Coldwater Creek Watershed Assessment Report

LAKEHEAD REGION
CONSERVATION AUTHORITY

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2017

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The Lakehead Region Conservation Authority would like to acknowledge the residents of the Coldwater Creek watershed who allowed Lakehead Region Conservation Authority staff access to their property and who were eager to share valuable information about the condition and health of Coldwater Creek.

The 2017 Coldwater Creek Watershed Assessment was prepared by Michael Dykstra and Allan Hurst, Assistant Water Resource Technologists of the Lakehead Region Conservation Authority. Scott Drebit, GIS Technician/Planner of the Lakehead Region Conservation Authority, produced the maps for this report and provided input and revisions towards the final copy. Simon Shankie, Watershed Manager of the LRCA, also provided guidance, input and revisions towards the completion of this report. Gene Kent, Education/Special Projects Coordinator of the LRCA, assisted with the identification and sampling of the soils and completed the section on Geology.

This report has been prepared in-house at the Lakehead Region Conservation Authority for internal purposes to document the condition of the Coldwater Creek watershed in 2017.

EXECUTIVE SUMMARY

The Coldwater Creek watershed is located within the Municipality of Shuniah, Township of Dorion and unorganized Township of Glen. The watershed covers a drainage area of approximately 138.1 square kilometres. Coldwater Creek is approximately 46.5 kilometres in length and travels from Wiggins Lake, in the northwestern area of the watershed, into Lake Superior at the confluence point in the northeastern area of the watershed. The general slope of the watershed is 0.53 percent.

The majority of the Coldwater Creek watershed is Crown land (67.8 percent) and the remainder is privately owned land (32.2 percent). The watershed is mainly designated as a rural land use zone by the Official Plans of the Municipality of Shuniah and Township of Dorion.

The surficial geology distribution of the watershed changes from bedrock (61.3 percent) in the headwaters area of Coldwater Creek, to glaciolacustrine plain (24.1 percent) in the valleys, with esker/ kame/ outwash plain (8.2 percent) in the area surrounding Crow Lake, moraine (5.6 percent) in the area surrounding Clegge Lake, organic soils (0.6 percent) and alluvial (0.2 percent) at the confluence of Coldwater Creek at Lake Superior.

The bedrock formation is mostly composed of mafic to intermediate metavolcanic rocks (41.0 percent) however there is a significant presence of Sibley group rocks (33.3 percent), massive granodiorite to granite rocks (21.4), mafic and related intrusive rocks (2.6 percent) and muscovite bearing granitic rocks (1.7 percent) present in the watershed.

The Coldwater Creek watershed is located within the boundaries of the Great Lakes and Boreal forest regions. The most common tree species in the watershed are white spruce, jack pine, black spruce, balsam poplar and trembling aspen. There are a variety of other plants present in the watershed including ferns, shrubs, herbs, mosses and lichens.

For this report, eight sample sites located within the Coldwater Creek watershed were chosen based on a variety of attributes including: accessibility, physical features, land use designation, and proximity to man-made features that may alter water quality, as well as headwaters used as a background reference. Site 1 is located on the main channel near the confluence of the Coldwater Creek and Lake Superior. Sites 2, 5, 6 and 7 were located on the main channel. Sites 3, 4 and 8 were located on tributaries of the main channel. Due to the lack of maintained roads in the area it was not possible

to reach the headwaters at Wiggins Lake in the northwestern portion of the watershed.

At each of the eight sample locations, surface water samples and field measurements were collected on June 13 and July 13, 2017. Surface water samples were analyzed by ALS Laboratory Group for conductivity, total dissolved solids, turbidity, total ammonia, nitrate, nitrite, total phosphorus, *Escherichia coli (E. coli)*, total coliforms and a full metal scan. Field measurements taken using a YSI Pro DSS Multi-Parameter Probe included: water temperature, pH, conductivity, turbidity, oxidation-reduction potential and dissolved oxygen. Field and laboratory results were compared to the Ministry of Environment and Climate Change's *Provincial Water Quality Objectives* (PWQO), 1994. Parameters that exceeded the PWQOs included: *E. coli*, aluminum and iron.

PWQO criterion for *E. coli* bacteria levels below 100 counts per 100 mL of water are considered safe for swimming and bathing. During the June sampling period, none of the sites exceeded the criterion. During the July sampling period Site 2 (179 counts/100 mL) exceeded the criterion. It was noted at that a farm was located upstream of Site 2; however, there were no exceedances of *E.coli* at the downstream sample location.

The PWQO criterion for aluminum is 0.075 mg/L. During the June sampling period Sites 1 and 2 were above the criterion. During the July sampling period Sites 1, 2, 4, 5, 6 and 8 were above the criterion. Aluminum concentrations ranged from 0.015mg/L (Site 7) to 0.719 mg/L (Site 1). These values are typically associated with fine-grained sediments.

The PWQO criterion for iron is 0.30 mg/L. During the June sampling period Sites 1, 2, 3 and 4 were above the criterion. During the July sampling period Sites 1, 2 and 8 were above the criterion. Iron concentrations ranged from 0.077 mg/L (Site 3) to 0.836 mg/L (Site 1) for the watershed. Iron exceedances are common in the region due to the type of bedrock; however, an increasing trend for iron concentrations was noted downstream compared to background.

As there is no current PWQO for total coliforms, results were compared to the pre-1994 PWQO criterion (1,000 MPN/100 mL). During the June sampling period Sites 4, 5 and 8 were above the criterion. During the July sampling period Sites 1, 2, 4, 5, 7 and 8 were above the criterion. The total coliform concentrations in 2017 ranged from 178 MPN/100mL (Site 7) to >2,420 MPN/100 mL (multiple sites) for the watershed.

The flora and fauna inventory indicated that the Coldwater Creek watershed supports a healthy population of diverse plants and animals. The stream banks were stable and showed little signs of erosion. The bridges located at Sites 1, 2 and 5 were in good and stable condition and all culverts were also mostly in good condition. The culverts at

Sites 4 and 7 (C1 and C3) should be monitored in the future as C1 is structurally compromised on the upstream side (slightly bent inwards) and perched on the downstream side, and there was a blockage caused by organic waste on the north side of C3.

The Coldwater Creek watershed was also assessed using the *Guide to Developing Conservation Authority Watershed Report Cards*, 2011. Using this guideline, surface water quality and forest conditions for the Coldwater Creek watershed were used to determine a grade for the watershed. Surface water quality maintained an excellent rating with minimal exceedances of phosphorus and *E. coli* present within the Coldwater Creek watershed. Forest condition scored an overall good rating with high forest coverage and a low percentage of riparian forest cover. Overall the quality of the Coldwater Creek watershed in 2017 was determined to be in good to excellent health and graded an A based on the surface water quality and a B based on the forest condition.

At the time of sampling in 2017 the Coldwater Creek watershed was considered to be in excellent health.

Upon completion of the 2017 Coldwater Creek Watershed Assessment, the following recommendations have been made for consideration:

- Staff and funding permitting, it is recommended that an update to the 2017 Coldwater Creek Watershed Assessment be completed in the next five to ten years.
- Benthic analysis indicates water quality over an extended period of time and should be considered for future watershed assessments.
- Additional sampling should be conducted in the spring to observe the water quality differences between high and low flow seasons.
- A copy of this report should be provided to the Township of Dorion, the Municipality of Shuniah and the Dorion Fish Culture Station for reference purposes. The Report should be kept on file at the LRCA Administration Office for review by interested parties.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

LIST OF APPENDICES

1 INTRODUCTION

The Coldwater Creek watershed is located within the Municipality of Shuniah, the Township of Dorion and the unorganized Township of Glen as shown on Map M-1: Key Plan Map. Areas regulated by the Lakehead Region Conservation Authority (LRCA) and Municipal boundaries can be found on Map M-2: Regulated Areas.

A watershed can be defined as all the land and water within the confines of a drainage divide. In essence, the Coldwater Creek watershed consists of all the surrounding land that naturally drains its lakes, streams, wetlands and precipitation runoff into the Coldwater Creek which then flows into Lake Superior.

The headwaters of the main branch begin at Wiggins Lake, which lies within the boundaries of the geographic Township of Dorion. The watershed covers a drainage area of approximately 138.1 square kilometres. Most of the watershed is dominated by white spruce, white birch, balsam poplar and trembling aspen. The Coldwater Creek runs approximately 46.5 kilometres in length through well-defined drainage courses and valleys.

The goal of this report is to document the conditions of the watershed, especially surface water quality, as observed in June and July of 2017. This information will ultimately be used to develop and maintain programs to sustain a healthy ecosystem consistent with the Natural Hazards and Natural Heritage Policies of the Province of Ontario. The main objectives of this assessment report are to:

- Summarize the physical, biological and socio-economic attributes of the watershed;
- Collect surface water quality data;
- Collect field measurements;
- Conduct an inventory of the forest ecosystem and fauna observed within the watershed;
- Conduct an inventory of soil, streambed substrate and stream bank cover observed within the watershed;
- Document active erosion sites;
- Document the physical condition of all Coldwater Creek water crossings (bridges/culverts); and
- Interpret results to record the health status of the watershed

2 BACKGROUND

2.1 Physical Attributes

2.1.1 Topography

Coldwater Creek originates in the northwestern area of the watershed, at Wiggins Lake, in the upper bedrock highlands which are composed of Logan Diabase sills. Coldwater Creek flows in an easterly direction through the watershed until its confluence in Black Bay of Lake Superior. The highest point in the watershed is approximately 539 metres above sea level southwest of Allan Lake (372702 N, 5396541 E) in the most southerly area of the watershed and is underlain by bedrock. The lowest point in elevation can be found near the confluence of Coldwater Creek and Black Bay of Lake Superior, at approximately 183 metres above sea level (388644 N, 5406387 E) and it is underlain by glaciolacustrine plain and organics . The general slope of the watershed is 0.53 percent. Map M-3 illustrates the Oliver Creek watershed topography.

2.1.2 Geology & Soils

2.1.2.1 Bedrock

Three distinct bedrock formations underlie the Coldwater Creek Watershed. The ancient Granodiorite and younger Logan Diabase sills form bedrock hills and highlands. Sibley Formation sedimentary rocks form deeply eroded valleys which channel Coldwater Creek and tributary streams.

The western and southern portions of the Coldwater Creek Watershed begin in an area of high elevation (460-500 metres) bounded by bedrock hills of Neo or Meso Archaean Granodiorite 2.5 to 3.4 billion years of age. These are dense crystalline rocks which resist erosion. In the northwestern area of the watershed there are several mineral occurrences which feature lead, copper, zinc, molybdenum and barite. The most significant occurrence was explored by the Thunder Bay Lead and Zinc Company. This occurrence lies just to the west of the watershed boundary although the fault structure may extend into the Coldwater Creek Watershed.

The main channel of Coldwater Creek follows lower elevation areas of the watershed. These valley areas are underlain by Meso-Proterozoic rocks of the Sibley Group consisting of clastic rocks, primarily red and white sandstone, intercalated with carbonate units. The Sibley Group is approximately 1.34 billion years in age. The sedimentary rocks form lowland valleys beginning at Gulch Lake and flowing south to Twin Lakes and then north and east to Lake Superior. The sedimentary rocks are very easily eroded and breakdown into sandy gravel which has been exploited in several

sand/gravel pits. Erosion and infiltration of the underlying iron rich red sandstone contributes to the high iron values observed in lower portions of the watershed.

Logan Diabase Sills (diabase) outcrops are found throughout the centre of the watershed. The diabase rocks are about 1,100 million years old, and are the youngest rocks in the area. These diabase sills form flat top mountains called mesas. The diabase rock, which forms the mesas, were intruded as flat lying magma in between layers of sedimentary rock. The overlying sediments have eroded away over the last billion years leaving the igneous rock exposed along the tops of the mesas. The hard diabase sills form steep talus slopes where erosion has occurred along the edge of the mountains. A broken area of shale regolith can be seen at the base of some of the mesas. Map M-4 illustrates the Coldwater Creek watershed bedrock geology.

2.1.2.2 Surficial Geology

Map M-5: Surficial Geology is based on the Northern Ontario Engineering Geology Terrain Study (NOEGTS-058 Black Bay and Dorion); it details the main types overburden as well as their glaciofluvial origins. The surficial geology distribution changes from bedrock (61.3 percent) in the headwaters area of Coldwater Creek, to glaciolacustrine plain (24.1 percent) in the valleys, with esker/ kame/ outwash plain (8.2 percent) in the area surrounding Crow Lake, moraine (5.6 percent) in the area surrounding Clegge Lake, organic soils (0.6 percent) and alluvial (0.2 percent) at the confluence of Coldwater Creek at Lake Superior.

The underlying sedimentary bedrock in the Coldwater Creek Watershed has been deeply eroded; the visible surficial geology consists of Holocene Age glacial sediments mixed with sand and gravel eroded from the Sibley Formation. The substrates or sediments were laid down as glacial outwash and lake bottom deposits called Glaciolacustrine horizons, and from on-going erosion of the Sibley Group bedrock. The sediments and soils labelled Glaciolacustrine plain have also been deposited by historical flooding of the area by Glacial Lake Minong. During the time period of 8,000 to 10,000 years ago, thick beds of silt, sand and loamy clay material were deposited on the glacial lake bottom. These lacustrine soils now form the lowlands of the watershed, primarily in the eastern portion of the watershed in the valley areas from Gulch Lake to Lake Superior.

2.1.2.3 Soils

Soil logging in this Watershed Assessment Report was completed to test the extent of the NOEGTS soil types; the soil logging was completed using criteria derived from the "Field Guide to the Substrates of Ontario" (MNRF, March 2015). Soil samples were taken and logged using a 1.2 metre soil auger. The depth of the organic layer as well as

the depth, composition and characteristics of the A, B and C soil horizons were logged at the eight water sampling sites along Coldwater Creek.

Map M-6: Soils illustrates the location of the eight soil sampling sites. The majority of soils consist of sandy clay loam with areas silty clay loam in the lower parts of the watershed as represented by soil profiles CW1 to CW4. The higher elevation sections of the watershed have thin soil profiles on top of bedrock. Sand and sandy gravel were sampled at sites CW5 to CW8; bedrock was encountered at between 25 and 50 centimetres depth at all of these sites. The soil testing results and photographs of each soil profile are shown in Appendix A: Soil Logging Summary and Photography. The "A" horizon soils are generally less than 0.1 metre in thickness and often transition directly to the "C" horizon, which represents the mineral soils from the last glacial period. The only significant difference in soil types occurred at site CW1 which should have been in an area mapped as peaty organic soils, but instead showed sandy clay loam in an auger test at CW1.

The sandy clay loam and sandy loam underlie the majority of the watershed. Map M-6: Soils as displayed in this report lacks data showing soils because there is no data available for most of the watershed, with the exception of the southern portion of the watershed. An analysis of Map M-5 contains soil mapping data which correspond closely with soil profiles taken by LRCA staff. The data shown in the table in Appendix A, is a fair characterization of the watershed and has been confirmed by the sampling program. The mapping data for Surficial Geology and Soils corresponds well with the provincial surficial geology data, and it closely follows the extent of underlying bedrock in Map M-4.

2.1.3 Climate

The climate of the Coldwater Creek watershed is similar to the Thunder Bay region, in that it is a modified continental climate influenced by Lake Superior. From the months of July to March the westerly winds prevail, whereas the easterly winds prevail the remainder of the year (LRCA, 1985). These winds modify the climate of Thunder Bay and the surrounding regions. The mean daily temperatures (degrees Celsius) and precipitation levels (millimetres) were recorded at the Thunder Bay Airport from 1971 to 2000 (Environment Canada, 2016) as shown in Table 2.1-1. This table also summarizes the extreme daily precipitation in millimetres recorded within a 24-hour period and the date it occurred.

Table 2.1-1: Average Monthly Temperature and Precipitation for Thunder Bay, 1971-2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature												
Daily (° C)	-14.8	-12	-5.5	2.9	9.5	14	17.6	16.6	11	5	-3	-11.6
Precipitation												
Total Precipitation (millimetres)	31.3	24.9	41.6	41.5	66.5	85.7	89	87.5	88	62.6	55.6	37.5
Extreme Max. Daily Precipitation (millimetres)	51.6	33.5	41.9	69.3	76.2	49.3	53.8	87.1	131.2	47.8	63	42.7
Date (yyyy /dd)	1956 /20	1951 /26	1957 /14	1954 /30	1971 /24	1947 /04	1973 /27	1973 /19	1977 /08	1968 /09	1973 /21	1948 /05

The average monthly temperatures (degrees Celsius) and precipitation levels (millimetres) were recorded at the Thunder Bay Airport for 2017 (Environment Canada, 2017), as shown below.

Table 2.1-2: Average Monthly Temperature and Precipitation for Thunder Bay, January-July 2017

	Jan	Feb	Mar	Apr	May	June	July
Average Temperature							
Daily (° C)	-10.1	-8.8	-5.2	4.0	7.8	15.0	18.1
Precipitation							
Total Precipitation (millimetres)	30.1	22.3	17.9	29.6	70.8	86.3	61.8

The average monthly temperature for the June and July sampling periods was 16.6 degrees Celsius and the average monthly precipitation was 74.1 millimetres. In comparison with the historical data, the 2017 temperature was within 0.8 degrees Celsius of the average for June and July. The 2017 precipitation for June was 0.6 millimetres higher than the historical average precipitation. The precipitation for July 2017 was 27.2 millimetres less than recorded historical average precipitation. In general, temperatures in June and July were very near normal while received precipitation for June was slightly above average while July was below average.

2.1.4 Hydrology

The main channel of the Coldwater Creek watershed is 46.5 kilometres in length and the watershed itself covers an area of approximately 138.1 square kilometres which flows in a general easterly direction to its confluence with Lake Superior. The surface water drainage area has been estimated at 3.9 square kilometres and the wetland area

has been estimated to be 2.5 square kilometres. There are no provincially significant wetlands within the watershed.

