3	N/A	2021/08/04	ATL SOP 00048	Auto Calc
Metals Water Total MS	2	2021/07/30	2021/08/03	ATL SOP 00058	EPA 6020B R2 m
Metals Water Total MS	1	2021/08/03	2021/08/03	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	3	N/A	2021/08/05	N/A	Auto Calc.
Anion and Cation Sum	3	N/A	2021/08/05	N/A	Auto Calc.
Nitrogen Ammonia - water	3	N/A	2021/08/04	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	3	N/A	2021/08/04	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	3	N/A	2021/08/04	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	3	N/A	2021/08/05	ATL SOP 00018	ASTM D3867-16
pH (4)	3	N/A	2021/08/04	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	3	N/A	2021/08/04	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	3	N/A	2021/08/05	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	3	N/A	2021/08/05	ATL SOP 00049	Auto Calc.
Reactive Silica	3	N/A	2021/08/04	ATL SOP 00022	EPA 366.0 m
Sulphate	3	N/A	2021/08/04	ATL SOP 00023	ASTM D516-16 m
Chlorophyll A (Sub from Bedford) (3)	2	2021/08/03	2021/08/04		
Total Dissolved Solids (TDS calc)	3	N/A	2021/08/05	N/A	Auto Calc.
Organic carbon - Total (TOC) (5)	3	N/A	2021/08/04	ATL SOP 00203	SM 23 5310B m

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Your Project #: 142-039
Your C.O.C. #: 381421

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/08/19
Report #: R6772107
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1L2900
Received: 2021/07/29, 09:52

Sample Matrix: Surface Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Turbidity	3	N/A	2021/08/04	ATL SOP 00011	EPA 180.1 R2 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
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Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Mississauga
(2) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.
(3) This test was performed by Dalhousie Dept of Oceanography
(4) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(5) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Your Project #: 142-039
Your C.O.C. #: 381421

Attention: Kathryn Dawe

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Report Date: 2021/08/19
Report #: R6772107
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1L2900
Received: 2021/07/29, 09:52

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Maryann Comeau, Customer Experience Supervisor/PM
Email: Maryann.COMEAU@bureauveritas.com
Phone# (902)420-0203 Ext:298
==========

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF SEDIMENT

BV Labs ID		QFT155	QFT158			QFT158		
Sampling Date		2021/07/22 11:10	2021/07/26 11:30			2021/07/26 11:30		
COC Number		381421	381421			381421		
	UNITS	L-19 SED	L-10 SED	RDL	QC Batch	L-10 SED Lab-Dup	RDL	QC Batch
Inorganics								
Total Organic Carbon	mg/kg	11000	12000	500	7501850	12000	500	7501850
< -1 Phi (2 mm)	%	75	100	0.10	7508307			
< 0 Phi (1 mm)	%	54	100	0.10	7508307			
< +1 Phi (0.5 mm)	%	31	99	0.10	7508307			
< +2 Phi (0.25 mm)	%	13	98	0.10	7508307			
< +3 Phi (0.12 mm)	%	6.3	94	0.10	7508307			
< +4 Phi (0.062 mm)	%	4.7	87	0.10	7508307			
< +5 Phi (0.031 mm)	%	4.0	78	0.10	7508307			
< +6 Phi (0.016 mm)	%	3.7	58	0.10	7508307			
< +7 Phi (0.0078 mm)	%	3.1	31	0.10	7508307			
< +8 Phi (0.0039 mm)	%	2.8	24	0.10	7508307			
< +9 Phi (0.0020 mm)	%	2.5	13	0.10	7508307			
Gravel	%	25	ND	0.10	7508307			
Sand	%	71	13	0.10	7508307			
Silt	%	1.9	63	0.10	7508307			
Clay	%	2.8	24	0.10	7508307			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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ELEMENTS BY ATOMIC SPECTROSCOPY (SEDIMENT)

BV Labs ID		QFT155	QFT158		
Sampling Date		2021/07/22 11:10	2021/07/26 11:30		
COC Number		381421	381421		
	UNITS	L-19 SED	L-10 SED	RDL	QC Batch
Metals					
Acid Extractable Aluminum (Al)	mg/kg	3300	13000	10	7499329
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	2.0	7499329
Acid Extractable Arsenic (As)	mg/kg	ND	6.4	2.0	7499329
Acid Extractable Barium (Ba)	mg/kg	180	130	5.0	7499329
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	2.0	7499329
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	2.0	7499329
Acid Extractable Boron (B)	mg/kg	ND	ND	50	7499329
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	0.30	7499329
Acid Extractable Chromium (Cr)	mg/kg	16	60	2.0	7499329
Acid Extractable Cobalt (Co)	mg/kg	3.9	13	1.0	7499329
Acid Extractable Copper (Cu)	mg/kg	2.7	25	2.0	7499329
Acid Extractable Iron (Fe)	mg/kg	19000	46000	50	7499329
Acid Extractable Lead (Pb)	mg/kg	1.4	7.4	0.50	7499329
Acid Extractable Lithium (Li)	mg/kg	3.5	12	2.0	7499329
Acid Extractable Manganese (Mn)	mg/kg	2800	720	2.0	7499329
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	0.10	7499329
Acid Extractable Molybdenum (Mo)	mg/kg	ND	10	2.0	7499329
Acid Extractable Nickel (Ni)	mg/kg	11	36	2.0	7499329
Acid Extractable Rubidium (Rb)	mg/kg	2.7	36	2.0	7499329
Acid Extractable Selenium (Se)	mg/kg	ND	ND	0.50	7499329
Acid Extractable Silver (Ag)	mg/kg	ND	ND	0.50	7499329
Acid Extractable Strontium (Sr)	mg/kg	ND	15	5.0	7499329
Acid Extractable Thallium (Tl)	mg/kg	0.12	0.32	0.10	7499329
Acid Extractable Tin (Sn)	mg/kg	ND	ND	1.0	7499329
Acid Extractable Uranium (U)	mg/kg	0.43	4.1	0.10	7499329
Acid Extractable Vanadium (V)	mg/kg	9.5	41	2.0	7499329
Acid Extractable Zinc (Zn)	mg/kg	36	54	5.0	7499329

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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BV Labs Job #: C1L2900
Report Date: 2021/08/19

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QFT154			QFT156			QFT156		
Sampling Date		2021/07/20 11:45			2021/07/22 11:10			2021/07/22 11:10		
COC Number		381421			381421			381421		
	UNITS	S-6	RDL	QC Batch	L-19	RDL	QC Batch	L-19 Lab-Dup	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	0.550	N/A	7490119	0.630	N/A	7490119			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	27	1.0	7490116	29	1.0	7490116			
Calculated TDS	mg/L	29	1.0	7490123	33	1.0	7490123			
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7490116	ND	1.0	7490116			
Cation Sum	me/L	0.540	N/A	7490119	0.530	N/A	7490119			
Hardness (CaCO3)	mg/L	25	1.0	7490117	24	1.0	7490117			
Ion Balance (% Difference)	%	0.920	N/A	7490118	8.62	N/A	7490118			
Langelier Index (@ 20C)	N/A	-1.28		7490121	-1.63		7490121			
Langelier Index (@ 4C)	N/A	-1.53		7490122	-1.88		7490122			
Nitrate (N)	mg/L	ND	0.050	7490736	ND	0.050	7490736			
Saturation pH (@ 20C)	N/A	9.09		7490121	9.08		7490121			
Saturation pH (@ 4C)	N/A	9.35		7490122	9.33		7490122			
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	28	5.0	7497574	29	5.0	7497544	25	5.0	7497544
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7497578	ND	1.0	7497550	ND	1.0	7497550
Colour	TCU	20	5.0	7497592	22	5.0	7497557	22	5.0	7497557
Nitrate + Nitrite (N)	mg/L	ND	0.050	7497598	ND	0.050	7497563	ND	0.050	7497563
Nitrite (N)	mg/L	ND	0.010	7497601	ND	0.010	7497566	ND	0.010	7497566
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7499264	0.090	0.050	7499264			
Total Organic Carbon (C)	mg/L	5.2	0.50	7499045	5.3	0.50	7499045			
Orthophosphate (P)	mg/L	ND	0.010	7497594	ND	0.010	7497558	ND	0.010	7497558
pH	pH	7.81		7499065	7.45		7499062	7.58		7499062
Reactive Silica (SiO2)	mg/L	3.2	0.50	7497586	3.3	0.50	7497555	3.3	0.50	7497555
Dissolved Sulphate (SO4)	mg/L	ND	2.0	7497581	2.4	2.0	7497552	2.1	2.0	7497552
Turbidity	NTU	0.89	0.10	7499221	1.2	0.10	7499221			
Conductivity	uS/cm	54	1.0	7499064	51	1.0	7499060	50	1.0	7499060
Subcontracted Analysis										
Subcontract Parameter	N/A				ATTACHED	N/A	7497850			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not detected

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RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QFT157		
Sampling Date		2021/07/20 11:30		
COC Number		381421		
	UNITS	**L-10**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	1.11	N/A	7490119
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	52	1.0	7490116
Calculated TDS	mg/L	54	1.0	7490123
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7490116
Cation Sum	me/L	0.980	N/A	7490119
Hardness (CaCO3)	mg/L	47	1.0	7490117
Ion Balance (% Difference)	%	6.22	N/A	7490118
Langelier Index (@ 20C)	N/A	-0.460		7490121
Langelier Index (@ 4C)	N/A	-0.712		7490122
Nitrate (N)	mg/L	ND	0.050	7490736
Saturation pH (@ 20C)	N/A	8.56		7490121
Saturation pH (@ 4C)	N/A	8.82		7490122
Inorganics				
Total Alkalinity (Total as CaCO3)	mg/L	53	5.0	7497574
Dissolved Chloride (Cl-)	mg/L	ND	1.0	7497578
Colour	TCU	11	5.0	7497592
Nitrate + Nitrite (N)	mg/L	ND	0.050	7497598
Nitrite (N)	mg/L	ND	0.010	7497601
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7499264
Total Organic Carbon (C)	mg/L	4.3	0.50	7499045
Orthophosphate (P)	mg/L	ND	0.010	7497594
pH	pH	8.10		7499065
Reactive Silica (SiO2)	mg/L	2.3	0.50	7497586
Dissolved Sulphate (SO4)	mg/L	2.6	2.0	7497581
Turbidity	NTU	0.79	0.10	7499221
Conductivity	uS/cm	94	1.0	7499064
Subcontracted Analysis				
Subcontract Parameter	N/A	ATTACHED	N/A	7497850

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

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ELEMENTS BY ICP/MS (SURFACE WATER)

BV Labs ID		QFT154		QFT156	QFT157		
Sampling Date		2021/07/20 11:45		2021/07/22 11:10	2021/07/20 11:30		
COC Number		381421		381421	381421		
	UNITS	S-6	QC Batch	L-19	L-10	RDL	QC Batch
Metals							
Total Aluminum (Al)	ug/L	19	7496722	12	6.7	5.0	7493002
Total Antimony (Sb)	ug/L	ND	7496722	ND	ND	1.0	7493002
Total Arsenic (As)	ug/L	ND	7496722	ND	ND	1.0	7493002
Total Barium (Ba)	ug/L	12	7496722	9.5	8.9	1.0	7493002
Total Beryllium (Be)	ug/L	ND	7496722	ND	ND	1.0	7493002
Total Bismuth (Bi)	ug/L	ND	7496722	ND	ND	2.0	7493002
Total Boron (B)	ug/L	ND	7496722	ND	ND	50	7493002
Total Cadmium (Cd)	ug/L	ND	7496722	ND	ND	0.010	7493002
Total Calcium (Ca)	ug/L	5700	7496722	5600	11000	100	7493002
Total Chromium (Cr)	ug/L	ND	7496722	ND	ND	1.0	7493002
Total Cobalt (Co)	ug/L	ND	7496722	ND	ND	0.40	7493002
Total Copper (Cu)	ug/L	ND	7496722	ND	ND	0.50	7493002
Total Iron (Fe)	ug/L	160	7496722	92	110	50	7493002
Total Lead (Pb)	ug/L	ND	7496722	ND	ND	0.50	7493002
Total Magnesium (Mg)	ug/L	2500	7496722	2500	4800	100	7493002
Total Manganese (Mn)	ug/L	89	7496722	27	8.9	2.0	7493002
Total Molybdenum (Mo)	ug/L	ND	7496722	ND	ND	2.0	7493002
Total Nickel (Ni)	ug/L	ND	7496722	2.6	ND	2.0	7493002
Total Phosphorus (P)	ug/L	ND	7496722	ND	ND	100	7493002
Total Potassium (K)	ug/L	630	7496722	590	1000	100	7493002
Total Selenium (Se)	ug/L	ND	7496722	ND	ND	0.50	7493002
Total Silver (Ag)	ug/L	ND	7496722	ND	ND	0.10	7493002
Total Sodium (Na)	ug/L	490	7496722	500	410	100	7493002
Total Strontium (Sr)	ug/L	10	7496722	11	11	2.0	7493002
Total Thallium (Tl)	ug/L	ND	7496722	ND	ND	0.10	7493002
Total Tin (Sn)	ug/L	ND	7496722	ND	ND	2.0	7493002
Total Titanium (Ti)	ug/L	ND	7496722	ND	ND	2.0	7493002
Total Uranium (U)	ug/L	ND	7496722	ND	ND	0.10	7493002
Total Vanadium (V)	ug/L	ND	7496722	ND	ND	2.0	7493002
Total Zinc (Zn)	ug/L	ND	7496722	ND	ND	5.0	7493002

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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GENERAL COMMENTS

Sample QFT156 [L-19] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample QFT157 [L-10] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7493002	BAN	Matrix Spike	Total Aluminum (Al)	2021/08/03		96	%	80 - 120
			Total Antimony (Sb)	2021/08/03		104	%	80 - 120
			Total Arsenic (As)	2021/08/03		96	%	80 - 120
			Total Barium (Ba)	2021/08/03		NC	%	80 - 120
			Total Beryllium (Be)	2021/08/03		104	%	80 - 120
			Total Bismuth (Bi)	2021/08/03		95	%	80 - 120
			Total Boron (B)	2021/08/03		104	%	80 - 120
			Total Cadmium (Cd)	2021/08/03		99	%	80 - 120
			Total Calcium (Ca)	2021/08/03		99	%	80 - 120
			Total Chromium (Cr)	2021/08/03		97	%	80 - 120
			Total Cobalt (Co)	2021/08/03		99	%	80 - 120
			Total Copper (Cu)	2021/08/03		98	%	80 - 120
			Total Iron (Fe)	2021/08/03		98	%	80 - 120
			Total Lead (Pb)	2021/08/03		100	%	80 - 120
			Total Magnesium (Mg)	2021/08/03		100	%	80 - 120
			Total Manganese (Mn)	2021/08/03		99	%	80 - 120
			Total Molybdenum (Mo)	2021/08/03		104	%	80 - 120
			Total Nickel (Ni)	2021/08/03		100	%	80 - 120
			Total Phosphorus (P)	2021/08/03		100	%	80 - 120
			Total Potassium (K)	2021/08/03		96	%	80 - 120
			Total Selenium (Se)	2021/08/03		100	%	80 - 120
			Total Silver (Ag)	2021/08/03		98	%	80 - 120
			Total Sodium (Na)	2021/08/03		100	%	80 - 120
			Total Strontium (Sr)	2021/08/03		99	%	80 - 120
			Total Thallium (Tl)	2021/08/03		96	%	80 - 120
			Total Tin (Sn)	2021/08/03		99	%	80 - 120
			Total Titanium (Ti)	2021/08/03		97	%	80 - 120
			Total Uranium (U)	2021/08/03		101	%	80 - 120
			Total Vanadium (V)	2021/08/03		99	%	80 - 120
			Total Zinc (Zn)	2021/08/03		96	%	80 - 120
7493002	BAN	Spiked Blank	Total Aluminum (Al)	2021/08/03		95	%	80 - 120
			Total Antimony (Sb)	2021/08/03		101	%	80 - 120
			Total Arsenic (As)	2021/08/03		94	%	80 - 120
			Total Barium (Ba)	2021/08/03		98	%	80 - 120
			Total Beryllium (Be)	2021/08/03		102	%	80 - 120
			Total Bismuth (Bi)	2021/08/03		98	%	80 - 120
			Total Boron (B)	2021/08/03		102	%	80 - 120
			Total Cadmium (Cd)	2021/08/03		98	%	80 - 120
			Total Calcium (Ca)	2021/08/03		98	%	80 - 120
			Total Chromium (Cr)	2021/08/03		97	%	80 - 120
			Total Cobalt (Co)	2021/08/03		99	%	80 - 120
			Total Copper (Cu)	2021/08/03		98	%	80 - 120
			Total Iron (Fe)	2021/08/03		99	%	80 - 120
			Total Lead (Pb)	2021/08/03		100	%	80 - 120
			Total Magnesium (Mg)	2021/08/03		101	%	80 - 120
			Total Manganese (Mn)	2021/08/03		100	%	80 - 120
			Total Molybdenum (Mo)	2021/08/03		100	%	80 - 120
			Total Nickel (Ni)	2021/08/03		98	%	80 - 120
			Total Phosphorus (P)	2021/08/03		100	%	80 - 120
			Total Potassium (K)	2021/08/03		96	%	80 - 120
			Total Selenium (Se)	2021/08/03		100	%	80 - 120
			Total Silver (Ag)	2021/08/03		97	%	80 - 120
			Total Sodium (Na)	2021/08/03		101	%	80 - 120
			Total Strontium (Sr)	2021/08/03		96	%	80 - 120
			Total Thallium (Tl)	2021/08/03		99	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2021/08/03		97	%	80 - 120
			Total Titanium (Ti)	2021/08/03		97	%	80 - 120
			Total Uranium (U)	2021/08/03		101	%	80 - 120
			Total Vanadium (V)	2021/08/03		97	%	80 - 120
			Total Zinc (Zn)	2021/08/03		97	%	80 - 120
7493002	BAN	Method Blank	Total Aluminum (Al)	2021/08/03	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Boron (B)	2021/08/03	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2021/08/03	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2021/08/03	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2021/08/03	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2021/08/03	ND, RDL=0.50		ug/L	
			Total Iron (Fe)	2021/08/03	ND, RDL=50		ug/L	
			Total Lead (Pb)	2021/08/03	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2021/08/03	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2021/08/03	ND, RDL=100		ug/L	
			Total Potassium (K)	2021/08/03	ND, RDL=100		ug/L	
			Total Selenium (Se)	2021/08/03	ND, RDL=0.50		ug/L	
			Total Silver (Ag)	2021/08/03	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2021/08/03	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2021/08/03	ND, RDL=0.10		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2021/08/03	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2021/08/03	ND, RDL=5.0		ug/L	
7493002	BAN	RPD	Total Manganese (Mn)	2021/08/03	2.8		%	20
7496722	MLB	Matrix Spike	Total Aluminum (Al)	2021/08/03		103	%	80 - 120
			Total Antimony (Sb)	2021/08/03		101	%	80 - 120
			Total Arsenic (As)	2021/08/03		96	%	80 - 120
			Total Barium (Ba)	2021/08/03		98	%	80 - 120
			Total Beryllium (Be)	2021/08/03		102	%	80 - 120
			Total Bismuth (Bi)	2021/08/03		96	%	80 - 120
			Total Boron (B)	2021/08/03		100	%	80 - 120
			Total Cadmium (Cd)	2021/08/03		98	%	80 - 120
			Total Calcium (Ca)	2021/08/03		NC	%	80 - 120
			Total Chromium (Cr)	2021/08/03		99	%	80 - 120
			Total Cobalt (Co)	2021/08/03		99	%	80 - 120
			Total Copper (Cu)	2021/08/03		97	%	80 - 120
			Total Iron (Fe)	2021/08/03		96	%	80 - 120
			Total Lead (Pb)	2021/08/03		98	%	80 - 120
			Total Magnesium (Mg)	2021/08/03		NC	%	80 - 120
			Total Manganese (Mn)	2021/08/03		NC	%	80 - 120
			Total Molybdenum (Mo)	2021/08/03		108	%	80 - 120
			Total Nickel (Ni)	2021/08/03		98	%	80 - 120
			Total Phosphorus (P)	2021/08/03		106	%	80 - 120
			Total Potassium (K)	2021/08/03		105	%	80 - 120
			Total Selenium (Se)	2021/08/03		101	%	80 - 120
			Total Silver (Ag)	2021/08/03		100	%	80 - 120
			Total Sodium (Na)	2021/08/03		NC	%	80 - 120
			Total Strontium (Sr)	2021/08/03		NC	%	80 - 120
			Total Thallium (Tl)	2021/08/03		98	%	80 - 120
			Total Tin (Sn)	2021/08/03		101	%	80 - 120
			Total Titanium (Ti)	2021/08/03		101	%	80 - 120
			Total Uranium (U)	2021/08/03		106	%	80 - 120
			Total Vanadium (V)	2021/08/03		102	%	80 - 120
			Total Zinc (Zn)	2021/08/03		98	%	80 - 120
7496722	MLB	Spiked Blank	Total Aluminum (Al)	2021/08/03		103	%	80 - 120
			Total Antimony (Sb)	2021/08/03		100	%	80 - 120
			Total Arsenic (As)	2021/08/03		96	%	80 - 120
			Total Barium (Ba)	2021/08/03		98	%	80 - 120
			Total Beryllium (Be)	2021/08/03		99	%	80 - 120
			Total Bismuth (Bi)	2021/08/03		100	%	80 - 120
			Total Boron (B)	2021/08/03		100	%	80 - 120
			Total Cadmium (Cd)	2021/08/03		97	%	80 - 120
			Total Calcium (Ca)	2021/08/03		103	%	80 - 120
			Total Chromium (Cr)	2021/08/03		100	%	80 - 120
			Total Cobalt (Co)	2021/08/03		100	%	80 - 120
			Total Copper (Cu)	2021/08/03		102	%	80 - 120
			Total Iron (Fe)	2021/08/03		101	%	80 - 120
			Total Lead (Pb)	2021/08/03		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Magnesium (Mg)	2021/08/03		105	%	80 - 120
			Total Manganese (Mn)	2021/08/03		101	%	80 - 120
			Total Molybdenum (Mo)	2021/08/03		105	%	80 - 120
			Total Nickel (Ni)	2021/08/03		103	%	80 - 120
			Total Phosphorus (P)	2021/08/03		104	%	80 - 120
			Total Potassium (K)	2021/08/03		105	%	80 - 120
			Total Selenium (Se)	2021/08/03		100	%	80 - 120
			Total Silver (Ag)	2021/08/03		99	%	80 - 120
			Total Sodium (Na)	2021/08/03		103	%	80 - 120
			Total Strontium (Sr)	2021/08/03		98	%	80 - 120
			Total Thallium (Tl)	2021/08/03		101	%	80 - 120
			Total Tin (Sn)	2021/08/03		101	%	80 - 120
			Total Titanium (Ti)	2021/08/03		101	%	80 - 120
			Total Uranium (U)	2021/08/03		105	%	80 - 120
			Total Vanadium (V)	2021/08/03		102	%	80 - 120
			Total Zinc (Zn)	2021/08/03		101	%	80 - 120
7496722	MLB	Method Blank	Total Aluminum (Al)	2021/08/03	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Boron (B)	2021/08/03	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2021/08/03	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2021/08/03	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2021/08/03	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2021/08/03	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2021/08/03	ND, RDL=0.50		ug/L	
			Total Iron (Fe)	2021/08/03	ND, RDL=50		ug/L	
			Total Lead (Pb)	2021/08/03	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2021/08/03	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2021/08/03	ND, RDL=100		ug/L	
			Total Potassium (K)	2021/08/03	ND, RDL=100		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Selenium (Se)	2021/08/03	ND, RDL=0.50		ug/L	
			Total Silver (Ag)	2021/08/03	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2021/08/03	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2021/08/03	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2021/08/03	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2021/08/03	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2021/08/03	ND, RDL=5.0		ug/L	
7496722	MLB	RPD	Total Aluminum (Al)	2021/08/03	NC		%	20
			Total Antimony (Sb)	2021/08/03	NC		%	20
			Total Arsenic (As)	2021/08/03	NC		%	20
			Total Barium (Ba)	2021/08/03	1.1		%	20
			Total Beryllium (Be)	2021/08/03	NC		%	20
			Total Bismuth (Bi)	2021/08/03	NC		%	20
			Total Boron (B)	2021/08/03	NC		%	20
			Total Cadmium (Cd)	2021/08/03	NC		%	20
			Total Calcium (Ca)	2021/08/03	0.51		%	20
			Total Chromium (Cr)	2021/08/03	NC		%	20
			Total Cobalt (Co)	2021/08/03	5.6		%	20
			Total Copper (Cu)	2021/08/03	NC		%	20
			Total Iron (Fe)	2021/08/03	2.3		%	20
			Total Lead (Pb)	2021/08/03	NC		%	20
			Total Magnesium (Mg)	2021/08/03	0.30		%	20
			Total Manganese (Mn)	2021/08/03	0.69		%	20
			Total Molybdenum (Mo)	2021/08/03	NC		%	20
			Total Nickel (Ni)	2021/08/03	0.97		%	20
			Total Phosphorus (P)	2021/08/03	NC		%	20
			Total Potassium (K)	2021/08/03	0.81		%	20
			Total Selenium (Se)	2021/08/03	NC		%	20
			Total Silver (Ag)	2021/08/03	NC		%	20
			Total Sodium (Na)	2021/08/03	1.2		%	20
			Total Strontium (Sr)	2021/08/03	0.24		%	20
			Total Thallium (Tl)	2021/08/03	NC		%	20
			Total Tin (Sn)	2021/08/03	NC		%	20
			Total Titanium (Ti)	2021/08/03	NC		%	20
			Total Uranium (U)	2021/08/03	7.7		%	20
			Total Vanadium (V)	2021/08/03	NC		%	20
			Total Zinc (Zn)	2021/08/03	NC		%	20
7497544	EMT	Matrix Spike [QFT156-01]	Total Alkalinity (Total as CaCO3)	2021/08/04		93	%	80 - 120
7497544	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/08/04		105	%	80 - 120
7497544	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/08/04	ND, RDL=5.0		mg/L	
7497544	EMT	RPD [QFT156-01]	Total Alkalinity (Total as CaCO3)	2021/08/04	16		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7497550	EMT	Matrix Spike [QFT156-01]	Dissolved Chloride (Cl-)	2021/08/04		98	%	80 - 120
7497550	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/08/04		104	%	80 - 120
7497550	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/08/04	ND, RDL=1.0		mg/L	
7497550	EMT	RPD [QFT156-01]	Dissolved Chloride (Cl-)	2021/08/04	NC		%	20
7497552	EMT	Matrix Spike [QFT156-01]	Dissolved Sulphate (SO4)	2021/08/04		95	%	80 - 120
7497552	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/08/04		100	%	80 - 120
7497552	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/08/04	ND, RDL=2.0		mg/L	
7497552	EMT	RPD [QFT156-01]	Dissolved Sulphate (SO4)	2021/08/04	13		%	20
7497555	EMT	Matrix Spike [QFT156-01]	Reactive Silica (SiO2)	2021/08/04		95	%	80 - 120
7497555	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/08/04		104	%	80 - 120
7497555	EMT	Method Blank	Reactive Silica (SiO2)	2021/08/04	ND, RDL=0.50		mg/L	
7497555	EMT	RPD [QFT156-01]	Reactive Silica (SiO2)	2021/08/04	1.6		%	20
7497557	EMT	Spiked Blank	Colour	2021/08/04		97	%	80 - 120
7497557	EMT	Method Blank	Colour	2021/08/04	ND, RDL=5.0		TCU	
7497557	EMT	RPD [QFT156-01]	Colour	2021/08/04	1.7		%	20
7497558	EMT	Matrix Spike [QFT156-01]	Orthophosphate (P)	2021/08/04		90	%	80 - 120
7497558	EMT	Spiked Blank	Orthophosphate (P)	2021/08/04		93	%	80 - 120
7497558	EMT	Method Blank	Orthophosphate (P)	2021/08/04	ND, RDL=0.010		mg/L	
7497558	EMT	RPD [QFT156-01]	Orthophosphate (P)	2021/08/04	NC		%	20
7497563	EMT	Matrix Spike [QFT156-01]	Nitrate + Nitrite (N)	2021/08/04		91	%	80 - 120
7497563	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/08/04		95	%	80 - 120
7497563	EMT	Method Blank	Nitrate + Nitrite (N)	2021/08/04	ND, RDL=0.050		mg/L	
7497563	EMT	RPD [QFT156-01]	Nitrate + Nitrite (N)	2021/08/04	NC		%	20
7497566	EMT	Matrix Spike [QFT156-01]	Nitrite (N)	2021/08/04		90	%	80 - 120
7497566	EMT	Spiked Blank	Nitrite (N)	2021/08/04		99	%	80 - 120
7497566	EMT	Method Blank	Nitrite (N)	2021/08/04	ND, RDL=0.010		mg/L	
7497566	EMT	RPD [QFT156-01]	Nitrite (N)	2021/08/04	NC		%	20
7497574	EMT	Matrix Spike	Total Alkalinity (Total as CaCO3)	2021/08/04		NC	%	80 - 120
7497574	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/08/04		106	%	80 - 120
7497574	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/08/04	ND, RDL=5.0		mg/L	
7497574	EMT	RPD	Total Alkalinity (Total as CaCO3)	2021/08/04	2.1		%	20
7497578	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2021/08/04		98	%	80 - 120
7497578	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/08/04		102	%	80 - 120
7497578	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/08/04	ND, RDL=1.0		mg/L	
7497578	EMT	RPD	Dissolved Chloride (Cl-)	2021/08/04	0.93		%	20
7497581	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2021/08/04		96	%	80 - 120
7497581	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/08/04		99	%	80 - 120
7497581	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/08/04	ND, RDL=2.0		mg/L	
7497581	EMT	RPD	Dissolved Sulphate (SO4)	2021/08/04	19		%	20
7497586	EMT	Matrix Spike	Reactive Silica (SiO2)	2021/08/04		NC	%	80 - 120
7497586	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/08/04		99	%	80 - 120
7497586	EMT	Method Blank	Reactive Silica (SiO2)	2021/08/04	ND, RDL=0.50		mg/L	
7497586	EMT	RPD	Reactive Silica (SiO2)	2021/08/04	3.9		%	20
7497592	EMT	Spiked Blank	Colour	2021/08/04		100	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7497592	EMT	Method Blank	Colour	2021/08/04	ND, RDL=5.0		TCU	
7497592	EMT	RPD	Colour	2021/08/04	6.3		%	20
7497594	EMT	Matrix Spike	Orthophosphate (P)	2021/08/04		92	%	80 - 120
7497594	EMT	Spiked Blank	Orthophosphate (P)	2021/08/04		94	%	80 - 120
7497594	EMT	Method Blank	Orthophosphate (P)	2021/08/04	ND, RDL=0.010		mg/L	
7497594	EMT	RPD	Orthophosphate (P)	2021/08/04	NC		%	20
7497598	EMT	Matrix Spike	Nitrate + Nitrite (N)	2021/08/04		91	%	80 - 120
7497598	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/08/04		92	%	80 - 120
7497598	EMT	Method Blank	Nitrate + Nitrite (N)	2021/08/04	ND, RDL=0.050		mg/L	
7497598	EMT	RPD	Nitrate + Nitrite (N)	2021/08/04	NC		%	20
7497601	EMT	Matrix Spike	Nitrite (N)	2021/08/04		91	%	80 - 120
7497601	EMT	Spiked Blank	Nitrite (N)	2021/08/04		93	%	80 - 120
7497601	EMT	Method Blank	Nitrite (N)	2021/08/04	ND, RDL=0.010		mg/L	
7497601	EMT	RPD	Nitrite (N)	2021/08/04	NC		%	20
7499045	NGI	Matrix Spike	Total Organic Carbon (C)	2021/08/04		100	%	85 - 115
7499045	NGI	Spiked Blank	Total Organic Carbon (C)	2021/08/04		102	%	80 - 120
7499045	NGI	Method Blank	Total Organic Carbon (C)	2021/08/04	ND, RDL=0.50		mg/L	
7499045	NGI	RPD	Total Organic Carbon (C)	2021/08/04	NC		%	15
7499060	SHW	Spiked Blank	Conductivity	2021/08/04		101	%	80 - 120
7499060	SHW	Method Blank	Conductivity	2021/08/04	ND, RDL=1.0		uS/cm	
7499060	SHW	RPD [QFT156-01]	Conductivity	2021/08/04	0.39		%	10
7499062	SHW	Spiked Blank	pH	2021/08/04		100	%	97 - 103
7499062	SHW	RPD [QFT156-01]	pH	2021/08/04	1.7		%	N/A
7499064	SHW	Spiked Blank	Conductivity	2021/08/04		101	%	80 - 120
7499064	SHW	Method Blank	Conductivity	2021/08/04	ND, RDL=1.0		uS/cm	
7499064	SHW	RPD	Conductivity	2021/08/04	0.48		%	10
7499065	SHW	Spiked Blank	pH	2021/08/04		100	%	97 - 103
7499065	SHW	RPD	pH	2021/08/04	2.5		%	N/A
7499221	SHW	QC Standard	Turbidity	2021/08/04		102	%	80 - 120
7499221	SHW	Spiked Blank	Turbidity	2021/08/04		104	%	80 - 120
7499221	SHW	Method Blank	Turbidity	2021/08/04	ND, RDL=0.10		NTU	
7499221	SHW	RPD	Turbidity	2021/08/04	10		%	20
7499264	EMT	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2021/08/04		99	%	80 - 120
7499264	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2021/08/04		106	%	80 - 120
7499264	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2021/08/04	ND, RDL=0.050		mg/L	
7499264	EMT	RPD	Nitrogen (Ammonia Nitrogen)	2021/08/04	NC		%	20
7499329	BAN	Matrix Spike	Acid Extractable Antimony (Sb)	2021/08/04		108	%	75 - 125
			Acid Extractable Arsenic (As)	2021/08/04		104	%	75 - 125
			Acid Extractable Barium (Ba)	2021/08/04		99	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/08/04		101	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/08/04		108	%	75 - 125
			Acid Extractable Boron (B)	2021/08/04		99	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/08/04		101	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/08/04		103	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/08/04		103	%	75 - 125
			Acid Extractable Copper (Cu)	2021/08/04		101	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Lead (Pb)	2021/08/04		101	%	75 - 125
			Acid Extractable Lithium (Li)	2021/08/04		106	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/08/04		95	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/08/04		102	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/08/04		111	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/08/04		103	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/08/04		107	%	75 - 125
			Acid Extractable Selenium (Se)	2021/08/04		105	%	75 - 125
			Acid Extractable Silver (Ag)	2021/08/04		103	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/08/04		105	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/08/04		108	%	75 - 125
			Acid Extractable Tin (Sn)	2021/08/04		106	%	75 - 125
			Acid Extractable Uranium (U)	2021/08/04		105	%	75 - 125
			Acid Extractable Vanadium (V)	2021/08/04		104	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/08/04		100	%	75 - 125
7499329	BAN	Spiked Blank	Acid Extractable Antimony (Sb)	2021/08/04		111	%	75 - 125
			Acid Extractable Arsenic (As)	2021/08/04		100	%	75 - 125
			Acid Extractable Barium (Ba)	2021/08/04		101	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/08/04		97	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/08/04		100	%	75 - 125
			Acid Extractable Boron (B)	2021/08/04		99	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/08/04		98	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/08/04		99	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/08/04		99	%	75 - 125
			Acid Extractable Copper (Cu)	2021/08/04		99	%	75 - 125
			Acid Extractable Lead (Pb)	2021/08/04		101	%	75 - 125
			Acid Extractable Lithium (Li)	2021/08/04		109	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/08/04		100	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/08/04		107	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/08/04		104	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/08/04		100	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/08/04		100	%	75 - 125
			Acid Extractable Selenium (Se)	2021/08/04		104	%	75 - 125
			Acid Extractable Silver (Ag)	2021/08/04		101	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/08/04		100	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/08/04		102	%	75 - 125
			Acid Extractable Tin (Sn)	2021/08/04		105	%	75 - 125
			Acid Extractable Uranium (U)	2021/08/04		104	%	75 - 125
			Acid Extractable Vanadium (V)	2021/08/04		99	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/08/04		100	%	75 - 125
7499329	BAN	Method Blank	Acid Extractable Aluminum (Al)	2021/08/04	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2021/08/04	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Bismuth (Bi)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2021/08/04	ND, RDL=50		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Cadmium (Cd)	2021/08/04	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2021/08/04	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2021/08/04	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2021/08/04	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2021/08/04	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2021/08/04	ND, RDL=0.50		mg/kg	
			Acid Extractable Silver (Ag)	2021/08/04	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2021/08/04	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2021/08/04	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2021/08/04	ND, RDL=1.0		mg/kg	
			Acid Extractable Uranium (U)	2021/08/04	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2021/08/04	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2021/08/04	ND, RDL=5.0		mg/kg	
7499329	BAN	RPD	Acid Extractable Aluminum (Al)	2021/08/05	6.0		%	35
			Acid Extractable Antimony (Sb)	2021/08/05	NC		%	35
			Acid Extractable Arsenic (As)	2021/08/05	NC		%	35
			Acid Extractable Barium (Ba)	2021/08/05	11		%	35
			Acid Extractable Beryllium (Be)	2021/08/05	NC		%	35
			Acid Extractable Bismuth (Bi)	2021/08/05	NC		%	35
			Acid Extractable Boron (B)	2021/08/05	NC		%	35
			Acid Extractable Cadmium (Cd)	2021/08/05	NC		%	35
			Acid Extractable Chromium (Cr)	2021/08/05	13		%	35
			Acid Extractable Cobalt (Co)	2021/08/05	NC		%	35
			Acid Extractable Copper (Cu)	2021/08/05	7.7		%	35
			Acid Extractable Iron (Fe)	2021/08/05	7.6		%	35
			Acid Extractable Lead (Pb)	2021/08/05	9.5		%	35
			Acid Extractable Lithium (Li)	2021/08/05	NC		%	35
			Acid Extractable Manganese (Mn)	2021/08/05	101 (1)		%	35
			Acid Extractable Mercury (Hg)	2021/08/05	17		%	35