2.2 Biological Attributes

2.2.1 Flora

The Coldwater Creek watershed is located within the boundaries of the Great Lakes forest region and the Boreal forest region as shown on the Canada's Forest Regions map (Figure 1). The trees, which comprise the Great Lakes forest region, are primarily white pine, red pine and yellow birch. Although the watershed is geographically located in this forest region, the tree species observed are more indicative of a Boreal forest region, as the trees present are predominantly black spruce, jack pine, white birch and trembling aspen. This discrepancy is likely due to the fact that the watershed is relatively close to the Boreal forest region and mechanisms such as local climate (slope, aspect), site condition (soil characteristics), disturbance regimes and species interaction can affect the species distribution in the area. The coarse scale of the Canada's Forest Regions distribution map is only a basic division of the forest types; there is no discrete line that separates the two zones. Factors such as the ones mentioned above could easily alter forest types, which are located between two zones.

There are a variety of other plant species present in the Coldwater Creek watershed including ferns, shrubs, herbs, mosses and lichens. Plant species identified at the sample sites are listed in Appendix B: Common and Scientific Names of Identified Flora and Fauna.

2.2.2 Fauna

The Coldwater Creek watershed provides breeding grounds for a variety of wildlife. Species of amphibians, reptiles and butterflies that have been sighted in the watershed and surrounding area historically and recently are listed below in Table 2.2-1. There is also a complete list of the wildlife observed in the watershed in Appendix B: Common and Scientific Names of Identified Flora and Fauna. The Coldwater Creek watershed is part of the Ontario Ministry of Natural Resources and Forestry (OMNRF) Wildlife Management Unit 13 and Fisheries Management Zone 6.

Table 2.2-1 : Common Reptiles, Amphibians, and Butterflies

Species Name	
Common Name	**Scientific Name**
Amphibians and Reptiles	
Blue-Spotted Salamander	*Ambystoma laterale*
Jefferson Salamander	*Ambystoma jeffersonianum*
Snapping Turtle	*Chelydra serpentine*

Table 2.2-1 : Common Reptiles, Amphibians, and Butterflies	
Species Name	
Common Name	**Scientific Name**
Western Painted Turtle	*Chrysemys picta bellii*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Eastern Newt	*Notophthalmus viridescens viridescens*
Mudpuppy	*Necturus maculosus*
American Toad	*Anaxyrus americanus*
Boreal Chorus Frog	*Pseudacris maculata*
Gray Tree Frog	*Hyla versicolor*
Green Frog	*Lithobates clamitans*
Mink Frog	*Lithobates septentrionalis*
Northern Leopard Frog	*Lithobates pipiens*
Spring Peeper	*Pseudacris crucifer*
Wood Frog	*Lithobates sylvaticus*
Butterflies	
Juvenal's Duskywing	*Erynnis juvenalis*
European Skipper	*Thymelicus lineola*
Common Branded Skipper	*Hesperia comma*
Long Dash Skipper	*Polites mystic*
Canadian Tiger Swallowtail	*Papilio Canadensis*
Mustard White	*Pieris oleracea*
Cabbage White	*Pieris oleracea*
Clouded Sulphur	*Colias philodice*
Atlantis Fritillary	*Speyeria atlantis*
Northern Crescent	*Phyciodes cocyta*
Satyr Comma	*Polygonia satyrus*
Mourning Cloak	*Nymphalis antiopa*
Milbert's Tortoiseshell	*Algais milberti*
American Lady	*Vanessa virginiensis*
Painted Lady	*Vanessa cardui*
Red Admiral	*Vanessa atalanta*
White Admiral	*Limenitis arthemis*
Northern Pearly-Eye	*Lethe anthedon*
Common Wood-Nymph	*Cercyonis pegala*
Monarch	*Danaus plexippus*

Source: Ontario Butterfly Atlas & Reptile and Amphibian Atlas, 2015

2.2.3 Species at Risk

Ontario has more than 200 species at risk living in its forests and lakes, all at varying degrees of risk. There are approximately 19 species at risk in the Thunder Bay region that have potential to exist within the Coldwater Creek watershed. The surrounding area is considered in addition to the watershed boundary limits, as it is also Boreal forest region, which would allow for movement of individuals in and out of the watershed boundary. Below is a table showing the species at risk in the Thunder Bay region.

Table 2.2-2: Species at Risk		
Species Name		Status of Risk
Common Name	Scientific Name	
American White Pelican	*Pelecanus erythrorhynchos*	Threatened
Bald Eagle	*Haliaeetus leucocephalus*	Special Concern
Barn Swallow	*Hirundo rustica*	Threatened
Black Tern	*Chlidonias niger*	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Threatened
Eastern Whip-poor-will	*Antrostomas vociferus*	Threatened
Golden Eagle	*Aquila chrysaetos*	Endangered
Least Bittern	*Ixobrychus exilis*	Threatened
Loggerhead Shrike	*Lanius ludovicianus*	Endangered
Peregrine Falcon	*Falco peregrinus*	Special Concern
Yellow Rail	*Coturnicops noveboracensis*	Special Concern
Lake Sturgeon	*Acipenser fulvescens*	Special Concern
Northern Brook Lamprey	*Ichthyomyzon fossor*	Special Concern
Shortjaw Cisco	*Coregonus zenithicus*	Threatened
American Badger	*Taxidea taxus*	Endangered
Wolverine	*Gulo gulo*	Threatened
Caribou, Boreal population	*Rangifer tarandus*	Threatened
Pitcher's Thistle	*Cirsium pitcheri*	Threatened
Snapping Turtle	*Chelydra serpentina*	Special Concern

Source: Ontario Ministry of Natural Resources and Forestry - Species at Risk in Thunder Bay Region, 2016

2.2.4 Invasive Species

Invasive species are a threat to native plants and animals and can disturb entire ecosystems. They are introduced and spread as a result of movement of people and goods around the world, increased urbanization, improved transportation routes and through recreational activities. Some of the ways invasive species can enter Ontario include:

- All-terrain vehicles
- Aquarium, water garden and pet trades
- Ballast water of ships
- Canals and changes to waterways
- Gardening and landscaping
- Release of live fish and bait
- Transport of topsoil
- Recreational and commercial boating
- Transport of animal carcasses or products made from them
- Transport of raw wood and other forest products

Invasive species that were observed in the Lake Superior or District of Thunder Bay area may be present in the Coldwater Creek watershed according to the Canada/Ontario Invasive Species Centre, OMNRF and the Ontario Federation of

Anglers and Hunters' Early Detection and Distribution Mapping System. These species are listed in the table below.

Table 2.2-3 : Invasive Species

Species Name	
Common Name	**Scientific Name**
Chinese Mitten Crab	*Eriocheir sinensis*
Common Reed	*Phragmites australis*
Eurasian Ruffe	*Gymnocephalus cernua*
European Common Reed	*Phragmites australis ssp. australis*
European Flounder	*Platichthys flesus*
Flowering-Rush	*Butomus umbellatus*
Goldfish	*Carassius auratus*
Himalayan Balsam	*Impatiens glandulifera*
Japanese Knotweed	*Reynoutria japonica*
New Zealand Mud Snail	*Potamopyrgus antipodarum*
Purple Loosestrife	*Lythrum salicaria*
Rainbow Smelt	*Osmerus mordax*
Round Goby	*Neogobius melanostomus*
Rusty Crayfish	*Orconectes rusticus*
Spiny Water Flea	*Bythotrephes longimanus*
Three Spine Stickleback	*Gasterosteus aculeatus*
Tubenose Goby	*Proterorhinus marmoratus*
White Perch	*Morone Americana*
Yellow Sweet-Clover	*Melilotus officinalis*
Zebra Mussel	*Dreissena polymorpha*

Source: Early Detection & Distribution Mapping System for Ontario, 2015

2.3 Socio-Economic Attributes

2.3.1 Planning & Development Controls

Land Tenure

The majority of the Coldwater Creek watershed is designated as provincially owned Crown land (67.8 percent), and the remainder is designated as privately owned land (32.2 percent). Land ownership in the watershed is illustrated on Map M-7: Land Ownership.

Areas of Jurisdiction

The hydrological boundaries of the Coldwater Creek watershed fall within the Township of Dorion, the Municipality of Shuniah and the unorganized township of Glen. Map M-7: Land Ownership, illustrates the location of the Coldwater Creek

watershed within these areas. Table 2.3-1 below outlines the watershed area within each boundary.

Table 2.3-1: Areas of Jurisdiction within the Coldwater Creek Watershed

Geographic Boundaries	Total Municipal Area (km^2)	Municipal Area within Coldwater Creek Watershed (km^2)	Municipal Area within Coldwater Creek Watershed (%)
Township of Dorion	218.72	121.70	88.12
Municipality of Shuniah	588.12	13.31	9.64
Unorganized Township of Glen	65.60	3.09	2.24
Total	**872.44**	**138.10**	**100**

Within the regulated area, the Authority administers the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses O. Reg 180/06 under the Conservations Authorities Act. Areas considered regulated include: Provincially Significant Wetlands and 120 metres adjacent, all watercourses, all land zoned Hazard Land, Use Limitation or Environmental Protection, steep slopes and 15 metres landward and one kilometre lakeward from the 100-year flood level on Lake Superior (i.e. 183.9 metres Geodetic Survey of Canada), as shown on Map M-2: Regulated Area. Activities within the approximate regulated area may require a permit from the Authority.

2.3.1.1 Land Use Designation/Zoning

Municipal Official Plans contain long term goals and policies that serve as guidelines for future land use and development. The Coldwater Creek watershed is affected by the Township of Dorion and the Municipality of Shuniah Official Plan and Zoning by-laws. There is no Official Plan for the Unorganized Township of Glen. Land use designations within the Coldwater Creek watershed can be found on Map M-8: Zoning.

The policies of the Official Plan and all land use designations are implemented through zoning by-laws. Zoning provides an additional level of detail, particularly with respect to the range of permitted uses and any specific conditions which must be satisfied such as buffering, suitable distances between uses and parking requirements.

Within the Township of Dorion the Coldwater Creek watershed has been zoned as:

- Environmental Protection (EP) Zone
- Open Space (OS) Zone
- Rural (R) Zone
- Seasonal Residential (SR) Zone
- Tourist Commercial (TC)

The following definitions are taken from the Township of Dorion zoning By-Law No. 642-05, dated January 2005.

Environmental Protection (EP) Zone

No person shall within any Environmental Protection (EP) Zone use any lot or erect, alter or use any building or structure for any purpose except in accordance with the following permitted uses: (1) natural resources management, (2) conservation, (3) outdoor educational uses, (4) outdoor recreational uses, and (5) accessory uses, buildings, and structures.

Open Space (OS) Zone

No person shall within any Open Space (OS) Zone use any lot or erect, alter or use any building or structure for any purpose except in accordance with the following permitted uses: (1) public or private park, including playgrounds, picnic facilities, sports fields, tennis courts, docks and golf courses, (2) community centre, (3) cemeteries, (4) marina, (5) wildlife preserves, (6) watershed management and conservation uses, and (7) accessory uses, buildings, and structures which may include an accessory dwelling.

Rural (RU) Zone

No person shall within any Rural (RU) Zone use any lot or erect, alter or use any building or structure for any purpose except in accordance with the following permitted uses: (1) agriculture, (2) commercial fishing, fish hatchery, (3) forestry, including a bush camp for forestry staff, (4) fishing or hunting camps in accordance with section 4.35 (c), (5) institutional use, church, church camp, public works yard for roads authority, (6) park, conservation uses, and/or watershed management, (7) railway, gas pipeline, utilities, (8) mining exploration and/or mining, (9) wayside pit/quarry, (10) portable asphalt plant, (11) one single detached residential dwelling, (12) one single detached seasonal residential dwelling on an original lot as described by the initial patent, (13) group home, (14) garden suite, (15) home occupation, home profession, home industry, and (16) accessory uses, buildings, and structures.

Seasonal Residential (SR) Zone

No person shall within any Seasonal Residential (SR) Zone use any lot or erect, alter or use any building or structure for any purpose except in accordance with the following permitted uses: (1) one single detached seasonal residential dwelling or one mobile home used as a seasonal residential dwelling on one lot, (2) park, and (3) accessory uses, buildings, and structures.

Tourist Commercial (TC) Zone

No person shall within any Tourist Commercial (TC) Zone use any lot or erect, alter or use any building or structure for any purpose except in accordance with the following permitted uses: (1) hotel, motel, tourist cabins, tourist commercial use, (2) tourist outfitters establishments, (3) lodges and/or resorts, (4) private park and/or tourist campgrounds (5) outdoor recreation, (6) sale of tourist goods and merchandise or sale of fishing baits, (7) accessory dwelling unit and accessory office and/or sale of convenience goods, and (8) accessory uses, buildings, and structures.

Within the Municipality of Shuniah the Coldwater Creek watershed has been zoned as:

- Rural (R) Zone

The following definitions are taken from the Municipality of Shuniah Zoning By-Law 2038-00.

Rural (R) Zone

No use of land building, building, or structure shall be permitted within the Rural (R) Zone except as follow: (1) agriculture, which may include one only permanent dwelling, (2) conservation use, (3) forestry harvesting, (4) parks, (5) one only permanent dwelling, (6) wayside pit or quarry, (7) home occupation, (8) accessory sale of fish baits, (9) buildings, structures, and/or uses accessory, subordinate, and exclusively devoted to a permitted use, which may include a kennel, riding academy or stable, and (10) on properties that front onto Highway 527 only, up to three pulp trucks, or other such large commercial vehicles shall be permitted to be maintained and operated in association with a permitted residence.

2.3.2 Existing Land Uses

Dorion Fish Culture Station

The Dorion Fish Culture Station, located at 800 Hatchery Road, is operated by the Ministry of Natural Resources and Forestry. The facility has been operating at this site since 1931 and raises four species of fish – Lake Trout, Brook Trout, Rainbow Trout and Splake. The fish are stocked in district lakes, ranging from Wawa to Kenora, using a variety of transportation methods including vehicles, helicopters, all-terrain vehicles, and snowmobiles or hiked in by backpack.

3 METHODS AND MATERIALS

A summary of the sampling techniques used is included in Appendix C: Techniques for Data Collection.

3.1 Site Selection

Eight sites were chosen within the Coldwater Creek watershed to assess the health of the watershed as a whole. Each site was chosen based on its accessibility and its proximity to natural or man-made features that may alter water quality. Site locations can be found on Map M-9: Site Plan.

3.2 Quantitative Assessment

Several parameters were measured to assess surface water quality of Coldwater Creek. Surface water samples were collected in laboratory supplied bottles by LRCA staff and summer students and transported on ice, to ALS Laboratory Group, 1081 Barton Street, Thunder Bay, Ontario. An analysis was conducted on the samples to determine conductivity, total dissolved solids (TDS), turbidity, nutrients (ammonia-total nitrogen, nitrate, nitrite and phosphorus), bacteria (*E. coli* and total coliforms) and total metals.

Sampling was conducted on two separate occasions for each site, to enable comparisons and reveal discrepancies. The first data set was collected on June 13, 2017. The second data set was collected on July 13, 2017.

Methodology for water sample collection was based on the Provincial Water Quality Monitoring Network (PWQMN), Ministry of the Environment and Climate Change, protocol. Grab samples were collected away from the stream bank in the main current by wading or by using a reaching pole. Effort was taken to enter the stream downstream of the sampling location in order to disturb as little sediment as possible. Additionally, samples were taken upstream from any water crossings and/or outlet culverts and were taken facing upstream into the current. In cases where current was not detectable (stagnant water) or current was flowing in the opposite direction (influenced by wind direction), samples were still collected facing upstream. Samples were collected at a depth of 0.3 metres below the surface of the water to avoid capturing any floating debris.

ALS Laboratory Group provided five collection bottles for each site to conduct the following tests: routine, nutrient, metal, and bacterial analysis. The routine analysis sample bottles and lids were rinsed twice before a true sample was collected. The ALS Laboratory Group pre-charged the nutrient sample bottles with sulfuric acid and the total metals bottles were pre-charged with nitric acid to preserve the samples taken,

and were not rinsed before filling. Bottles for bacterial analysis were also not rinsed as they were pre-charged with sodium thiosulphate preservative and special care was taken not to open the bottle until the true sample was to be filled. All filled sample bottles were transported on ice for delivery to the laboratory.

Field parameters of water temperature, pH, conductivity, dissolved oxygen, salinity and oxygen reduction potential were measured using an YSI ProDSS multi-parameter water quality sampler at the time of water sample collection. The following additional field parameters were also measured: air temperature by mercury thermometer, channel width using a measuring-tape reel, channel depth using a weighted measuring tape reel and velocity was measured using a stick, measuring tape, stopwatch and appropriate calculations. Velocity was only measured for water running downstream (not in ponds producing only windblown results). A description of the water quality parameters is attached in Appendix D: Summary of Water Quality Parameters.

3.3 Applicable Criteria

Surface water quality results from the Coldwater Creek watershed were compared to applicable criteria published in the *Provincial Water Quality Objectives* (PWQO) by the Ontario Ministry of Environment and Climate Change (MOECC), July 1994. The goal of the PWQO is to "ensure that the surface waters of the province are of the quality which is satisfactory for aquatic life and recreation".

The applicable criteria published in the PWQO water quality guidelines are attached in Appendix E: Water Quality Guidelines. Total Coliform results were compared to the pre-1994 PWQO, as there are no current criteria.

3.4 Qualitative Assessment

Watershed health can also be assessed by qualitative monitoring (i.e. visual inspection). The composition of in-stream substrate, forest soil, stream bank riparian community, shoreline vegetation and condition of the stream bank can all affect water quality. The presence or absence of certain flora and fauna can indicate the status of the watershed to provide suitable habitat. Nine field guides were used to identify terrestrial and aquatic species. Each site was given a Vegetation Type (V-type) allocation based on the *Field Guide to the Forest Ecosystem Classification for Northwestern Ontario* (Sims *et al.* 1997). Sites were assessed based on vegetation that could be seen from the site, with no distinct sample area, using a dichotomous key. It is important to note that these classifications are a general overview of a larger area and no site was exactly the same as another. Differences or inconsistencies between the V-types should be expected. Vegetation Types for each site are attached in Appendix F: Forest Ecosystem Classification. Common and Latin names of plant

species are attached in Appendix D: Common and Scientific Names of Identified Flora and Fauna. Fauna was assessed by identifying the species and number of individuals observed at each site.

An inventory of Coldwater Creek water crossings (bridges and culverts) was conducted. Physical dimensions were measured, Universal Transverse Mercator (UTM) coordinates and pictures were taken and general observations were noted including high water marks, stability of fill and any restriction of flow. Culvert and bridge locations can be found on Map M-10: Bridge and Culvert Sites. The bridge and culvert assessments are attached in Appendix G: Culvert Assessments and Appendix H: Bridge Assessments.

3.5 Watershed Report Card Rating

The Conservation Authorities in Ontario have developed the Watershed Report Card (WRC) as a means of reporting and designating watershed health through the use of environmental indicators and to utilize the information to better target programs and measure environmental change. Four resource categories are measured in the Watershed Report Cards, which include surface water quality, forest conditions, wetland conditions and groundwater quality. The grading system for each resource category is recognized as A-Excellent; B-Good; C-Fair; D-Poor; F-Very Poor.

Surface water quality and forest conditions were identified for the Coldwater Creek watershed. The three indicators used to assess surface water quality for the watershed are total phosphorus, *Escherichia coli* (*E. coli*) and benthic macroinvertebrates (data not available). The average point score of the surface water indicators is used to determine the overall surface water quality grade. No wetland or groundwater data was available for the watershed.

Forest conditions utilize three indicators to determine the grade for the quality of the forest, which include forest coverage, forest interior percentage and percentage of riparian zone forested. Forest cover is the percentage of the watershed that is forested. Forest interior is the area of forest that lies more than 100 metres from a forest edge. Forest riparian zone measures the amount of forest cover within 30 metres adjacent to all open watercourses. Northern Ontario Forest Cover criteria are currently being developed.

Table 3.5-1: 2011 Surface Water Quality Indicator Guidelines						
					Overall Surface Water Quality Grade	
Total Phosphorus (mg/L)	*E. coli* (#100 mL)	Benthic Invertebrates	Point Score	Grade	Final Points	Final Grade
<0.020	0-30	0.00-4.25	5	A	>4.4	A
0.020-0.030	31-100	4.26-5.00	4	B	3.5 - 4.4	B
0.031-0.060	101-300	5.01-5.75	3	C	2.5 - 3.4	C
0.061-0.180	301-1000	5.76-6.50	2	D	1.5 - 2.4	D
>0.180	>1000	6.51-10.00	1	F	<1.5	F

Table 3.5-2: 2011 Forest Conditions Indicator Guidelines						
					Overall Forest Conditions	
% Forest Cover	% Forest Interior	% Riparian Zone Forested	Point Score	Grade	Final Points	Final Grade
>35.0	>11.5	>57.5	5	A	>4.4	A
25.1 - 35.0	8.6 - 11.5	42.6- 57.5	4	B	3.5 - 4.4	B
15.1 - 25.0	5.6 - 8.5	27.6 - 42.5	3	C	2.5 - 3.4	C
5.0 – 15.0	2.5 - 5.5	12.5 - 27.5	2	D	1.5 - 2.4	D
<5.0	<2.5	<12.5	1	F	<1.5	F

3.6 Materials

Materials used during the assessment included:

- Auger
- Chest waders
- Cooler and ice packs
- Clipboard and observation chart paper
- Dip net
- Digital camera
- Field guides
- Fluorescent orange vests
- Latex gloves
- Measuring tape reel
- Mercury thermometer
- Metre stick
- Writing utensils
- Reaching pole
- Road map
- Sampling bottles and preservative provided by ALS Laboratory Group
- Scissors
- Stick (to measure velocity)
- Stopwatch

- Trimble Geo XH GPS
- YSI Pro DSS metre
- Ziploc bags

Field Guides:

- Field Guide to the Forest Ecosystem Classification for Northwestern Ontario (Sims *et al.,* 1997)
- Terrestrial and Wetland Ecosites of Northwestern Ontario (G. Racey *et al.*, 1996)
- Wetland Plants of Ontario (Newmaster *et al.*, 1997)
- Atlas of the Breeding Birds of Ontario (Cadman *et al.*, 2007)
- Newcomb's Wildflower Guide (Newcomb, 1977)
- Forest Plants of Northeastern Ontario (Legasy *et al.*,1995)
- Bugs of Ontario (Acorn, 2003)
- Shrubs of Ontario (Heimburger & Soper, 1982)
- Trees in Canada (Farrar, 1995)

4 RESULTS

Site photos from each sampling site are attached in Appendix I: Site Photography. The laboratory water quality results and PWQO criteria have been compared and attached in Appendix J: Laboratory Water Quality Results Summary Tables. The original Laboratory Certificates of Analysis and Analytical Reports have been attached in Appendix K: Laboratory Certificates of Analysis and Test Results.

The results for the Coldwater Creek watershed are summarized in the tables below for each site.

4.1 Site 1

Site 1 was located at a decommissioned railway bridge spanning Coldwater Creek south of Bible Camp Road, approximately 1.8 kilometres northwest from the confluence of Coldwater Creek and Lake Superior. The substrate at this site was unable to be identified because the water was too turbid and deep. The banks of the creek were stable with abundant vegetation in the riparian zone including: balsam fir, trembling aspen, white birch, speckled alder and balsam poplar. There was no erosion present along the banks. The soil type present at this site was a sandy clay loam in both the "B" Horizon and the "C" Horizon.

The laboratory results from both the June and July 2017 sampling period showed that aluminum and iron exceeded the PWQO guidelines. Total coliforms were above the pre-1994 PWQO criterion (1,000 MPN/100mL) with a value of 1990 MPN/100mL on July 13, 2017 however, the June 13, 2017 results were well under the PWQO criterion with a value of 435 MPN/100mL. Aluminum results exceeded the PWQO criterion (0.075 mg/L) with a value of 0.254 mg/L on June 13, 2017 and 0.719 mg/L on July 13, 2017. Iron exceeded the PWQO criterion (0.3 mg/L) with a value of 0.302 mg/L on June 13, 2017 and a value of 0.836 mg/L on July 13, 2017.

Table 4.1-1: Location References for Site 1

Location Description	Bible Camp Road, near decommissioned railway above Coldwater Creek
UTM Coordinates	Northing 5407383 Easting 388274
Altitude/Elevation	192 metres above sea level

Table 4.1-2: Field Measurements for Site 1

Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 15:10	**Date**: 13-JUL-17 **Time**: 10:15
Water Temperature	°C	16.5	13.7
Conductivity	uS/cm	265.8	250.0
Dissolved Oxygen	mg/L	10.36	10.14
Dissolved Oxygen	%	106.0	98.2

Table 4.1-2: Field Measurements for Site 1			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 15:10	**Date**: 13-JUL-17 **Time**: 10:15
pH		8.17	8.65
Turbidity	NTU	11.6	16.7
Air Temperature	°C	21.0	13.0
Total Dissolved Solids	mg/L	172.964	161.951
Channel Width	m	12.6	12.6
Channel Depth	m	0.813	0.813
Velocity	m/s	0.29	0.34

Table 4.1-3: Select Laboratory Water Quality Results for Site 1				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 15:10	**Date:** 13-JUL-17 **Time:** 10:15
Bacteriological				
Escherichia coli	MPN/100mL	100	25	77
Total Coliforms	MPN/100mL	1,000 (prior to 1994)	435	**1990**
Physical				
Conductivity (EC)	uS/cm	N/A	273	263
pH		6.5-8.5	8.24	8.18
Total Dissolved Solids	mg/L	N/A	160	150
Turbidity	NTU	N/A	5.83	18.7
Nutrients and Anions				
Alkalinity, Total (as $CaCO_3$)	mg/L	26.5 (June); 27.5 (July)	153	145
Ammonia-N, Total	mg/L	N/A	0.240	0.021
Un-ionized Ammonia	mg/L	0.02	0.0109	0.0008
Chloride (Cl)	mg/L	N/A	1.90	1.93
Nitrate-N (NO3-N)	mg/L	N/A	0.023	0.041
Nitrite-N (NO2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0116	0.0234
Sulfate (SO4)	mg/L	N/A	1.79	2.38
Metals				
Aluminum (Al)	mg/L	0.075	**0.254**	**0.719**
Cadmium (Cd)	mg/L	0.0001 (0-100 mg/L $CaCO_3$)		
	mg/L	0.0005 (>100 mg/L $CaCO_3$)	0.0000058	0.0000088
Cobalt (Co)	mg/L	0.0009	0.00016	0.00045
Copper (Cu)	mg/L	0.005 (interim)	0.00197	0.00303
Iron (Fe)	mg/L	0.300	**0.302**	**0.836**
Lead (Pb)	mg/L	0.001 (<30 mg/L $CaCO_3$)		
	mg/L	0.003 (30- 80 mg/L $CaCO_3$)		
	mg/L	0.005 (>80 mg/L $CaCO_3$)	0.000082	0.00029
Sodium (Na)	mg/L	N/A	2.23	2.35

Bold indicates exceedance above PWQO guidelines

Table 4.1-4: Flora Observed at Site 1			
FEC V-Type: V7 – Trembling Aspen / Balsam Fir			
Forest Density / Stream Cover	40% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
Balsam Fir Trembling Aspen White Birch Balsam Poplar Eastern White Cedar	Green Alder Pin Cherry Speckled Alder Wild Red Raspberry	Dandelion Dwarf Raspberry Wild Strawberry	Woodland Horsetail Lady Fern
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	-
Free Floating	-	**Slimes or Crusts**	-

Table 4.1-5: Fauna Observed at Site 1	
Fauna Species	
Amphibians	-
Birds	-
Crustaceans	-
Fish	-
Insects	Mosquito, Grasshopper, Blackfly, Bee
Mammals	Rabbit
Mollusca	-
Reptiles	-

Table 4.1-6: Physical Features Observed at Site 1							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	-	-	-	-	-	-	-
Bank Stability/Erosion	No erosion – very stable						

4.2 Site 2

Site 2 was located on Coldwater Drive at the confluence of Coldwater Creek and Spring Creek. The substrate at this site included: gravel, sand and clay. The banks of the creek were stable with abundant vegetation in the riparian zone including: white spruce, white birch, balsam fir, trembling aspen, red osier dogwood and speckled alder. There was signs of erosion along the banks. The soil type present at this site in the "A" Horizon was sand; the "C" Horizon was sandy gravel.

The laboratory results from both the June and July 2017 sampling period showed that aluminum, iron, *E. coli* and total coliforms exceeded the PWQO guidelines. Levels of

E.coli were above the PWQO criterion of 100 MPN/100 mL for the July 13, 2017 sampling period with a value of 179 MPN/100 mL. Total coliforms were above the pre-1994 PWQO criterion (1,000 MPN/100mL) with a value of >2420 MPN/100mL on July 13, 2017 however, the June 13, 2017 results were well under the PWQO criterion with a value of 687 MPN/100mL. Aluminum results exceeded the PWQO criterion (0.075 mg/L) with a value of 0.287 mg/L on June 13, 2017 and 0.655 mg/L on July 13, 2017. Iron exceeded the PWQO criterion (0.3 mg/L) with a value of 0.370 mg/L on June 13, 2017 and a value of 0.761 mg/L on July 13, 2017.

Table 4.2-1: Location References for Site 2	
Location Description	Confluence of Spring Creek and Coldwater Creek
UTM Coordinates	Northing 5407159 Easting 385484
Altitude/Elevation	196 metres above sea level

Table 4.2-2: Field Measurements for Site 2			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 14:35	**Date:** 13-JUL-17 **Time:** 11:15
Water Temperature	℃	17.3	14.9
Conductivity	uS/cm	232.5	214.4
Dissolved Oxygen	mg/L	9.77	9.72
Dissolved Oxygen	%	92.2	96.3
pH		8.11	8.17
Turbidity	NTU	6.6	13.6
Air Temperature	℃	21.0	14.0
Total Dissolved Solids	mg/L	151.061	140.470
Channel Width	m	12.0	12.0
Channel Depth	m	0.312	0.312
Velocity	m/s	0.38	0.53

Table 4.2-3: Select Laboratory Water Quality Results for Site 2				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 14:35	**Date:** 13-JUL-17 **Time:** 11:15
Bacteriological				
Escherichia coli	MPN/100mL	100	28	**179**
Total Coliforms	MPN/100mL	1,000 (prior to 1994)	687	**>2420**
Physical				
Conductivity (EC)	uS/cm	N/A	251	228
pH		6.5-8.5	8.16	8.15
Total Dissolved Solids	mg/L	N/A	147	128
Turbidity	NTU	N/A	6.27	15.8
Nutrients and Anions				
Alkalinity, Total (as $CaCO_3$)	mg/L	26.5 (June); 27.5 (July)	142	126
Ammonia-N, Total	mg/L	N/A	<0.020	0.135
Un-ionized Ammonia	mg/L	0.02	N/A	0.0054
Chloride (Cl)	mg/L	N/A	0.93	0.96
Nitrate-N (NO3-N)	mg/L	N/A	0.026	0.029
Nitrite-N (NO2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0126	0.0184
Sulfate (SO4)	mg/L	N/A	1.49	2.14

Table 4.2-3: Select Laboratory Water Quality Results for Site 2				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 14:35	**Date:** 13-JUL-17 **Time:** 11:15
Metals				
Aluminum (Al)	mg/L	0.075	**0.287**	**0.655**
Cadmium (Cd)	mg/L	0.0001 (0-100 mg/L $CaCO_3$)		
	mg/L	0.0005 (>100 mg/L $CaCO_3$)	0.000057	0.000010
Cobalt (Co)	mg/L	0.0009	0.00018	0.00035
Copper (Cu)	mg/L	0.005 (interim)	0.00184	0.00230
Iron (Fe)	mg/L	0.300	**0.370**	**0.761**
Lead (Pb)	mg/L	0.001 (<30 mg/L $CaCO_3$)		
	mg/L	0.003 (30- 80 mg/L $CaCO_3$)		
	mg/L	0.005 (>80 mg/L $CaCO_3$)	0.000097	0.00025
Sodium (Na)	mg/L	N/A	1.69	1.64

Bold indicates exceedance above PWQO guidelines

Table 4.2-4: Flora Observed at Site 2			
FEC V-Type: V24 – White Spruce / Balsam Fir			
Forest Density / Stream Cover	30% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
White Birch Black Spruce White Spruce Trembling Aspen Balsam Poplar Balsam Fir	Speckled Alder Red Osier Dogwood	Pyrola spp. Dandelion Common Bluebell	Three-way Sedge
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	-
Free Floating	-	**Slimes or Crusts**	-

Table 4.2-5: Fauna Observed at Site 2	
Fauna Species	
Amphibians	-
Birds	-
Crustaceans	-
Fish	-
Insects	Blackfly, Mosquito, Dragonfly, Wasp, Monarch Butterfly, Summer Azure
Mammals	-
Mollusca	-
Reptiles	-

Table 4.2-6: Physical Features Observed at Site 2							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	-	-	20%	30%	-	-	50%
Bank Stability/ Erosion	Some erosion – abundant vegetation						

4.3 Site 3

Site 3 was located approximately 0.5 kilometres southeast of the Dorion Fish Culture Station. The substrate at this site included: boulders, cobble, gravel and clay. The banks of the creek were stable with abundant vegetation in the riparian zone including: white spruce, bog laurel, trembling aspen, black spruce and balsam fir. The soil type present at this site in the "A" Horizon was a sandy loam; the "B" Horizon was a sandy clay loam; and the "C" Horizon was a silty clay loam.

The laboratory results from the June 13, 2017 and July 13, 2017 sampling periods indicated that there was only one significant PWQO exceedance, aluminum, which was during the June 13, 2017 sampling period. Aluminum results exceeded the PWQO criterion (0.075 mg/L) with a value of 0.085 mg/L on June 13, 2017. Alkalinity results exceeded the PWQO criterion (20.3 mg/L as $CaCO_3$) with a value of 199 mg/L as $CaCO_3$ during the June 13, 2017 sampling period.