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Molybdenum (Mo)	2021/08/05	NC		%	35
			Acid Extractable Nickel (Ni)	2021/08/05	5.7		%	35
			Acid Extractable Rubidium (Rb)	2021/08/05	NC		%	35
			Acid Extractable Selenium (Se)	2021/08/05	8.9		%	35
			Acid Extractable Silver (Ag)	2021/08/05	NC		%	35
			Acid Extractable Strontium (Sr)	2021/08/05	NC		%	35
			Acid Extractable Thallium (Tl)	2021/08/05	NC		%	35
			Acid Extractable Tin (Sn)	2021/08/05	3.5		%	35
			Acid Extractable Uranium (U)	2021/08/05	10		%	35
			Acid Extractable Vanadium (V)	2021/08/05	8.6		%	35
			Acid Extractable Zinc (Zn)	2021/08/05	8.5		%	35
7501850	SEP	QC Standard	Total Organic Carbon	2021/08/05		87	%	75 - 125
7501850	SEP	Method Blank	Total Organic Carbon	2021/08/05	ND, RDL=500		mg/kg	
7501850	SEP	RPD [QFT158-01]	Total Organic Carbon	2021/08/05	1.4		%	35
7508307	NGI	RPD	Gravel	2021/08/18	NC		%	35
			Sand	2021/08/18	3.9		%	35
			Silt	2021/08/18	4.5		%	35
			Clay	2021/08/18	2.8		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Poor RPD due to sample inhomogeneity verified by repeat digestion and analysis.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Eric Dearman, Scientific Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Gina Thompson, Inorganics General Chemistry Supervisor

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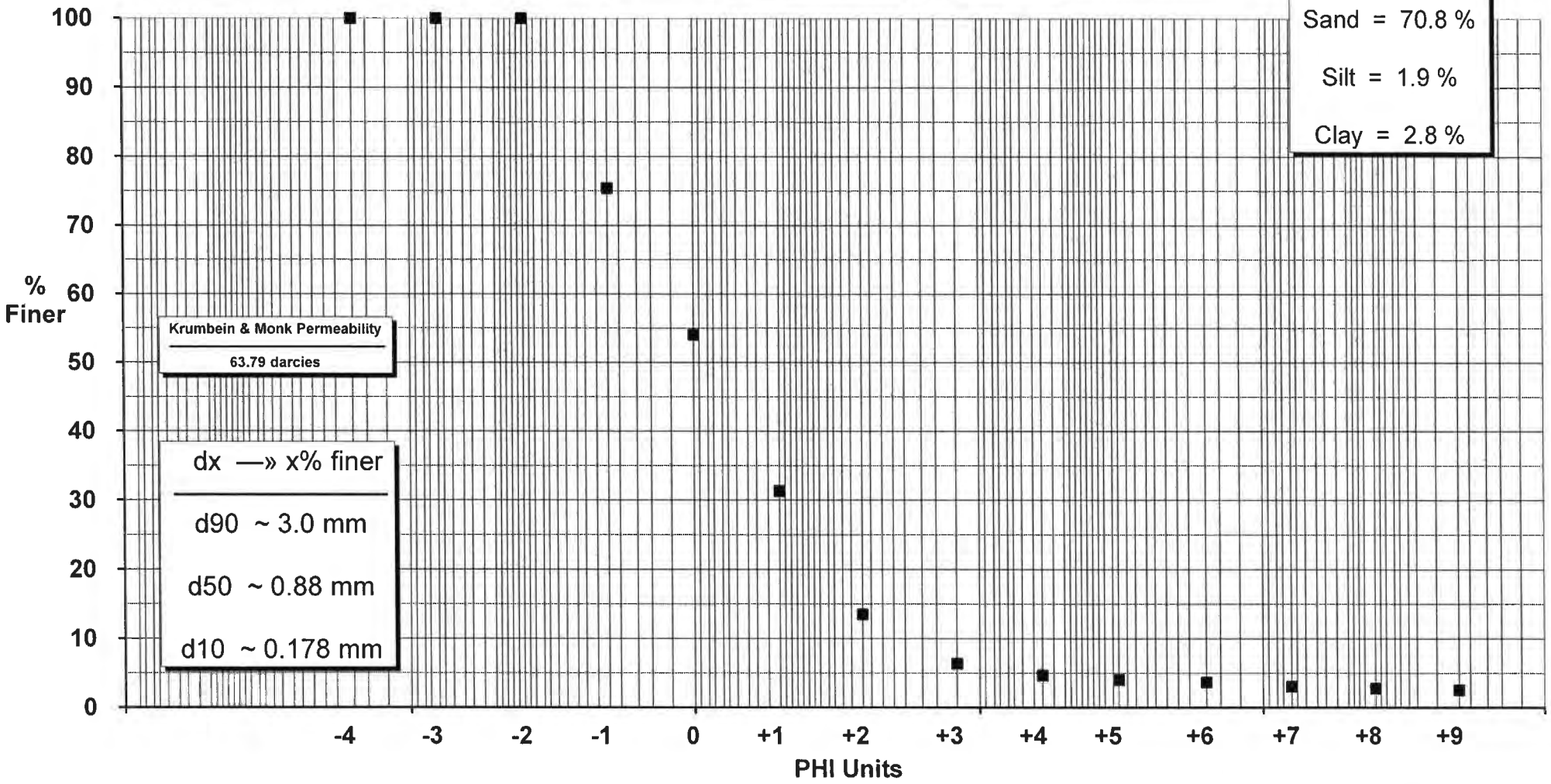
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BV Labs ID: QFT155-01

L-19 SED

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
—	—
94.9 %	95.5 %

Wentworth	
Gravel	24.6 %
Sand	70.8 %
Silt	1.9 %
Clay	2.8 %



Krumbein & Monk Permeability
63.79 darcies

dx —» x% finer
d90 ~ 3.0 mm
d50 ~ 0.88 mm
d10 ~ 0.178 mm

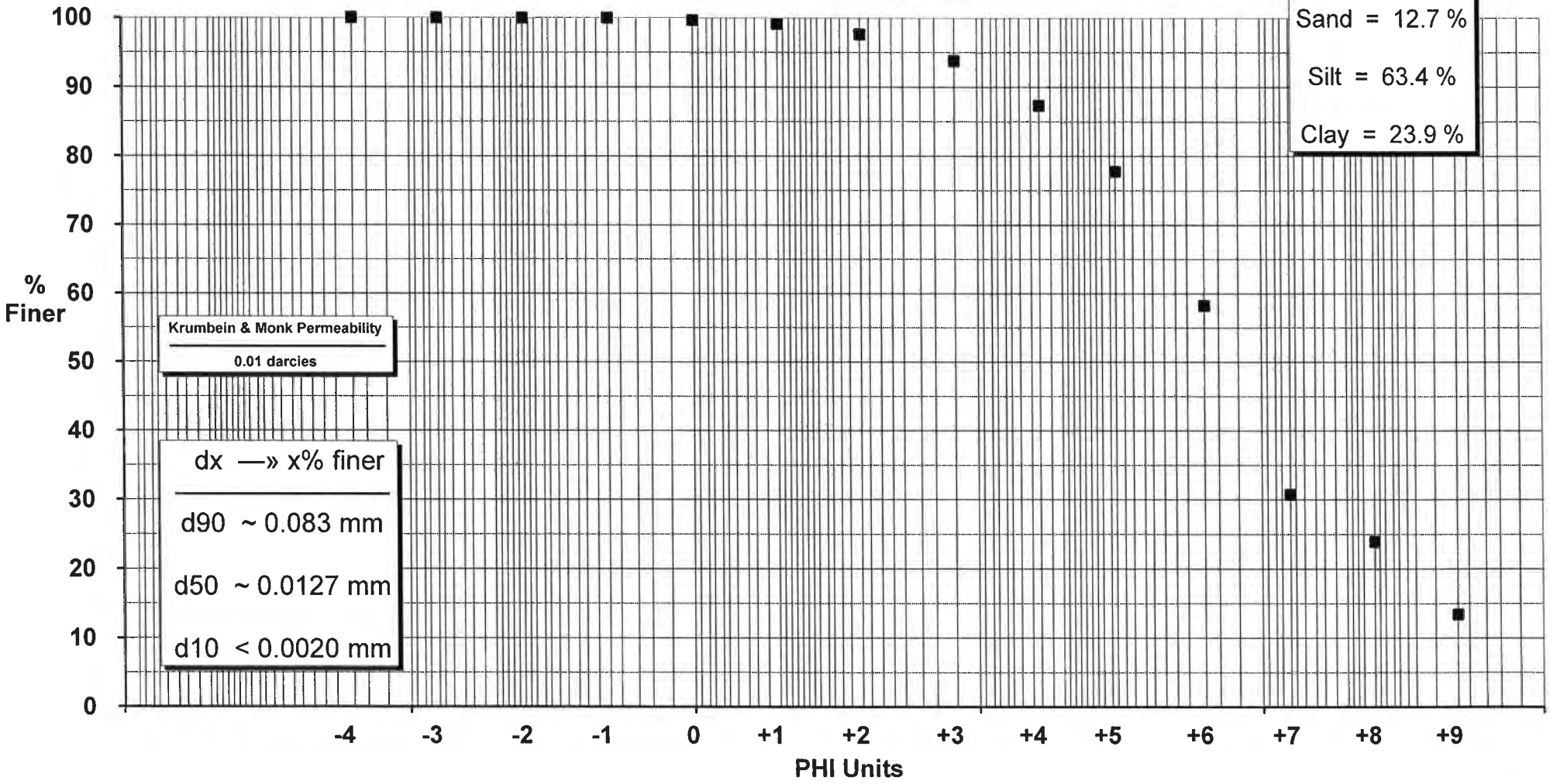
Approved

BV Labs ID: QFT158-01

L-10 SED

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
—	—
11.0 %	15.8 %

Wentworth	
Gravel	0.0 %
Sand	12.7 %
Silt	63.4 %
Clay	23.9 %



Krumbein & Monk Permeability
0.01 darcies

dx —» x% finer
d90 ~ 0.083 mm
d50 ~ 0.0127 mm
d10 < 0.0020 mm

Approved

Your Project #: 142-039
Your C.O.C. #: 384658

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/09/21
Report #: R6820214
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1L8408
Received: 2021/08/04, 12:32

Sample Matrix: Sediment
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals Solids Acid Extr. ICPMS	2	2021/08/10	2021/08/11	ATL SOP 00058	EPA 6020B R2 m
Particle size in solids (pipette&sieve) (1)	1	N/A	2021/09/15	ATL SOP 00012	MSAMS'78/WREP-125R3m
Particle size in solids (pipette&sieve) (1)	1	N/A	2021/09/21	ATL SOP 00012	MSAMS'78/WREP-125R3m
Total Organic Carbon in Soil	2	2021/08/10	2021/08/11	ATL SOP 00044	LECO203601224 1991 m

Sample Matrix: Surface Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate, Bicarbonate and Hydroxide	3	N/A	2021/08/09	N/A	SM 23 4500-CO2 D
Alkalinity	3	N/A	2021/08/09	ATL SOP 00013	EPA 310.2 R1974 m
Chloride	3	N/A	2021/08/10	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	3	N/A	2021/08/09	ATL SOP 00020	SM 23 2120C m
Conductance - water	3	N/A	2021/08/06	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	3	N/A	2021/08/06	ATL SOP 00048	Auto Calc
Metals Water Total MS	3	2021/08/05	2021/08/06	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	3	N/A	2021/08/10	N/A	Auto Calc.
Anion and Cation Sum	3	N/A	2021/08/10	N/A	Auto Calc.
Nitrogen Ammonia - water	1	N/A	2021/08/10	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen Ammonia - water	2	N/A	2021/08/09	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	3	N/A	2021/08/09	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	3	N/A	2021/08/10	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	3	N/A	2021/08/10	ATL SOP 00018	ASTM D3867-16
pH (3)	3	N/A	2021/08/06	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	3	N/A	2021/08/09	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	3	N/A	2021/08/10	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	3	N/A	2021/08/10	ATL SOP 00049	Auto Calc.
Reactive Silica	3	N/A	2021/08/09	ATL SOP 00022	EPA 366.0 m
Sulphate	3	N/A	2021/08/10	ATL SOP 00023	ASTM D516-16 m
Chlorophyll A (Sub from Bedford) (2)	2	2021/08/06	2021/08/06		

Your Project #: 142-039
Your C.O.C. #: 384658

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
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Report Date: 2021/09/21
Report #: R6820214
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1L8408
Received: 2021/08/04, 12:32

Sample Matrix: Surface Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Dissolved Solids (TDS calc)	3	N/A	2021/08/10	N/A	Auto Calc.
Organic carbon - Total (TOC) (4)	3	N/A	2021/08/06	ATL SOP 00203	SM 23 5310B m
Turbidity	3	N/A	2021/08/06	ATL SOP 00011	EPA 180.1 R2 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
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Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Note: Graphical representation of larger fractions (PHI-4, PHI -3 and PHI -2) not applicable unless these optional parameters are specifically requested.
(2) This test was performed by Dalhousie University, 1355 Oxford Street Dept of Oceanography Rm 2605, Halifax, NS, B3H 4R2
(3) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(4) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

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Your Project #: 142-039
Your C.O.C. #: 384658

Attention: Kathryn Dawe

SEM Ltd.
79 Mew's Place
Second Floor
St. John's, NL
CANADA A1B 4N2

Report Date: 2021/09/21
Report #: R6820214
Version: 3 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1L8408
Received: 2021/08/04, 12:32

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Maryann Comeau, Customer Experience Supervisor/PM
Email: Maryann.COMEAU@bureauveritas.com
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BV Labs Job #: C1L8408
Report Date: 2021/09/21

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SEDIMENT

BV Labs ID		QGY724		QGY727		
Sampling Date		2021/07/28 13:30		2021/07/28 12:38		
COC Number		384658		384658		
Sample #		SEDIMENT L16		SEDIMENT L17		
	UNITS	Sediment L16	RDL	Sediment L17	RDL	QC Batch
Inorganics						
Organic Carbon (TOC)	g/kg	430	2.5	330	1.3	7510050
< -1 Phi (2 mm)	%	92 (1)	0.10	100	0.10	7531866
< 0 Phi (1 mm)	%	85 (1)	0.10	100	0.10	7531866
< +1 Phi (0.5 mm)	%	77 (1)	0.10	98	0.10	7531866
< +2 Phi (0.25 mm)	%	71 (1)	0.10	97	0.10	7531866
< +3 Phi (0.12 mm)	%	66	0.10	96	0.10	7531866
< +4 Phi (0.062 mm)	%	64	0.10	95	0.10	7531866
< +5 Phi (0.031 mm)	%	64	0.10	94	0.10	7531866
< +6 Phi (0.016 mm)	%	67	0.10	92	0.10	7531866
< +7 Phi (0.0078 mm)	%	62	0.10	75	0.10	7531866
< +8 Phi (0.0039 mm)	%	64	0.10	73	0.10	7531866
< +9 Phi (0.0020 mm)	%	62	0.10	67	0.10	7531866
Gravel	%	7.8	0.10	ND	0.10	7531866
Sand	%	29	0.10	5.3	0.10	7531866
Silt	%	ND	0.10	22	0.10	7531866
Clay	%	64	0.10	73	0.10	7531866

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

(1) PSA sample observation comment: Fraction contained organic matter

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ELEMENTS BY ATOMIC SPECTROSCOPY (SEDIMENT)

BV Labs ID		QGY724	QGY727		
Sampling Date		2021/07/28 13:30	2021/07/28 12:38		
COC Number		384658	384658		
Sample #		SEDIMENT L16	SEDIMENT L17		
	UNITS	Sediment L16	Sediment L17	RDL	QC Batch
Metals					
Acid Extractable Aluminum (Al)	mg/kg	730	1700	10	7510064
Acid Extractable Antimony (Sb)	mg/kg	ND	ND	2.0	7510064
Acid Extractable Arsenic (As)	mg/kg	ND	ND	2.0	7510064
Acid Extractable Barium (Ba)	mg/kg	52	74	5.0	7510064
Acid Extractable Beryllium (Be)	mg/kg	ND	ND	2.0	7510064
Acid Extractable Bismuth (Bi)	mg/kg	ND	ND	2.0	7510064
Acid Extractable Boron (B)	mg/kg	ND	ND	50	7510064
Acid Extractable Cadmium (Cd)	mg/kg	ND	ND	0.30	7510064
Acid Extractable Chromium (Cr)	mg/kg	3.0	8.1	2.0	7510064
Acid Extractable Cobalt (Co)	mg/kg	ND	2.4	1.0	7510064
Acid Extractable Copper (Cu)	mg/kg	10	9.9	2.0	7510064
Acid Extractable Iron (Fe)	mg/kg	8200	15000	50	7510064
Acid Extractable Lead (Pb)	mg/kg	1.1	8.7	0.50	7510064
Acid Extractable Lithium (Li)	mg/kg	ND	ND	2.0	7510064
Acid Extractable Manganese (Mn)	mg/kg	390	290	2.0	7510064
Acid Extractable Mercury (Hg)	mg/kg	ND	ND	0.10	7510064
Acid Extractable Molybdenum (Mo)	mg/kg	64	9.0	2.0	7510064
Acid Extractable Nickel (Ni)	mg/kg	11	18	2.0	7510064
Acid Extractable Rubidium (Rb)	mg/kg	ND	ND	2.0	7510064
Acid Extractable Selenium (Se)	mg/kg	1.3	2.5	0.50	7510064
Acid Extractable Silver (Ag)	mg/kg	ND	ND	0.50	7510064
Acid Extractable Strontium (Sr)	mg/kg	18	17	5.0	7510064
Acid Extractable Thallium (Tl)	mg/kg	ND	ND	0.10	7510064
Acid Extractable Tin (Sn)	mg/kg	1.8	1.1	1.0	7510064
Acid Extractable Uranium (U)	mg/kg	2.0	3.2	0.10	7510064
Acid Extractable Vanadium (V)	mg/kg	ND	5.5	2.0	7510064
Acid Extractable Zinc (Zn)	mg/kg	28	31	5.0	7510064

RDL = Reportable Detection Limit
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ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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BV Labs Job #: C1L8408
Report Date: 2021/09/21