Table 4.3-1: Location References for Site 3	
Location Description	Approximately 0.5 kilometres southeast of the Dorion Fish Culture Station
UTM Coordinates	Northing 5410721 Easting 382481
Altitude/Elevation	231 metres above sea level

Table 4.3-2: Field Measurements for Site 3			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 14:12	**Date**: 13-JUL-17 **Time**: 11:00
Water Temperature	°C	11.9	9.0
Conductivity	uS/cm	309.6	311.3
Dissolved Oxygen	mg/L	11.17	10.76
Dissolved Oxygen	%	103.6	93.2
pH		7.76	7.89
Turbidity	NTU	2.1	2.5
Air Temperature	°C	21.0	14.0
Total Dissolved Solids	mg/L	201.242	202.369
Channel Width	m	5.1	5.1
Channel Depth	m	0.498	0.498
Velocity	m/s	0.26	0.41

Table 4.3-3: Select Laboratory Water Quality Results for Site 3				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 14:12	**Date:** 13-JUL-17 **Time:** 11:00
Bacteriological				
Escherichia coli	MPN/100mL	100	1	9
Total Coliforms	MPN/100mL	1,000 (prior to 1994)	210	435
Physical				
Conductivity (EC)	uS/cm	N/A	331	324
pH		6.5-8.5	8.16	8.10
Total Dissolved Solids	mg/L	N/A	1.79	180
Turbidity	NTU	N/A	1.50	1.84
Nutrient and Anions				
Alkalinity, Total (as $CaCO_3$)	mg/L	26.5 (June); 27.5 (July)	199	183
Ammonia-N, Total	mg/L	N/A	0.052	0.050
Un-ionized Ammonia	mg/L	0.02	0.0014	0.0012
Chloride (Cl)	mg/L	N/A	0.91	0.72
Nitrate-N (NO3-N)	mg/L	N/A	0.024	0.087
Nitrite-N 2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0117	0.0147
Sulfate (SO4)	mg/L	N/A	1.46	2.96
Metals				
Aluminum (Al)	mg/L	0.075	**0.085**	0.057
Cadmium (Cd)	mg/L	0.0001 (0-100 mg/L $CaCO_3$)		
	mg/L	0.0005 (>100 mg/L $CaCO_3$)	<0.000050	<0.0000050
Cobalt (Co)	mg/L	0.0009	<0.00010	<0.00010
Copper (Cu)	mg/L	0.005 (interim)	0.00168	0.00178
Iron (Fe)	mg/L	0.300	0.096	0.077
Lead (Pb)	mg/L	0.001 (<30 mg/L $CaCO_3$)		
	mg/L	0.003 (30- 80 mg/L $CaCO_3$)		
	mg/L	0.005 (>80 mg/L $CaCO_3$)	<0.000050	<0.000050
Sodium (Na)	mg/L	N/A	1.62	1.56

Bold indicates exceedance above PWQO guidelines

Table 4.3-4: Flora Observed at Site 3			
FEC V-Type: V19 – Black Spruce Mixedwood / Herb Rich			
Forest Density / Stream Cover	5% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
Balsam Poplar Trembling Aspen White Spruce Black Spruce Balsam Fir White Birch	Bog Laurel	Sweet Coltsfoot Dandelion Wild Strawberry	Field Horsetail
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	-
Free Floating	-	**Slimes or Crusts**	-

Table 4.3-5: Fauna Observed at Site 3	
Fauna Species	
Amphibians	-
Birds	-
Crustaceans	-
Fish	-
Insects	Blackfly, Mosquito
Mammals	-
Mollusca	-
Reptiles	-

Table 4.3-6: Physical Features Observed at Site 3							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	5%	5%	10%	-	-	-	80%
Bank Stability/ Erosion	Stable/ abundant vegetation						

4.4 Site 4

Site 4 was located on Valley Road in Dorion, approximately 100 metres south from property #250. The substrate at this site included: boulders and cobbles. The banks of the creek were stable with abundant vegetation in the riparian zone including: speckled alder, balsam fir, trembling aspen, showy mountain ash and white birch. The soil type present at this site in both the "A" Horizon and the "C" Horizon was a sandy clay loam.

The laboratory results showed that total coliforms and aluminum both exceeded the PWQO guidelines on both June 13, 2017 and July 13, 2017 sampling periods. Total coliforms were above the pre-1994 PWQO criterion (1,000 MPN/100mL) with a value of >2,420 MPN/100mL on June 13, 2017 and >2,420 MPN/100mL on July 13, 2017. Aluminum results exceeded the PWQO criterion (0.075 mg/L) with a value of 0.221 mg/L on June 13, 2017 and 0.170 mg/L on July 14, 2017.

Table 4.4-1: Location References for Site 4	
Location Description	Property #250 Valley Road in Dorion, approximately 100 metres south
UTM Coordinates	Northing 5405531 Easting 381356
Altitude/Elevation	239 metres above sea level

Table 4.4-2: Field Measurements for Site 4			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 13:30	**Date:** 13-JUL-17 **Time:** 11:45
Water Temperature	℃	15.9	14.7
Conductivity	uS/cm	77.4	84.9
Dissolved Oxygen	mg/L	9.34	9.64

Table 4.4-2: Field Measurements for Site 4			
Dissolved Oxygen	%	94.4	95.1
pH		7.93	8.36
Turbidity	NTU	3.5	3.8
Air Temperature	℃	21.0	14.0
Total Dissolved Solids	mg/L	50.426	55.149
Channel Width	m	1.68	1.68
Channel Depth	m	0.160	0.160
Velocity	m/s	0.26	0.63

Table 4.4-3: Select Laboratory Water Quality Results for Site 4				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 13:30	**Date:** 13-JUL-17 **Time:** 11:45
Bacteriological				
Escherichia coli	MPN/100mL	100	0	5
Total Coliforms	MPN/100mL	1,000 (prior to 1994)	**>2420**	**>2420**
Physical				
Conductivity (EC)	uS/cm	N/A	86.3	91.5
pH		6.5-8.5	7.55	7.68
Total Dissolved Solids	mg/L	N/A	71	63
Turbidity	NTU	N/A	2.18	3.33
Nutrients and Anions				
Alkalinity, Total (as $CaCO_3$)	mg/L	26.5 (June); 27.5 (July)	43.5	45.5
Ammonia-N, Total	mg/L	N/A	<0.020	<0.020
Un-ionized Ammonia	mg/L	0.02	N/A	N/A
Chloride (Cl)	mg/L	N/A	0.13	0.1
Nitrate-N (NO3-N)	mg/L	N/A	0.070	0.051
Nitrite-N (NO2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0112	0.0098
Sulfate (SO4)	mg/L	N/A	1.18	2.14
Metals				
Aluminum (Al)	mg/L	0.075	**0.221**	**0.170**
Cadmium (Cd)	mg/L	0.0001 (0-100 $CaCO_3$)	0.000055	0.0000066
	mg/L	0.0005 (>100 mg/L $CaCO_3$)		
Cobalt (Co)	mg/L	0.0009	0.00014	0.00013
Copper (Cu)	mg/L	0.005 (interim)	0.00333	0.00299
Iron (Fe)	mg/L	0.300	0.275	0.293
Lead (Pb)	mg/L	0.001 (<30 mg/L $CaCO_3$)		
	mg/L	0.003 (30- 80 mg/L $CaCO_3$)	0.000057	0.00008
	mg/L	0.005 (>80 mg/L $CaCO_3$)		
Sodium (Na)	mg/L	N/A	0.770	0.817

Bold indicates exceedance above PWQO guidelines

Table 4.4-4: Flora Observed at Site 4			
FEC V-Type: V7 – Trembling Aspen / Balsam Fir			
Forest Density / Stream Cover	90% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
White Birch Balsam Fir Trembling Aspen	Showy Mountain Ash Speckled Alder	Broad Leaf Arrowhead Dandelion Large Leaf Aster Dwarf Raspberry Common Bluebell	Lady Fern Woodland Horsetail
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	-
Free Floating	-	**Slimes or Crusts**	-

Table 4.4-5: Fauna Observed at Site 4	
Fauna Species	
Amphibians	-
Birds	Partridge
Crustaceans	-
Fish	-
Insects	Monarch Butterfly, Blackfly, Deerfly, Mosquito, Bee
Mammals	Chipmunk
Mollusca	-
Reptiles	-

Table 4.4-6: Physical Features Observed at Site 4							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	70%	30%	-	-	-	-	-
Bank Stability/ Erosion	Stable/ abundant vegetation						

4.5 Site 5

Site 5 was located on Ouimet Canyon Road, approximately 2.5 kilometres northwest of Highway 11/17 at the bottom of a small hill on the west side of a bridge which spanned Coldwater Creek. The substrate at this site included: clay, sand and gravel. The banks of the creek were stable with abundant vegetation in the riparian zone including: white birch, balsam poplar, red osier dogwood, black spruce and speckled alder. The soil type present at this site in the "A" Horizon was sandy loam. The soil type present in the "C" Horizon was a sandy gravel.

The laboratory results for the June 13, 2017 and July 13, 2017 sampling periods showed that total coliforms exceeded the PWQO guidelines during both sampling periods and aluminum exceeded the PWQO guideline for the July 13, 2017 sampling period. Total coliforms were above the pre-1994 PWQO criterion (1,000 MPN/100mL) with a value of 1050 MPN/100mL on June 13, 2017 and >2,420 MPN/100mL on July 13, 2017. Aluminum results exceeded the PWQO criterion (0.075 mg/L) with a value of 0.080 mg/L on July 13, 2017.

Table 4.5-1: Location References for Site 5

Location Description	Ouimet Canyon Road, approximately 2.5 kilometres northwest from Highway 11/17
UTM Coordinates	Northing 5402311 Easting 382048
Altitude/Elevation	228 metres above sea level

Table 4.5-2: Field Measurements for Site 5

Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 13:15	**Date**: 13-JUL-17 **Time**: 13:20
Water Temperature	℃	17.0	15.0
Conductivity	uS/cm	172.5	154.2
Dissolved Oxygen	mg/L	9.60	9.79
Dissolved Oxygen	%	99.1	97.1
pH		7.84	7.92
Turbidity	NTU	1.9	2.7
Air Temperature	℃	21.0	14.0
Total Dissolved Solids	mg/L	112.113	100.228
Channel Width	m	7.3	7.3
Channel Depth	m	0.321	0.321
Velocity	m/s	0.20	0.30

Table 4.5-3: Select Laboratory Water Quality Results for Site 5

Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 13:15	**Date:** 13-JUL-17 **Time:** 13:20
Bacteriological				
Escherichia coli	MPN/100mL	100	84	67
Total Coliforms	MPN/100mL	1,000 (prior to 1994)	**1050**	**>2420**
Physical				
Conductivity (EC)	uS/cm	N/A	186	164
pH		6.5-8.5	7.98	7.99
Total Dissolved Solids	mg/L	N/A	108	95
Turbidity	NTU	N/A	1.70	2.57
Nutrients and Anions				
Alkalinity, Total (as $CaCO_3$)	mg/L	26.5 (June); 27.5 (July)	105	89.8
Ammonia-N, Total	mg/L	N/A	<0.020	0.114
Un-ionized Ammonia	mg/L	0.02	N/A	0.0032
Chloride (Cl)	mg/L	N/A	0.76	0.79
Nitrate-N (NO3-N)	mg/L	N/A	0.037	0.033
Nitrite-N (NO2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0066	0.0064
Sulfate (SO4)	mg/L	N/A	1.02	1.85

Table 4.5-3: Select Laboratory Water Quality Results for Site 5				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 13:15	**Date:** 13-JUL-17 **Time:** 13:20
Metals				
Aluminum (Al)	mg/L	0.075	0.069	**0.080**
Cadmium (Cd)	mg/L	0.0001 (0-100 mg/L $CaCO_3$)		<0.0000050
	mg/L	0.0005 (>100 mg/L $CaCO_3$)	<0.0000050	
Cobalt (Co)	mg/L	0.0009	<0.00010	<0.00010
Copper (Cu)	mg/L	0.005 (interim)	0.00112	0.00120
Iron (Fe)	mg/L	0.300	0.176	0.248
Lead (Pb)	mg/L	0.001 (<30 mg/L $CaCO_3$)		
	mg/L	0.003 (30- 80 mg/L $CaCO_3$)		
	mg/L	0.005 (>80 mg/L $CaCO_3$)	<0.000050	<0.000050
Sodium (Na)	mg/L	N/A	1.27	1.09

Bold indicates exceedance above PWQO guidelines

Table 4.5-4: Flora Observed at Site 5			
FEC V-Type: V9 – Trembling Aspen Mixedwood			
Forest Density / Stream Cover	40% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
Balsam Poplar White Spruce White Birch Black Spruce	Speckled Alder Red Osier Dogwood	Cow Parsnip Dandelion	Lady Fern
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	-
Free Floating	-	**Slimes or Crusts**	-

Table 4.5-5: Fauna Observed at Site 5	
Fauna Species	
Amphibians	Green Frog
Birds	-
Crustaceans	-
Fish	-
Insects	Blackfly, Dragonfly, Eastern Tiger Swallowtail, Summer Azure
Mammals	-
Mollusca	-
Reptiles	-

Table 4.5-6: Physical Features Observed at Site 5							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	-	-	30%	30%	-	-	40%
Bank Stability/ Erosion	Stable/ abundant vegetation						

4.6 Site 6

Site 6 was located on Ouimet Canyon Road, approximately 100 metres east of the turn off for Greenwich Lake Road. The substrate at this site included: clay and organic matter. The banks of the creek were stable with abundant vegetation in the riparian zone including: white spruce, mountain maple, balsam fir, red osier dogwood, speckled alder, white birch and trembling aspen. The soil type present at this site in the "C" Horizon was sand.

The laboratory results showed that the only exceedance during both the June 13, 2017 and July 13, 2017 sampling periods was aluminum. The aluminum result exceeded the PWQO criterion (0.075 mg/L) with a value of 0.180 mg/L on July 13, 2017.

Table 4.6-1: Location References for Site 6	
Location Description	Ouimet Canyon Road, approximately 100 metres east from Greenwich Lake Road turnoff
UTM Coordinates	Northing 5402829 Easting 377372
Altitude/Elevation	266 metres above sea level

Table 4.6-2: Field Measurements for Site 6			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 12:35	**Date**: 13-JUL-17 **Time**: 13:00
Water Temperature	°C	15.0	14.8
Conductivity	uS/cm	0.165	159.1
Dissolved Oxygen	mg/L	8.69	8.52
Dissolved Oxygen	%	86.3	84.3
pH		7.62	7.82
Turbidity	NTU	0.8	1.1
Air Temperature	°C	21.0	14.0
Total Dissolved Solids	mg/L	131.168	103.285
Channel Width	m	9.3	9.3
Channel Depth	m	0.598	0.598
Velocity	m/s	N/A	N/A

Table 4.6-3: Select Laboratory Water Quality Results for Site 6				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 12:35	**Date:** 13-JUL-17 **Time:** 13:00
Bacteriological				
Escherichia coli	MPN/100	100	2	5
Total Coliforms	MPN/100	1000 (prior to 1994)	770	770
Physical				

Table 4.6-3: Select Laboratory Water Quality Results for Site 6				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 12:35	**Date:** 13-JUL-17 **Time:** 13:00
Conductivity (EC)	uS/cm	N/A	102	162
pH		6.5-8.5	7.64	7.8
Total Dissolved Solids	mg/L	N/A	70	97
Turbidity	NTU	N/A	2.36	0.54
Nutrients and Anions				
Alkalinity, Total (as $CaCO_3$)	mg/L	26.5 (June); 27.5 (July)	105	89.8
Ammonia-N, Total	mg/L	N/A	<0.020	0.076
Un-ionized Ammonia	mg/L	0.02	N/A	0.0013
Chloride (Cl)	mg/L	N/A	0.31	0.58
Nitrate-N (NO3-N)	mg/L	N/A	0.052	<0.020
Nitrite-N (NO2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0041	0.0102
Sulfate (SO4)	mg/L	N/A	0.87	1.55
Metals				
Aluminum (Al)	mg/L	0.075	0.036	**0.180**
Cadmium (Cd)	mg/L	0.0001 (0-100 mg/L $CaCO_3$)	0.000065	0.000008
	mg/L	0.0005 (>100 mg/L $CaCO_3$)		
Cobalt (Co)	mg/L	0.0009	<0.00010	0.0001
Copper (Cu)	mg/L	0.005 (interim)	0.00102	0.00260
Iron (Fe)	mg/L	0.300	0.094	0.270
Lead (Pb)	mg/L	0.001 (<30 mg/L $CaCO_3$)		
	mg/L	0.003 (30-80 mg/L $CaCO_3$)		
	mg/L	0.005 (>80 mg/L $CaCO_3$)	<0.000050	0.00014
Sodium (Na)	mg/L	N/A	0.945	0.922

Bold indicates exceedance above PWQO guidelines

Table 4.6-4: Flora Observed at Site 6			
FEC V-Type: V8 – Trembling Aspen (White Birch) / Mountain Maple			
Forest Density /Stream Cover	75% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
White Spruce White Pine Trembling Aspen Black Spruce Balsam Poplar Mountain Maple	Prickly Wild Rose Speckled Alder Red Osier Dogwood Wild Red Raspberry	Dandelion Buttercups	Sensitive Fern Bulrush
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	Yes
Free Floating	-	**Slimes or Crusts**	-

Table 4.6-5: Fauna Observed at Site 6	
Fauna Species	
Amphibians	-
Birds	-
Crustaceans	-
Fish	-
Insects	Eastern Tiger Swallowtail, Blackfly, Deerfly, Dragonfly, Summer Azure, White Admiral
Mammals	Red Fox
Mollusca	-
Reptiles	-

Table 4.6-6: Physical Features Observed at Site 6							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	-	-	-	-	-	90%	10%
Bank Stability/Erosion	Stable/ abundant vegetation						

4.7 Site 7

Site 7 was located on Greenwich Lake Road, at the culvert on the south side of the Goodmorning Lakes. The substrate at this site included: boulders, sand, gravel and cobbles. The banks of the creek were stable with abundant vegetation in the riparian zone including: white spruce, black spruce, balsam fir, trembling aspen, speckled alder, tamarack and white birch. The soil type present at this site in the "A" Horizon and the "C" Horizon was silty sand.

The laboratory results showed that the only exceedance during both the June 13, 2017 and July 13, 2017 sampling periods was total coliforms during the July 13, 2017 sampling period. The total coliforms result exceeded the pre-1994 PWQO criterion (1,000 MPN/100mL) with a value of >2420 MPN/100 mL.