SEM Ltd.
Client Project #: 142-039

RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QGY723	QGY725			QGY725		
Sampling Date		2021/07/28 13:30	2021/07/28 12:38			2021/07/28 12:38		
COC Number		384658	384658			384658		
Sample #		L16	L17			L17		
	UNITS	**L16**	**L17**	**RDL**	**QC Batch**	**L17 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters								
Anion Sum	me/L	0.970	0.990	N/A	7499110			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	42	36	1.0	7499107			
Calculated TDS	mg/L	51	49	1.0	7499115			
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	1.0	7499107			
Cation Sum	me/L	0.860	0.720	N/A	7499110			
Hardness (CaCO3)	mg/L	40	33	1.0	7499108			
Ion Balance (% Difference)	%	6.01	15.8	N/A	7499109			
Langelier Index (@ 20C)	N/A	-1.06	-1.41		7499113			
Langelier Index (@ 4C)	N/A	-1.32	-1.66		7499114			
Nitrate (N)	mg/L	ND	ND	0.050	7499731			
Saturation pH (@ 20C)	N/A	8.71	8.86		7499113			
Saturation pH (@ 4C)	N/A	8.96	9.12		7499114			
Inorganics								
Total Alkalinity (Total as CaCO3)	mg/L	43	36	5.0	7505025			
Dissolved Chloride (Cl-)	mg/L	1.5	6.9	1.0	7505026			
Colour	TCU	26	36	5.0	7505031			
Nitrate + Nitrite (N)	mg/L	ND	ND	0.050	7505035			
Nitrite (N)	mg/L	ND	ND	0.010	7505037			
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.050	7507879			
Total Organic Carbon (C)	mg/L	4.5	4.7	0.50	7504317			
Orthophosphate (P)	mg/L	ND	ND	0.010	7505033			
pH	pH	7.65	7.45		7504290	7.48		7504290
Reactive Silica (SiO2)	mg/L	4.5	3.6	0.50	7505030			
Dissolved Sulphate (SO4)	mg/L	3.8	3.6	2.0	7505029			
Turbidity	NTU	0.88	0.94	0.10	7504525			
Conductivity	uS/cm	81	67	1.0	7504287	67	1.0	7504287
Subcontracted Analysis								
Subcontract Parameter	N/A	ATTACHED	ATTACHED	N/A	7504307			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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RESULTS OF ANALYSES OF SURFACE WATER

BV Labs ID		QGY726			QGY726		
Sampling Date		2021/07/29 12:45			2021/07/29 12:45		
COC Number		384658			384658		
Sample #		S5			S5		
	UNITS	S5	RDL	QC Batch	S5 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L	0.600	N/A	7499110			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	24	1.0	7499107			
Calculated TDS	mg/L	32	1.0	7499115			
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	7499107			
Cation Sum	me/L	0.550	N/A	7499110			
Hardness (CaCO3)	mg/L	24	1.0	7499108			
Ion Balance (% Difference)	%	4.35	N/A	7499109			
Langelier Index (@ 20C)	N/A	-1.85		7499113			
Langelier Index (@ 4C)	N/A	-2.11		7499114			
Nitrate (N)	mg/L	ND	0.050	7499731			
Saturation pH (@ 20C)	N/A	9.17		7499113			
Saturation pH (@ 4C)	N/A	9.42		7499114			
Inorganics							
Total Alkalinity (Total as CaCO3)	mg/L	24	5.0	7505025			
Dissolved Chloride (Cl-)	mg/L	1.3	1.0	7505026			
Colour	TCU	21	5.0	7505031			
Nitrate + Nitrite (N)	mg/L	ND	0.050	7505035			
Nitrite (N)	mg/L	ND	0.010	7505037			
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	7507879	ND	0.050	7507879
Total Organic Carbon (C)	mg/L	5.6	0.50	7504317			
Orthophosphate (P)	mg/L	ND	0.010	7505033			
pH	pH	7.32		7504290			
Reactive Silica (SiO2)	mg/L	1.8	0.50	7505030			
Dissolved Sulphate (SO4)	mg/L	4.4	2.0	7505029			
Turbidity	NTU	3.7	0.10	7504525			
Conductivity	uS/cm	49	1.0	7504287			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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ELEMENTS BY ICP/MS (SURFACE WATER)

BV Labs ID		QGY723	QGY725	QGY726		
Sampling Date		2021/07/28 13:30	2021/07/28 12:38	2021/07/29 12:45		
COC Number		384658	384658	384658		
Sample #		L16	L17	S5		
	UNITS	**L16**	**L17**	**S5**	**RDL**	**QC Batch**
Metals						
Total Aluminum (Al)	ug/L	8.9	11	8.9	5.0	7501552
Total Antimony (Sb)	ug/L	ND	ND	ND	1.0	7501552
Total Arsenic (As)	ug/L	ND	ND	ND	1.0	7501552
Total Barium (Ba)	ug/L	20	11	4.2	1.0	7501552
Total Beryllium (Be)	ug/L	ND	ND	ND	1.0	7501552
Total Bismuth (Bi)	ug/L	ND	ND	ND	2.0	7501552
Total Boron (B)	ug/L	ND	ND	ND	50	7501552
Total Cadmium (Cd)	ug/L	ND	0.011	0.011	0.010	7501552
Total Calcium (Ca)	ug/L	9400	7700	5600	100	7501552
Total Chromium (Cr)	ug/L	ND	ND	ND	1.0	7501552
Total Cobalt (Co)	ug/L	ND	ND	ND	0.40	7501552
Total Copper (Cu)	ug/L	0.55	ND	ND	0.50	7501552
Total Iron (Fe)	ug/L	270	300	1000	50	7501552
Total Lead (Pb)	ug/L	ND	ND	ND	0.50	7501552
Total Magnesium (Mg)	ug/L	3900	3300	2500	100	7501552
Total Manganese (Mn)	ug/L	48	26	35	2.0	7501552
Total Molybdenum (Mo)	ug/L	ND	ND	ND	2.0	7501552
Total Nickel (Ni)	ug/L	ND	ND	ND	2.0	7501552
Total Phosphorus (P)	ug/L	ND	ND	ND	100	7501552
Total Potassium (K)	ug/L	1200	960	720	100	7501552
Total Selenium (Se)	ug/L	ND	ND	ND	0.50	7501552
Total Silver (Ag)	ug/L	ND	ND	ND	0.10	7501552
Total Sodium (Na)	ug/L	600	560	400	100	7501552
Total Strontium (Sr)	ug/L	15	11	7.4	2.0	7501552
Total Thallium (Tl)	ug/L	ND	ND	ND	0.10	7501552
Total Tin (Sn)	ug/L	ND	ND	ND	2.0	7501552
Total Titanium (Ti)	ug/L	ND	ND	ND	2.0	7501552
Total Uranium (U)	ug/L	ND	ND	ND	0.10	7501552
Total Vanadium (V)	ug/L	ND	ND	ND	2.0	7501552
Total Zinc (Zn)	ug/L	ND	ND	ND	5.0	7501552

RDL = Reportable Detection Limit
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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.7°C

Sample QGY723 [L16] : RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample QGY725 [L17] : Ion balance acceptable. Low ionic strength sample.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7501552	MLB	Matrix Spike	Total Aluminum (Al)	2021/08/05		102	%	80 - 120
			Total Antimony (Sb)	2021/08/05		104	%	80 - 120
			Total Arsenic (As)	2021/08/05		96	%	80 - 120
			Total Barium (Ba)	2021/08/05		103	%	80 - 120
			Total Beryllium (Be)	2021/08/05		97	%	80 - 120
			Total Bismuth (Bi)	2021/08/05		102	%	80 - 120
			Total Boron (B)	2021/08/05		95	%	80 - 120
			Total Cadmium (Cd)	2021/08/05		98	%	80 - 120
			Total Calcium (Ca)	2021/08/05		101	%	80 - 120
			Total Chromium (Cr)	2021/08/05		96	%	80 - 120
			Total Cobalt (Co)	2021/08/05		97	%	80 - 120
			Total Copper (Cu)	2021/08/05		99	%	80 - 120
			Total Iron (Fe)	2021/08/05		100	%	80 - 120
			Total Lead (Pb)	2021/08/05		103	%	80 - 120
			Total Magnesium (Mg)	2021/08/05		104	%	80 - 120
			Total Manganese (Mn)	2021/08/05		NC	%	80 - 120
			Total Molybdenum (Mo)	2021/08/05		102	%	80 - 120
			Total Nickel (Ni)	2021/08/05		99	%	80 - 120
			Total Phosphorus (P)	2021/08/05		102	%	80 - 120
			Total Potassium (K)	2021/08/05		103	%	80 - 120
			Total Selenium (Se)	2021/08/05		98	%	80 - 120
			Total Silver (Ag)	2021/08/05		98	%	80 - 120
			Total Sodium (Na)	2021/08/05		97	%	80 - 120
			Total Strontium (Sr)	2021/08/05		99	%	80 - 120
			Total Thallium (Tl)	2021/08/05		101	%	80 - 120
			Total Tin (Sn)	2021/08/05		101	%	80 - 120
			Total Titanium (Ti)	2021/08/05		97	%	80 - 120
			Total Uranium (U)	2021/08/05		108	%	80 - 120
			Total Vanadium (V)	2021/08/05		98	%	80 - 120
			Total Zinc (Zn)	2021/08/05		98	%	80 - 120
7501552	MLB	Spiked Blank	Total Aluminum (Al)	2021/08/05		101	%	80 - 120
			Total Antimony (Sb)	2021/08/05		103	%	80 - 120
			Total Arsenic (As)	2021/08/05		94	%	80 - 120
			Total Barium (Ba)	2021/08/05		99	%	80 - 120
			Total Beryllium (Be)	2021/08/05		95	%	80 - 120
			Total Bismuth (Bi)	2021/08/05		102	%	80 - 120
			Total Boron (B)	2021/08/05		93	%	80 - 120
			Total Cadmium (Cd)	2021/08/05		95	%	80 - 120
			Total Calcium (Ca)	2021/08/05		100	%	80 - 120
			Total Chromium (Cr)	2021/08/05		96	%	80 - 120
			Total Cobalt (Co)	2021/08/05		96	%	80 - 120
			Total Copper (Cu)	2021/08/05		97	%	80 - 120
			Total Iron (Fe)	2021/08/05		97	%	80 - 120
			Total Lead (Pb)	2021/08/05		101	%	80 - 120
			Total Magnesium (Mg)	2021/08/05		99	%	80 - 120
			Total Manganese (Mn)	2021/08/05		100	%	80 - 120
			Total Molybdenum (Mo)	2021/08/05		102	%	80 - 120
			Total Nickel (Ni)	2021/08/05		97	%	80 - 120
			Total Phosphorus (P)	2021/08/05		100	%	80 - 120
			Total Potassium (K)	2021/08/05		102	%	80 - 120
			Total Selenium (Se)	2021/08/05		97	%	80 - 120
			Total Silver (Ag)	2021/08/05		96	%	80 - 120
			Total Sodium (Na)	2021/08/05		98	%	80 - 120
			Total Strontium (Sr)	2021/08/05		97	%	80 - 120
			Total Thallium (Tl)	2021/08/05		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2021/08/05		101	%	80 - 120
			Total Titanium (Ti)	2021/08/05		97	%	80 - 120
			Total Uranium (U)	2021/08/05		107	%	80 - 120
			Total Vanadium (V)	2021/08/05		98	%	80 - 120
			Total Zinc (Zn)	2021/08/05		97	%	80 - 120
7501552	MLB	Method Blank	Total Aluminum (Al)	2021/08/06	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2021/08/06	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2021/08/06	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2021/08/06	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2021/08/06	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Boron (B)	2021/08/06	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2021/08/06	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2021/08/06	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2021/08/06	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2021/08/06	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2021/08/06	ND, RDL=0.50		ug/L	
			Total Iron (Fe)	2021/08/06	ND, RDL=50		ug/L	
			Total Lead (Pb)	2021/08/06	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2021/08/06	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2021/08/06	ND, RDL=100		ug/L	
			Total Potassium (K)	2021/08/06	ND, RDL=100		ug/L	
			Total Selenium (Se)	2021/08/06	ND, RDL=0.50		ug/L	
			Total Silver (Ag)	2021/08/06	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2021/08/06	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2021/08/06	ND, RDL=0.10		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2021/08/06	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2021/08/06	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2021/08/06	ND, RDL=5.0		ug/L	
7501552	MLB	RPD	Total Aluminum (Al)	2021/08/05	2.0		%	20
			Total Antimony (Sb)	2021/08/05	NC		%	20
			Total Arsenic (As)	2021/08/05	NC		%	20
			Total Barium (Ba)	2021/08/05	0.12		%	20
			Total Beryllium (Be)	2021/08/05	NC		%	20
			Total Bismuth (Bi)	2021/08/05	NC		%	20
			Total Boron (B)	2021/08/05	NC		%	20
			Total Cadmium (Cd)	2021/08/05	12		%	20
			Total Calcium (Ca)	2021/08/05	2.7		%	20
			Total Chromium (Cr)	2021/08/05	NC		%	20
			Total Cobalt (Co)	2021/08/05	NC		%	20
			Total Copper (Cu)	2021/08/05	2.2		%	20
			Total Iron (Fe)	2021/08/05	1.7		%	20
			Total Lead (Pb)	2021/08/05	0.45		%	20
			Total Magnesium (Mg)	2021/08/05	0.72		%	20
			Total Manganese (Mn)	2021/08/05	NC		%	20
			Total Molybdenum (Mo)	2021/08/05	NC		%	20
			Total Nickel (Ni)	2021/08/05	1.6		%	20
			Total Phosphorus (P)	2021/08/05	NC		%	20
			Total Potassium (K)	2021/08/05	1.2		%	20
			Total Selenium (Se)	2021/08/05	NC		%	20
			Total Silver (Ag)	2021/08/05	NC		%	20
			Total Sodium (Na)	2021/08/05	0.25		%	20
			Total Strontium (Sr)	2021/08/05	0.99		%	20
			Total Thallium (Tl)	2021/08/05	NC		%	20
			Total Tin (Sn)	2021/08/05	NC		%	20
			Total Titanium (Ti)	2021/08/05	NC		%	20
			Total Uranium (U)	2021/08/05	15		%	20
			Total Vanadium (V)	2021/08/05	NC		%	20
			Total Zinc (Zn)	2021/08/05	1.9		%	20
7504287	SHW	Spiked Blank	Conductivity	2021/08/06		98	%	80 - 120
7504287	SHW	Method Blank	Conductivity	2021/08/06	ND, RDL=1.0		uS/cm	
7504287	SHW	RPD [QGY725-01]	Conductivity	2021/08/06	0.58		%	10
7504290	SHW	Spiked Blank	pH	2021/08/06		100	%	97 - 103
7504290	SHW	RPD [QGY725-01]	pH	2021/08/06	0.36		%	N/A
7504317	NGI	Matrix Spike	Total Organic Carbon (C)	2021/08/06		96	%	85 - 115
7504317	NGI	Spiked Blank	Total Organic Carbon (C)	2021/08/06		100	%	80 - 120
7504317	NGI	Method Blank	Total Organic Carbon (C)	2021/08/06	ND, RDL=0.50		mg/L	
7504317	NGI	RPD	Total Organic Carbon (C)	2021/08/06	NC		%	15
7504525	SHW	QC Standard	Turbidity	2021/08/06		104	%	80 - 120
7504525	SHW	Spiked Blank	Turbidity	2021/08/06		105	%	80 - 120
7504525	SHW	Method Blank	Turbidity	2021/08/06	ND, RDL=0.10		NTU	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7504525	SHW	RPD	Turbidity	2021/08/06	5.9		%	20
7505025	EMT	Matrix Spike	Total Alkalinity (Total as CaCO3)	2021/08/10		NC	%	80 - 120
7505025	EMT	Spiked Blank	Total Alkalinity (Total as CaCO3)	2021/08/09		109	%	80 - 120
7505025	EMT	Method Blank	Total Alkalinity (Total as CaCO3)	2021/08/09	ND, RDL=5.0		mg/L	
7505025	EMT	RPD	Total Alkalinity (Total as CaCO3)	2021/08/10	3.4		%	20
7505026	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2021/08/09		101	%	80 - 120
7505026	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2021/08/09		99	%	80 - 120
7505026	EMT	Method Blank	Dissolved Chloride (Cl-)	2021/08/09	ND, RDL=1.0		mg/L	
7505026	EMT	RPD	Dissolved Chloride (Cl-)	2021/08/09	3.1		%	20
7505029	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2021/08/10		NC	%	80 - 120
7505029	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2021/08/09		101	%	80 - 120
7505029	EMT	Method Blank	Dissolved Sulphate (SO4)	2021/08/09	ND, RDL=2.0		mg/L	
7505029	EMT	RPD	Dissolved Sulphate (SO4)	2021/08/10	1.1		%	20
7505030	EMT	Matrix Spike	Reactive Silica (SiO2)	2021/08/09		90	%	80 - 120
7505030	EMT	Spiked Blank	Reactive Silica (SiO2)	2021/08/09		96	%	80 - 120
7505030	EMT	Method Blank	Reactive Silica (SiO2)	2021/08/09	ND, RDL=0.50		mg/L	
7505030	EMT	RPD	Reactive Silica (SiO2)	2021/08/09	0.51		%	20
7505031	EMT	Spiked Blank	Colour	2021/08/09		98	%	80 - 120
7505031	EMT	Method Blank	Colour	2021/08/09	ND, RDL=5.0		TCU	
7505031	EMT	RPD	Colour	2021/08/09	NC		%	20
7505033	EMT	Matrix Spike	Orthophosphate (P)	2021/08/09		95	%	80 - 120
7505033	EMT	Spiked Blank	Orthophosphate (P)	2021/08/09		100	%	80 - 120
7505033	EMT	Method Blank	Orthophosphate (P)	2021/08/09	ND, RDL=0.010		mg/L	
7505033	EMT	RPD	Orthophosphate (P)	2021/08/09	NC		%	20
7505035	EMT	Matrix Spike	Nitrate + Nitrite (N)	2021/08/09		95	%	80 - 120
7505035	EMT	Spiked Blank	Nitrate + Nitrite (N)	2021/08/09		91	%	80 - 120
7505035	EMT	Method Blank	Nitrate + Nitrite (N)	2021/08/09	ND, RDL=0.050		mg/L	
7505035	EMT	RPD	Nitrate + Nitrite (N)	2021/08/09	NC		%	20
7505037	EMT	Matrix Spike	Nitrite (N)	2021/08/10		97	%	80 - 120
7505037	EMT	Spiked Blank	Nitrite (N)	2021/08/10		98	%	80 - 120
7505037	EMT	Method Blank	Nitrite (N)	2021/08/10	ND, RDL=0.010		mg/L	
7505037	EMT	RPD	Nitrite (N)	2021/08/10	NC		%	20
7507879	EMT	Matrix Spike [QGY726-03]	Nitrogen (Ammonia Nitrogen)	2021/08/10		100	%	80 - 120
7507879	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2021/08/09		104	%	80 - 120
7507879	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2021/08/10	ND, RDL=0.050		mg/L	
7507879	EMT	RPD [QGY726-03]	Nitrogen (Ammonia Nitrogen)	2021/08/10	NC		%	20
7510050	BBD	QC Standard	Organic Carbon (TOC)	2021/08/11		101	%	75 - 125
7510050	BBD	Method Blank	Organic Carbon (TOC)	2021/08/11	ND, RDL=0.50		g/kg	
7510050	BBD	RPD	Organic Carbon (TOC)	2021/08/11	1.7		%	35
7510064	MLB	Matrix Spike	Acid Extractable Antimony (Sb)	2021/08/10		NC	%	75 - 125
			Acid Extractable Arsenic (As)	2021/08/10		NC	%	75 - 125
			Acid Extractable Barium (Ba)	2021/08/10		107	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/08/10		102	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/08/10		NC	%	75 - 125
			Acid Extractable Boron (B)	2021/08/10		96	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Cadmium (Cd)	2021/08/10		104	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/08/10		109	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/08/10		101	%	75 - 125
			Acid Extractable Copper (Cu)	2021/08/10		NC	%	75 - 125
			Acid Extractable Lead (Pb)	2021/08/10		NC	%	75 - 125
			Acid Extractable Lithium (Li)	2021/08/10		111	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/08/10		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/08/10		99	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/08/10		NC	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/08/10		104	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/08/10		98	%	75 - 125
			Acid Extractable Selenium (Se)	2021/08/10		104	%	75 - 125
			Acid Extractable Silver (Ag)	2021/08/10		89	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/08/10		106	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/08/10		96	%	75 - 125
			Acid Extractable Tin (Sn)	2021/08/10		102	%	75 - 125
			Acid Extractable Uranium (U)	2021/08/10		100	%	75 - 125
			Acid Extractable Vanadium (V)	2021/08/10		109	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/08/10		NC	%	75 - 125
7510064	MLB	Spiked Blank	Acid Extractable Antimony (Sb)	2021/08/10		109	%	75 - 125
			Acid Extractable Arsenic (As)	2021/08/10		104	%	75 - 125
			Acid Extractable Barium (Ba)	2021/08/10		100	%	75 - 125
			Acid Extractable Beryllium (Be)	2021/08/10		99	%	75 - 125
			Acid Extractable Bismuth (Bi)	2021/08/10		99	%	75 - 125
			Acid Extractable Boron (B)	2021/08/10		98	%	75 - 125
			Acid Extractable Cadmium (Cd)	2021/08/10		102	%	75 - 125
			Acid Extractable Chromium (Cr)	2021/08/10		104	%	75 - 125
			Acid Extractable Cobalt (Co)	2021/08/10		103	%	75 - 125
			Acid Extractable Copper (Cu)	2021/08/10		105	%	75 - 125
			Acid Extractable Lead (Pb)	2021/08/10		102	%	75 - 125
			Acid Extractable Lithium (Li)	2021/08/10		102	%	75 - 125
			Acid Extractable Manganese (Mn)	2021/08/10		105	%	75 - 125
			Acid Extractable Mercury (Hg)	2021/08/10		110	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2021/08/10		100	%	75 - 125
			Acid Extractable Nickel (Ni)	2021/08/10		104	%	75 - 125
			Acid Extractable Rubidium (Rb)	2021/08/10		99	%	75 - 125
			Acid Extractable Selenium (Se)	2021/08/10		108	%	75 - 125
			Acid Extractable Silver (Ag)	2021/08/10		103	%	75 - 125
			Acid Extractable Strontium (Sr)	2021/08/10		103	%	75 - 125
			Acid Extractable Thallium (Tl)	2021/08/10		101	%	75 - 125
			Acid Extractable Tin (Sn)	2021/08/10		104	%	75 - 125
			Acid Extractable Uranium (U)	2021/08/10		101	%	75 - 125
			Acid Extractable Vanadium (V)	2021/08/10		102	%	75 - 125
			Acid Extractable Zinc (Zn)	2021/08/10		107	%	75 - 125
7510064	MLB	Method Blank	Acid Extractable Aluminum (Al)	2021/08/10	ND, RDL=10		mg/kg	
			Acid Extractable Antimony (Sb)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Arsenic (As)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Barium (Ba)	2021/08/10	ND, RDL=5.0		mg/kg	
			Acid Extractable Beryllium (Be)	2021/08/10	ND, RDL=2.0		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Bismuth (Bi)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Boron (B)	2021/08/10	ND, RDL=50		mg/kg	
			Acid Extractable Cadmium (Cd)	2021/08/10	ND, RDL=0.30		mg/kg	
			Acid Extractable Chromium (Cr)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Cobalt (Co)	2021/08/10	ND, RDL=1.0		mg/kg	
			Acid Extractable Copper (Cu)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Iron (Fe)	2021/08/10	ND, RDL=50		mg/kg	
			Acid Extractable Lead (Pb)	2021/08/10	ND, RDL=0.50		mg/kg	
			Acid Extractable Lithium (Li)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Manganese (Mn)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Mercury (Hg)	2021/08/10	ND, RDL=0.10		mg/kg	
			Acid Extractable Molybdenum (Mo)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Nickel (Ni)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Rubidium (Rb)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Selenium (Se)	2021/08/10	ND, RDL=0.50		mg/kg	
			Acid Extractable Silver (Ag)	2021/08/10	ND, RDL=0.50		mg/kg	
			Acid Extractable Strontium (Sr)	2021/08/10	ND, RDL=5.0		mg/kg	
			Acid Extractable Thallium (Tl)	2021/08/10	ND, RDL=0.10		mg/kg	
			Acid Extractable Tin (Sn)	2021/08/10	ND, RDL=1.0		mg/kg	
			Acid Extractable Uranium (U)	2021/08/10	ND, RDL=0.10		mg/kg	
			Acid Extractable Vanadium (V)	2021/08/10	ND, RDL=2.0		mg/kg	
			Acid Extractable Zinc (Zn)	2021/08/10	ND, RDL=5.0		mg/kg	
7510064	MLB	RPD	Acid Extractable Aluminum (Al)	2021/08/10	8.4		%	35
			Acid Extractable Antimony (Sb)	2021/08/10	19		%	35
			Acid Extractable Arsenic (As)	2021/08/10	2.4		%	35
			Acid Extractable Barium (Ba)	2021/08/10	8.6		%	35
			Acid Extractable Beryllium (Be)	2021/08/10	NC		%	35
			Acid Extractable Bismuth (Bi)	2021/08/10	3.6		%	35
			Acid Extractable Boron (B)	2021/08/10	NC		%	35
			Acid Extractable Cadmium (Cd)	2021/08/10	7.6		%	35
			Acid Extractable Chromium (Cr)	2021/08/10	5.6		%	35
			Acid Extractable Cobalt (Co)	2021/08/10	8.4		%	35
			Acid Extractable Copper (Cu)	2021/08/10	2.5		%	35
			Acid Extractable Iron (Fe)	2021/08/10	5.5		%	35

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Lead (Pb)	2021/08/10	11		%	35
			Acid Extractable Lithium (Li)	2021/08/10	9.0		%	35
			Acid Extractable Manganese (Mn)	2021/08/10	8.9		%	35
			Acid Extractable Mercury (Hg)	2021/08/10	11		%	35
			Acid Extractable Molybdenum (Mo)	2021/08/10	5.2		%	35
			Acid Extractable Nickel (Ni)	2021/08/10	7.6		%	35
			Acid Extractable Rubidium (Rb)	2021/08/10	11		%	35
			Acid Extractable Selenium (Se)	2021/08/10	7.2		%	35
			Acid Extractable Silver (Ag)	2021/08/10	2.1		%	35
			Acid Extractable Strontium (Sr)	2021/08/10	5.0		%	35
			Acid Extractable Thallium (Tl)	2021/08/10	2.1		%	35
			Acid Extractable Tin (Sn)	2021/08/10	NC		%	35
			Acid Extractable Uranium (U)	2021/08/10	4.3		%	35
			Acid Extractable Vanadium (V)	2021/08/10	12		%	35
			Acid Extractable Zinc (Zn)	2021/08/10	4.5		%	35
7531866	MKY	RPD	Gravel	2021/09/15	2.1		%	35
			Sand	2021/09/15	1.2		%	35
			Silt	2021/09/15	20		%	35
			Clay	2021/09/15	9.9		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Colleen Acker, B.Sc, Scientific Service Specialist

Eric Dearman, Scientific Specialist

Gina Thompson, Inorganics General Chemistry Supervisor

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

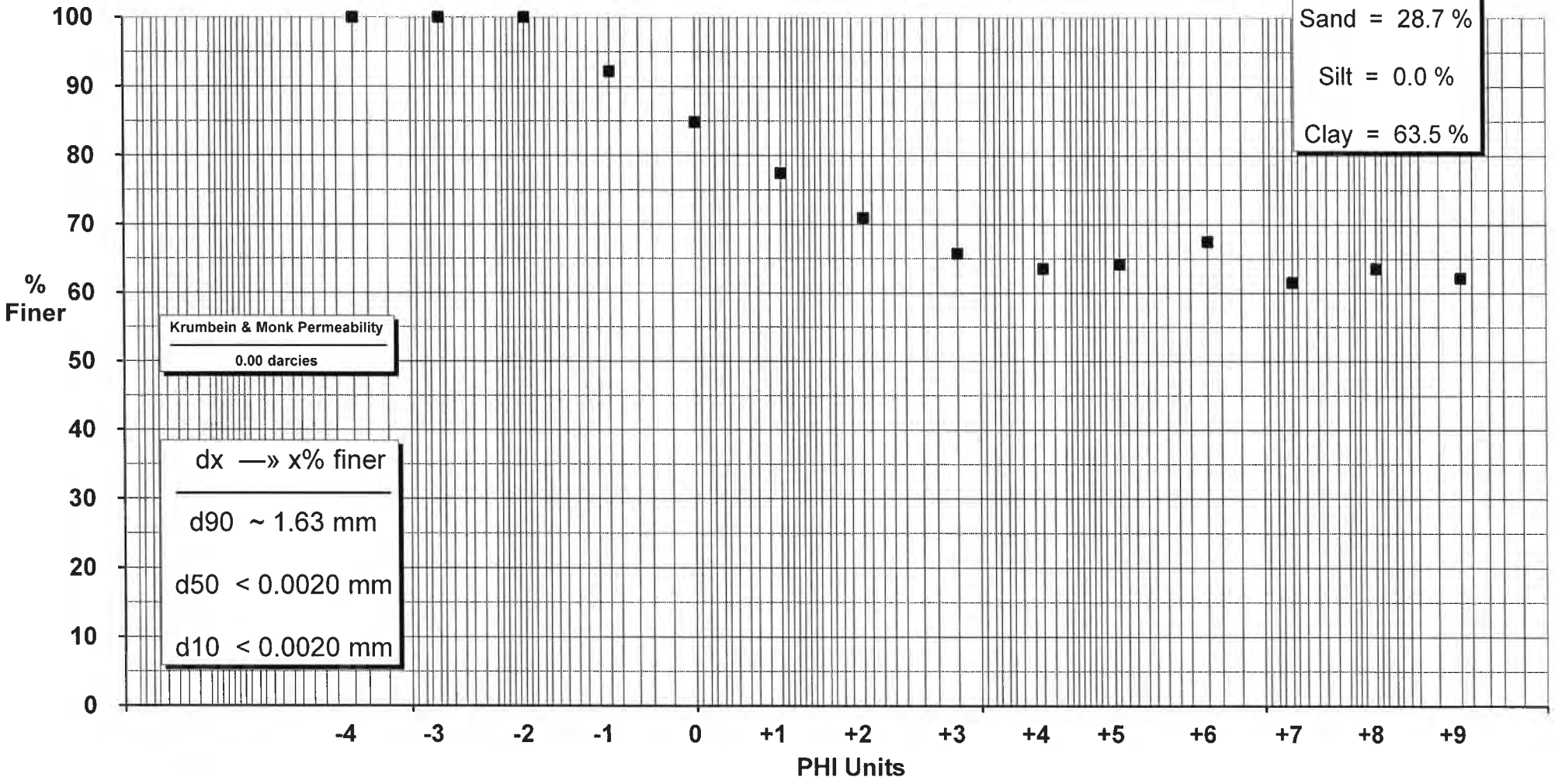
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BV Labs ID: QGY724-01

SEDIMENT L16

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
35.9 %	36.3 %

Wentworth	
Gravel	7.8 %
Sand	28.7 %
Silt	0.0 %
Clay	63.5 %



Krumbein & Monk Permeability: 0.00 darcies

dx —» x% finer	
d90	~ 1.63 mm
d50	< 0.0020 mm
d10	< 0.0020 mm

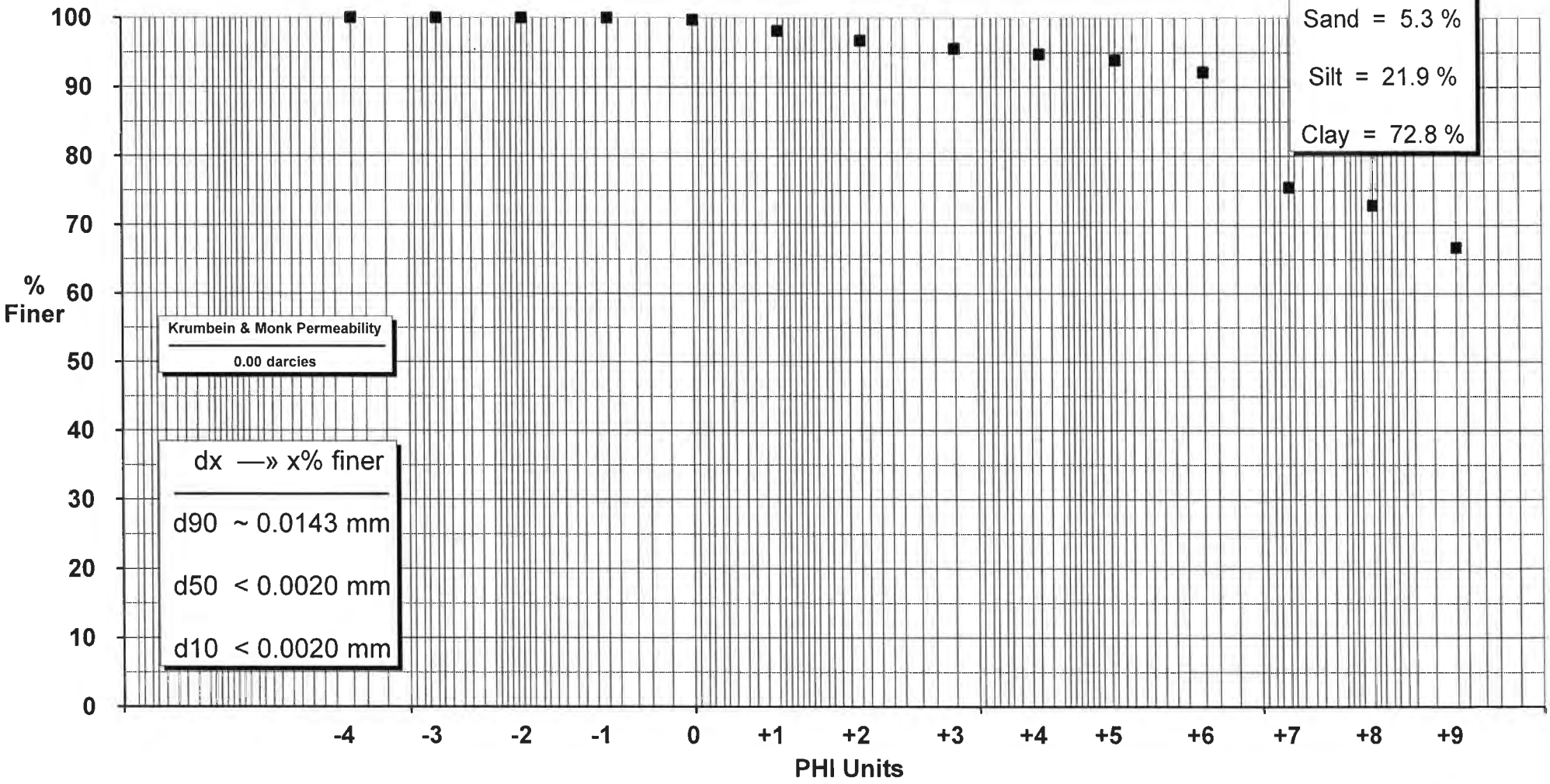
Approved

BV Labs ID: QGY727-01

SEDIMENT L17

Percent Coarser than 75 µm (PHI = 3.737)	Percent Coarser than 50 µm (PHI = 4.322)
—	—
5.1 %	5.5 %

Wentworth	
Gravel	0.0 %
Sand	5.3 %
Silt	21.9 %
Clay	72.8 %



Krumbein & Monk Permeability
0.00 darcies

dx —» x% finer
d90 ~ 0.0143 mm
d50 < 0.0020 mm
d10 < 0.0020 mm

Approved

Department of Oceanography
1355 Oxford St
Halifax, NS
B3H 4R2

Determination of chlorophyll a by fluorescence

Client: Bureau Veritas Laboratories, 200 Bluewater Road, Bedford, NS, B4B 1G9

Attention: Melissa DiPinto **Received:** 2021-07-05

Project #: C1I2905 **Completed:** 2021-07-09



Hugh MacIntyre, Ph.D.

Chl *a* (chlorophyll *a*; µg L-1) determined by the acidification method (Holm-Hansen et al., 1965). Estimates made with the non-acidification method (Welschmeyer, 1994) are shown for comparison.

The non-acidification method is considered more reliable than the acidification method in correcting for bias due to the contributions of chlorophyll *b* and chlorophyll degradation products.

Holm-Hansen O, Lorenzen CJ, Holmes RW, Strickland JDH (1965) Fluorometric determination of chlorophyll. J Conseil 30:3-15

Welschmeyer NA (1994) Fluorometric analysis of chlorophyll *a* in the presence of chlorophyll *b* and phaeopigments. Limnol Oceanogr 39:1985-1992

Contractor ID	Client ID	Chl a (acidification)	Chl a (non-acidification)
PZM494-05R	L8 (WATER)	0.304	1.23
PZM498-05R	L9	0.08	0.356

Department of Oceanography
1355 Oxford St
Halifax, NS
B3H 4R2

Determination of chlorophyll a by fluorescence

Client: Bureau Veritas Laboratories, 200 Bluewater Road, Bedford, NS, B4B 1G9

Attention: Maryann Comeau **Received:** 2021-07-14

Project #: C1J4879 **Completed:** 2021-07-22



Hugh MacIntyre, Ph.D.

Chl *a* (chlorophyll *a*; µg L-1) determined by the acidification method (Holm-Hansen et al., 1965). Estimates made with the non-acidification method (Welschmeyer, 1994) are shown for comparison. The non-acidification method is considered more reliable than the acidification method in correcting for bias due to the contributions of chlorophyll *b* and chlorophyll degradation products.

Holm-Hansen O, Lorenzen CJ, Holmes RW, Strickland JDH (1965) Fluorometric determination of chlorophyll. J Conseil 30:3-15

Welschmeyer NA (1994) Fluorometric analysis of chlorophyll *a* in the presence of chlorophyll *b* and phaeopigments. Limnol Oceanogr 39:1985-1992

Contractor ID	Client ID	Chl a (acidification)	Chl a (non-acidification)
QBZ126-04R	L20-3	1.85	2.36
QBZ127-04R	L20-2	0.959	1.19
QBZ132-04R	L20-1	1.04	1.31
QBZ137-04R	L23	1.86	2.3

Department of Oceanography
1355 Oxford St
Halifax, NS
B3H 4R2

Determination of chlorophyll a by fluorescence

Client: Bureau Veritas Laboratories, 200 Bluewater Road, Bedford, NS, B4B 1G9

Attention: Maryann Comeau **Received:** 2021-07-21

Project #: C1K3263 **Completed:** 2021-07-24



Hugh MacIntyre, Ph.D.

Chl *a* (chlorophyll *a*; µg L-1) determined by the acidification method (Holm-Hansen et al., 1965). Estimates made with the non-acidification method (Welschmeyer, 1994) are shown for comparison.

The non-acidification method is considered more reliable than the acidification method in correcting for bias due to the contributions of chlorophyll *b* and chlorophyll degradation products.

Holm-Hansen O, Lorenzen CJ, Holmes RW, Strickland JDH (1965) Fluorometric determination of chlorophyll. J Conseil 30:3-15

Welschmeyer NA (1994) Fluorometric analysis of chlorophyll *a* in the presence of chlorophyll *b* and phaeopigments. Limnol Oceanogr 39:1985-1992

Contractor ID	Client ID	Chl a (acidification)	Chl a (non-acidification)
QDS727-04R	L14	1.56	1.82
QDS729-04R	L12	0.817	0.875
QDS733-04R	L18	3.46	3.8

Department of Oceanography
1355 Oxford St
Halifax, NS
B3H 4R2

Determination of chlorophyll a by fluorescence

Client: Bureau Veritas Laboratories, 200 Bluewater Road, Bedford, NS, B4B 1G9

Attention: Maryann Comeau **Received:** 2021-07-30

Project #: C1L2900 **Completed:** 2021-08-04



Hugh MacIntyre, Ph.D.

Chl *a* (chlorophyll *a*; µg L-1) determined by the acidification method (Holm-Hansen et al., 1965). Estimates made with the non-acidification method (Welschmeyer, 1994) are shown for comparison. The non-acidification method is considered more reliable than the acidification method in correcting for bias due to the contributions of chlorophyll *b* and chlorophyll degradation products.

Holm-Hansen O, Lorenzen CJ, Holmes RW, Strickland JDH (1965) Fluorometric determination of chlorophyll. J Conseil 30:3-15

Welschmeyer NA (1994) Fluorometric analysis of chlorophyll *a* in the presence of chlorophyll *b* and phaeopigments. Limnol Oceanogr 39:1985-1992

Contractor ID	Client ID	Chl a (acidification)	Chl a (non-acidification)
QFT156-04R	L-19	0.895	0.716
QFT157-04R	L-10	0.604	0.457

Department of Oceanography
1355 Oxford St
Halifax, NS
B3H 4R2

Determination of chlorophyll a by fluorescence

Client: Bureau Veritas Laboratories, 200 Bluewater Road, Bedford, NS, B4B 1G9

Attention: Maryann Comeau **Received:** 2021-08-05

Project #: C1L8408 **Completed:** 2021-08-06



Hugh MacIntyre, Ph.D.

Chl *a* (chlorophyll *a*; µg L-1) determined by the acidification method (Holm-Hansen et al., 1965). Estimates made with the non-acidification method (Welschmeyer, 1994) are shown for comparison.

The non-acidification method is considered more reliable than the acidification method in correcting for bias due to the contributions of chlorophyll *b* and chlorophyll degradation products.

Holm-Hansen O, Lorenzen CJ, Holmes RW, Strickland JDH (1965) Fluorometric determination of chlorophyll. J Conseil 30:3-15

Welschmeyer NA (1994) Fluorometric analysis of chlorophyll *a* in the presence of chlorophyll *b* and phaeopigments. Limnol Oceanogr 39:1985-1992

Contractor ID	Client ID	Chl a (acidification)	Chl a (non-acidification)
QGY723-04R	L16	0.747	0.614
QGY725-04R	L17	0.765	0.675



Appendix B

Experimental License

Fisheries and Oceans Pêches et Océans

2021

EXPERIMENTAL LICENCE

NL-6483-21

Sikumiut Environmental Management Limited (SEM)
79 Mews Place, 2nd Floor
St. John's, NL A1B 4N2
Contact: Grant Vivian (709) 754-0499 ext. 213 Grant.Vivian@semltd.ca

Pursuant to Section 52 of the Fishery (General) Regulations, permission is hereby granted to **Sikumiut Environmental Management Limited (SEM)** or their designate(s) noted below, to collect baseline data on fish communities and populations in streams and lakes that will be affected by Tacora's tailings expansion project subject to the following conditions:

1. **Purpose:** To collect baseline data on fish communities and populations in streams and lakes that will be affected by Tacora's tailings expansion project.

2. **Fishing Season**: This licence is valid from June 15, 2021 to September 15, 2021.

3. **Authorized Fishing Area:** See attached maps.

4. **Authorized Fishing Gear:** All fish will be captured by fyke net, angling with barbless hooks, and minnow traps. Some limited experimental gill netting using short (2 hour), tended sets will be conducted in order to determine if species not susceptible to fyke netting are present in the lake(s).

   All sampling in streams will be conducted using a Smith-Root backpack electrofisher (Model LR-24) L-24).

   1) Electro fishing may **only** be conducted in streams between June 15, 2021 and September 15, 2021 and at water temperatures 18˚C or less.

   2) Electro fishing methodology must be adopted from the following reference: Scruton, D.A. and R.J. Gibson. 1995, Quantitative Electro fishing in Newfoundland and Labrador. Results of Workshops to Review Current Methods and Recommended Standardization of Techniques. Can. Manuscr. Rep. Fish. Fish Aquat. Sci. 2308: vii + 145 pp.

5. **Species & Quantity:** A total of 14 lakes with an inter-connecting stream will be surveyed. Fish species that may reside in these waterbodies, include: lake whitefish (100), lake trout (100), brook trout (2,000), northern pike (100), longnose sucker (200), burbot (100), slimy sculpin (500), longnose dace (500), and lake chub (1000). The anticipated maximum # of fish to be captured are in brackets.

6. **Biological Sampling:** Fish will be measured for fork length and weight, and some scale samples will be collected for aging purposes. A length stratified sub sample of scales from brook trout (n=75), lake trout (n=25), and lake whitefish (n=25), if captured.

   All sampling will employ non-lethal methods and all fish will be returned to the water unharmed. For species of recreational interest, a mark-recapture program will be conducted to determine a population estimate. This will involve catching fish, marking with a hole punch in the caudal fin, and release back to the waterbody it came from.

EXPERIMENTAL LICENCE

NL-6483-21

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79 Mews Place, 2nd Floor
St. John's, NL A1B 4N2
Contact: Grant Vivian (709) 754-0499 ext. 213 Grant.Vivian@semltd.ca

7. Authorized Designates:

Designates (NL-6483-21)
Jody Penny
Stefan Cahill
Colin Bursey
Brittany Marche
Siham Bendenia
Jason Lewis
Jamie Hunt
Tomer Katan

8. Vessels – N/A

9. General:

9.1 This licence must be carried at all times during your study and must be produced for inspection upon request of a Fishery Officer.

9.2 All by-catch of other species are to be returned to the water in the areas from which they are caught and in a manner that causes them the least harm.

9.3 Fish caught under the authority of this licence cannot be sold, traded, or bartered.

10. General Reporting Requirements:

10.1 If there are any unusual mortalities or diseases identified, notify the nearest department of Fisheries and Oceans office.

10.2 Requests for amendments to this licence (i.e. changes or additions to species, quantities, gear, etc.) shall be made in writing to and emailed to: experimental.licenses@dfo-mpo.gc.ca

10.3 An electronic report containing records of the dates fished, numbers of fish of each species counted, and any biological characteristics data collected shall be submitted within 90 days of the licence end date and identified as NL-6483-21 to, Chantelle Burke Salmonid Section, Fisheries and Oceans Canada: Chantelle.Burke@dfo-mpo.gc.ca

10.4 Prior to activities taking place, the Area Chief, Conservation and Protection, Fisheries and Oceans Canada for the area of activity shall be notified verbally or in writing of your activities:

- Western Newfoundland and Labrador (Corner Brook) – Brent Watkins, Brent.Watkins@dfo-mpo.gc.ca

Fisheries and Oceans Pêches et Océans

2021

EXPERIMENTAL LICENCE

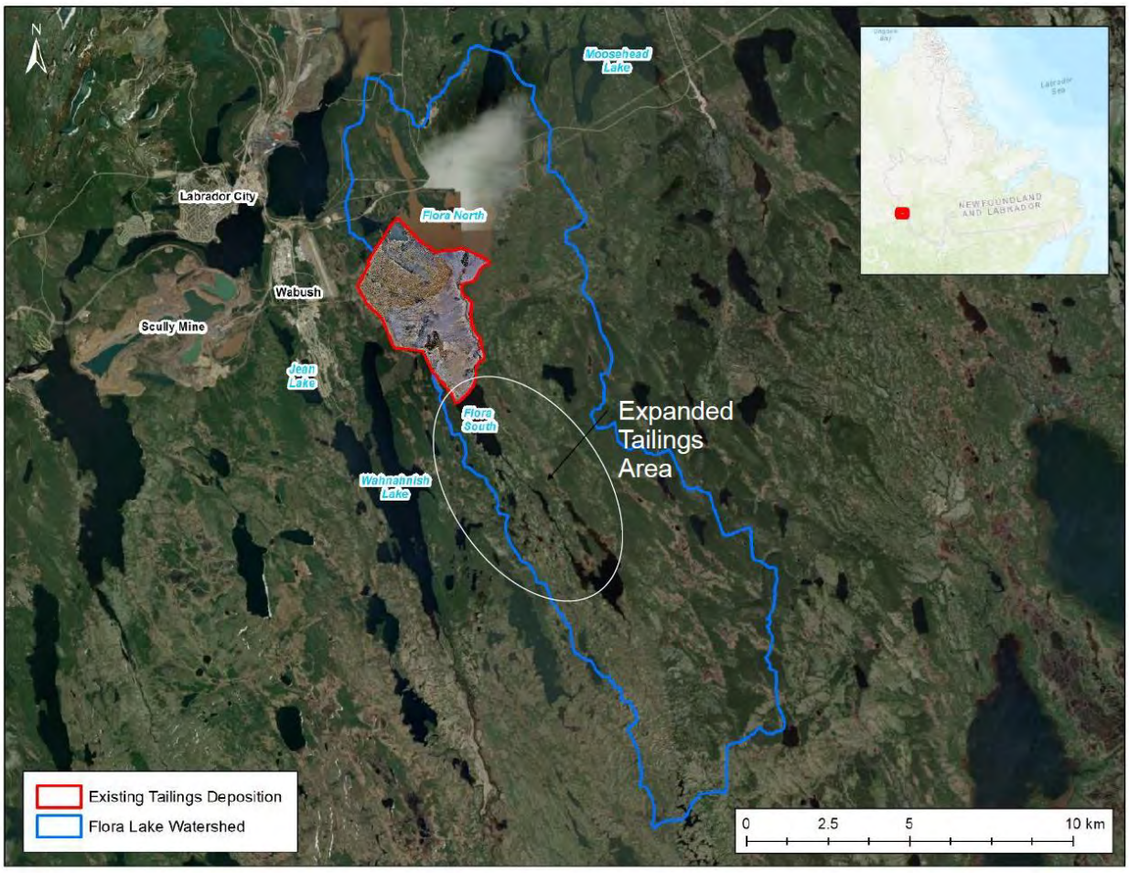
NL-6483-21

Sikumiut Environmental Management Limited (SEM)
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St. John's, NL A1B 4N2
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Area Map 1 of 2:

Location of Tacora's Scully Mine in Wabush, Labrador



Fisheries and Oceans Pêches et Océans

2021

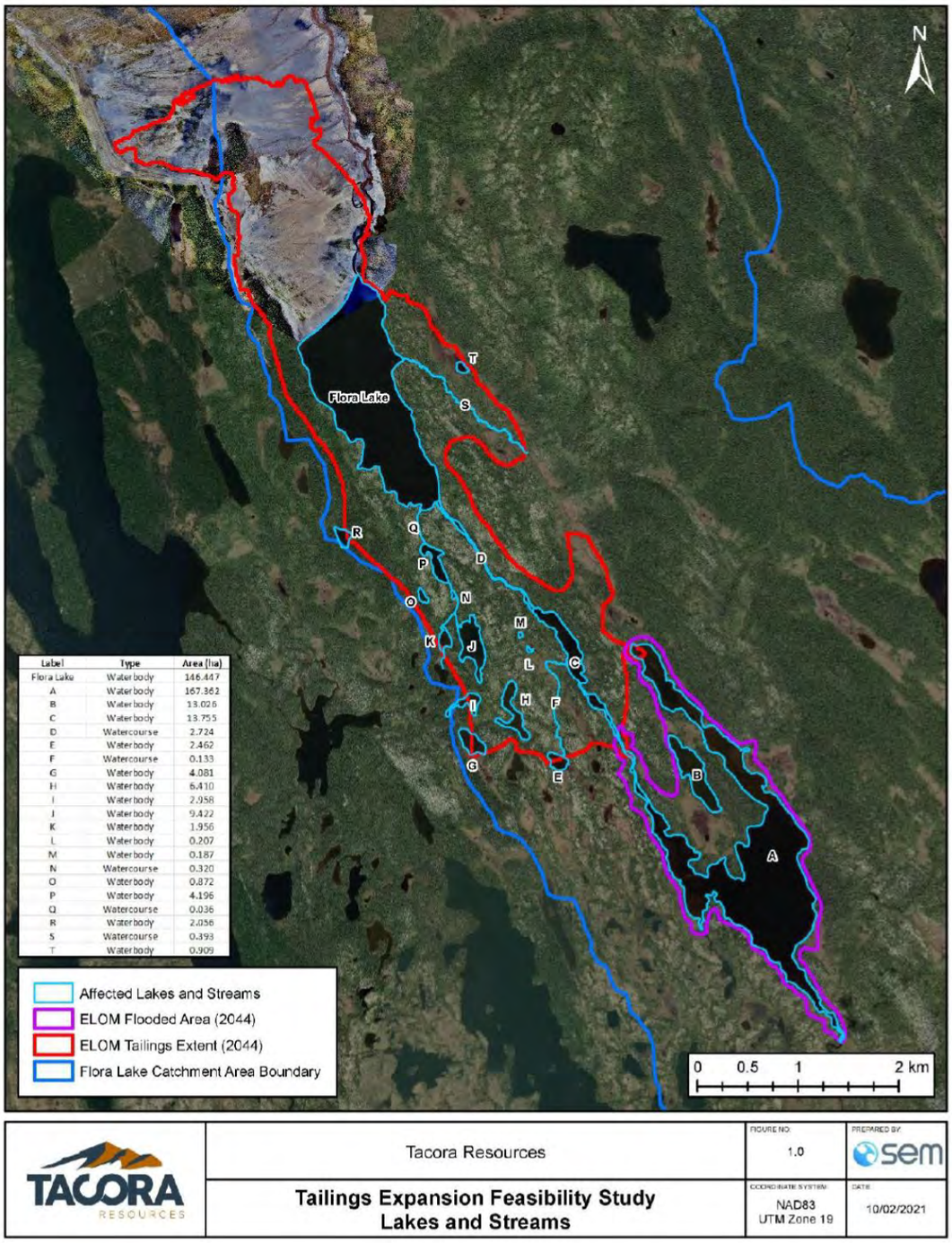
EXPERIMENTAL LICENCE

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Area Map 2 of 2:

Lakes and Stream Affected by Tacora's Tailings Expansion



Label	Type	Area (ha)
Flora Lake	Waterbody	146.447
A	Waterbody	167.362
B	Waterbody	13.026
C	Waterbody	13.755
D	Watercourse	2.724
E	Waterbody	2.462
F	Watercourse	0.133
G	Waterbody	4.081
H	Waterbody	6.410
I	Waterbody	2.958
J	Waterbody	9.422
K	Waterbody	1.956
L	Waterbody	0.207
M	Waterbody	0.187
N	Watercourse	0.320
O	Waterbody	0.872
P	Waterbody	4.196
Q	Watercourse	0.036
R	Waterbody	2.056
S	Watercourse	0.393
T	Waterbody	0.909

TACORA RESOURCES	Tacora Resources	FIGURE NO: 1.0	PREPARED BY: sem
	Tailings Expansion Feasibility Study Lakes and Streams	COORDINATE SYSTEM: NAD83 UTM Zone 19	DATE: 10/02/2021

Appendix C

Data Tables - Lakes

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Table C1 Water Quality Data for Metals in Lake L1, August 2021.

	Units	RDL	L1
Aluminum (Al)	µg/L	5.0	18
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	13
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	6,800
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	490
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2,600
Manganese (Mn)	µg/L	2.0	59
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	470
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	530
Strontium (Sr)	µg/L	2.0	14
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C2 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L1, August 2021.

	Units	RDL	L1
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	33
Calculated TDS	mg/L	1.0	33
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	28
Anion Sum	me/L	NA	0.67
Cation Sum	me/L	NA	0.61
Ion Balance (% Difference)	%	NA	4.69
Langelier Index (@ 20C)	N/A		-1.54
Langelier Index (@ 4C)	N/A		-1.79
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.94
Saturation pH (@ 4C)	N/A		9.19
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	34
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	25
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	0.07
Total Organic Carbon (C)	mg/L	0.50	6.7
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	NA	7.40
Reactive Silica (SiO2)	mg/L	0.50	1.9
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.1
Conductivity	µS/cm	1.0	54
Productivity			
Chlorophyll a (acidification)	µg/L		0.35

RDL = Reportable Detection Limit, ND = Not Detected, NA = Not Applicable.

Table C3 Field Water Quality Data for Lake L1, August 2021.

	Depth (m)
Parameter	0.5
pH	7.44
Conductivity (µS/cm)	51.1
ORP (mV)	-49.6
DO (mg/L)	8.23
DO (% sat.)	89.6
Temperature (°C)	19.5

Table C4 Sediment Chemistry Data for Lake L1, August 2021.