Table 4.7-1: Location References for Site 7	
Location Description	On Greenwich Lake Road, at the culvert on the south side of Goodmorning Lakes
UTM Coordinates	Northing 5403939 Easting 375392
Altitude/Elevation	364 metres above sea level

Table 4.7-2: Field Measurements for Site 7			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 12:15	**Date:** 13-JUL-17 **Time:** 12:30
Water Temperature	°C	18.9	18.2
Conductivity	uS/cm	71.7	77.3
Dissolved Oxygen	mg/L	9.15	7.79

Table 4.7-2: Field Measurements for Site 7			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 12:15	**Date:** 13-JUL-17 **Time:** 12:30
Dissolved Oxygen	%	98.5	82.8
pH		8.01	7.94
Turbidity	NTU	1.7	1.2
Air Temperature	°C	20.0	14.0
Total Dissolved Solids	mg/L	46.583	50.275
Channel Width	m	N/A	N/A
Channel Depth	m	0.395	0.395
Velocity	m/s	0.55	N/A

Table 4.7-3: Select Laboratory Water Quality Results for Site 7				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 12:15	**Date:** 13-JUL-17 **Time:** 12:30
Bacteriological				
Escherichia coli	MPN/100mL	100	1	9
Total Coliforms	MPN/100mL	1000 (prior to 1994)	178	**>2420**
Physical				
Conductivity (EC)	uS/cm	N/A	78.3	83.6
pH		6.5-8.5	7.55	7.62
Total Dissolved Solids	mg/L	N/A	57	57
Turbidity	NTU	N/A	0.77	0.88
Nutrients and Anions				
Alkalinity, Total (as	mg/L	26.5 (June); 27.5 (July)	41	43.9
Ammonia-N, Total	mg/L	N/A	0.044	0.05
Un-ionized Ammonia	mg/L	0.02	0.0005	0.0007
Chloride (Cl)	mg/L	N/A	0.35	0.39
Nitrate-N (NO3-N)	mg/L	N/A	0.095	<0.020
Nitrite-N (NO2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0106	0.0073
Sulfate (SO4)	mg/L	N/A	1.02	1.96
Metals				
Aluminum (Al)	mg/L	0.075	0.0512	0.0149
Cadmium (Cd)	mg/L	0.0001 (0-100 mg/L $CaCO_3$)	0.0000051	<0.0000050
	mg/L	0.0005 (>100 mg/L $CaCO_3$)		
Cobalt (Co)	mg/L	0.0009	<0.00010	<0.00010
Copper (Cu)	mg/L	0.005 (interim)	0.00103	0.00099
Iron (Fe)	mg/L	0.300	0.115	0.113
Lead (Pb)	mg/L	0.001 (<30 mg/L $CaCO_3$)		
	mg/L	0.003 (30- 80 mg/L $CaCO_3$)	<0.00005	<0.000050
	mg/L	0.005 (>80 mg/L $CaCO_3$)		
Sodium (Na)	mg/L	N/A	0.823	0.858

Bold indicates exceedance above PWQO guidelines

Table 4.7-4: Flora Observed at Site 7			
FEC V-Type: V35 – Black Spruce / Speckled Alder			
Forest Density / Stream Cover	0% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
White Spruce Black Spruce Trembling Aspen Balsam Fir White Birch Tamarack	Bush Honeysuckle Speckled Alder	Large Leaf Aster Dandelion Field Strawberry Marsh Marigold	Three-way Sedge Woodland Horsetail
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	-
Free Floating	-	**Slimes or Crusts**	-

Table 4.7-5: Fauna Observed at Site 7	
Fauna Species	
Amphibians	-
Birds	-
Crustaceans	-
Fish	Speckled Trout
Insects	Dragonfly, Mosquito, Blackfly, Eastern Tiger Swallowtail, Horsefly
Mammals	Black Bear, Moose
Mollusca	-
Reptiles	-

Table 4.7-6: Physical Features Observed at Site 7							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	10%	10%	70%	10%	-	-	-
Bank Stability/ Erosion	Stable/ abundant vegetation						

4.8 Site 8

Site 8 was located approximately 3.1 kilometres down Greenwich Lake Road. The substrate at this site included: boulders, gravel and cobbles. The banks of the creek were stable with abundant vegetation in the riparian zone including: speckled alder, white birch, balsam poplar, trembling aspen and black spruce. The soil type present at this site in the "C" Horizon was sandy gravel.

The June 13, 2017 sampling period resulted in an exceedance in total coliforms, while the July 13, 2017 sampling period resulted in exceedances in total coliforms, aluminum and iron. Total coliforms were above the pre-1994 PWQO criterion (1,000

MPN/100 mL) for both the June 13, 2017 and July 13, 2017 sampling periods with a value of 1,120 MPN/100mL and >2420 MPN/100 mL respectively. Aluminum results exceeded the PWQO criterion (0.075 mg/L) with a value of 0.106 mg/L for the July 13, 2017 period. Iron results exceeded the PWQO criterion (0.3 mg/L) with a value of 0.362 mg/L during the July 13, 2017 period.

Table 4.8-1: Location References for Site 8	
Location Description	Approximately 3.1 kilometres west on Greenwich Lake Road
UTM Coordinates	Northing 5404176 Easting 374944
Altitude/Elevation	363 metres above sea level

Table 4.8-2: Field Measurements for Site 8			
Parameter	**Unit**	**Date:** 13-JUN-17 **Time:** 11:30	**Date**: 13-JUL-17 **Time**: 12:15
Water Temperature	°C	18.2	14.0
Conductivity	uS/cm	48.3	51.4
Dissolved Oxygen	mg/L	8.29	8.86
Dissolved Oxygen	%	87.9	86.2
pH		8.23	8.19
Turbidity	NTU	1.1	1.4
Air Temperature	°C	20.0	14.0
Total Dissolved Solids	mg/L	31.417	33.420
Channel Width	m	2.25	2.25
Channel Depth	m	0.295	0.295
Velocity	m/s	0.53	1.14

Table 4.8-3:Select Laboratory Water Quality Results for Site 8				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 11:30	**Date:** 13-JUL-17 **Time:** 12:15
Bacteriological				
Escherichia coli	MPN/100mL	100	29	16
Total Coliforms	MPN/100mL	1,000 (prior to 1994)	**1120**	**>2420**
Physical				
Conductivity (EC)	uS/cm	N/A	53.3	55.7
pH		6.5-8.5	7.37	7.33
Total Dissolved Solids	mg/L	N/A	41	49
Turbidity	NTU	N/A	0.54	0.7
Nutrients and Anions				
Alkalinity, Total (as	mg/L	26.5 (June); 27.5 (July)	29.7	29.3
Ammonia-N, Total	mg/L	N/A	<0.020	0.087
Un-ionized Ammonia	mg/L	0.02	N/A	0.0005
Chloride (Cl)	mg/L	N/A	0.22	0.22
Nitrate-N (NO3-N)	mg/L	N/A	<0.020	0.059
Nitrite-N (NO2-N)	mg/L	N/A	<0.010	<0.010
Phosphorus (P)-Total	mg/L	0.03	0.0056	0.0054
Sulfate (SO4)	mg/L	N/A	0.76	1.59
Metals				
Aluminum (Al)	mg/L	0.075	0.0595	**0.106**
Cadmium (Cd)	mg/L	0.0001 (0-100 mg/L $CaCO_3$)	<0.0000050	0.000008
	mg/L	0.0005 (>100 mg/L $CaCO_3$)		

Table 4.8-3:Select Laboratory Water Quality Results for Site 8				
Parameter	**Unit**	**PWQO Guidelines**	**Date:** 13-JUN-17 **Time:** 11:30	**Date:** 13-JUL-17 **Time:** 12:15
Cobalt (Co)	mg/L	0.0009	<0.00010	<0.0001
Copper (Cu)	mg/L	0.005 (interim)	0.00073	0.00096
Iron (Fe)	mg/L	0.300	0.181	**0.362**
Lead (Pb)	mg/L	0.001 (<30 mg/L CaCO3)	<0.000050	0.00009
	mg/L	0.003 (30- 80 mg/L $CaCO_3$)		
	mg/L	0.005 (>80 mg/L $CaCO_3$)		
Sodium (Na)	mg/L	N/A	0.920	0.877

Bold indicates exceedance above PWQO guidelines

Table 4.8-4: Flora Observed at Site 8			
FEC V-Type: V35 Black Spruce / Speckled Alder			
Forest Density / Stream Cover	30% stream cover		
Terrestrial Species			
Trees	**Shrubs**	**Herbs**	**Ferns / Horsetails / Mosses / Grasses**
Black Spruce White Birch Balsam Poplar Trembling Aspen	Speckled Alder Prickly Wild Rose Bush Honeysuckle Red Osier Dogwood	Viola spp. Broad Leaf Arrowhead Large Leaf Aster Wild Strawberry Dandelion	Woodland Horsetail Three-way Sedge
Aquatic Macrophytes and Algae			
Emergent	-	**Floating Algae**	-
Rooted Floating	-	**Filaments**	-
Submergent	-	**Attached Algae**	-
Free Floating	-	**Slimes or Crusts**	-

Table 4.8-5: Fauna Observed at Site 8	
Fauna Species	
Amphibians	-
Birds	-
Crustaceans	-
Fish	-
Insects	Dragonfly, Blackfly, Mosquito, Eastern Tiger Swallowtail, Bee
Mammals	Chipmunk
Mollusca	-
Reptiles	-

Table 4.8-6: Physical Features Observed at Site 8							
In-stream Substrate							
Bedrock	**Boulder**	**Cobbles**	**Gravel**	**Sand**	**Silt**	**Organic**	**Clay**
-	40%	50%	10%	-	-	-	-
Bank Stability/ Erosion	Stable/ abundant vegetation						

4.9 Watershed Report Card Results

The overall surface water quality for the Coldwater Creek watershed maintained a total averaged point score of 4.75. With no exceedances for phosphorus and minimal exceedances for *E. coli*, the rating of the surface water quality for the Coldwater Creek watershed was determined to have a grade of A, which is considered excellent quality.

The forest coverage for the Coldwater Creek watershed was 121.6 square kilometres (88 percent), interior forest coverage was 89.0 square kilometres (64.4 percent) and the riparian forest cover was 7.4 square kilometres (5.4 percent). These percentages generated a total point score of eleven (average of 3.7) for the forest conditions, which determined a grade of B or which is considered to be of good quality.

Table 4.9-1: Coldwater Creek Watershed Surface Water Indicators and Overall Grade Calculation

Site Number	Average Total Phosphorus (mg/L)	Average *E. coli* (MPN/ 100mL)	Average of Benthic Invertebrates	Total Point Score	Grade	Overall Surface Water Quality Grade Final Points	Grade
1	0.0175	51	N/A	9	A	4.5	A
2	0.0155	103.5	N/A	8	B	4	B
3	0.0132	5	N/A	10	A	5	A
4	0.0105	2.5	N/A	10	A	5	A
5	0.0065	75.5	N/A	9	A	4.5	A
6	0.0072	3.5	N/A	10	A	5	A
7	0.0090	5	N/A	10	A	5	A
8	0.0055	22.5	N/A	10	A	5	A
					Average	**4.75**	**A**

Table 4.9-2: Coldwater Creek Watershed Forest Conditions and Overall Grade Calculation

					Overall Forest Conditions	
% Forest Cover	% Forest Interior	% Riparian Zone Forested	Total Point Score	Grade	Final Points	Final Grade
88	64.4	5.4	11	B	**3.7**	**B**

5 DISCUSSION

The Coldwater Creek watershed was sampled at eight different locations, chosen based on accessibility and possible contamination sources, as well as attempting to reach all areas of the watershed. The first sampling period was on June 13, 2017 and the second sampling period on July 13, 2017.

The average air temperature for the June 13, 2017 sampling period was 20.8 degrees Celsius which exceeded the monthly average temperature of 15 degrees Celsius for June 2017 as well as the historical average of 14 degrees Celsius for June 1971-2000 in Thunder Bay. The average air temperature for the July 13, 2017 sampling period was 13.9 degrees Celsius, which was below the monthly average temperature of 18.1 degrees Celsius and exceeded the historical average of 17.6 degrees Celsius for July 1971-2000. Precipitation for the month of June totaled 86.3 millimetres, which was above the historical monthly average of 85.7 millimetres for Thunder Bay from June 1971-2000. In July, precipitation totaled 61.8 millimetres, which was below the historical monthly average of 89 millimetres for July 1971-2000.

Water temperatures ranged from 11.9 to 17.3 degrees Celsius in June and 9.0 to 18.2 degrees Celsius in July, which can be seen on Figure 2: Coldwater Creek Watershed Water Temperature. The site with the lowest recorded water temperature, 9.0 degrees Celsius, was Site 3 and this was believed to be because the creek was spring fed. The stream depths observed ranged from 0.16 metres to 0.81 metres for both June and July. The shallowest of all the stream depths was located at Site 4 (0.16 metres) and the deepest at Site 1 (0.81 metres).

All of the sample locations, with the exception of Site 3 which was located approximately twenty metres from Fish Hatchery Road, were water crossings that required a bridge or culvert to support the road. The only test sites with bridges were at Sites 1, 2 and 5. The bridges were made out of timber beams and did not appear to alter flow in a significant way or change the natural stream course. Rip rap protection was used along the sides of the bridge at Site 5, and aided in bridge support as well as erosion and sedimentation control from road run-off. Culverts were present at Sites 4, 6, 7 and 8. The culverts at Site 4 (C1) and Site 7 (C3) should be monitored in the future as C1 is structurally compromised on the upstream side (slightly bent inwards) and perched on the downstream side, and there was a blockage caused by organic waste on the north side of C3.

A vegetation assessment was carried out at each site, recording species present within view of each site. A summary of each site is included in Appendix F: Forest Ecosystem Classification. FEC type V-7 "Trembling Aspen – Balsam Fir/Balsam Fir Shrub" and FEC type V-35 "Black Spruce/Speckled Alder/*Sphagnum*" were the most common and occurred at Sites 1 and 4 and at Sites 7 and 8. The remaining sites had a similar

mixedwood forest type favouring coniferous species as opposed to hardwood. The dominant tree species within the Coldwater Creek watershed included: white spruce, balsam poplar, trembling aspen, white birch, balsam fir and black spruce. The shrub layer was very diverse throughout the watershed, with many species present. Some commonly observed species in the shrub layer were: prickly wild rose, red osier dogwood, speckled alder and wild red raspberry. The most commonly observed herb and wildflower species included dandelions, wild strawberry and large leaf aster. No invasive plant species or species at risk were seen at the sample sites within the Coldwater Creek watershed.

Overall, the stream banks documented within the Coldwater Creek watershed were stable. The main soil type was sandy clay loam; however, all sites had some element of sand present whether it be sandy clay loam, loamy sand, sandy loam, etc. These types of substrate aid the banks by helping with slope stability and keeping erosion to a minimum; however, some soil types are more effective than others. For example, a combination of sand, clay and loam works quite effectively at mitigating the effects of erosion caused by the flowing rivers/creeks/stream because the clay content aids in cohesion and prevents the sand from eroding easily (in comparison to a strictly sand substrate).

The PWQO acceptable pH range is 6.5-8.5. The range within the Coldwater Creek watershed was 7.33 to 8.24, as illustrated on Figure 3: pH Level at Coldwater Creek Sample Sites. The average pH of the watershed was within an acceptable water quality range.

TDS can be related to conductivity since the dissolved solids help to conduct an electric current through the water. The more dissolved solids present in a solution, the greater the conductive potential, as there are more ions present to carry the charge. The relationship can be seen in the watershed data when comparing between Figure 4: Conductivity at Coldwater Creek Sample Sites and Figure 5: Total Dissolved Solids at Coldwater Creek Sample Sites. The highest measured levels of TDS and conductivity were at Site 3, and the lowest for both parameters were at Site 8. With regards to drinking water, TDS levels are a secondary drinking water standard, meaning that this standard is based on aesthetic properties such as odour, colour, taste, corrosivity, foaming and staining, not based on health considerations.

Monitoring of bacterial levels in surface water is often limited to *E. coli*, as this is the most common water-borne pathogen that can cause illness and death. The levels of *E. coli* at Site 2 were in exceedance of the PWQO of 100 MPN/100 mL with a value of 179 MPN/100 mL at Site 2 during the July 13, 2017 sampling period, as illustrated on Figure 6: Escherichia *coli* Bacteria Counts at Coldwater Creek Sample Sites. The remaining sampling sites did not have exceedances of *E. coli* during both the June and July sampling periods. Presence of *E. coli* generally indicates a fecal contamination source

nearby and many studies have shown that the presence of farm animals near a stream can significantly influence bacteria counts. *E. coli* could also enter the watershed from leaking residential septic tanks and/or from manure. It can be inferred that, since there was only one exceedance of *E. coli* in the watershed, a slight exceedance at Site 2, that *E. coli* does not appear to be a water quality concern.

Total coliforms are among the flora present in the intestinal tract of animals and are often present in much greater numbers than potential pathogens, such as *E. coli*. Therefore, coliforms are easier to isolate and identify within a water sample. In order to better determine the possibility of contamination, total coliforms are measured in surface water as indicators of pathogenic bacteria contamination. No current PWQO exists for total coliforms; however, total coliforms exceeded the pre-1994 PWQO of 1,000 MPN/100 mL at Sites 4, 5 and 8 during the June 13, 2017 sampling period and at Sites 1, 2, 4, 5, 7 and 8 during the July 13, 2017 sampling period. The highest level of total coliforms present was >2,420 MPN/100mL at Sites 4, 5 and 8 on June 13, 2017 and Sites 1, 2, 4, 5, 7 and 8 on July 13, 2017. Total coliforms for all sampling results ranged from 178 to >2,420 MPN/100mL.