	Units	RDL	L1
Metals			
Aluminum (Al)	mg/kg	10	5,600
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	2.1
Barium (Ba)	mg/kg	5.0	98
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.32
Chromium (Cr)	mg/kg	2.0	13
Cobalt (Co)	mg/kg	1.0	2.7
Copper (Cu)	mg/kg	2.0	28
Iron (Fe)	mg/kg	50	13,000
Lead (Pb)	mg/kg	0.50	2.2
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	670
Mercury (Hg)	mg/kg	0.10	0.15
Molybdenum (Mo)	mg/kg	2.0	ND
Nickel (Ni)	mg/kg	2.0	25
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	ND
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	12
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	2.6
Vanadium (V)	mg/kg	2.0	3.7
Zinc (Zn)	mg/kg	5.0	48
Other Parameters			
Total Organic Carbon (TOC)[1]	g/kg	0.50	140 (0.60)

RDL = Reportable Detection Limit, ND = Not Detected.
[1] Number in bracket represent RDL for the specific measurements.

Table C5 Sediment Particle Size Distribution (%) for Lake L1, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	100	0.10
< +2 Phi (0.25 mm)	99	0.10
< +3 Phi (0.12 mm)	99	0.10
< +4 Phi (0.062 mm)	94	0.10
< +5 Phi (0.031 mm)	93	0.10
< +6 Phi (0.016 mm)	87	0.10
< +7 Phi (0.0078 mm)	70	0.10
< +8 Phi (0.0039 mm)	63	0.10
< +9 Phi (0.0020 mm)	51	0.10
Size classes		
Sand	6	0.10
Silt	31	0.10
Clay	63	0.10

RDL = Reportable Detection Limit.

Table C6 Summary of the Phytoplankton Community in the Study Lakes, August 2021.

Lake Number	Biomass (mg/m^3)			
	Total	0-10 µm	10-30 µm	>30 µm
L1	204	70	**134**	0
L2	Not Fish Habitat			
L3	401	**252**	102	47
L4	233	**124**	102	7
L5	274	**172**	102	0
L6	341	120	**221**	0
L7	1005	388	**533**	84
L8	630	254	**376**	0
L9	52	**52**	0	0
L10	524	226	**298**	0
L11	268	133	**135**	0
L12	929	287	**642**	0
L13	244	**223**	21	0
L14	458	**328**	123	7
L15	Not Fish Habitat			
L16	537	**269**	266	2
L17	678	331	**345**	2
L18	1034	**530**	479	25
L19	711	234	**450**	27
L20	651	311	**325**	15
L21	540	259	**281**	0
L22	Not Fish Habitat			
L23	564	**285**	279	0
L24	Not Fish Habitat			
Dominant Size Group is **bolded.**				

Table C7 Summary of the Zooplankton Community in the Study Lakes.

Lake Number	Biomass (mg/m³)				Key/Dominant Taxa
	Total	Copepods	Cladocerans	Rotifers	
1	419.26	138.44	**280.81**	0.01	Ceriodaphnia, Calanoids, Bosmina
2	Not fish habitat				
3	190.30	80.06	**108.87**	1.37	Daphnia, Calanoids, Ceriodaphnia
4	**57.21**	**43.07**	14.14	0.00	Holopedium, Bosmina, Daphnia
5	82.87	**49.99**	32.87	0.00	Calanoids, Bosmina, Ceriodaphnia
6	427.21	**348.10**	79.05	0.05	Calanoids, Ceriodaphnia, Epischura
7	264.72	**175.65**	87.84	1.23	Calanoids, Daphnia, Bosmina
8	292.41	**257.59**	25.77	9.05	Calanoids, Epischura, Bosmina
9	453.46	**280.34**	172.91	0.22	Calanoids, Bosmina, Holopedium
10	69.28	**43.46**	25.68	0.14	Calanoids, Bosmina
11	1.79	**1.18**	0.59	0.01	Calanoids
12	268.05	**162.71**	105.33	0.01	Calanoids, Bosmina, Daphnia
13	112.62	**104.74**	7.81	0.06	Calanoids, Daphnia, Epischura
14	292.77	99.77	**192.92**	0.07	Holopedium, Daphnia
15	Not fish habitat				
16	40.84	**37.29**	3.55	0.00	Calanoids, Epischura
17	280.07	**247.69**	32.38	0.00	Calanoids, Daphnia, Epischura
18	1.37	0.23	**1.01**	0.13	Bosmina
19	0.16	0.05	0.00	**0.11**	Kellicottia
20	170.11	70.61	**90.19**	9.31	Site 1: Polyphemus, Calanoids. Site 2: Daphnia, Holopedium, Calanoids. Site 3: Calanoids, Kellicottia
21	25.18	2.48	**22.69**	0.02	Bosmina, Ceriodaphnia
22	Not fish habitat				
23	169.12	**148.04**	20.37	0.71	Calanoids, Daphnia
24	Not fish habitat				
The dominant group in each lake is **bolded.**					

Table C8 Field Water Quality Data for the Two Depths in Lake L2, August 2021.

	Depth (m)	
Parameter	**1**	**1.5**
pH	7.33	7.32
Conductivity (µS/cm)	31.2	32.3
ORP (mV)	-44.4	-43.3
DO (mg/L)	8.39	8.56
DO (% sat.)	95.0	99.4
Temperature (°C)	21.8	21.7

Table C9 Water Quality Data for Metals in Lake L3, August 2021.

	Units	RDL	L3
Aluminum (Al)	µg/L	5.0	5.7
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	14
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	11.000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	ND
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	4.700
Manganese (Mn)	µg/L	2.0	24
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1.200
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	490
Strontium (Sr)	µg/L	2.0	13
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	19

RDL = Reportable Detection Limit, ND = Not Detected.

Table C10 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L3, August 2021.

	Units	RDL	L3
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	50
Calculated TDS	mg/L	1.0	54
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	46
Anion Sum	me/L	NA	1.07
Cation Sum	me/L	NA	0.98
Ion Balance (% Difference)	%	NA	4.39
Langelier Index (@ 20C)	N/A		-0.92
Langelier Index (@ 4C)	N/A		-1.18
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.58
Saturation pH (@ 4C)	N/A		8.83
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	50
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	6.4
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	0.12
Total Organic Carbon (C)	mg/L	0.50	2.4
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	NA	7.66
Reactive Silica (SiO2)	mg/L	0.50	3.8
Dissolved Sulphate (SO4)	mg/L	2.0	3.0
Turbidity	NTU	0.10	0.93
Conductivity	µS/cm	1.0	88
Productivity			
Chlorophyll a (acidification)	µg/L		1.06

RDL = Reportable Detection Limit, ND = Not Detected, NA = Not Applicable.

Table C11 Field Water Quality Data for the Four Depths in Lake L3, August 2021.

	Depth (m)			
Parameter	1	2	3	4
pH	7.55	7.52	7.39	7.45
Conductivity (µS/cm)	80.0	80.0	82.2	81.5
ORP (mV)	-57.1	-55.7	-46.9	-52.0
DO (mg/L)	7.75	7.85	7.50	7.10
DO (% sat.)	79.0	77.7	78.1	67.0
Temperature (°C)	16.1	16.6	16.5	16.3

Table C12 Sediment Chemistry Data for Lake L3, August 2021.

	Units	RDL	L3
Metals			
Aluminum (Al)	mg/kg	10	5,100
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	9.8
Barium (Ba)	mg/kg	5.0	140
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.47
Chromium (Cr)	mg/kg	2.0	23.0
Cobalt (Co)	mg/kg	1.0	8.7
Copper (Cu)	mg/kg	2.0	14.0
Iron (Fe)	mg/kg	50	240,000
Lead (Pb)	mg/kg	0.50	24.0
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	3,800
Mercury (Hg)	mg/kg	0.10	0.14
Molybdenum (Mo)	mg/kg	2.0	24.0
Nickel (Ni)	mg/kg	2.0	17
Rubidium (Rb)	mg/kg	2.0	3.9
Selenium (Se)	mg/kg	0.50	2.7
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	9
Thallium (Tl)	mg/kg	0.10	0.11
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	3.1
Vanadium (V)	mg/kg	2.0	18.0
Zinc (Zn)	mg/kg	5.0	66
Other Parameters			
Total Organic Carbon (TOC)[1]	g/kg	0.50	220 (0.60)

RDL = Reportable Detection Limit, ND = Not Detected.
[1] Number in bracket represent RDL for the specific measurements.

Table C13 Sediment Particle Size Distribution (%) for Lake L3, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	100	0.10
< +2 Phi (0.25 mm)	100	0.10
< +3 Phi (0.12 mm)	99	0.10
< +4 Phi (0.062 mm)	98	0.10
< +5 Phi (0.031 mm)	90	0.10
< +6 Phi (0.016 mm)	84	0.10
< +7 Phi (0.0078 mm)	78	0.10
< +8 Phi (0.0039 mm)	75	0.10
< +9 Phi (0.0020 mm)	67	0.10
Size classes		
Sand	2	0.10
Silt	23	0.10
Clay	75	0.10

RDL = Reportable Detection Limit.

Table C14 Benthic Invertebrate Community in the Lakes, 2021.

				Lakes																			
Major Taxon	Family	Subfamily / Tribe	Genus/Species	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L18	L19	L20-1	L20-2	L20-3	L21	L23
Oligochaeta	Lumbriculidae		*Lumbriculus*			1				1			1									
Oligochaeta	Naididae	Naidinae																				
Nematoda																						
Gastropoda	Planorbidae		*Gyraulus*										1	2								
Gastropoda	Valvatidae		*Valvata sincera*	3						2	1		1			1			2			
Pelecypoda	Pisidiidae (i/d)							9														
Pelecypoda	Pisidiidae		*Pisidium*	16	1		3	4							1						1	1
Pelecypoda	Pisidiidae		*Sphaerium*					74														
Amphipoda	Hyalellidae		*Hyalella azteca*													5		13				
Ephemeroptera	Baetidae		*Baetis*																			
Ephemeroptera	Ephemerellidae		*Drunella*																			
Ephemeroptera	Ephemerellidae		*Ephemerella*																			
Ephemeroptera	Ephemeridae		*Ephemera*														1					
Ephemeroptera	Ephemeridae		*Hexagenia*														1					
Ephemeroptera	Heptageniidae		*Heptagenia*																			
Ephemeroptera	Heptageniidae		*Maccaffertium*																			
Ephemeroptera	Leptophlebiidae		*Leptophlebia*																			
Odonata - Anisoptera	Gomphidae (i/d)							1														
Odonata - Anisoptera	Corduliidae		*Somatochlora*			1																
Odonata - Anisoptera	Libellulidae		*Leucorrhinia*												1							
Plecoptera	Chloroperlidae		*Sweltsa*																			
Plecoptera	Leuctridae (i/d)																					
Plecoptera	Perlidae		*Acroneuria*					1														
Plecoptera	Perlidae		*Claassenia sabulosa*																			
Plecoptera	Perlodidae		*Isoperla*					1														
Trichoptera	Hydropsychidae		*Hydropsyche*					2														
Trichoptera	Lepidostomatidae		*Lepidostoma*																			
Trichoptera	Limnephilidae		*Anabolia*																			
Trichoptera	Molannidae		*Molanna*														3					
Trichoptera	Phryganeidae		*Agrypnia*																	1		
Trichoptera	Rhyacophilidae - pupa																					
Terrestrial	Rhyacophilidae		*Rhyacophila*					1														
Coleoptera	Dytiscidae (i/d)					1																
Coleoptera	Elmidae		*Promoresia*					1														
Diptera	Ceratopogonidae		*Probezzia*																1			
Diptera	Chaoboridae		*Chaoborus*	1																		
Diptera	Empididae		*Wiedemannia*																			
Diptera	Tipulidae (i/d)							1														
Diptera	Tipulidae		*Dicranota*																			
Diptera	Simuliidae		*Simulium*																			
Diptera	Chironomidae - pupa							1												1		
Diptera	Chironomidae	Chironominae	*Chironomus*	11			1												8			
Diptera	Chironomidae		*Cryptochironomus*																1			
Diptera	Chironomidae		*Microtendipes*																			
Diptera	Chironomidae		*Polypedilum*	2					1										1			
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*					1			1											
Diptera	Chironomidae		*Procladius*	6																		
Diptera	Chironomidae		*Thienemannimyia*					5														
Diptera	Chironomidae	Tanytarsini	*Micropsectra*					1														
Diptera	Chironomidae		*Rheotanytarsus*					1														
Diptera	Chironomidae		*Tanytarsus*																1			
Diptera	Chironomidae	Orthocladiinae	*Cricotopus / Orthocladius*					1														
Diptera	Chironomidae		*Tvetenia*					2														
			TOTAL	*39*	*1*	*3*	*4*	*107*	*1*	*3*	*2*	*0*	*3*	*2*	*2*	*6*	*5*	*13*	*14*	*2*	*1*	*1*

Table C15 Summary of Total Abundance, Taxon Richness, and Density of Benthic organisms identified in the Lakes, 2021.

Lakes	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L18	L19	L20-1	L20-2	L20-3	L21	L23
Total Abundance	39	1	3	4	107	1	3	2	1419	3	2	2	6	5	13	14	2	1	1
Taxon Richness	4	1	3	2	9	1	2	2	0	3	1	2	2	2	1	3	2	1	1
Density (individuals/m^2)	780	20	60	80	2140	20	60	40	28380	60	40	40	120	100	260	280	40	20	20

Table C16 Water Quality Data for Metals in Lake L4, August 2021.

	Units	RDL	L4
Aluminum (Al)	µg/L	5.0	5.60
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	18
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	14,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	240
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	5,600
Manganese (Mn)	µg/L	2.0	18
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,700
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	590
Strontium (Sr)	µg/L	2.0	18
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	0.16
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C17 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L4, August 2021.

	Units	RDL	L4
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	62
Calculated TDS	mg/L	1.0	69
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	58
Anion Sum	me/L	N/A	1.35
Cation Sum	me/L	N/A	1.24
Ion Balance (% Difference)	%	N/A	4.25
Langelier Index (@ 20C)	N/A		-0.64
Langelier Index (@ 4C)	N/A		-0.89
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.39
Saturation pH (@ 4C)	N/A		8.64
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	62
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	8.30
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	3
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.74
Reactive Silica (SiO2)	mg/L	0.50	4
Dissolved Sulphate (SO4)	mg/L	2.0	5.10
Turbidity	NTU	0.10	0.98
Conductivity	µS/cm	1.0	110
Productivity			
Chlorophyll a (acidification)	µg/L		0.23

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C18 Field Water Quality Data for Lake L4, August 2021.

	Depth (m)
Parameter	1.0
pH	7.64
Conductivity (µS/cm)	99.3
ORP (mV)	-61.0
DO (mg/L)	8.35
DO (% sat.)	92.9
Temperature (°C)	20.3

Table C19 Sediment Chemistry Data for Lake L4, August 2021.

	Units	RDL	L4
Metals			
Aluminum (Al)	mg/kg	10	260
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	160
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	ND
Cobalt (Co)	mg/kg	1.0	ND
Copper (Cu)	mg/kg	2.0	3.6
Iron (Fe)	mg/kg	50	5,700
Lead (Pb)	mg/kg	0.50	0.7
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	2,100
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	21.0
Nickel (Ni)	mg/kg	2.0	ND
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	1.8
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	98
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	20.0
Vanadium (V)	mg/kg	2.0	ND
Zinc (Zn)	mg/kg	5.0	13
Other Parameters			
Total Organic Carbon (TOC)[1]	g/kg	0.50	150

RDL= Reportable Detection Limit, ND= Not Detected

[1] Number in bracket represent RDL for the specific measurement

Table C20 Sediment Particle Size Distribution (%) for Lake L4, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	100	0.10
< +2 Phi (0.25 mm)	99	0.10
< +3 Phi (0.12 mm)	97	0.10
< +4 Phi (0.062 mm)	97	0.10
< +5 Phi (0.031 mm)	95	0.10
< +6 Phi (0.016 mm)	84	0.10
< +7 Phi (0.0078 mm)	57	0.10
< +8 Phi (0.0039 mm)	45	0.10
< +9 Phi (0.0020 mm)	26	0.10
Size classes		
Sand	4	0.10
Silt	51	0.10
Clay	45	0.10

RDL = Reportable Detection Limit

Table C21 Water Quality Data for Metals in Lake L5, August 2021.

	Units	RDL	L5
Aluminum (Al)	µg/L	5.0	6.9
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	4.5
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	6,100
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	270
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2,600
Manganese (Mn)	µg/L	2.0	19
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	750
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	380
Strontium (Sr)	µg/L	2.0	7.9
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C22 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L5, August 2021.

	Units	RDL	L5
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	29
Calculated TDS	mg/L	1.0	32
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	26
Anion Sum	me/L	N/A	0.63
Cation Sum	me/L	N/A	0.57
Ion Balance (% Difference)	%	N/A	5.00
Langelier Index (@ 20C)	N/A		-1.58
Langelier Index (@ 4C)	N/A		-1.83
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.04
Saturation pH (@ 4C)	N/A		9.29
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	29
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	15
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	0.06
Total Organic Carbon (C)	mg/L	0.50	5.50
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.46
Reactive Silica (SiO2)	mg/L	0.50	2.30
Dissolved Sulphate (SO4)	mg/L	2.0	2.40
Turbidity	NTU	0.10	1.00
Conductivity	µS/cm	1.0	51
Productivity			
Chlorophyll a (acidification)	µg/L		0.63

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C23 Field Water Quality Data for Lake L5, August 2021.

	Depth (m)
Parameter	0.7
pH	7.38
Conductivity (µS/cm)	44.0
ORP (mV)	-46.9
DO (mg/L)	8.11
DO (% sat.)	91.0
Temperature (°C)	21.8

Table C24 Sediment Chemistry Data for Lake L5, August 2021.

	Units	RDL	L5
Metals			
Aluminum (Al)	mg/kg	10	1,500
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	58
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.42
Chromium (Cr)	mg/kg	2.0	6.5
Cobalt (Co)	mg/kg	1.0	1.8
Copper (Cu)	mg/kg	2.0	5.8
Iron (Fe)	mg/kg	50	17,000
Lead (Pb)	mg/kg	0.50	18.0
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	400
Mercury (Hg)	mg/kg	0.10	0.11
Molybdenum (Mo)	mg/kg	2.0	11.0
Nickel (Ni)	mg/kg	2.0	10
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	3.2
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	13
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	6.0
Vanadium (V)	mg/kg	2.0	6.0
Zinc (Zn)	mg/kg	5.0	54
Other Parameters			
Total Organic Carbon (TOC)[1]	g/kg	0.50	350 (1.3)

RDL= Reportable Detection Limit, ND= Not Detected

[1] Number in bracket represent RDL for the specific measurement

Table C25 Sediment Particle Size Distribution (%) for Lake L5, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	96	0.10
< +4 Phi (0.062 mm)	95	0.10
< +5 Phi (0.031 mm)	97	0.10
< +6 Phi (0.016 mm)	93	0.10
< +7 Phi (0.0078 mm)	78	0.10
< +8 Phi (0.0039 mm)	78	0.10
< +9 Phi (0.0020 mm)	69	0.10
Size classes		
Sand	5	0.10
Silt	17	0.10
Clay	78	0.10

RDL = Reportable Detection Limit

Table C26 Water Quality Data for Metals in Lake L6, August 2021.

	Units	RDL	L6
Aluminum (Al)	µg/L	5.0	5.6
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	5.4
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	13,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	210
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	6,600
Manganese (Mn)	µg/L	2.0	12
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	970
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	530
Strontium (Sr)	µg/L	2.0	17
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	0.17
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C27 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L6, August 2021.

	Units	RDL	L6
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	65
Calculated TDS	mg/L	1.0	68
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	61
Anion Sum	me/L	N/A	1.39
Cation Sum	me/L	N/A	1.26
Ion Balance (% Difference)	%	N/A	4.91
Langelier Index (@ 20C)	N/A		-0.52
Langelier Index (@ 4C)	N/A		-0.77
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.39
Saturation pH (@ 4C)	N/A		8.64
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	66
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	9.50
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.30
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.87
Reactive Silica (SiO2)	mg/L	0.50	2.60
Dissolved Sulphate (SO4)	mg/L	2.0	4.00
Turbidity	NTU	0.10	1.40
Conductivity	µS/cm	1.0	120
Productivity			
Chlorophyll a (acidification)	µg/L		0.33

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C28 Field Water Quality Data for Lake L6, August 2021.

	Depth (m)	
Parameter	1	1.5
pH	8.23	8.10
Conductivity (µS/cm)	114.3	121.0
ORP (mV)	-93.0	-86.9
DO (mg/L)	8.00	9.10
DO (% sat.)	84.3	98.4
Temperature (°C)	17.8	17.3

Table C29 Sediment Chemistry Data for Lake L6, August 2021.

	Units	RDL	L6
Metals			
Aluminum (Al)	mg/kg	10	2,000
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	2.3
Barium (Ba)	mg/kg	5.0	64
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.43
Chromium (Cr)	mg/kg	2.0	11.0
Cobalt (Co)	mg/kg	1.0	1.9
Copper (Cu)	mg/kg	2.0	7.9
Iron (Fe)	mg/kg	50	29,000
Lead (Pb)	mg/kg	0.50	18.0
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	280
Mercury (Hg)	mg/kg	0.10	0.11
Molybdenum (Mo)	mg/kg	2.0	10.0
Nickel (Ni)	mg/kg	2.0	9
Rubidium (Rb)	mg/kg	2.0	3.1
Selenium (Se)	mg/kg	0.50	2.4
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	11
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	1.2
Uranium (U)	mg/kg	0.10	8.2
Vanadium (V)	mg/kg	2.0	7.8
Zinc (Zn)	mg/kg	5.0	47
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	260 (0.60)

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C30 Sediment Particle Size Distribution (%) for Lake L6, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100 (1)	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	94	0.10
< +4 Phi (0.062 mm)	91	0.10
< +5 Phi (0.031 mm)	89	0.10
< +6 Phi (0.016 mm)	86	0.10
< +7 Phi (0.0078 mm)	69	0.10
< +8 Phi (0.0039 mm)	63	0.10
< +9 Phi (0.0020 mm)	53	0.10
Size classes		
Sand	9	0.10
Silt	28	0.10
Clay	63	0.10

RDL = Reportable Detection Limit

Table C31 Water Quality Data for Metals in Lake L7, August 2021.

	Units	RDL	L7
Aluminum (Al)	µg/L	5.0	ND
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	14
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	11,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	ND
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	5,100
Manganese (Mn)	µg/L	2.0	17
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,200
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	370
Strontium (Sr)	µg/L	2.0	12
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C32 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L7, August 2021.

	Units	RDL	L7
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	56
Calculated TDS	mg/L	1.0	58
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	49
Anion Sum	me/L	N/A	1.19
Cation Sum	me/L	N/A	1.02
Ion Balance (% Difference)	%	N/A	7.69
Langelier Index (@ 20C)	N/A		-0.74
Langelier Index (@ 4C)	N/A		-0.99
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.52
Saturation pH (@ 4C)	N/A		8.77
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	56
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	ND
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	3.10
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.79
Reactive Silica (SiO2)	mg/L	0.50	3.50
Dissolved Sulphate (SO4)	mg/L	2.0	2.80
Turbidity	NTU	0.10	1.10
Conductivity	µS/cm	1.0	99
Productivity			
Chlorophyll a (acidification)	µg/L		1.12

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C33 Field Water Quality Data for Lake L7, August 2021.

	Depth (m)			
Parameter	1	2	3	4
pH	7.88	8.04	8.12	6.99
Conductivity (µS/cm)	105	97	91.3	156
ORP (mV)	-74.8	-82.9	-87.1	-27.0
DO (mg/L)	8.80	8.02	8.10	5.32
DO (% sat.)	93.2	86.4	84.0	67.0
Temperature (°C)	17.6	17.6	17.6	17.1

Table C34 Sediment Chemistry Data for Lake L7, August 2021.

	Units	RDL	L7
Metals			
Aluminum (Al)	mg/kg	10	2,500
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	28
Barium (Ba)	mg/kg	5.0	120
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.56
Chromium (Cr)	mg/kg	2.0	14.0
Cobalt (Co)	mg/kg	1.0	3.6
Copper (Cu)	mg/kg	2.0	12.0
Iron (Fe)	mg/kg	50	37,000
Lead (Pb)	mg/kg	0.50	25.0
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	750
Mercury (Hg)	mg/kg	0.10	0.13
Molybdenum (Mo)	mg/kg	2.0	14.0
Nickel (Ni)	mg/kg	2.0	10
Rubidium (Rb)	mg/kg	2.0	4
Selenium (Se)	mg/kg	0.50	2.9
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	11
Thallium (Tl)	mg/kg	0.10	0.11
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	2.7
Vanadium (V)	mg/kg	2.0	11.0
Zinc (Zn)	mg/kg	5.0	57
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	300 (1.1)

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C35 Sediment Particle Size Distribution (%) for Lake L7, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	98	0.10
< +3 Phi (0.12 mm)	95	0.10
< +4 Phi (0.062 mm)	91	0.10
< +5 Phi (0.031 mm)	84	0.10
< +6 Phi (0.016 mm)	78	0.10
< +7 Phi (0.0078 mm)	67	0.10
< +8 Phi (0.0039 mm)	65	0.10
< +9 Phi (0.0020 mm)	60	0.10
Size classes		
Sand	9	0.10
Silt	26	0.10
Clay	65	0.10

RDL = Reportable Detection Limit

Table C36 Water Quality Data for Metals in Lake L8, June 2021.

	Units	RDL	L8
Aluminum (Al)	µg/L	5.0	9.2
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	8.4
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	0.012
Calcium (Ca)	µg/L	100	11,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	190
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	6,000
Manganese (Mn)	µg/L	2.0	14
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	720
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	330
Strontium (Sr)	µg/L	2.0	9.6
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C37 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L8, June 2021.

	Units	RDL	L8
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	55
Calculated TDS	mg/L	1.0	56
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	53
Anion Sum	me/L	N/A	1.17
Cation Sum	me/L	N/A	1.10
Ion Balance (% Difference)	%	N/A	3.08
Langelier Index (@ 20C)	N/A		-0.88
Langelier Index (@ 4C)	N/A		-1.13
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.52
Saturation pH (@ 4C)	N/A		8.77
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	56
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	19
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.50
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.64
Reactive Silica (SiO2)	mg/L	0.50	1.10
Dissolved Sulphate (SO4)	mg/L	2.0	2.50
Turbidity	NTU	0.10	0.97
Conductivity	µS/cm	1.0	96
Productivity			
Chlorophyll a (acidification)	µg/L		0.30

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C38 Field Water Quality Data for Lake L8, June 2021.

	Depth (m)
Parameter	0.9
pH	7.96
Conductivity (µS/cm)	117.2
ORP (mV)	-66.0
DO (mg/L)	9.19
DO (% sat.)	90.5
Temperature (°C)	14.0

Table C39 Sediment Chemistry Data for Lake L8, June 2021.

	Units	RDL	L8
Metals			
Aluminum (Al)	mg/kg	10	1,500
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	70
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.41
Chromium (Cr)	mg/kg	2.0	8.1
Cobalt (Co)	mg/kg	1.0	1.8
Copper (Cu)	mg/kg	2.0	7.6
Iron (Fe)	mg/kg	50	12,000
Lead (Pb)	mg/kg	0.50	14
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	210
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	5.2
Nickel (Ni)	mg/kg	2.0	8.1
Rubidium (Rb)	mg/kg	2.0	3
Selenium (Se)	mg/kg	0.50	1.7
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	12
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	1.2
Uranium (U)	mg/kg	0.10	2.2
Vanadium (V)	mg/kg	2.0	5.8
Zinc (Zn)	mg/kg	5.0	42
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	380

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C40 Sediment Particle Size Distribution (%) for Lake L8, June 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	95	0.10
< +4 Phi (0.062 mm)	92	0.10
< +5 Phi (0.031 mm)	85	0.10
< +6 Phi (0.016 mm)	86	0.10
< +7 Phi (0.0078 mm)	75	0.10
< +8 Phi (0.0039 mm)	73	0.10
< +9 Phi (0.0020 mm)	63	0.10
Size classes		
Sand	7	0.10
Silt	20	0.10
Clay	73	0.10

RDL = Reportable Detection Limit

Table C41 Water Quality Data for Metals in Lake L9, June 2021.

	Units	RDL	L9
Aluminum (Al)	µg/L	5.0	5.6
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	18
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	8,900
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	140
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	4,300
Manganese (Mn)	µg/L	2.0	8.3
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	690
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	270
Strontium (Sr)	µg/L	2.0	6.9
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C42 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L9, June 2021.

	Units	RDL	L9
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	43
Calculated TDS	mg/L	1.0	41
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	40
Anion Sum	me/L	N/A	0.87
Cation Sum	me/L	N/A	0.83
Ion Balance (% Difference)	%	N/A	2.35
Langelier Index (@ 20C)	N/A		-0.81
Langelier Index (@ 4C)	N/A		-1.06
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.72
Saturation pH (@ 4C)	N/A		8.97
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	43
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	12
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	3.6
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.91
Reactive Silica (SiO2)	mg/L	0.50	0.88
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.10
Conductivity	µS/cm	1.0	75
Productivity			
Chlorophyll a (acidification)	µg/L		0.08

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C43 Field Water Quality Data for Lake L9, June 2021.

	Depth (m)
Parameter	1
pH	7.50
Conductivity (µS/cm)	67.0
ORP (mV)	-43.8
DO (mg/L)	9.63
DO (% sat.)	100
Temperature (°C)	15.4

Table C44 Sediment Chemistry Data for Lake L9, July 2021.

	Units	RDL	L9
Metals			
Aluminum (Al)	mg/kg	10	900
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	200
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	6.3
Cobalt (Co)	mg/kg	1.0	1.7
Copper (Cu)	mg/kg	2.0	4.3
Iron (Fe)	mg/kg	50	26,000
Lead (Pb)	mg/kg	0.50	8.1
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	270
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	ND
Nickel (Ni)	mg/kg	2.0	6.3
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	0.65
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	9.8
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	3.4
Uranium (U)	mg/kg	0.10	1.1
Vanadium (V)	mg/kg	2.0	6.3
Zinc (Zn)	mg/kg	5.0	24
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	350

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C45 Sediment Particle Size Distribution (%) for Lake L9, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	98	0.10
< +3 Phi (0.12 mm)	96	0.10
< +4 Phi (0.062 mm)	95	0.10
< +5 Phi (0.031 mm)	74	0.10
< +6 Phi (0.016 mm)	88	0.10
< +7 Phi (0.0078 mm)	90	0.10
< +8 Phi (0.0039 mm)	63	0.10
< +9 Phi (0.0020 mm)	96	0.10
Size classes		
Sand	6	0.10
Silt	31	0.10
Clay	63	0.10

RDL = Reportable Detection Limit

Table C46 Water Quality Data for Metals in Lake L10, July 2021.

	Units	RDL	L10
Aluminum (Al)	µg/L	5.0	6.7
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	8.9
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	11,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	110
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	4,800
Manganese (Mn)	µg/L	2.0	8.9
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,000
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	410
Strontium (Sr)	µg/L	2.0	11
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C47 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L10, July 2021.

	Units	RDL	L10
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	52
Calculated TDS	mg/L	1.0	54
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	47
Anion Sum	me/L	N/A	1.11
Cation Sum	me/L	N/A	0.98
Ion Balance (% Difference)	%	N/A	6.22
Langelier Index (@ 20C)	N/A		-0.46
Langelier Index (@ 4C)	N/A		-0.71
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.56
Saturation pH (@ 4C)	N/A		8.82
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	53
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	11
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.30
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	8.10
Reactive Silica (SiO2)	mg/L	0.50	2.30
Dissolved Sulphate (SO4)	mg/L	2.0	2.60
Turbidity	NTU	0.10	0.79
Conductivity	µS/cm	1.0	94
Productivity			
Chlorophyll a (acidification)	µg/L		0.72

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C48 Field Water Quality Data for Lake L10, July 2021.

	Depth (m)
Parameter	0.5
pH	8.60
Conductivity (µS/cm)	109.6
ORP (mV)	-104.6
DO (mg/L)	7.56
DO (% sat.)	84.8
Temperature (°C)	20.2

Table C49 Sediment Chemistry Data for Lake L10, July 2021.

	Units	RDL	L10
Metals			
Aluminum (Al)	mg/kg	10	13,000
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	6.4
Barium (Ba)	mg/kg	5.0	130
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	60
Cobalt (Co)	mg/kg	1.0	13
Copper (Cu)	mg/kg	2.0	25
Iron (Fe)	mg/kg	50	46,000
Lead (Pb)	mg/kg	0.50	7.4
Lithium (Li)	mg/kg	2.0	12.0
Manganese (Mn)	mg/kg	2.0	720
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	10.0
Nickel (Ni)	mg/kg	2.0	36
Rubidium (Rb)	mg/kg	2.0	36
Selenium (Se)	mg/kg	0.50	ND
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	15
Thallium (Tl)	mg/kg	0.10	0.32
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	4.1
Vanadium (V)	mg/kg	2.0	41
Zinc (Zn)	mg/kg	5.0	54
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	12,000

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C50 Sediment Particle Size Distribution (%) for Lake L10, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	98	0.10
< +3 Phi (0.12 mm)	94	0.10
< +4 Phi (0.062 mm)	87	0.10
< +5 Phi (0.031 mm)	78	0.10
< +6 Phi (0.016 mm)	58	0.10
< +7 Phi (0.0078 mm)	31	0.10
< +8 Phi (0.0039 mm)	24	0.10
< +9 Phi (0.0020 mm)	13	0.10
Size classes		
Sand	13	0.10
Silt	63	0.10
Clay	24	0.10

RDL = Reportable Detection Limit

Table C51 Water Quality Data for Metals in Lake L11, August 2021.

	Units	RDL	L11
Aluminum (Al)	µg/L	5.0	ND
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	15
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	11,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	110
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	5,100
Manganese (Mn)	µg/L	2.0	11
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	940
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	270
Strontium (Sr)	µg/L	2.0	9.9
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C52 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L11, August 2021.

	Units	RDL	L11
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	56
Calculated TDS	mg/L	1.0	53
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	49
Anion Sum	me/L	N/A	1.13
Cation Sum	me/L	N/A	1.02
Ion Balance (% Difference)	%	N/A	5.12
Langelier Index (@ 20C)	N/A		-0.55
Langelier Index (@ 4C)	N/A		-0.80
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.52
Saturation pH (@ 4C)	N/A		8.77
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	56
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	8.5
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.10
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.96
Reactive Silica (SiO2)	mg/L	0.50	1.50
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	0.56
Conductivity	µS/cm	1.0	96
Productivity			
Chlorophyll a (acidification)	µg/L		0.56

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C53 Field Water Quality Data for Lake L11, August 2021.

	Depth (m)	
Parameter	0	1
pH	8.20	8.29
Conductivity (µS/cm)	75.3	73.9
ORP (mV)	-89.8	-95.1
DO (mg/L)	9.14	9.02
DO (% sat.)	99.1	96.9
Temperature (°C)	18.6	18.6

Table C54 Sediment Chemistry Data for Lake L11, August 2021.

	Units	RDL	L11
Metals			
Aluminum (Al)	mg/kg	10	930
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	100
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.45
Chromium (Cr)	mg/kg	2.0	4.4
Cobalt (Co)	mg/kg	1.0	ND
Copper (Cu)	mg/kg	2.0	5.2
Iron (Fe)	mg/kg	50	17,000
Lead (Pb)	mg/kg	0.50	9.2
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	350
Mercury (Hg)	mg/kg	0.10	0.1
Molybdenum (Mo)	mg/kg	2.0	10
Nickel (Ni)	mg/kg	2.0	4.1
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	3.3
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	21
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	4.3
Uranium (U)	mg/kg	0.10	11
Vanadium (V)	mg/kg	2.0	3.4
Zinc (Zn)	mg/kg	5.0	58
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	450 (1.2)

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C55 Sediment Particle Size Distribution (%) for Lake L11, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	96	0.10
< +3 Phi (0.12 mm)	93	0.10
< +4 Phi (0.062 mm)	92	0.10
< +5 Phi (0.031 mm)	110	0.10
< +6 Phi (0.016 mm)	99	0.10
< +7 Phi (0.0078 mm)	86	0.10
< +8 Phi (0.0039 mm)	88	0.10
< +9 Phi (0.0020 mm)	85	0.10
Size classes		
Sand	8	0.10
Silt	4	0.10
Clay	88	0.10

RDL = Reportable Detection Limit

Table C56 Water Quality Data for Metals in Lake L12, July 2021.

	Units	RDL	L12
Aluminum (Al)	µg/L	5.0	5.6
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	14
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	12,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	150
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	5,100
Manganese (Mn)	µg/L	2.0	18
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	980
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	450
Strontium (Sr)	µg/L	2.0	11
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C57 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L12, July 2021.

	Units	RDL	L12
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	54
Calculated TDS	mg/L	1.0	54
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	51
Anion Sum	me/L	N/A	1.09
Cation Sum	me/L	N/A	1.07
Ion Balance (% Difference)	%	N/A	0.93
Langelier Index (@ 20C)	N/A		-0.86
Langelier Index (@ 4C)	N/A		-1.06
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.50
Saturation pH (@ 4C)	N/A		8.75
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	55
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	17
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.30
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.89
Reactive Silica (SiO2)	mg/L	0.50	2.40
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	0.72
Conductivity	µS/cm	1.0	96
Productivity			
Chlorophyll a (acidification)	µg/L		0.82

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C58 Field Water Quality Data for Lake L12, July 2021.

	Depth (m)	
Parameter	1	1.7
pH	7.76	6.96
Conductivity (µS/cm)	115.2	28.8
ORP (mV)	-60.3	-11.4
DO (mg/L)	8.7	3.4
DO (% sat.)	93.5	35.9
Temperature (°C)	18.6	18.0

Table C59 Sediment Chemistry Data for Lake L12, July 2021.

	Units	RDL	L12
Metals			
Aluminum (Al)	mg/kg	10	18,000
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	2.5
Barium (Ba)	mg/kg	5.0	310
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.65
Chromium (Cr)	mg/kg	2.0	59
Cobalt (Co)	mg/kg	1.0	15
Copper (Cu)	mg/kg	2.0	28
Iron (Fe)	mg/kg	50	88,000
Lead (Pb)	mg/kg	0.50	6.8
Lithium (Li)	mg/kg	2.0	7
Manganese (Mn)	mg/kg	2.0	3,200
Mercury (Hg)	mg/kg	0.10	0.15
Molybdenum (Mo)	mg/kg	2.0	12
Nickel (Ni)	mg/kg	2.0	49
Rubidium (Rb)	mg/kg	2.0	9
Selenium (Se)	mg/kg	0.50	1.3
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	20
Thallium (Tl)	mg/kg	0.10	0.36
Tin (Sn)	mg/kg	1.0	1.6
Uranium (U)	mg/kg	0.10	8.5
Vanadium (V)	mg/kg	2.0	38
Zinc (Zn)	mg/kg	5.0	200
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	160

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C60 Sediment Particle Size Distribution (%) for Lake L12, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	96	0.10
< +3 Phi (0.12 mm)	94	0.10
< +4 Phi (0.062 mm)	92	0.10
< +5 Phi (0.031 mm)	93	0.10
< +6 Phi (0.016 mm)	90	0.10
< +7 Phi (0.0078 mm)	78	0.10
< +8 Phi (0.0039 mm)	74	0.10
< +9 Phi (0.0020 mm)	68	0.10
Size classes		
Sand	8	0.10
Silt	18	0.10
Clay	74	0.10

Table C61 Water Quality Data for Metals in Lake L13, August 2021.

	Units	RDL	L13
Aluminum (Al)	µg/L	5.0	6.4
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	37
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	22,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	130
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	9,500
Manganese (Mn)	µg/L	2.0	33
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,900
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	600
Strontium (Sr)	µg/L	2.0	23
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	0.14
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	9.6

RDL = Reportable Detection Limit, ND = Not Detected.

Table C62 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L13, August 2021.

	Units	RDL	L13
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	95
Calculated TDS	mg/L	1.0	100
Carb. Alkalinity (CaCO3)	mg/L	1.0	1.2
Hardness (CaCO3)	mg/L	1.0	95
Anion Sum	me/L	N/A	1.99
Cation Sum	me/L	N/A	1.97
Ion Balance (% Difference)	%	N/A	0.51
Langelier Index (@ 20C)	N/A		0.11
Langelier Index (@ 4C)	N/A		-0.14
Nitrate (N)	mg/L	0.050	0.09
Saturation pH (@ 20C)	N/A		8.02
Saturation pH (@ 4C)	N/A		8.27
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	96 (1)
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	13
Nitrate + Nitrite (N)	mg/L	0.050	0.09
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.50
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	8.13
Reactive Silica (SiO2)	mg/L	0.50	5.30
Dissolved Sulphate (SO4)	mg/L	2.0	2.90
Turbidity	NTU	0.10	1.20
Conductivity	µS/cm	1.0	180
Productivity			
Chlorophyll a (acidification)	µg/L		0.41

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C63 Field Water Quality Data for Lake L13, August 2021.

	Depth (m)
Parameter	0.5
pH	8.15
Conductivity (µS/cm)	136.6
ORP (mV)	-86.3
DO (mg/L)	9.60
DO (% sat.)	89.4
Temperature (°C)	15.7

Table C64 Sediment Chemistry Data for Lake L13, August 2021.

	Units	RDL	L13
Metals			
Aluminum (Al)	mg/kg	10	6,500
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	2.3
Barium (Ba)	mg/kg	5.0	100
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	32
Cobalt (Co)	mg/kg	1.0	7.3
Copper (Cu)	mg/kg	2.0	15
Iron (Fe)	mg/kg	50	56,000
Lead (Pb)	mg/kg	0.50	4
Lithium (Li)	mg/kg	2.0	6.1
Manganese (Mn)	mg/kg	2.0	2,800
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	15
Nickel (Ni)	mg/kg	2.0	20
Rubidium (Rb)	mg/kg	2.0	20
Selenium (Se)	mg/kg	0.50	ND
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	83
Thallium (Tl)	mg/kg	0.10	0.18
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	13
Vanadium (V)	mg/kg	2.0	21
Zinc (Zn)	mg/kg	5.0	30
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	50

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C65 Sediment Particle Size Distribution (%) for Lake L13, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	99	0.10
< +1 Phi (0.5 mm)	98	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	94	0.10
< +4 Phi (0.062 mm)	88	0.10
< +5 Phi (0.031 mm)	76	0.10
< +6 Phi (0.016 mm)	56	0.10
< +7 Phi (0.0078 mm)	14	0.10
< +8 Phi (0.0039 mm)	8.7	0.10
< +9 Phi (0.0020 mm)	4.5	0.10
Size classes		
Sand	11	0.10
Silt	80	0.10
Clay	9	0.10

RDL = Reportable Detection Limit

Table C66 Water Quality Data for Metals in Lake L14, July 2021.

	Units	RDL	L14
Aluminum (Al)	µg/L	5.0	10
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	2
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	870
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	4.1
Iron (Fe)	µg/L	50	640
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	360
Manganese (Mn)	µg/L	2.0	12
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	ND
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	120
Strontium (Sr)	µg/L	2.0	ND
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C67 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L14, July 2021.

	Units	RDL	L14
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	6.30
Calculated TDS	mg/L	1.0	6.00
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	3.60
Anion Sum	me/L	N/A	0.13
Cation Sum	me/L	N/A	0.10
Ion Balance (% Difference)	%	N/A	13
Langelier Index (@ 20C)	N/A		-3.92
Langelier Index (@ 4C)	N/A		-4.17
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		10.50
Saturation pH (@ 4C)	N/A		10.80
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	6.30
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	24
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.50
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	6.60
Reactive Silica (SiO2)	mg/L	0.50	0.57
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.20
Conductivity	µS/cm	1.0	7.20
Productivity			
Chlorophyll a (acidification)	µg/L		1.56

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C68 Field Water Quality Data for Lake L14, July 2021.

	Depth (m)	
Parameter	0.5	1.1
pH	8.09	8.62
Conductivity (µS/cm)	14.1	17.8
ORP (mV)	-83.3	-110.5
DO (mg/L)	7.55	8.65
DO (% sat.)	79.7	87.6
Temperature (°C)	16.9	16.8

Table C69 Sediment Chemistry Data for Lake L14, July 2021.

	Units	RDL	L14
Metals			
Aluminum (Al)	mg/kg	10	3,400
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	90
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.75
Chromium (Cr)	mg/kg	2.0	11
Cobalt (Co)	mg/kg	1.0	3.8
Copper (Cu)	mg/kg	2.0	18
Iron (Fe)	mg/kg	50	25,000
Lead (Pb)	mg/kg	0.50	7.2
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	240
Mercury (Hg)	mg/kg	0.10	0.11
Molybdenum (Mo)	mg/kg	2.0	2.4
Nickel (Ni)	mg/kg	2.0	22
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	1.2
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	15
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	0.38
Vanadium (V)	mg/kg	2.0	7.9
Zinc (Zn)	mg/kg	5.0	110
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	440 (1.3)

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C70 Sediment Particle Size Distribution (%) for Lake L14, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	94	0.10
< +4 Phi (0.062 mm)	91	0.10
< +5 Phi (0.031 mm)	90	0.10
< +6 Phi (0.016 mm)	95	0.10
< +7 Phi (0.0078 mm)	74	0.10
< +8 Phi (0.0039 mm)	63	0.10
< +9 Phi (0.0020 mm)	70	0.10
Size classes		
Sand	9	0.10
Silt	28	0.10
Clay	63	0.10

RDL = Reportable Detection Limit

Table C71 Water Quality Data for Metals in Lake L16, July 2021.

	Units	RDL	L16
Aluminum (Al)	µg/L	5.0	8.9
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	20
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	9,400
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	0.55
Iron (Fe)	µg/L	50	270
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,900
Manganese (Mn)	µg/L	2.0	48
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,200
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	600
Strontium (Sr)	µg/L	2.0	15
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C72 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L16, July 2021.

	Units	RDL	L16
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	42
Calculated TDS	mg/L	1.0	51
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	40
Anion Sum	me/L	N/A	0.97
Cation Sum	me/L	N/A	0.86
Ion Balance (% Difference)	%	N/A	6.01
Langelier Index (@ 20C)	N/A		-1.06
Langelier Index (@ 4C)	N/A		-1.32
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.71
Saturation pH (@ 4C)	N/A		8.96
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	43
Dissolved Chloride (Cl-)	mg/L	1.0	1.50
Colour	TCU	5.0	26
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.50
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.65
Reactive Silica (SiO2)	mg/L	0.50	4.50
Dissolved Sulphate (SO4)	mg/L	2.0	3.80
Turbidity	NTU	0.10	0.88
Conductivity	µS/cm	1.0	81
Productivity			
Chlorophyll a (acidification)	µg/L		0.75

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C73 Field Water Quality Data for Lake L16, July 2021.

	Depth (m)
Parameter	0.75
pH	6.87
Conductivity (µS/cm)	72.7
ORP (mV)	-17.8
DO (mg/L)	9.31
DO (% sat.)	90.2
Temperature (°C)	15.2

Table C74 Sediment Chemistry Data for Lake L16, July 2021.

	Units	RDL	L16
Metals			
Aluminum (Al)	mg/kg	10	730
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	52
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	3
Cobalt (Co)	mg/kg	1.0	ND
Copper (Cu)	mg/kg	2.0	10
Iron (Fe)	mg/kg	50	8,200
Lead (Pb)	mg/kg	0.50	1.1
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	390
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	64
Nickel (Ni)	mg/kg	2.0	11
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	1.3
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	18
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	1.8
Uranium (U)	mg/kg	0.10	2
Vanadium (V)	mg/kg	2.0	ND
Zinc (Zn)	mg/kg	5.0	28
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	430 (2.5)

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C75 Sediment Particle Size Distribution (%) for Lake L16, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	94	0.10
< +4 Phi (0.062 mm)	91	0.10
< +5 Phi (0.031 mm)	90	0.10
< +6 Phi (0.016 mm)	95	0.10
< +7 Phi (0.0078 mm)	74	0.10
< +8 Phi (0.0039 mm)	63	0.10
< +9 Phi (0.0020 mm)	70	0.10
Size classes		
Sand	9	0.10
Silt	28	0.10
Clay	63	0.10

RDL = Reportable Detection Limit

Table C76 Water Quality Data for Metals in Lake L17, July 2021.

	Units	RDL	L17
Aluminum (Al)	µg/L	5.0	11
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	11
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	0.011
Calcium (Ca)	µg/L	100	7700
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	300
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3300
Manganese (Mn)	µg/L	2.0	26
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	960
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	560
Strontium (Sr)	µg/L	2.0	11
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C77 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L17, July 2021.

	Units	RDL	L17
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	36
Calculated TDS	mg/L	1.0	49
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	33
Anion Sum	me/L	N/A	0.99
Cation Sum	me/L	N/A	072
Ion Balance (% Difference)	%	N/A	15.80
Langelier Index (@ 20C)	N/A		-1.41
Langelier Index (@ 4C)	N/A		-1.66
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.86
Saturation pH (@ 4C)	N/A		9.12
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	36
Dissolved Chloride (Cl-)	mg/L	1.0	6.9
Colour	TCU	5.0	36
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.70
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.45
Reactive Silica (SiO2)	mg/L	0.50	3.60
Dissolved Sulphate (SO4)	mg/L	2.0	3.60
Turbidity	NTU	0.10	0.94
Conductivity	µS/cm	1.0	67
Productivity			
Chlorophyll a (acidification)	µg/L		0.77

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C78 Field Water Quality Data for Lake L17, July 2021.

	Depth (m)
Parameter	0.6
pH	6.80
Conductivity (µS/cm)	61
ORP (mV)	-14.0
DO (mg/L)	8.71
DO (% sat.)	83.8
Temperature (°C)	15.6

Table C79 Sediment Chemistry Data for Lake L17, July 2021.

	Units	RDL	L17
Metals			
Aluminum (Al)	mg/kg	10	1700
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	74
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	8.1
Cobalt (Co)	mg/kg	1.0	2.4
Copper (Cu)	mg/kg	2.0	9.9
Iron (Fe)	mg/kg	50	15000
Lead (Pb)	mg/kg	0.50	8.7
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	290
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	9
Nickel (Ni)	mg/kg	2.0	18
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	2.5
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	17
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	1.1
Uranium (U)	mg/kg	0.10	3.2
Vanadium (V)	mg/kg	2.0	5.5
Zinc (Zn)	mg/kg	5.0	31
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	330 (1.3)

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C80 Sediment Particle Size Distribution (%) for Lake L17, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	98	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	96	0.10
< +4 Phi (0.062 mm)	95	0.10
< +5 Phi (0.031 mm)	94	0.10
< +6 Phi (0.016 mm)	92	0.10
< +7 Phi (0.0078 mm)	75	0.10
< +8 Phi (0.0039 mm)	73	0.10
< +9 Phi (0.0020 mm)	67	0.10
Size classes		
Sand	5	0.10
Silt	22	0.10
Clay	73	0.10

RDL = Reportable Detection Limit

Table C81 Water Quality Data for Metals in Lake L18, July 2021.

	Units	RDL	L18
Aluminum (Al)	µg/L	5.0	12
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	11
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	0.011
Calcium (Ca)	µg/L	100	6100
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	120
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2600
Manganese (Mn)	µg/L	2.0	46
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	800
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	590
Strontium (Sr)	µg/L	2.0	11
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C82 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L18, July 2021.

	Units	RDL	L18
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	27
Calculated TDS	mg/L	1.0	34
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	26
Anion Sum	me/L	N/A	0.64
Cation Sum	me/L	N/A	0.57
Ion Balance (% Difference)	%	N/A	5.79
Langelier Index (@ 20C)	N/A		-1.50
Langelier Index (@ 4C)	N/A		-1.76
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.07
Saturation pH (@ 4C)	N/A		9.33
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	27
Dissolved Chloride (Cl-)	mg/L	1.0	1.80
Colour	TCU	5.0	22
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.20
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.57
Reactive Silica (SiO2)	mg/L	0.50	3.10
Dissolved Sulphate (SO4)	mg/L	2.0	2.00
Turbidity	NTU	0.10	1.40
Conductivity	µS/cm	1.0	52
Productivity			
Chlorophyll a (acidification)	µg/L		3.46

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C83 Field Water Quality Data for Lake L18, July 2021.

	Depth (m)	
Parameter	1	2
pH	7.28	7.29
Conductivity (µS/cm)	59.8	82.2
ORP (mV)	-35.9	-33.7
DO (mg/L)	8.23	7.97
DO (% sat.)	84.9	84.1
Temperature (°C)	17.3	16.7

Table C84 Sediment Chemistry Data for Lake L18, July 2021.

	Units	RDL	L18
Metals			
Aluminum (Al)	mg/kg	10	2800
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	74
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	11
Cobalt (Co)	mg/kg	1.0	1.9
Copper (Cu)	mg/kg	2.0	13
Iron (Fe)	mg/kg	50	23000
Lead (Pb)	mg/kg	0.50	3.9
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	450
Mercury (Hg)	mg/kg	0.10	0.11
Molybdenum (Mo)	mg/kg	2.0	7.2
Nickel (Ni)	mg/kg	2.0	19
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	2.7
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	12
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	4.2
Vanadium (V)	mg/kg	2.0	5.1
Zinc (Zn)	mg/kg	5.0	63
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	300

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C85 Sediment Particle Size Distribution (%) for Lake L18, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	99	0.10
< +2 Phi (0.25 mm)	97	0.10
< +3 Phi (0.12 mm)	90	0.10
< +4 Phi (0.062 mm)	74	0.10
< +5 Phi (0.031 mm)	70	0.10
< +6 Phi (0.016 mm)	63	0.10
< +7 Phi (0.0078 mm)	53	0.10
< +8 Phi (0.0039 mm)	51	0.10
< +9 Phi (0.0020 mm)	46	0.10
Size classes		
Sand	26	0.10
Silt	23	0.10
Clay	51	0.10

RDL = Reportable Detection Limit

Table C86 Water Quality Data for Metals in Lake L19, July 2021.

	Units	RDL	L19
Aluminum (Al)	µg/L	5.0	12
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	9.5
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	5600
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	92
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2500
Manganese (Mn)	µg/L	2.0	27
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	2.6
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	590
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	500
Strontium (Sr)	µg/L	2.0	11
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C87 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L19, July 2021.

	Units	RDL	L19
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	29
Calculated TDS	mg/L	1.0	33
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	24
Anion Sum	me/L	N/A	0.63
Cation Sum	me/L	N/A	0.53
Ion Balance (% Difference)	%	N/A	8.62
Langelier Index (@ 20C)	N/A		-1.63
Langelier Index (@ 4C)	N/A		-1.88
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.08
Saturation pH (@ 4C)	N/A		9.33
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	29
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	22
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	0.09
Total Organic Carbon (C)	mg/L	0.50	5.3
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.45
Reactive Silica (SiO2)	mg/L	0.50	3.30
Dissolved Sulphate (SO4)	mg/L	2.0	2.40
Turbidity	NTU	0.10	1.20
Conductivity	µS/cm	1.0	51
Productivity			
Chlorophyll a (acidification)	µg/L		0.90

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C88 Field Water Quality Data for Lake L19, July 2021.

	Depth (m)	
Parameter	1	1.9
pH	7.17	7.20
Conductivity (µS/cm)	54.7	54.8
ORP (mV)	-29.2	-31.8
DO (mg/L)	9.71	8.73
DO (% sat.)	95.1	87.0
Temperature (°C)	15.5	15.5

Table C89 Sediment Chemistry Data for Lake L19, July 2021.

	Units	RDL	L19
Metals			
Aluminum (Al)	mg/kg	10	3300
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	180
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	16
Cobalt (Co)	mg/kg	1.0	4
Copper (Cu)	mg/kg	2.0	3
Iron (Fe)	mg/kg	50	19000
Lead (Pb)	mg/kg	0.50	1.4
Lithium (Li)	mg/kg	2.0	3.5
Manganese (Mn)	mg/kg	2.0	2800
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	ND
Nickel (Ni)	mg/kg	2.0	11
Rubidium (Rb)	mg/kg	2.0	3
Selenium (Se)	mg/kg	0.50	ND
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	ND
Thallium (Tl)	mg/kg	0.10	0.12
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	0.4
Vanadium (V)	mg/kg	2.0	10
Zinc (Zn)	mg/kg	5.0	36
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	11000

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C90 Sediment Particle Size Distribution (%) for Lake L19, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	75	0.10
< 0 Phi (1 mm)	54	0.10
< +1 Phi (0.5 mm)	31	0.10
< +2 Phi (0.25 mm)	13	0.10
< +3 Phi (0.12 mm)	6.3	0.10
< +4 Phi (0.062 mm)	4.7	0.10
< +5 Phi (0.031 mm)	4	0.10
< +6 Phi (0.016 mm)	3.7	0.10
< +7 Phi (0.0078 mm)	3.1	0.10
< +8 Phi (0.0039 mm)	2.8	0.10
< +9 Phi (0.0020 mm)	2.5	0.10
Size classes		
Sand	71	0.10
Silt	2	0.10
Clay	2	0.10
Gravel	25	0.10

RDL = Reportable Detection Limit

Table C91 Water Quality Data for Metals in Lake L20 - 1, July 2021.