The PWQO criterion of 0.075 mg/L for aluminum was exceeded at Sites 1, 2, 3 and 4 during the June sampling period and at Sites 1, 2, 4, 5, 6 and 8 during the July sampling period. Aluminum concentrations ranged from 0.0149 mg/L at Site 7 on June 13, 2017 to 0.719 mg/L at Site 1 on July 13, 2017. The average concentration of aluminum was 0.133 mg/L for all sites during the June sampling period and 0.248 mg/L during the July sampling period, which are both above the PWQO criterion.

The PWQO criterion of 0.3 mg/L for iron was exceeded at Sites 1 and 2 during the June sampling period and at Sites 1, 2 and 8 during the July sampling period. Iron concentrations ranged between 0.077 mg/L at Site 3 on June 13, 2017 to 0.836 mg/L at Site 1 on July 13, 2017. The average concentration of iron was calculated to be 0.201 mg/L for the June sampling period and 0.370 mg/L for the July sampling period. There seemed to be a trend of increasing iron concentration from background concentrations upstream in the watershed to downstream concentrations in the watershed.

High aluminum and iron levels may be caused by the underlying geology. These metals may naturally dissociate from mineral-rich rocks. The exceedances are likely a result of natural sources and are commonly high within the region.

The overall health of the Coldwater Creek watershed was determined using the ratings from surface water quality and forest conditions, which were combined to give a grade for the Watershed Report Card. Given that there was only one exceedance of *E. coli* and no exceedances of phosphorus, the overall health of the Coldwater Creek watershed surface water quality has received a rating of (A) for its Watershed Report

Card rating which is of excellent quality. The Coldwater Creek forest conditions based on forest coverage, forest interior and riparian zone forested, were determined to also result in a rating of (B). Based on this rating and other observed conditions, the Oliver Creek watershed has been determined to have good to excellent overall health.

6 CONCLUSION

The Coldwater Creek watershed was determined to be in good to excellent condition with minimal evident anthropogenic impacts. Surface water quality at the time of the study was excellent, with the exceedances of the Provincial Water Quality Objectives being mostly attributed to natural sources. Plant species composition seems characteristic of the boreal forest, with diversity at each site among the overstory, understory and herb layer. A more comprehensive fauna study would give a clear indication of the species and populations present, but at the time of the study multiple species were observed giving a good representation of a typical boreal forest area. Water levels appeared consistent with previous water markings. Erosion was not typically a concern, as the stream banks were stable. Stream cover was often provided by shrubs and trees growing along the creek banks which also helped prevent erosion. Bridges and culverts were in stable condition with no immediate concern for maintenance.

7 RECOMMENDATIONS

Upon completion of the 2017 Coldwater Creek Watershed Assessment, the following recommendations have been made for considerations:

- Staff and funding permitting it is recommended that an update to the 2017 Coldwater Creek Watershed Assessment be completed in the next five to ten years.
- Benthic analysis indicates water quality over an extended period of time and should be considered for future watershed assessments.
- Additional sampling should be conducted in the spring to observe the water quality differences between high and low flow seasons.
- A copy of this report should be provided to the Township of Dorion, the Municipality of Shuniah and the Dorion Fish Culture Station for reference purposes. The report should be kept on file at the LRCA Administration Office for review by interested parties.

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Figures

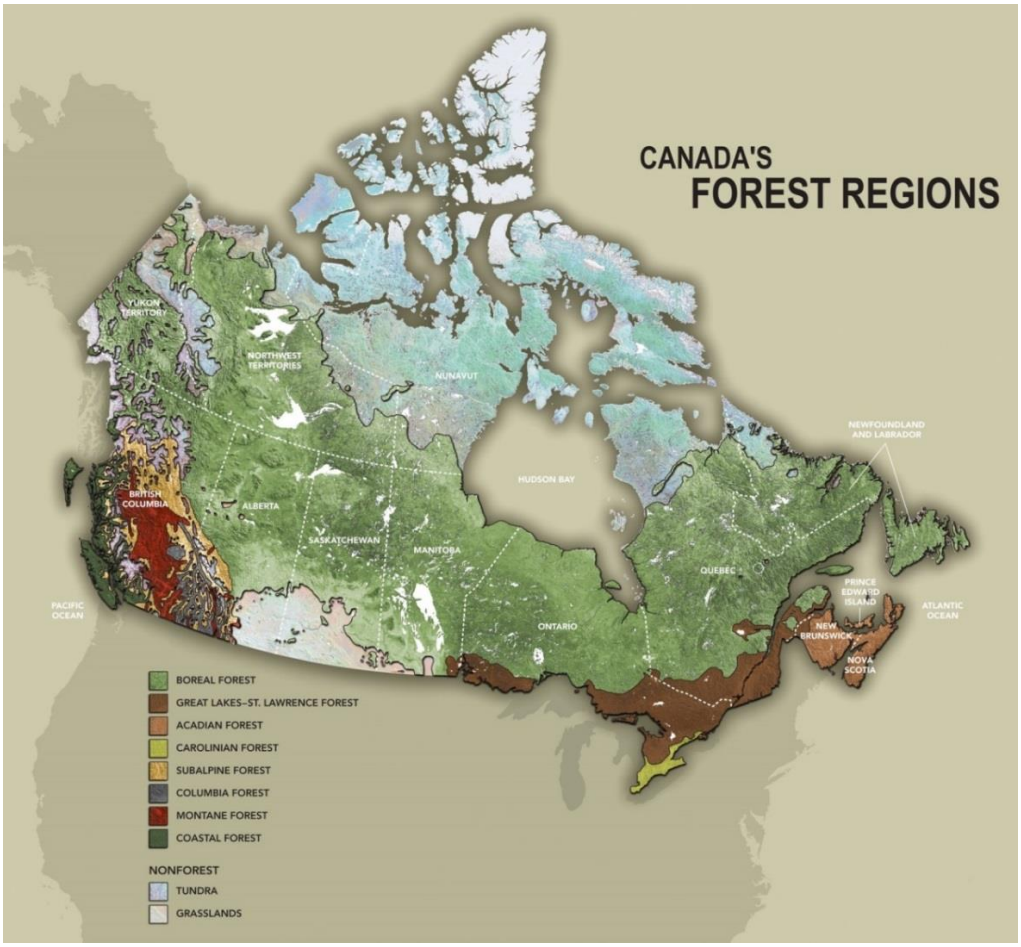


Figure 1: Canada's Forest Regions (Canadian Forest Service, 2013)

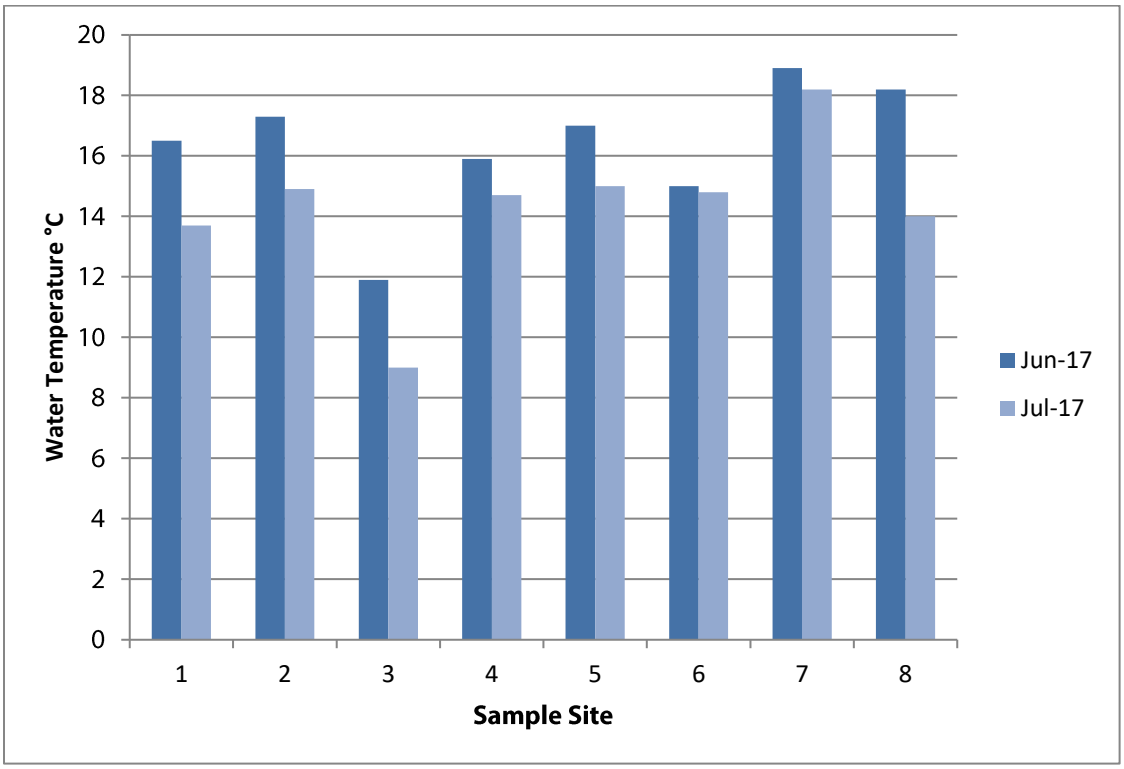


Figure 2: Water temperature at Coldwater Creek sample sites.

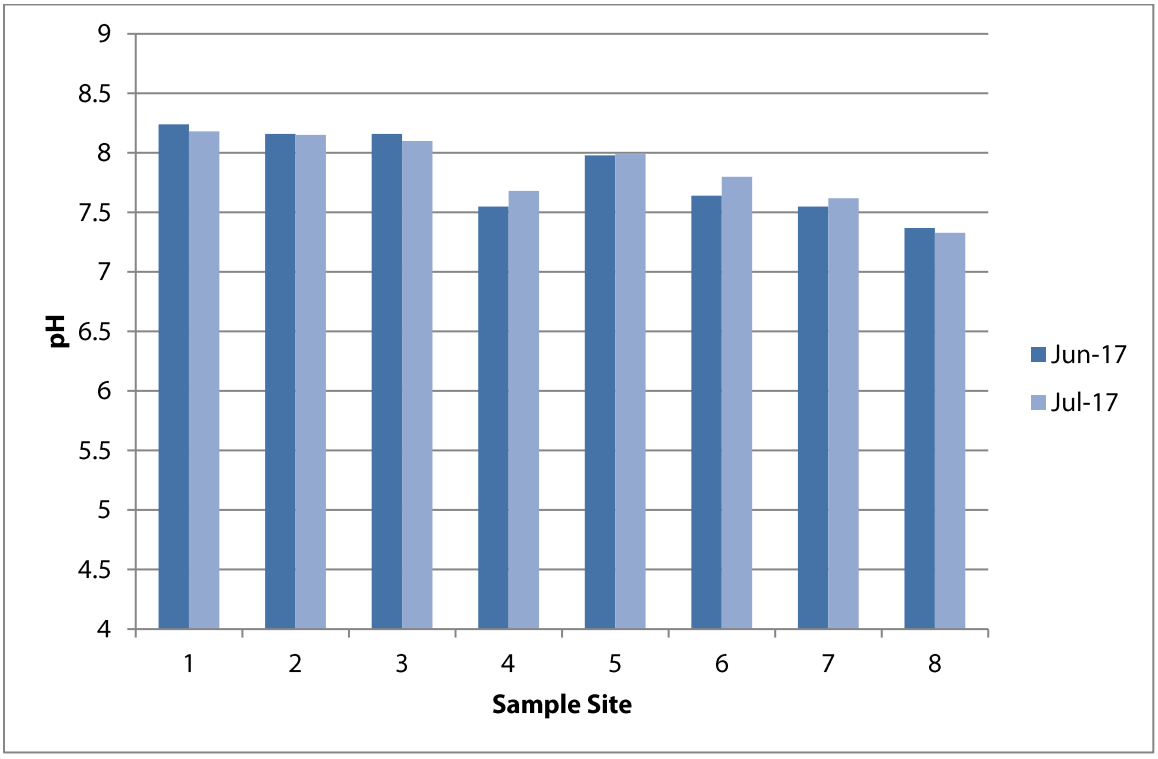


Figure 3: pH level at Coldwater Creek sample sites

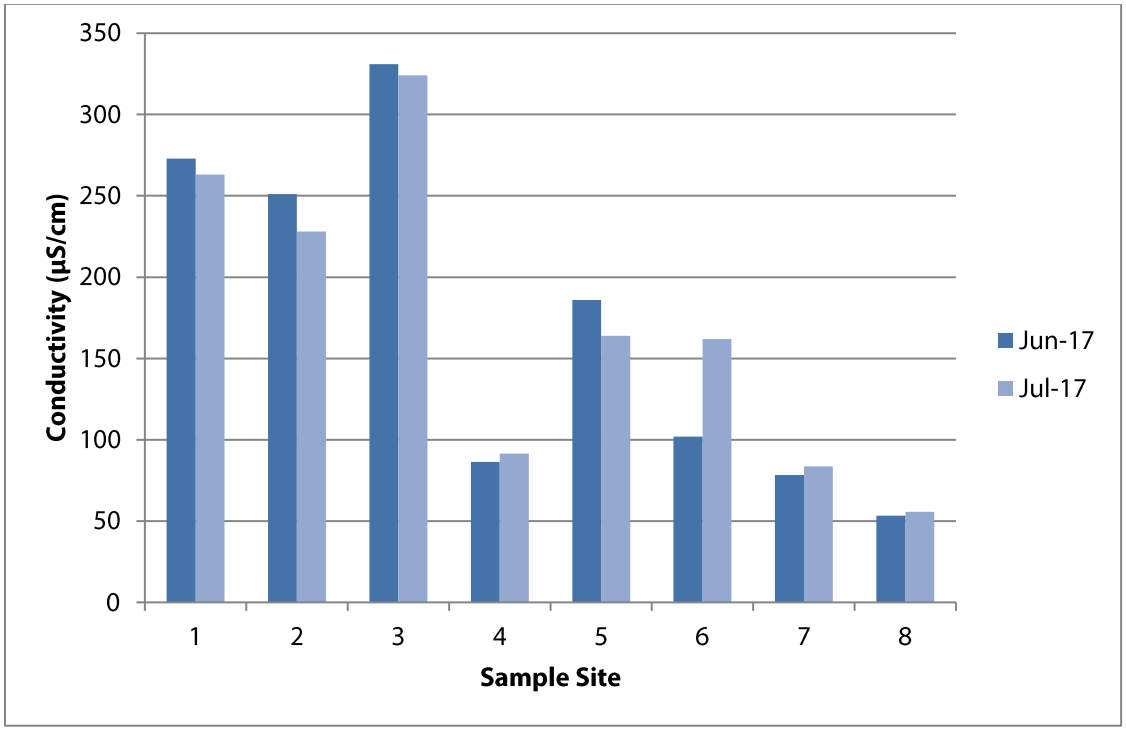


Figure 4: Conductivity at Coldwater Creek sample sites

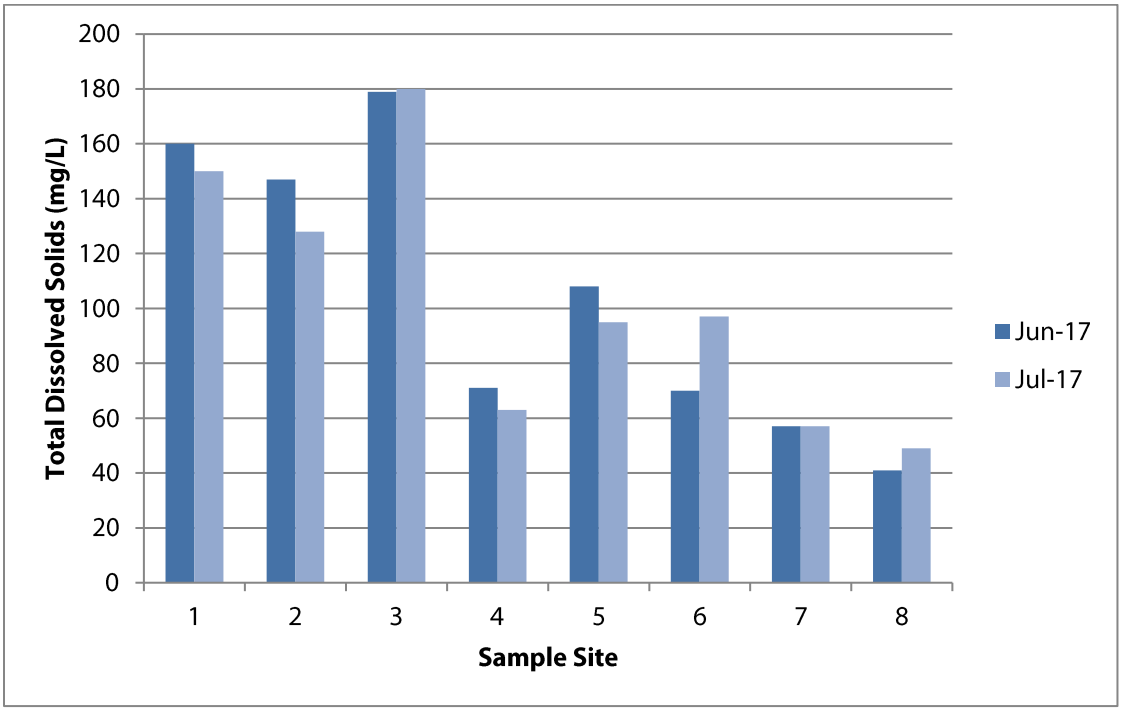


Figure 5: Total dissolved solids at Coldwater Creek sample sites

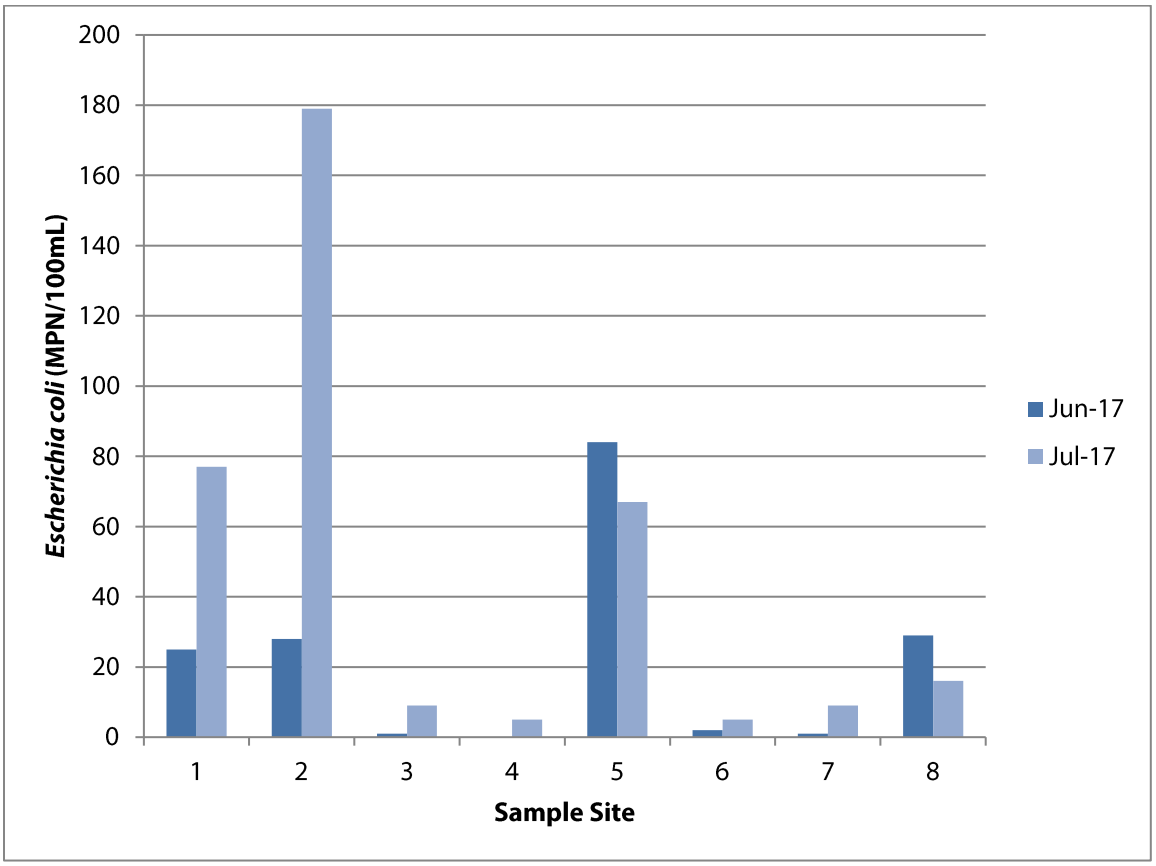
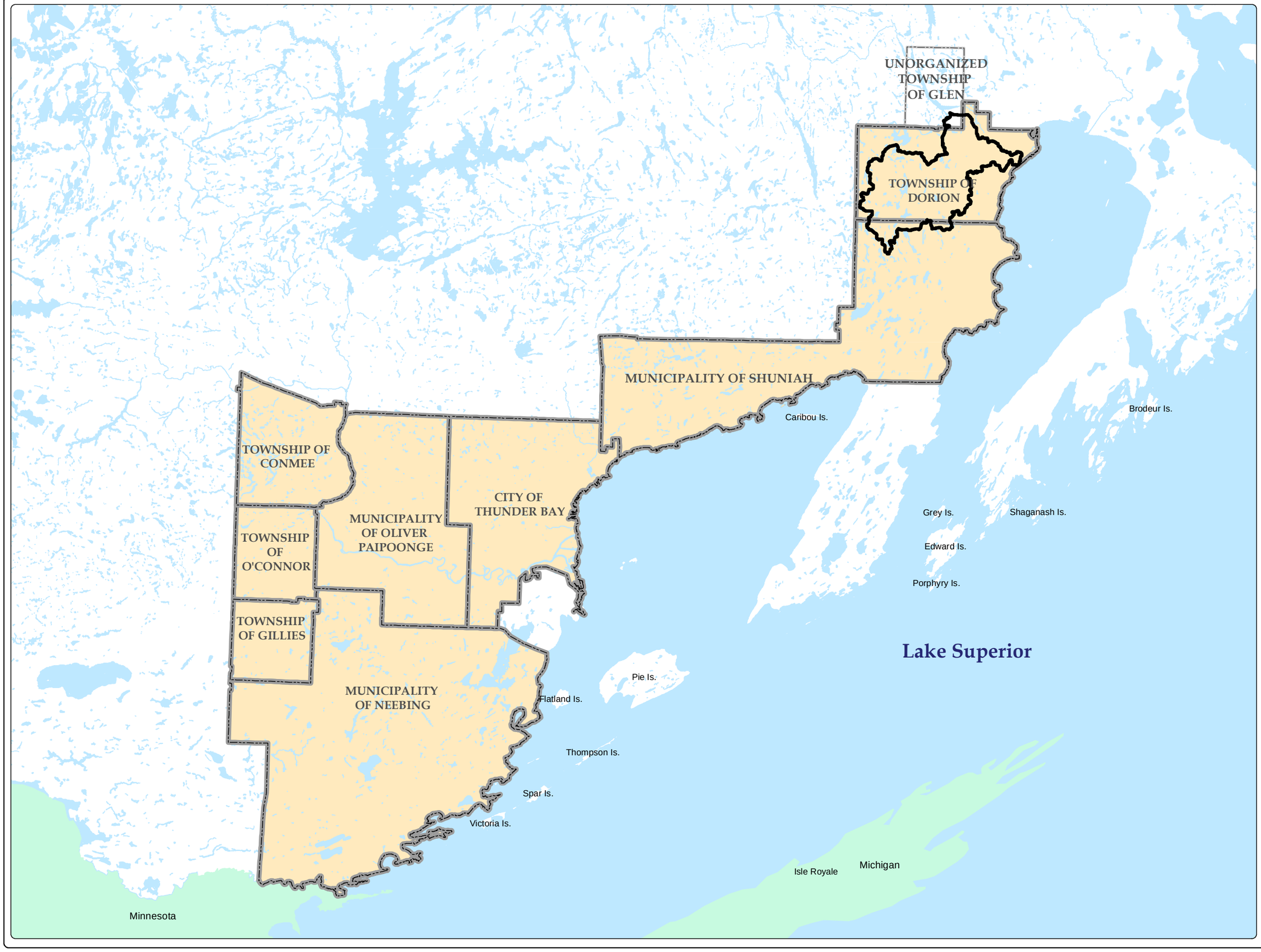


Figure 6: *Escherichia coli* bacteria counts at Coldwater Creek sample sites

Maps



LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-1: Key Plan

N

Legend

- Coldwater Creek Watershed
- Municipal Boundary
- Township Boundary
- LRCA Jurisdiction Boundary
- Water Body

0 10 20 km

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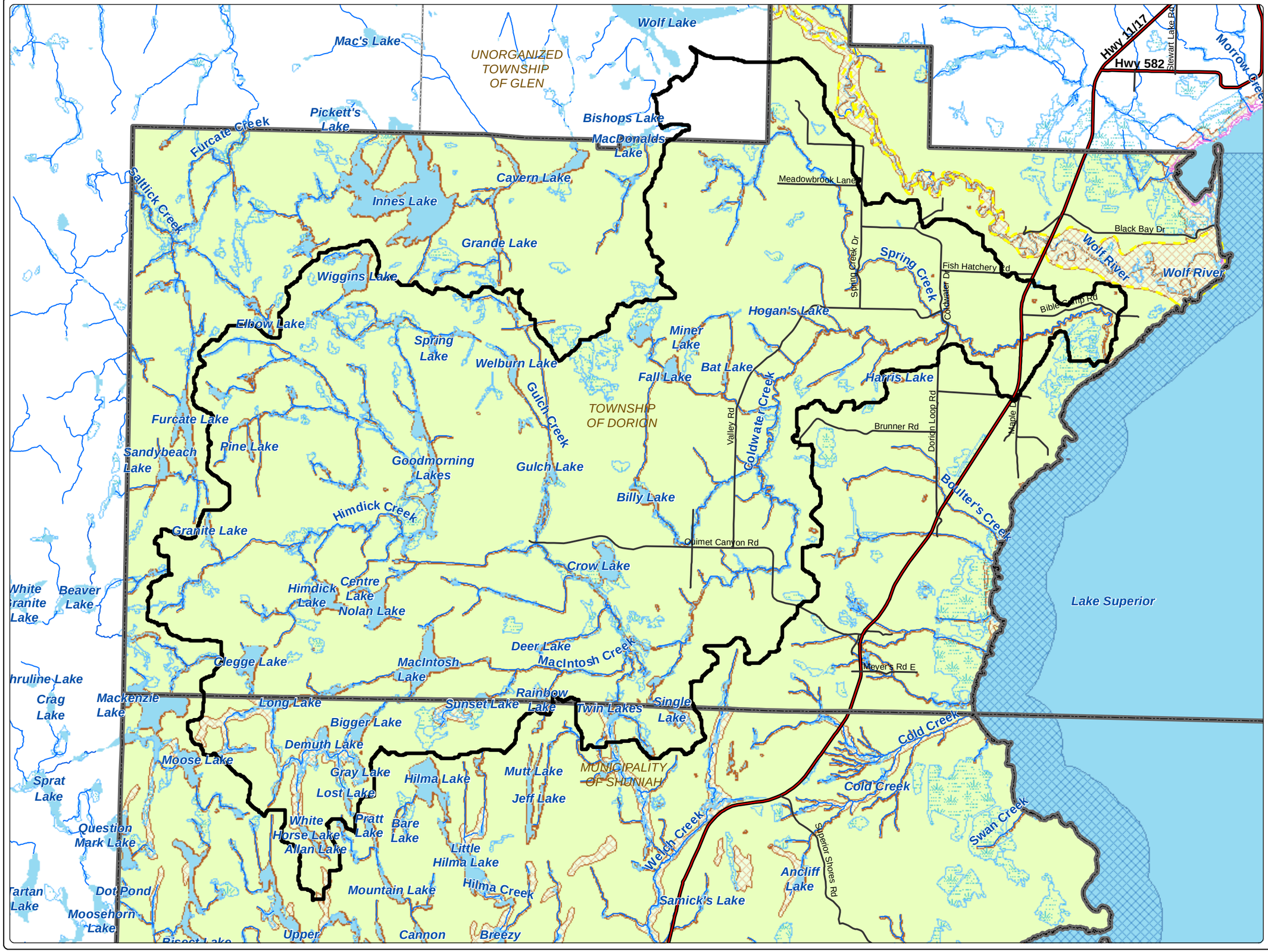
Datum: NAD 83
Projection: UTM Zone 16N
Date: May 2017

LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-2: Regulated Area



Legend

- Approximate Regulated Area
- Approximate Regulated Area within Lake Superior
- Coldwater Creek Watershed
- Municipal Boundary
- LRCA Jurisdiction Boundary

Drainage

- Water Body
- Provincially Significant Wetland
- Wetland
- Stream
- River
- Ditch
- Regional Floodline
- 100 Year Floodline
- Identified Spillway
- Fill Line
- Interpolated Floodline
- End of Study Area

Roads

- Highway
- Road
- Street

0 1 2 3 km

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LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-3: Topography

N

Legend

- Highest Point in Watershed
- Coldwater Creek Watershed
- Municipal Boundary

Drainage

- Water Body
- Provincially Significant Wetland
- Wetland
- Stream
- River
- Ditch

Contour Lines

- 10m Contour Intervals
- 50m Contour Intervals

Roads

- Highway
- Road
- Street
- Bush Roads

0 1 2 3 km

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Coldwater Creek Watershed

M-4: Bedrock Geology

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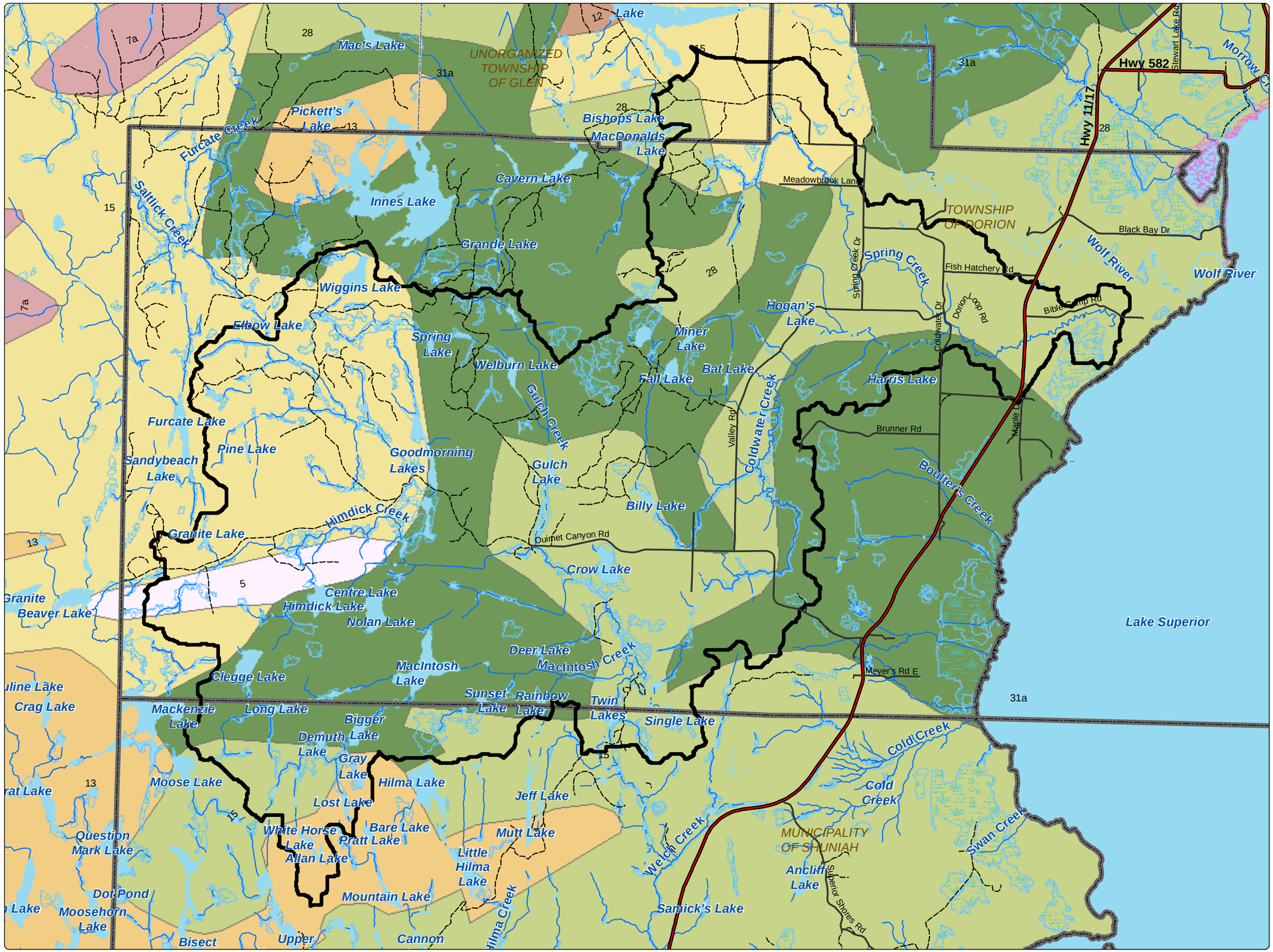

Legend

- Coldwater Creek Watershed
- Municipal Boundary

Bedrock Formation

- 31a, Mafic and related intrusive rocks (Keweenawan age)
- 28, Sibley Gp.
- 15, Massive granodiorite to granite
- 13, Muscovite - bearing granitic rocks
- 12, Foliated tonalite suite
- 7a, Metasedimentary rocks
- 5, Mafic to intermediate metavolcanic rocks

Drainage

- Water Body
- Provincially Significant Wetland
- Wetland
- Stream
- River
- Ditch