	Units	RDL	L20-1
Aluminum (Al)	µg/L	5.0	21
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	9.8
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	5300
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	140
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2400
Manganese (Mn)	µg/L	2.0	16
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	620
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	530
Strontium (Sr)	µg/L	2.0	9.6
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C92 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L20-1, July 2021.

	Units	RDL	L20-1
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	24
Calculated TDS	mg/L	1.0	29
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	23
Anion Sum	me/L	N/A	0.54
Cation Sum	me/L	N/A	0.50
Ion Balance (% Difference)	%	N/A	3.85
Langelier Index (@ 20C)	N/A		-1.67
Langelier Index (@ 4C)	N/A		-1.93
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.18
Saturation pH (@ 4C)	N/A		9.43
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	24
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	29
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.70
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.51
Reactive Silica (SiO2)	mg/L	0.50	3.20
Dissolved Sulphate (SO4)	mg/L	2.0	2.30
Turbidity	NTU	0.10	1.40
Conductivity	µS/cm	1.0	44
Productivity			
Chlorophyll a (acidification)	µg/L		1.04

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C93 Field Water Quality Data for Lake L20-1, July 2021.

	Depth (m)
Parameter	1.0
pH	7.83
Conductivity (µS/cm)	117
ORP (mV)	-67.2
DO (mg/L)	8.39
DO (% sat.)	86.0
Temperature (°C)	15.9

Table C94 Sediment Chemistry Data for Lake L20-1, July 2021.

	Units	RDL	L20-1
Metals			
Aluminum (Al)	mg/kg	10	16000
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	2.5
Barium (Ba)	mg/kg	5.0	190
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.5
Chromium (Cr)	mg/kg	2.0	53
Cobalt (Co)	mg/kg	1.0	9.3
Copper (Cu)	mg/kg	2.0	31
Iron (Fe)	mg/kg	50	82000
Lead (Pb)	mg/kg	0.50	7.3
Lithium (Li)	mg/kg	2.0	5.9
Manganese (Mn)	mg/kg	2.0	1500
Mercury (Hg)	mg/kg	0.10	0.18
Molybdenum (Mo)	mg/kg	2.0	14
Nickel (Ni)	mg/kg	2.0	41
Rubidium (Rb)	mg/kg	2.0	6.9
Selenium (Se)	mg/kg	0.50	1.3
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	17
Thallium (Tl)	mg/kg	0.10	0.19
Tin (Sn)	mg/kg	1.0	1.1
Uranium (U)	mg/kg	0.10	6.9
Vanadium (V)	mg/kg	2.0	35
Zinc (Zn)	mg/kg	5.0	150
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	190

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C95 Sediment Particle Size Distribution (%) for Lake L20-1, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	100	0.10
< +2 Phi (0.25 mm)	100	0.10
< +3 Phi (0.12 mm)	97	0.10
< +4 Phi (0.062 mm)	91	0.10
< +5 Phi (0.031 mm)	86	0.10
< +6 Phi (0.016 mm)	79	0.10
< +7 Phi (0.0078 mm)	64	0.10
< +8 Phi (0.0039 mm)	60	0.10
< +9 Phi (0.0020 mm)	53	0.10
Size classes		
Sand	9	0.10
Silt	31	0.10
Clay	60	0.10

RDL = Reportable Detection Limit

Table C96 Water Quality Data for Metals in Lake L20-2, July 2021.

	Units	RDL	L20-2
Aluminum (Al)	µg/L	5.0	17
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	9.4
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	5100
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	120
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2300
Manganese (Mn)	µg/L	2.0	11
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	550
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	530
Strontium (Sr)	µg/L	2.0	9.7
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C97 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L20-2, July 2021.

	Units	RDL	L20-2
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	25
Calculated TDS	mg/L	1.0	27
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	22
Anion Sum	me/L	N/A	0.49
Cation Sum	me/L	N/A	0.49
Ion Balance (% Difference)	%	N/A	0.00
Langelier Index (@ 20C)	N/A		-1.66
Langelier Index (@ 4C)	N/A		-1.92
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.19
Saturation pH (@ 4C)	N/A		9.45
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	25
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	31
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.70
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.53
Reactive Silica (SiO2)	mg/L	0.50	3.30
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.70
Conductivity	µS/cm	1.0	44
Productivity			
Chlorophyll a (acidification)	µg/L		0.96

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C98 Field Water Quality Data for Lake L20-2, July 2021.

Depth (m)			
Parameter	1.0	2.0	2.5
pH	7.37	7.33	7.33
Conductivity (µS/cm)	76.0	75.6	74.0
ORP (mV)	-43.0	-34.4	-41.4
DO (mg/L)	8.10	8.19	8.51
DO (% sat.)	86.2	81.7	86.0
Temperature (°C)	16.6	16.3	16.1

Table C99 Sediment Chemistry Data for Lake L20-2, July 2021.

	Units	RDL	L20-2
Metals			
Aluminum (Al)	mg/kg	10	12000
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	2.6
Barium (Ba)	mg/kg	5.0	120
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.48
Chromium (Cr)	mg/kg	2.0	36
Cobalt (Co)	mg/kg	1.0	7
Copper (Cu)	mg/kg	2.0	20
Iron (Fe)	mg/kg	50	61000
Lead (Pb)	mg/kg	0.50	13
Lithium (Li)	mg/kg	2.0	4.5
Manganese (Mn)	mg/kg	2.0	800
Mercury (Hg)	mg/kg	0.10	0.2
Molybdenum (Mo)	mg/kg	2.0	7.1
Nickel (Ni)	mg/kg	2.0	25
Rubidium (Rb)	mg/kg	2.0	5.8
Selenium (Se)	mg/kg	0.50	1.1
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	11
Thallium (Tl)	mg/kg	0.10	0.14
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	4.3
Vanadium (V)	mg/kg	2.0	24
Zinc (Zn)	mg/kg	5.0	120
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	160

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C100 Sediment Particle Size Distribution (%) for Lake L20-2, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	100	0.10
< +2 Phi (0.25 mm)	99	0.10
< +3 Phi (0.12 mm)	98	0.10
< +4 Phi (0.062 mm)	97	0.10
< +5 Phi (0.031 mm)	86	0.10
< +6 Phi (0.016 mm)	76	0.10
< +7 Phi (0.0078 mm)	63	0.10
< +8 Phi (0.0039 mm)	59	0.10
< +9 Phi (0.0020 mm)	51	0.10
Size classes		
Sand	4	0.10
Silt	37	0.10
Clay	59	0.10

RDL = Reportable Detection Limit

Table C101 Water Quality Data for Metals in Lake L20-3, July 2021.

	Units	RDL	L20-3
Aluminum (Al)	µg/L	5.0	26
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	8.3
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	5200
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	1.1
Iron (Fe)	µg/L	50	120
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2400
Manganese (Mn)	µg/L	2.0	21
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	570
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	490
Strontium (Sr)	µg/L	2.0	10
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	6.6

RDL = Reportable Detection Limit, ND = Not Detected.

Table C102 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L20-3, July 2021.

	Units	RDL	L20-3
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	23
Calculated TDS	mg/L	1.0	24
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	23
Anion Sum	me/L	N/A	0.46
Cation Sum	me/L	N/A	0.49
Ion Balance (% Difference)	%	N/A	3.16
Langelier Index (@ 20C)	N/A		-1.68
Langelier Index (@ 4C)	N/A		-1.93
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.21
Saturation pH (@ 4C)	N/A		9.46
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	23
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	29
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	7.60
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.53
Reactive Silica (SiO2)	mg/L	0.50	1.50
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.50
Conductivity	µS/cm	1.0	44
Productivity			
Chlorophyll a (acidification)	µg/L		1.85

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C103 Field Water Quality Data for Lake L20-3, July 2021.

	Depth (m)
Parameter	1.0
pH	7.22
Conductivity (µS/cm)	106
ORP (mV)	-28.0
DO (mg/L)	7.91
DO (% sat.)	71.0
Temperature (°C)	16.4

Table C104 Sediment Chemistry Data for Lake L20-3, July 2021.

	Units	RDL	L20-3
Metals			
Aluminum (Al)	mg/kg	10	6700
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	93
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	0.36
Chromium (Cr)	mg/kg	2.0	24
Cobalt (Co)	mg/kg	1.0	4.3
Copper (Cu)	mg/kg	2.0	18
Iron (Fe)	mg/kg	50	26000
Lead (Pb)	mg/kg	0.50	9.7
Lithium (Li)	mg/kg	2.0	3
Manganese (Mn)	mg/kg	2.0	320
Mercury (Hg)	mg/kg	0.10	0.14
Molybdenum (Mo)	mg/kg	2.0	3.8
Nickel (Ni)	mg/kg	2.0	25
Rubidium (Rb)	mg/kg	2.0	5.1
Selenium (Se)	mg/kg	0.50	0.85
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	13
Thallium (Tl)	mg/kg	0.10	0.11
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	2.4
Vanadium (V)	mg/kg	2.0	16
Zinc (Zn)	mg/kg	5.0	68
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	180

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C105 Sediment Particle Size Distribution (%) for Lake L20-3, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	100	0.10
< +2 Phi (0.25 mm)	99	0.10
< +3 Phi (0.12 mm)	98	0.10
< +4 Phi (0.062 mm)	95	0.10
< +5 Phi (0.031 mm)	91	0.10
< +6 Phi (0.016 mm)	83	0.10
< +7 Phi (0.0078 mm)	65	0.10
< +8 Phi (0.0039 mm)	61	0.10
< +9 Phi (0.0020 mm)	50	0.10
Size classes		
Sand	5	0.10
Silt	34	0.10
Clay	61	0.10

RDL = Reportable Detection Limit

Table C106 Water Quality Data for Metals in Lake L21, August 2021.

	Units	RDL	L21
Aluminum (Al)	µg/L	5.0	7.6
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	44
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	17000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	800
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	7000
Manganese (Mn)	µg/L	2.0	110
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1200
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	550
Strontium (Sr)	µg/L	2.0	23
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C107 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L21, August 2021.

	Units	RDL	L21
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	76
Calculated TDS	mg/L	1.0	79
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	72
Anion Sum	me/L	N/A	1.58
Cation Sum	me/L	N/A	1.52
Ion Balance (% Difference)	%	N/A	1.94
Langelier Index (@ 20C)	N/A		-0.40
Langelier Index (@ 4C)	N/A		-0.65
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.21
Saturation pH (@ 4C)	N/A		8.46
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	77
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	34
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.70.
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.82
Reactive Silica (SiO2)	mg/L	0.50	3.90
Dissolved Sulphate (SO4)	mg/L	2.0	2.10
Turbidity	NTU	0.10	2.90
Conductivity	µS/cm	1.0	130
Productivity			
Chlorophyll a (acidification)	µg/L		0.46

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C108 Field Water Quality Data for Lake L21, August 2021.

	Depth (m)
Parameter	0.4
pH	7.42
Conductivity (µS/cm)	103.6
ORP (mV)	-48.8
DO (mg/L)	9.95
DO (% sat.)	90.4
Temperature (°C)	17.6

Table C109 Sediment Chemistry Data for Lake L21, August 2021.

	Units	RDL	L21
Metals			
Aluminum (Al)	mg/kg	10	2000
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	70
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	6.5
Cobalt (Co)	mg/kg	1.0	2.1
Copper (Cu)	mg/kg	2.0	3.7
Iron (Fe)	mg/kg	50	63000
Lead (Pb)	mg/kg	0.50	2.2
Lithium (Li)	mg/kg	2.0	ND
Manganese (Mn)	mg/kg	2.0	2400
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	5.8
Nickel (Ni)	mg/kg	2.0	7.6
Rubidium (Rb)	mg/kg	2.0	ND
Selenium (Se)	mg/kg	0.50	ND
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	ND
Thallium (Tl)	mg/kg	0.10	ND
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	0.86
Vanadium (V)	mg/kg	2.0	3.8
Zinc (Zn)	mg/kg	5.0	55
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	88 (1.3)

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C110 Sediment Particle Size Distribution (%) for Lake L21, August 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	100	0.10
< +2 Phi (0.25 mm)	99	0.10
< +3 Phi (0.12 mm)	98	0.10
< +4 Phi (0.062 mm)	94	0.10
< +5 Phi (0.031 mm)	89	0.10
< +6 Phi (0.016 mm)	84	0.10
< +7 Phi (0.0078 mm)	70	0.10
< +8 Phi (0.0039 mm)	62	0.10
< +9 Phi (0.0020 mm)	50	0.10
Size classes		
Sand	6	0.10
Silt	32	0.10
Clay	62	0.10

RDL = Reportable Detection Limit

Table C111 Water Quality Data for Metals in Lake L23, July 2021.

	Units	RDL	L23
Aluminum (Al)	µg/L	5.0	16
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	5.2
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	0.013
Calcium (Ca)	µg/L	100	4300
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	0.55
Iron (Fe)	µg/L	50	170
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	1900
Manganese (Mn)	µg/L	2.0	17
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	600
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	360
Strontium (Sr)	µg/L	2.0	10
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected.

Table C112 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Lake L23, July 2021.

	Units	RDL	L23
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	21
Calculated TDS	mg/L	1.0	21
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	19
Anion Sum	me/L	N/A	0.42
Cation Sum	me/L	N/A	0.41
Ion Balance (% Difference)	%	N/A	1.20
Langelier Index (@ 20C)	N/A		-1.92
Langelier Index (@ 4C)	N/A		-2.17
Nitrate (N)	mg/L	0.050	0.06
Saturation pH (@ 20C)	N/A		9.33
Saturation pH (@ 4C)	N/A		9.58
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	21
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	17
Nitrate + Nitrite (N)	mg/L	0.050	0.06
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	0.05
Total Organic Carbon (C)	mg/L	0.50	7.10
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.41
Reactive Silica (SiO2)	mg/L	0.50	0.71
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.40
Conductivity	µS/cm	1.0	35
Productivity			
Chlorophyll a (acidification)	µg/L		1.86

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table C113 Field Water Quality Data for Lake L23, July 2021.

	Depth (m)	
Parameter	1	1.9
pH	7.66	7.81
Conductivity (µS/cm)	62.5	84.0
ORP (mV)	-59.0	-63.0
DO (mg/L)	8.34	8.12
DO (% sat.)	86.0	83.0
Temperature (°C)	16.0	16.0

Table C114 Sediment Chemistry Data for Lake L23, July 2021.

	Units	RDL	L23
Metals			
Aluminum (Al)	mg/kg	10	12000
Antimony (Sb)	mg/kg	2.0	ND
Arsenic (As)	mg/kg	2.0	ND
Barium (Ba)	mg/kg	5.0	130
Beryllium (Be)	mg/kg	2.0	ND
Bismuth (Bi)	mg/kg	2.0	ND
Boron (B)	mg/kg	50	ND
Cadmium (Cd)	mg/kg	0.30	ND
Chromium (Cr)	mg/kg	2.0	64
Cobalt (Co)	mg/kg	1.0	12
Copper (Cu)	mg/kg	2.0	45
Iron (Fe)	mg/kg	50	40000
Lead (Pb)	mg/kg	0.50	8.1
Lithium (Li)	mg/kg	2.0	9.2
Manganese (Mn)	mg/kg	2.0	810
Mercury (Hg)	mg/kg	0.10	ND
Molybdenum (Mo)	mg/kg	2.0	7.3
Nickel (Ni)	mg/kg	2.0	45
Rubidium (Rb)	mg/kg	2.0	25
Selenium (Se)	mg/kg	0.50	1.7
Silver (Ag)	mg/kg	0.50	ND
Strontium (Sr)	mg/kg	5.0	22
Thallium (Tl)	mg/kg	0.10	0.26
Tin (Sn)	mg/kg	1.0	ND
Uranium (U)	mg/kg	0.10	6.3
Vanadium (V)	mg/kg	2.0	40
Zinc (Zn)	mg/kg	5.0	77
Other Parameters			
Total Organic Carbon (TOC)[a]	g/kg	0.50	110

RDL= Reportable Detection Limit, ND= Not Detected

[a] Number in bracket represent RDL for the specific measurement

Table C115 Sediment Particle Size Distribution (%) for Lake L23, July 2021.

Diameter	Proportion	RDL
< -1 Phi (2 mm)	100	0.10
< 0 Phi (1 mm)	100	0.10
< +1 Phi (0.5 mm)	98	0.10
< +2 Phi (0.25 mm)	95	0.10
< +3 Phi (0.12 mm)	83	0.10
< +4 Phi (0.062 mm)	73	0.10
< +5 Phi (0.031 mm)	68	0.10
< +6 Phi (0.016 mm)	59	0.10
< +7 Phi (0.0078 mm)	43	0.10
< +8 Phi (0.0039 mm)	38	0.10
< +9 Phi (0.0020 mm)	29	0.10
Size classes		
Sand	27	0.10
Silt	35	0.10
Clay	38	0.10

RDL = Reportable Detection Limit



Appendix D

Data Tables - Streams

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Table D1 Water Quality Data for Metals in Stream S1, August 2021.

Parameter	Units	RDL	S1
Aluminum (Al)	µg/L	5.0	15
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	20
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	12,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	480
Lead (Pb)	µg/L	0.50	1.8
Magnesium (Mg)	µg/L	100	4,800
Manganese (Mn)	µg/L	2.0	54
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,100
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	860
Strontium (Sr)	µg/L	2.0	23
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

Table D2 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S1, August 2021.

Parameters	Units	RDL	S1
Calculated Parameters			
Bicarb. Alkalinity ($CaCO^3$)	mg/L	1.0	53
Calculated TDS	mg/L	1.0	60
Carb. Alkalinity ($CaCO^3$)	mg/L	1.0	ND
Hardness ($CaCO^3$)	mg/L	1.0	50
Anion Sum	me/L	N/A	1.12
Cation Sum	me/L	N/A	1.08
Ion Balance (% Difference)	%	N/A	1.82
Langelier Index (@ 20C)	N/A		-0.709
Langelier Index (@ 4C)	N/A		-0.961
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.51
Saturation pH (@ 4C)	N/A		8.76
Inorganics			
Total Alkalinity ($CaCO^3$)	mg/L	5.0	53
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	26
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.0
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.80
Reactive Silica (SiO^2)	mg/L	0.50	6.3
Dissolved Sulphate (SO^4)	mg/L	2.0	2.6
Turbidity	NTU	0.10	2.0
Conductivity	µS/cm	1.0	97

Table D3 Field Water Quality Data for Stream S1, August 2021.

Parameter	Units	S1
pH	N/A	8.11
Conductivity	µS/cm	71.3
ORP	mV	-82.3
DO	mg/L	11.83
DO	% Sat	113.6
Temperature	°C	14.7

Table D4 Flow Regime for Stream S1, August 2021.

Station No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	0	6	0
2	20	8	0.02
3	50	9	0.13
4	80	12	0.10
5	110	10	0.14
6	150	8	0.11
7	170	9	0.11
Mean		9.9	0.09
Discharge	0.016 m^3/s		

Table D5 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S1.

Stream ID	Section No.	Cover Type			Stream Bank[2]	
		Overhanging	Instream Substrate/Logs	Canopy	Eroding Banks	Undercut Banks
S1	1	15	5	5	0	70
	2	5	40	0	0	30
	3	20	50	0	0	40
	4	25	5	0	0	25
	5	30	5	5	0	50
	6	30	10	5	0	40
	7	40	10	10	0	40
	8	70	10	<5	<5	60
	9	20	0	0	0	5
	10	70	10	0	0	<5
	Mean	33	15	3	0	40.0

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks on each stream side.

Table D6 Water Quality Data for Metals in Stream S2, August 2021.

Parameters	Units	RDL	S2
Aluminum (Al)	µg/L	5.0	12
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	18
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	13,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	ND
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	5,200
Manganese (Mn)	µg/L	2.0	4.1
Molybdenum (Mo)	µg/L	2.0	ND.
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,300
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	830
Strontium (Sr)	µg/L	2.0	22
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

Table D7 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S2, August 2021.

Parameters	Units	RDL	S2
Calculated Parameters			
Bicarb. Alkalinity ($CaCO^3$)	mg/L	1.0	60
Calculated TDS	mg/L	1.0	68
Carb. Alkalinity ($CaCO^3$)	mg/L	1.0	ND
Hardness ($CaCO^3$)	mg/L	1.0	53
Anion Sum	me/L	N/A	1.29
Cation Sum	me/L	N/A	1.13
Ion Balance (% Difference)	%	N/A	6.61
Langelier Index (@ 20C)	N/A		-0.59
Langelier Index (@ 4C)	N/A		-0.84
Nitrate (N)	mg/L	0.050	0.07
Saturation pH (@ 20C)	N/A		8.44
Saturation pH (@ 4C)	N/A		8.69
Inorganics			
Total Alkalinity ($CaCO^3$)	mg/L	5.0	60
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	12
Nitrate + Nitrite (N)	mg/L	0.050	0.07
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	2.7
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.85
Reactive Silica (SiO^2)	mg/L	0.50	7.2
Dissolved Sulphate (SO^4)	mg/L	2.0	3.8
Turbidity	NTU	0.10	0.29
Conductivity	µS/cm	1.0	110

Table D8 Field Water Quality Data for Stream S2, August 2021.

Parameter	Units	S2
pH	NA	7.87
Conductivity	µS/cm	72.3
ORP	mV	-71.0
DO	mg/L	10.8
DO	% Sat	100.1
Temperature	°C	15.3

Table D9 Flow Regime for Stream S2, August 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	0	0	0
2	20	12	0.06
3	40	10	0.25
4	60	17	0.52
		10	0.277
Mean Discharge	0.014 m^3/s		

Table D10 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S2.

		Cover Type			Stream Bank[2]	
Stream ID	Section No.	Overhanging	Instream Substrate/Logs	Canopy	Eroding Banks	Undercut Banks
S2	1	100	70	10	0	95
	2	100	20	5	0	20
	3	100	30	0	0	10
	4	100	10	0	0	15
	Mean	100	33	4	0	35

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D11 Water Quality Data for Metals in Stream S3, June 2021.

Parameters	Units	RDL	S3
Aluminum (Al)	µg/L	5.0	18
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	17
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	9,600
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	200
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	4,100
Manganese (Mn)	µg/L	2.0	200
Molybdenum (Mo)	µg/L	2.0	2.7
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,000
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	470
Strontium (Sr)	µg/L	2.0	12
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL= Reportable Detection Limit, ND= Not Detected

Table D12 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S3, June 2021.

Parameters	Units	RDL	S3
Calculated Parameters			
Bicarb. Alkalinity ($CaCO^3$)	mg/L	1.0	45
Calculated TDS	mg/L	1.0	49
Carb. Alkalinity ($CaCO^3$)	mg/L	1.0	ND
Hardness ($CaCO^3$)	mg/L	1.0	41
Anion Sum	me/L	N/A	0.98
Cation Sum	me/L	N/A	0.88
Ion Balance (% Difference)	%	N/A	5.38
Langelier Index (@ 20C)	N/A		-1.02
Langelier Index (@ 4C)	N/A		-1.27
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.67
Saturation pH (@ 4C)	N/A		8.92
Inorganics			
Total Alkalinity ($CaCO^3$)	mg/L	5.0	46
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	ND
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	3.30
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.65
Reactive Silica (SiO^2)	mg/L	0.50	2.8
Dissolved Sulphate (SO^4)	mg/L	2.0	3.1
Turbidity	NTU	0.10	1.30
Conductivity	µS/cm	1.0	82

RDL= Reportable Detection Limit, ND= Not Detected, N/A= Not Applicable

Table D12 Field Water Quality Data for Stream S3, July 2021.

Parameter	Units	S3
pH	N/A	7.42
Conductivity	µS/cm	82.6
ORP	mV	-46.6
DO	mg/L	8.5
DO	% Sat	87.4
Temperature	°C	16.7

N/A= Not Applicable

Table D13 Flow Regime for Stream S3, June 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	30	12	0.04
2	61	14	0.18
3	91	13	0.103
4	122	10	0.019
5	152	6	0.059
Mean		11	0.080
Discharge	0.013 m^3/s		

Table D13 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S3.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	50	10	30	5	10
Mean	50	10	30	5	10

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D14 Water Quality Data for Metals in Stream S4, August 2021.

Parameters	Units	RDL	S4
Aluminum (Al)	µg/L	5.0	5.4
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	19
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	12,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	110
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	5,300
Manganese (Mn)	µg/L	2.0	110
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,200
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	380
Strontium (Sr)	µg/L	2.0	13
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D15 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S4, August 2021.

Parameters	Units	RDL	S4
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	59
Calculated TDS	mg/L	1.0	63
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	52
Anion Sum	me/L	N/A	1.27
Cation Sum	me/L	N/A	1.09
Ion Balance (% Difference)	%	N/A	7.63
Langelier Index (@ 20C)	N/A		-0.80
Langelier Index (@ 4C)	N/A		-1.05
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.47
Saturation pH (@ 4C)	N/A		8.72
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	59
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	ND
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	0.06
Total Organic Carbon (C)	mg/L	0.50	3.10
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.67
Reactive Silica (SiO2)	mg/L	0.50	3.70
Dissolved Sulphate (SO4)	mg/L	2.0	4.50
Turbidity	NTU	0.10	1.30
Conductivity	µS/cm	1.0	100

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D16 Field Water Quality Data for Stream S4, August 2021.

Parameter	Units	S4
pH	N/A	7.44
Conductivity	µS/cm	1227
ORP	mV	-44.4
DO	mg/L	5.9
DO	% Sat	78.5
Temperature	°C	21.2

N/A= Not Applicable

Table D17 Flow Regime for Stream S4, August 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	0	9	0.03
2	15	7	0.04
3	30	7.9	0.07
4	45	10.3	0.07
5	60	9.2	0.06
Mean		8.7	0.054
Discharge	0.003 m^3/s		

Table D18 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S4.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	5	0	10	0	10
Mean	5	0	10	0	10

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D19 Water Quality Data for Metals in Stream S5, July 2021.

Parameters	Units	RDL	S5
Aluminum (Al)	µg/L	5.0	8.9
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	4.2
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	0.011
Calcium (Ca)	µg/L	100	5,600
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	1,000
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2,500
Manganese (Mn)	µg/L	2.0	35
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	720
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	400
Strontium (Sr)	µg/L	2.0	7.4
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D20 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S5, July 2021.

Parameters	Units	RDL	S5
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	24
Calculated TDS	mg/L	1.0	32
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	24
Anion Sum	me/L	N/A	0.60
Cation Sum	me/L	N/A	0.55
Ion Balance (% Difference)	%	N/A	4.35
Langelier Index (@ 20C)	N/A		-1.85
Langelier Index (@ 4C)	N/A		-2.11
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.17
Saturation pH (@ 4C)	N/A		9.42
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	24
Dissolved Chloride (Cl-)	mg/L	1.0	1.30
Colour	TCU	5.0	21
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.60
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.32
Reactive Silica (SiO2)	mg/L	0.50	1.80
Dissolved Sulphate (SO4)	mg/L	2.0	4.40
Turbidity	NTU	0.10	3.70
Conductivity	µS/cm	1.0	49

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D21 Field Water Quality Data for Stream S5, July 2021.

Parameter	Units	S5
pH	N/A	7.26
Conductivity	µS/cm	48.8
ORP	mV	-32.5
DO	mg/L	8.9
DO	% Sat	91.4
Temperature	°C	17.0

N/A= Not Applicable

Table D22 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S5.

		Cover Type			Stream Bank[2]	
Stream ID	Section no.	Overhanging	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
S5	1	50	5	10	0	8

[1] Values are shown as percentages.
[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D23 Water Quality Data for Metals in Stream S6, July 2021.

Parameters	Units	RDL	S6
Aluminum (Al)	µg/L	5.0	19
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	12
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	5,700
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	160
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2,500
Manganese (Mn)	µg/L	2.0	89
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	630
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	490
Strontium (Sr)	µg/L	2.0	10
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D24 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S6, July 2021.

Parameters	Units	RDL	S6
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	27
Calculated TDS	mg/L	1.0	29
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	25
Anion Sum	me/L	N/A	0.55
Cation Sum	me/L	N/A	0.54
Ion Balance (% Difference)	%	N/A	0.92
Langelier Index (@ 20C)	N/A		-1.28
Langelier Index (@ 4C)	N/A		-1.53
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.09
Saturation pH (@ 4C)	N/A		9.35
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	28
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	20
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.20
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.81
Reactive Silica (SiO2)	mg/L	0.50	3.20
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	0.89
Conductivity	µS/cm	1.0	54

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D25 Field Water Quality Data for Stream S6, July 2021.

Parameter	Units	S6
pH	N/A	7.34
Conductivity	µS/cm	56.7
ORP	mV	-37.5
DO	mg/L	9.68
DO	% Sat	97.4
Temperature	°C	17.6

N/A= Not Applicable

Table D26 Flow Regime for Stream S6, August 2021.

Stream ID	Section no.	Distance (cm)	Depth (cm)	Velocity (m/s)
S6	1	3540	5	0.02
	2	3400	6	0.05
	3	3350	8	0.2
	4	3300	18	0.47
	5	3250	33	0.64
	6	3200	41	0.53
	7	3150	48	0.21
	8	3050	39	0.15
	9	3000	30	0.1
	10	2950	21	0
	11	2900	34	0.02
	12	2850	0	0
	13	2750	31	0.55
	14	2700	24	0.05
	15	2670	0	0
Mean Discharge				
	0.048 m^3/s			

Table D27 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S6.

		Cover Type				Stream Bank[2]	
Stream ID	Section no.	Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
S6	1	25	0	0	<5	0, 0	10, <5
	2	45	<5	<5	<5	0, 0	10, 20
	3	-	-	-	-	-	-
	Mean	35	<5	<5	<5	0	11

[1] Values are shown as percentages.

[2] Values separated by commas represent proportions of eroding and undercut banks in the left and right stream sides.

Table D28 Water Quality Data for Metals in Stream S7, June 2021.

Parameters	Units	RDL	S7
Aluminum (Al)	µg/L	5.0	5.4
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	13
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	9,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	150
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,900
Manganese (Mn)	µg/L	2.0	29
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	780
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	370
Strontium (Sr)	µg/L	2.0	9.5
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D29 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S7, June 2021.

Parameters	Units	RDL	S7
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	42
Calculated TDS	mg/L	1.0	42
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	38
Anion Sum	me/L	N/A	0.85
Cation Sum	me/L	N/A	0.81
Ion Balance (% Difference)	%	N/A	2.41
Langelier Index (@ 20C)	N/A		-0.95
Langelier Index (@ 4C)	N/A		-1.20
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.72
Saturation pH (@ 4C)	N/A		8.98
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	42
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	15
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.50
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.77
Reactive Silica (SiO2)	mg/L	0.50	2.00
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	0.56
Conductivity	µS/cm	1.0	75

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D30 Field Water Quality Data for Stream S7, July 2021.

Parameter	Units	S7
pH	N/A	7.26
Conductivity	µS/cm	143.1
ORP	mV	-36.1
DO	mg/L	9.56
DO	% Sat	83.4
Temperature	°C	9.7

N/A= Not Applicable

Table D31 Flow Regime for Stream S7, June 2021.

Section no.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	0	0	0
2	20	9	0.01
3	40	9	0.26
4	60	22	0.25
5	80	26	0.2
6	100	28	0.31
7	120	22	0.13
8	140	18	0
9	150	0	0
Mean		19.1	0.19
Discharge	0.049 m^3/s		

Table D32 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S7.

		Cover Type				Stream Bank[2]	
Stream ID	Section no.	Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
S7	1	10	80	20	<5	0	<5
	2	<5	0	<5	1	0	<5
	3	40	5-10	40	5	0	<5
	4	0	<5	0	0	0	0
	Mean	17	40	20	2	0	<5

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D33 Water Quality Data for Metals in Stream S8, July 2021.

Parameters	Units	RDL	S8
Aluminum (Al)	µg/L	5.0	ND
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	27
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	20,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	180
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	8,500
Manganese (Mn)	µg/L	2.0	100
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	1,300
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	590
Strontium (Sr)	µg/L	2.0	17
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D34 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S8, July 2021.

Parameters	Units	RDL	S8
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	85
Calculated TDS	mg/L	1.0	91
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	85
Anion Sum	me/L	N/A	1.81
Cation Sum	me/L	N/A	1.77
Ion Balance (% Difference)	%	N/A	1.12
Langelier Index (@ 20C)	N/A		-0.22
Langelier Index (@ 4C)	N/A		-0.47
Nitrate (N)	mg/L	0.050	0.06
Saturation pH (@ 20C)	N/A		8.11
Saturation pH (@ 4C)	N/A		8.36
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	85
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	14
Nitrate + Nitrite (N)	mg/L	0.050	0.06
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	3.00
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.89
Reactive Silica (SiO2)	mg/L	0.50	4.00
Dissolved Sulphate (SO4)	mg/L	2.0	4.90
Turbidity	NTU	0.10	0.97
Conductivity	µS/cm	1.0	160

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D35 Field Water Quality Data for Stream S8, July 2021.

Parameter	Units	S8
pH	N/A	7.66
Conductivity	µS/cm	273.2
ORP	mV	-58.4
DO	mg/L	13.72
DO	% Sat	122.5
Temperature	°C	11.6

N/A= Not Applicable

Table D36 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S8.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	15	5	5	0	0
2	35	0	5	0	0
Mean	25	5	5	0	0

Table D37 Water Quality Data for Metals in Stream S9, July 2021.

Parameters	Units	RDL	S9
Aluminum (Al)	µg/L	5.0	11
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	10
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	5,700
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	110
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2,400
Manganese (Mn)	µg/L	2.0	31
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	580
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	500
Strontium (Sr)	µg/L	2.0	11
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D38 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S9, July 2021.

Parameters	Units	RDL	S9
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	27
Calculated TDS	mg/L	1.0	29
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	24
Anion Sum	me/L	N/A	0.54
Cation Sum	me/L	N/A	0.52
Ion Balance (% Difference)	%	N/A	1.89
Langelier Index (@ 20C)	N/A		-1.57
Langelier Index (@ 4C)	N/A		-1.82
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.11
Saturation pH (@ 4C)	N/A		9.36
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	27
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	22
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.00
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.54
Reactive Silica (SiO2)	mg/L	0.50	3.10
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	0.91
Conductivity	µS/cm	1.0	49

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D39 Field Water Quality Data for Stream S9, July 2021.

Parameter	Units	S9
pH	N/A	7.27
Conductivity	µS/cm	55.7
ORP	mV	-35.7
DO	mg/L	9.46
DO	% Sat	108
Temperature	°C	18.5

N/A= Not Applicable

Table D40 Flow Regime for Stream S9, July 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	0	13	0.24
2	80	6	0.18
3	160	6	0.42
4	240	21	0.09
5	320	16	0.16
6	400	19	0.74
7	480	28	0.23
8	560	34	1.01
9	640	44	1
10	720	26	0.55
11	800	10	0.28
Mean		20	0.445
Discharge	0.975 m^3/s		

Table D41 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S9.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	0	5	5	0	5
Mean	0	5	5	0	5

Table D42 Water Quality Data for Metals in Stream S10, June 2021.

Parameters	Units	RDL	S10
Aluminum (Al)	µg/L	5.0	11
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	17
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	7,500
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	290
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,000
Manganese (Mn)	µg/L	2.0	37
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	600
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	340
Strontium (Sr)	µg/L	2.0	10
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D43 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S10, June 2021.

Parameters	Units	RDL	S10
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	36
Calculated TDS	mg/L	1.0	39
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	31
Anion Sum	me/L	N/A	0.79
Cation Sum	me/L	N/A	0.67
Ion Balance (% Difference)	%	N/A	8.22
Langelier Index (@ 20C)	N/A		-1.43
Langelier Index (@ 4C)	N/A		-1.68
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.86
Saturation pH (@ 4C)	N/A		9.11
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	37
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	44
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	6.00
Orthophosphate (P)	mg/L	0.010	0.01
pH	pH	N/A	7.44
Reactive Silica (SiO2)	mg/L	0.50	2.10
Dissolved Sulphate (SO4)	mg/L	2.0	2.70
Turbidity	NTU	0.10	1.30
Conductivity	µS/cm	1.0	61

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D44 Field Water Quality Data for Stream S10, July 2021.

Parameter	Units	S10
pH	N/A	7.24
Conductivity	µS/cm	165
ORP	mV	-35.1
DO	mg/L	9.50
DO	% Sat	101
Temperature	°C	16.9

N/A= Not Applicable

Table D45 Flow Regime for Stream S10, July 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	0	0	0.0
2	20	9	0.29
3	40	8.5	0.33
4	60	10	0.55
5	80	10	0.45
6	10	0	0.0
Mean		6.3	0.405
Discharge	0.033 m^3/s		

Table D46 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S10.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	5	0	5	0	45
2	60	0	5	0	60
3	75	0	5	0	45
Mean	47	0	5	0	50

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D47 Water Quality Data for Metals in Stream S11, July 2021.

Parameters	Units	RDL	S11
Aluminum (Al)	µg/L	5.0	17
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	17
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	8,300
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	640
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,800
Manganese (Mn)	µg/L	2.0	160
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	750
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	410
Strontium (Sr)	µg/L	2.0	10
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D48 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S11, July 2021.

Parameters	Units	RDL	S11
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	39
Calculated TDS	mg/L	1.0	39
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	37
Anion Sum	me/L	N/A	0.78
Cation Sum	me/L	N/A	0.79
Ion Balance (% Difference)	%	N/A	0.64
Langelier Index (@ 20C)	N/A		-1.19
Langelier Index (@ 4C)	N/A		-1.44
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.79
Saturation pH (@ 4C)	N/A		9.04
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	39
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	19
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.1
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.61
Reactive Silica (SiO2)	mg/L	0.50	1.4
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.90
Conductivity	µS/cm	1.0	68

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D49 Field Water Quality Data for Stream S11, July 2021.

Parameter	Units	S11
pH	N/A	7.16
Conductivity	µS/cm	110.9
ORP	mV	-30.0
DO	mg/L	8.24
DO	% Sat	81.0
Temperature	°C	14.9

N/A= Not Applicable

Table D50 Flow Regime for Stream S11, June 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	630	35	0
2	580	96	0.01
3	500	89	0.01
4	440	82	0.02
5	380	77	0.01
6	330	67	0
7	290	62	0
Mean		73	0.013
Discharge	0.026 m^3/s		

Table D51 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S11.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	1	2	0	0	10
Mean	1	2	0	0	10

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D52 Water Quality Data for Metals in Stream S12, July 2021.

Parameters	Units	RDL	S12
Aluminum (Al)	µg/L	5.0	23
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	15
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	7,500
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	330
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,400
Manganese (Mn)	µg/L	2.0	47
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	710
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	670
Strontium (Sr)	µg/L	2.0	15
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D53 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S12, July 2021.

Parameters	Units	RDL	S12
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	40
Calculated TDS	mg/L	1.0	44
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	33
Anion Sum	me/L	N/A	0.85
Cation Sum	me/L	N/A	0.71
Ion Balance (% Difference)	%	N/A	8.97
Langelier Index (@ 20C)	N/A		-1.20
Langelier Index (@ 4C)	N/A		-1.45
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.82
Saturation pH (@ 4C)	N/A		9.07
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	40
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	24
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	3.40
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.62
Reactive Silica (SiO2)	mg/L	0.50	4.70
Dissolved Sulphate (SO4)	mg/L	2.0	2.20
Turbidity	NTU	0.10	1.80
Conductivity	µS/cm	1.0	69

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D54 Field Water Quality Data for Stream S12, July 2021.

Parameter	Units	S12
pH	N/A	7.20
Conductivity	µS/cm	106
ORP	mV	-33.6
DO	mg/L	10.5
DO	% Sat	105
Temperature	°C	13.7

N/A= Not Applicable

Table D55 Flow Regime for Stream S12, June 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	1405	30	0
2	1370	34	0.04
3	1300	54	0.05
4	1220	70	0.02
5	1100	82	0.03
6	1000	82	0.04
7	900	76	0.03
8	800	72	0.05
9	700	70	0.04
10	600	52	0.8
11	500	54	0.04
12	400	38	0.03
13	300	50	0.01
14	200	48	0.04
15	100	36	0.01
16	0	26	0.01
Mean Discharge		54.6	0.083
	0.704 m^3/s		

Table D56 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S12.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	5	1	5	5	40
2	0	0	2	0	40
Mean	5	1	5	5	40

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D57 Water Quality Data for Metals in Stream S13, July 2021.

Parameters	Units	RDL	S13
Aluminum (Al)	µg/L	5.0	12
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	9.4
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	7,200
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	260
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,300
Manganese (Mn)	µg/L	2.0	25
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	640
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	740
Strontium (Sr)	µg/L	2.0	13
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D58 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S13, July 2021.

Parameters	Units	RDL	S13
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	34
Calculated TDS	mg/L	1.0	39
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	32
Anion Sum	me/L	N/A	0.72
Cation Sum	me/L	N/A	0.69
Ion Balance (% Difference)	%	N/A	2.13
Langelier Index (@ 20C)	N/A		-1.25
Langelier Index (@ 4C)	N/A		-1.50
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.91
Saturation pH (@ 4C)	N/A		9.16
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	34
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	23
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.60
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.66
Reactive Silica (SiO2)	mg/L	0.50	4.10
Dissolved Sulphate (SO4)	mg/L	2.0	2.10
Turbidity	NTU	0.10	1.20
Conductivity	µS/cm	1.0	63

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D59 Field Water Quality Data for Stream S13, July 2021.

Parameter	Units	S13
pH	N/A	7.23
Conductivity	µS/cm	98.7
ORP	mV	-34.8
DO	mg/L	11.0
DO	% Sat	108.7
Temperature	°C	13.3

N/A= Not Applicable

Table D60 Flow Regime for Stream S13, June 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	740	0	0
2	680	23	0.05
3	630	0	0
4	600	31	0.17
5	540	29	0.16
6	500	20	0.52
7	460	0	0
8	440	6	0.14
9	400	6	0.52
10	350	8	0.16
11	330	4	0.24
12	310	6	0.21
13	290	0	0
14	240	0	0
15	230	6	0.04
16	200	0	0
Mean		8.7	0.221
Discharge	0.106 m^3/s		

Table D61 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S13.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	5	1	4	0	4
Mean	5	1	4	0	4

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D62 Water Quality Data for Metals in Stream S14, July 2021.

Parameters	Units	RDL	S14
Aluminum (Al)	µg/L	5.0	24
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	12
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	7,600
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	61
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,600
Manganese (Mn)	µg/L	2.0	11
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	800
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	800
Strontium (Sr)	µg/L	2.0	14
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D63 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S14, July 2021.

Parameters	Units	RDL	S14
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	36
Calculated TDS	mg/L	1.0	44
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	34
Anion Sum	me/L	N/A	0.77
Cation Sum	me/L	N/A	0.73
Ion Balance (% Difference)	%	N/A	2.67
Langelier Index (@ 20C)	N/A		-1.31
Langelier Index (@ 4C)	N/A		-1.56
Nitrate (N)	mg/L	0.050	0.07
Saturation pH (@ 20C)	N/A		8.87
Saturation pH (@ 4C)	N/A		9.12
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	36
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	28
Nitrate + Nitrite (N)	mg/L	0.050	0.07
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	4.3
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.56
Reactive Silica (SiO2)	mg/L	0.50	6.8
Dissolved Sulphate (SO4)	mg/L	2.0	2.3
Turbidity	NTU	0.10	0.39
Conductivity	µS/cm	1.0	65

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D64 Field Water Quality Data for Stream S14, July 2021.

Parameter	Units	S14
pH	N/A	7.60
Conductivity	µS/cm	94.5
ORP	mV	-52.0
DO	mg/L	12.8
DO	% Sat	107
Temperature	°C	7.0

N/A= Not Applicable

Table D65 Flow Regime for Stream S14, July 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	345	34	0.05
2	310	30	0.06
3	260	21	0
4	220	18	0.04
5	180	6	0.09
6	150	6	0.07
7	120	4	0.09
8	100	0	0
Mean		15	0.067
Discharge	0.017 m^3/s		

Table D66 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S14.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	3	10	5	0	80
Mean	3	10	5	0	80

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D67 Water Quality Data for Metals in Stream S15, July 2021.

Parameters	Units	RDL	S15
Aluminum (Al)	µg/L	5.0	12
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	9.2
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	4,400
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	490
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	1,800
Manganese (Mn)	µg/L	2.0	130
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	560
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	340
Strontium (Sr)	µg/L	2.0	11
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D68 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S15, July 2021.

Parameters	Units	RDL	S15
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	21
Calculated TDS	mg/L	1.0	21
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	18
Anion Sum	me/L	N/A	0.41
Cation Sum	me/L	N/A	0.42
Ion Balance (% Difference)	%	N/A	1.20
Langelier Index (@ 20C)	N/A		-2.11
Langelier Index (@ 4C)	N/A		-2.36
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.32
Saturation pH (@ 4C)	N/A		9.58
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	21
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	31
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	0.05
Total Organic Carbon (C)	mg/L	0.50	7.30
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.21
Reactive Silica (SiO2)	mg/L	0.50	0.86
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.40
Conductivity	µS/cm	1.0	37

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D69 Field Water Quality Data for Stream S15, July 2021.

Parameter	Units	S15
pH	N/A	7.44
Conductivity	µS/cm	72.2
ORP	mV	-45.0
DO	mg/L	7.70
DO	% Sat	77.0
Temperature	°C	15.7

N/A= Not Applicable

Table D70 Flow Regime for Stream S15, July 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	8	0	0
2	20	4	0
3	30	12	0.02
4	40	12	0.02
5	50	15	0.03
6	60	18	0.03
7	70	20	0.03
8	80	24	0.01
Mean		13	0.023
Discharge	0.002 m^3/s		

Table D71 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S15.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	0	0	0	0	5
Mean	0	0	0	0	5

Table D72 Water Quality Data for Metals in Stream S16, July 2021.

Parameters	Units	RDL	S16
Aluminum (Al)	µg/L	5.0	26
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	9.4
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	5,600
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	110
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	2,300
Manganese (Mn)	µg/L	2.0	28
Molybdenum (Mo)	µg/L	2.0	8.8
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	670
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	730
Strontium (Sr)	µg/L	2.0	10
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D73 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S16, July 2021.

Parameters	Units	RDL	S16
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	25
Calculated TDS	mg/L	1.0	28
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	24
Anion Sum	me/L	N/A	0.51
Cation Sum	me/L	N/A	0.52
Ion Balance (% Difference)	%	N/A	0.97
Langelier Index (@ 20C)	N/A		-1.59
Langelier Index (@ 4C)	N/A		-1.84
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		9.14
Saturation pH (@ 4C)	N/A		9.39
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	26
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	24
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	5.60
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.55
Reactive Silica (SiO2)	mg/L	0.50	3.20
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	1.40
Conductivity	µS/cm	1.0	47

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D74 Field Water Quality Data for Stream S16, July 2021.

Parameter	Units	S16
pH	N/A	7.43
Conductivity	µS/cm	57.1
ORP	mV	-44.7
DO	mg/L	8.58
DO	% Sat	95.9
Temperature	°C	20.6

N/A= Not Applicable

Table D75 Flow Regime for Stream S16, June 2021.

Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	0	0	0
2	20	2	0.01
3	40	1.5	0.01
4	60	5	0.21
5	80	4.5	0.16
6	100	6	0.28
7	120	6.2	0.21
8	140	7	0.1
9	160	0	0
Mean		4.6	0.14
Discharge	0.010 m^3/s		

Table D76 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S16.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	1	0	0	0	5
2	40	5	5	0	5
Mean	21	3	3	0	5

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.

Table D77 Water Quality Data for Metals in Stream S17, June 2021.

Parameters	Units	RDL	S17
Aluminum (Al)	µg/L	5.0	5.3
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	15
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.010	ND
Calcium (Ca)	µg/L	100	7,600
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.40	ND
Copper (Cu)	µg/L	0.50	ND
Iron (Fe)	µg/L	50	150
Lead (Pb)	µg/L	0.50	ND
Magnesium (Mg)	µg/L	100	3,300
Manganese (Mn)	µg/L	2.0	40
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	690
Selenium (Se)	µg/L	0.50	ND
Silver (Ag)	µg/L	0.10	ND
Sodium (Na)	µg/L	100	320
Strontium (Sr)	µg/L	2.0	8.1
Thallium (Tl)	µg/L	0.10	ND
Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.10	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND

RDL = Reportable Detection Limit, ND = Not Detected

Table D78 Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Stream S17, June 2021.

Parameters	Units	RDL	S17
Calculated Parameters			
Bicarb. Alkalinity (CaCO3)	mg/L	1.0	36
Calculated TDS	mg/L	1.0	34
Carb. Alkalinity (CaCO3)	mg/L	1.0	ND
Hardness (CaCO3)	mg/L	1.0	33
Anion Sum	me/L	N/A	0.71
Cation Sum	me/L	N/A	0.69
Ion Balance (% Difference)	%	N/A	1.43
Langelier Index (@ 20C)	N/A		-1.39
Langelier Index (@ 4C)	N/A		-1.64
Nitrate (N)	mg/L	0.050	ND
Saturation pH (@ 20C)	N/A		8.86
Saturation pH (@ 4C)	N/A		9.12
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	36
Dissolved Chloride (Cl-)	mg/L	1.0	ND
Colour	TCU	5.0	9
Nitrate + Nitrite (N)	mg/L	0.050	ND
Nitrite (N)	mg/L	0.010	ND
Nitrogen (Ammonia)	mg/L	0.050	ND
Total Organic Carbon (C)	mg/L	0.50	3.50
Orthophosphate (P)	mg/L	0.010	ND
pH	pH	N/A	7.48
Reactive Silica (SiO2)	mg/L	0.50	0.90
Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.10	0.46
Conductivity	µS/cm	1.0	63

RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable

Table D79 Field Water Quality Data for Stream S17, July 2021.

Parameter	Units	S17
pH	N/A	
Conductivity	µS/cm	
ORP	mV	
DO	mg/L	
DO	% Sat	

Table D80 Flow Regime for Stream S17, July 2021.

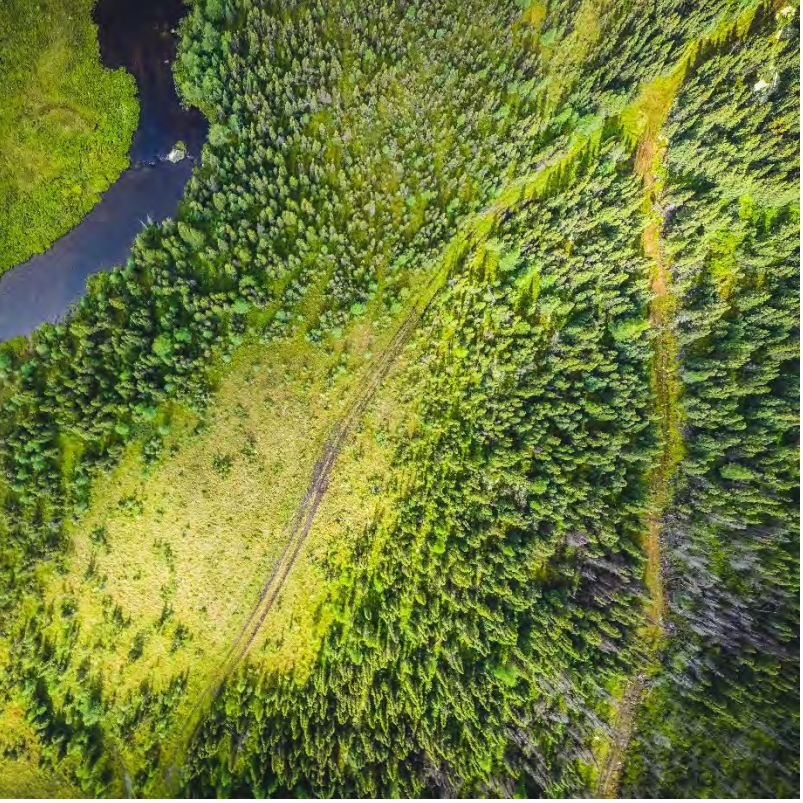
Section No.	Distance (cm)	Depth (cm)	Velocity (m/s)
1	2400	0	0
2	2430	12	0
3	2480	11	0.01
4	2530	14	0.02
5	2580	16	0.01
6	2630	30	0.02
7	2680	30	0.01
8	2730	33	0.06
9	2780	21	0.02
10	2830	21	0.04
11	2880	34	0.04
12	2930	14	0.11
13	2980	22	0.1
14	3030	18	0.01
15	3080	12	0.02
16	3130	18	0.12
17	3180	10	0.16
18	3230	18	0.02
19	3280	14	0
20	3330	44	0.08
21	3380	38	0.16
22	3430	40	0.25
23	3480	37	0.24
24	3530	32	0.26
25	3580	27	0.35
26	3630	35	0.29
27	3680	16	0.2
28	3730	20	0
29	3780	15	0.04
30	3860	10	0
31	3970	0	0
Mean		22.8	0.11
Discharge	0.372 m^3/s		

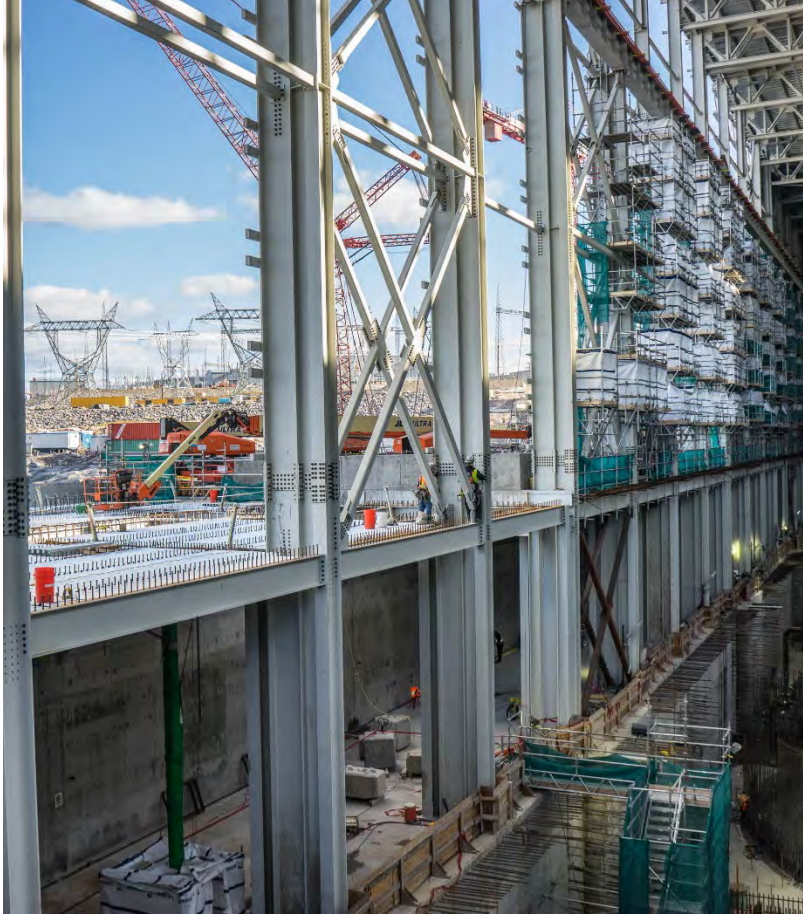
Table D81 Cover Type and Stream Bank Characteristics[1] of Each Section Surveyed in Stream S17.

	Cover Type			Stream Bank[2]	
Section No.	Overhanging	Instream substrate/logs	Canopy	Eroding Banks	Undercut Banks
1	5	10	5	5	5
2	0	0	0	5	5
3	0	5	5	5	5
4	0	0	0	5	5
5	10	5	10	10	10
6	0	5	0	10	10
Mean	3	4	3	7	7

[1] Values are shown as percentages.

[2] Values represent proportions of eroding and undercut banks in each stream side.









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