Roads

- Highway
- Road
- Street
- Bush Roads

0 1 2 3 km

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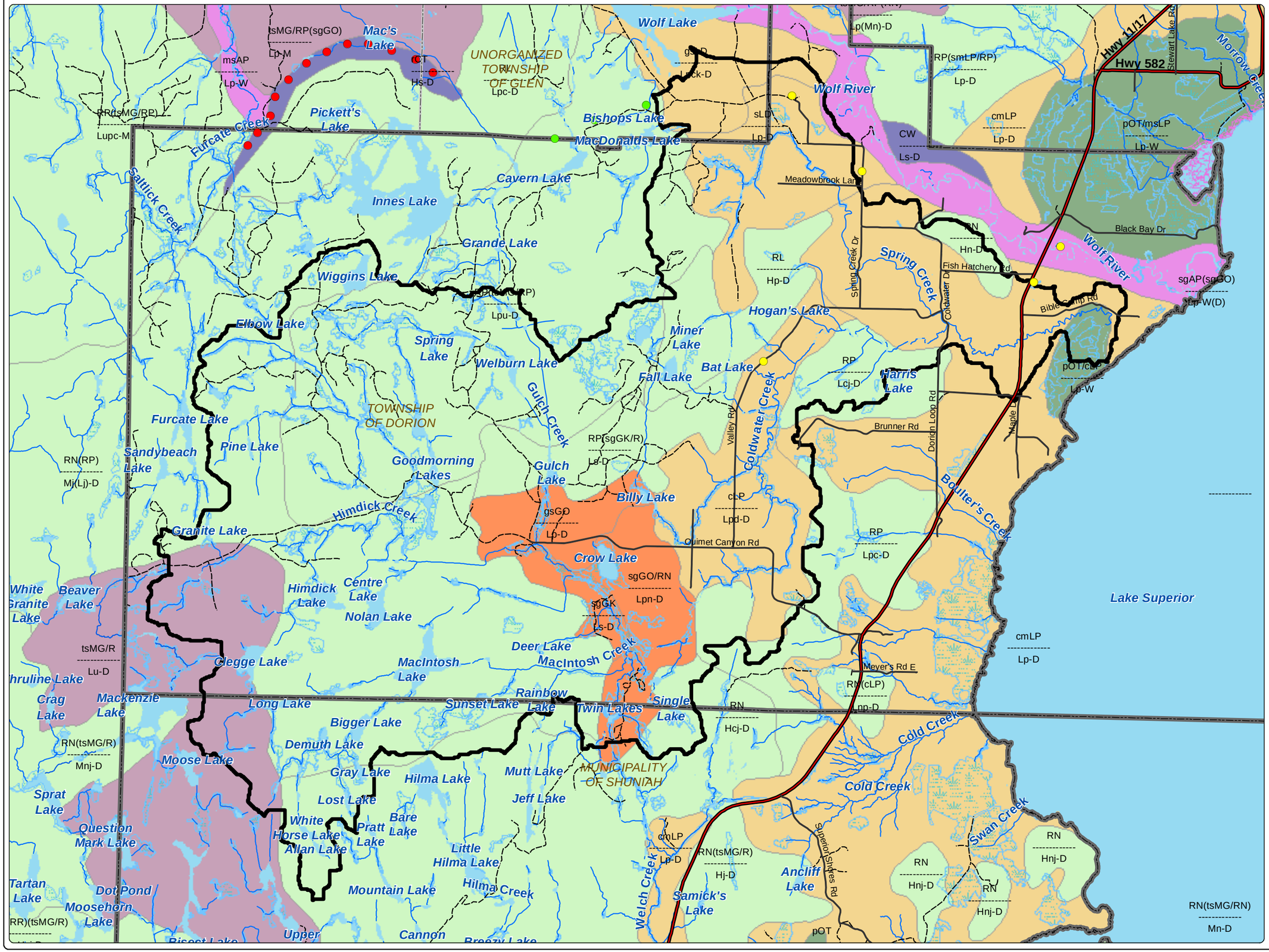
LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-5: Surficial Geology

N



Legend

- Coldwater Creek Watershed
- Municipal Boundary

Surficial Geology

- Alluvial
- Bedrock
- Esker/Kame/Outwash plain
- Glaciolacustrine plain
- Moraine
- Organics
- Slope/Talus pile

Surficial Points Features

- QUARRY/MINE WORKINGS
- SAND/GRAVEL PIT
- TALUS

Drainage

- Water Body
- Provincially Significant Wetland
- Wetland
- Stream
- River
- Ditch

Roads

- Highway
- Road
- Street
- Bush Roads

0 1 2 3 km

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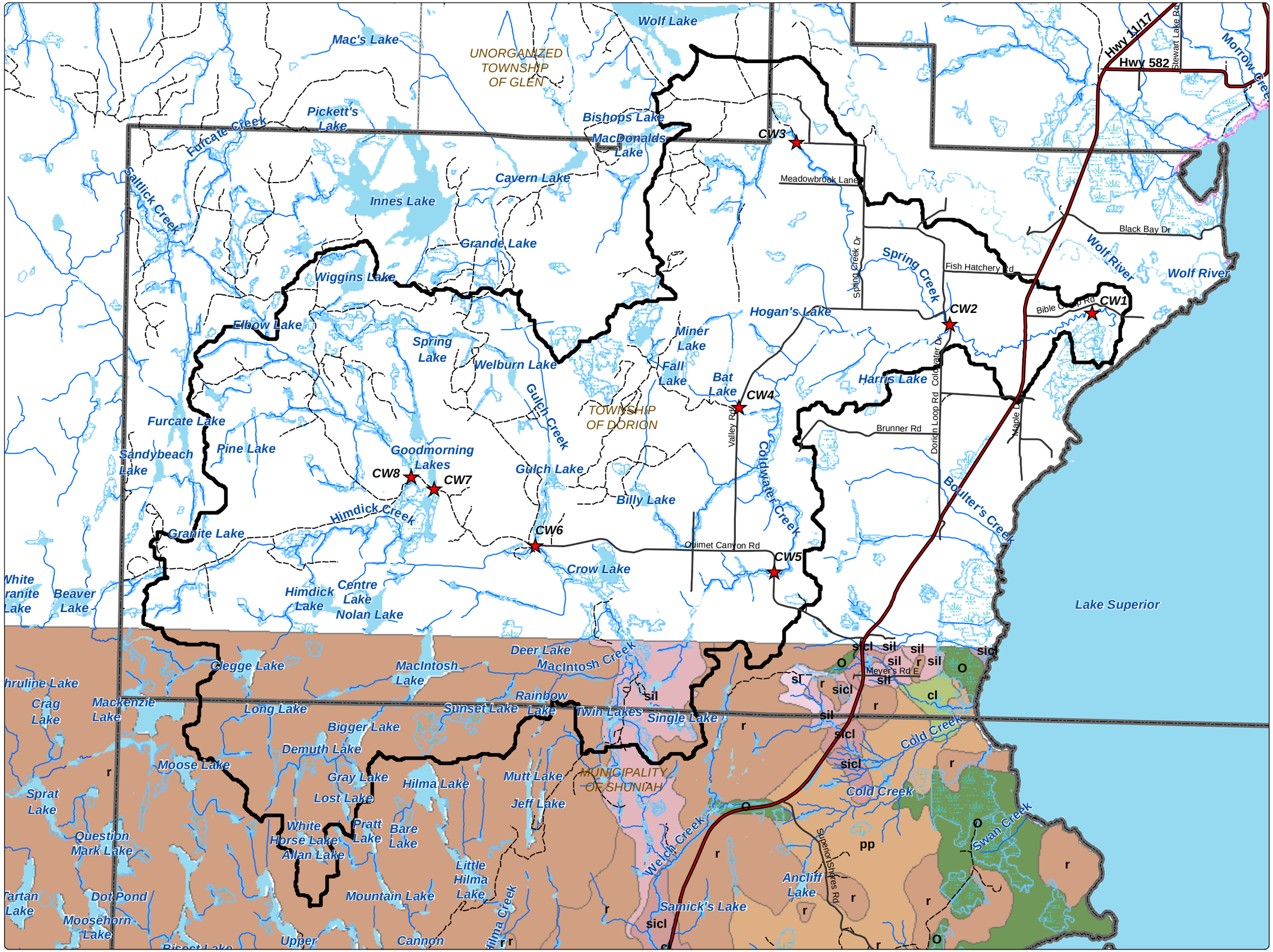
LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-6: Soils

N



Legend

- Sampling Sites
- Coldwater Creek Watershed
- Municipal Boundary

Drainage

- Water Body
- Provincially Significant Wetland
- Wetland
- Stream
- River
- Ditch

Soils

- Organic (O)
- Clay (c)
- Clay Loam (cl)
- Fine Sandy Loam (fsl)
- Gravel (g)
- Gravelly Sand (gs)
- Gravelly Sand Loam (gsl)
- Medium to Moderately Fine Loam (l)
- Loamy Sand (ls)
- Peaty Phase (pp)
- Rock (r)
- Coarse Sand and Loamy Sand (s)
- Silty Clay Loam (sicl)
- Silt Loam (sil)
- Moderately Coarse Sandy Loam (sl)
- Very Fine Sandy Loam (vfsl)

Roads

- Highway
- Road
- Street
- Bush Roads

0 1 2 3 km

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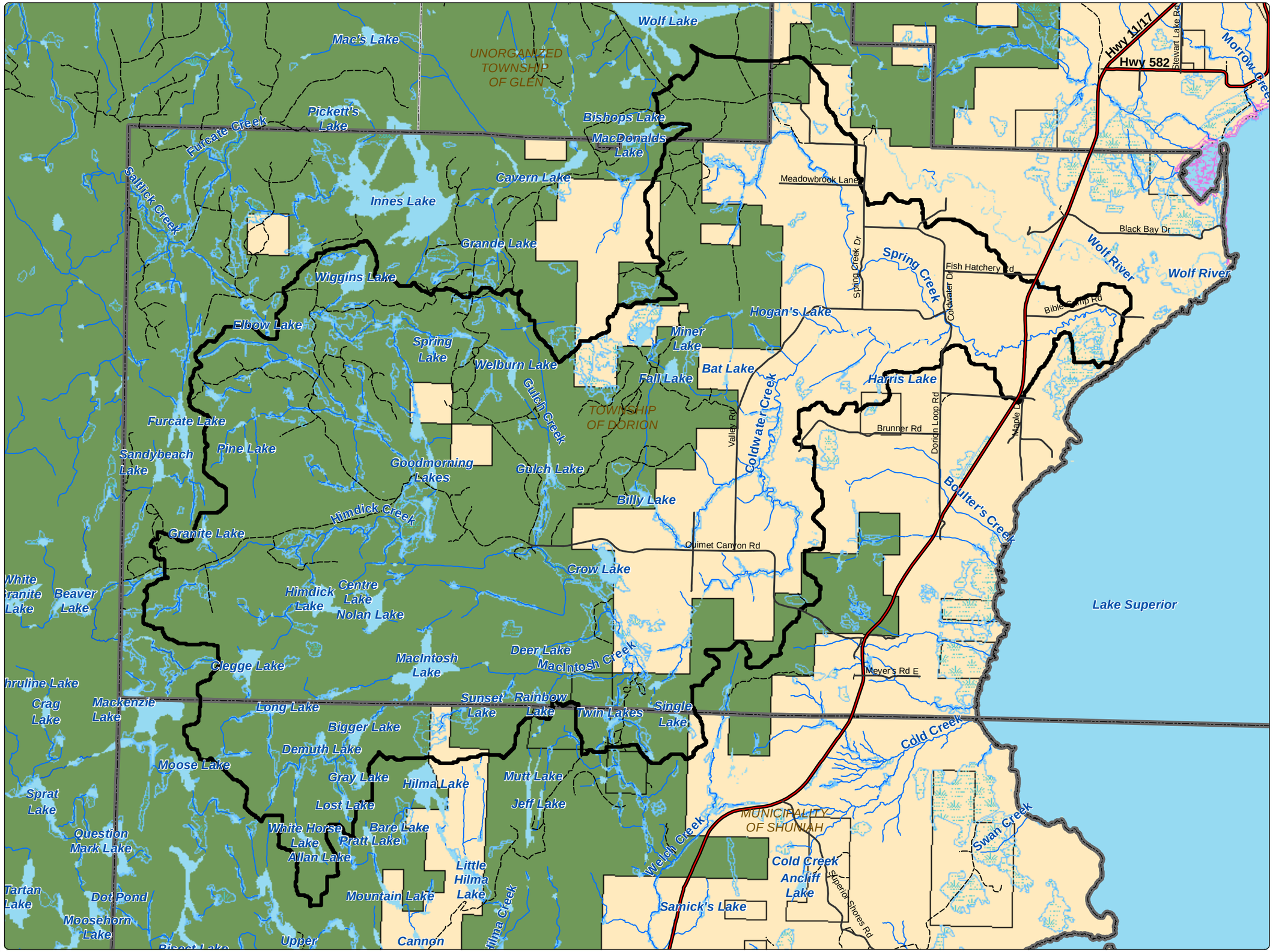
Datum: NAD 83
Projection: UTM Zone 16N
Date: August 2017

LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-7: Land Ownership

N



Legend

- Coldwater Creek Watershed
- Municipal Boundary

Land Ownership

- Crown Land
- Private Land

Drainage

- Water Body
- Provincially Significant Wetland
- Wetland
- Stream
- River
- Ditch

Roads

- Highway
- Road
- Street
- Bush Roads

0 1 2 3 km

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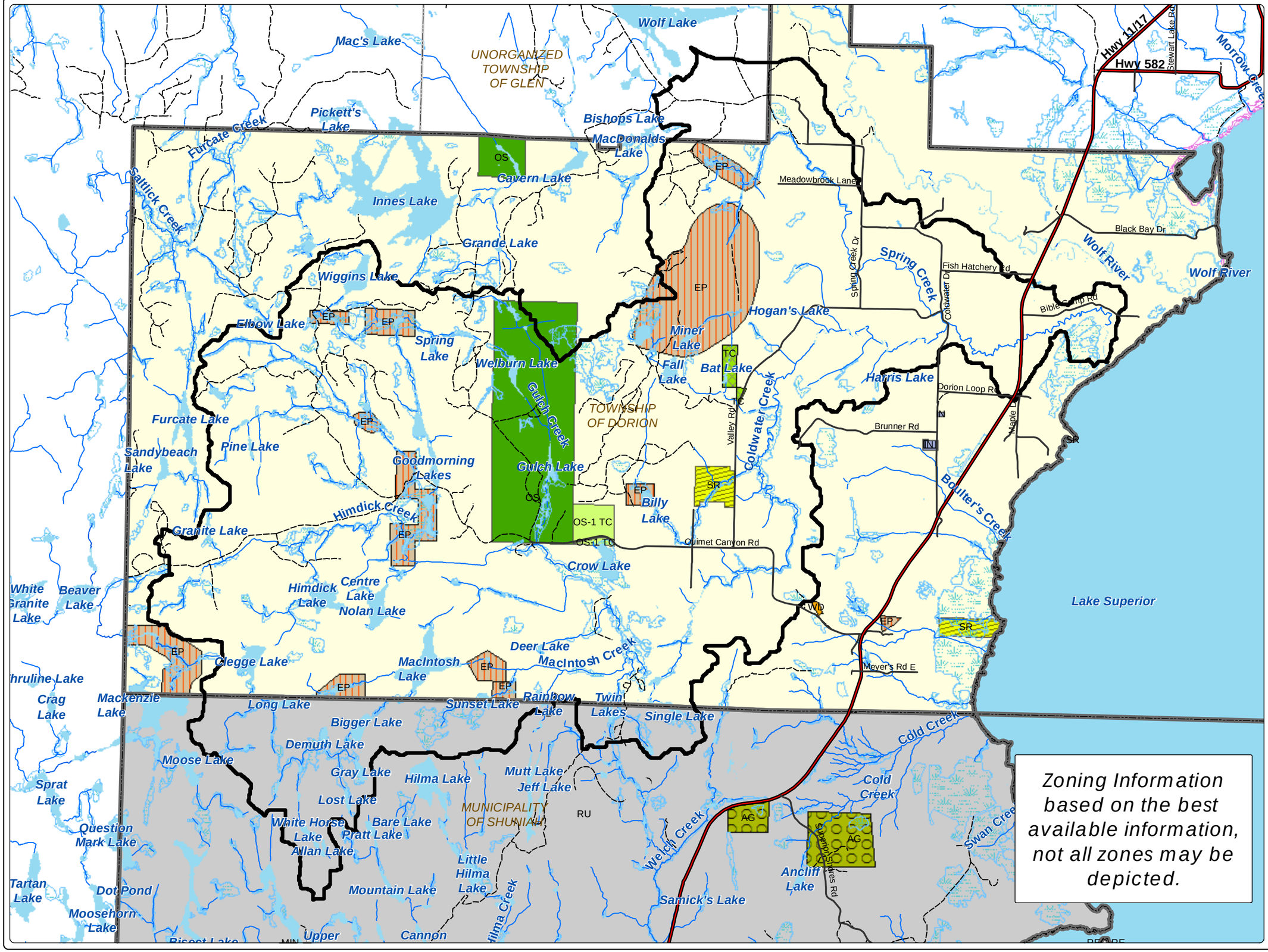
LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-8: Zoning

N



Zoning Information based on the best available information, not all zones may be depicted.

Legend

- Coldwater Creek Watershed

Township of Dorion Zoning

- EP, Environmental Protection
- IN, Institutional
- OS, Open Space
- OS-1 TC, Open Space Exception 1 - Tourist Commercial
- SR, Seasonal Residential
- TC, Tourist Commercial
- WD, Waste Disposal

Muncipality of Shuniah Zoning

- AG, Aggregate Extraction
- RU, Rural

Drainage

- Water Body
- Provincially Significant Wetland
- Wetland
- Stream
- River
- Ditch

Roads

- Highway
- Road
- Street
- Bush Roads

0 1 2 3 km

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LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-9: Site Plan

N

Legend

- Sampling Sites
- Coldwater Creek Watershed
- Municipal Boundary
- Household Waste Disposal Site
- Inactive Waste Disposal Site

Drainage

- Water Body
- Wetland
- Provincially Significant Wetland
- Stream
- River
- Ditch

Roads

- Highway
- Road
- Street
- Bush Roads

0 1 2 3 km

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Projection: UTM Zone 16N
Date: August 2017

LAKEHEAD REGION CONSERVATION AUTHORITY

Coldwater Creek Watershed

M-10: Bridge & Culvert Sites

N

Legend

- Confluence
- Bridge
- Culvert
- Coldwater Creek Watershed
- Municipal Boundary

Drainage

- Water Body
- Wetland
- Stream
- River
- Ditch

Roads

- Highway
- Road
- Street

0 1 2 3 km

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Datum: NAD 83
Projection: UTM Zone 16N
Date: August 2017

Appendix A:

Soil Logging Summary and Photography

Appendix A: Soil Logging Summary and Photography

Soil Logging Summary

SITE ID	Organic Layer "O"	"A" Horizon	"B" Horizon	"C" Horizon
CW1			0-30 cm Sandy clay loam	30-80 cm Sandy clay loam
CW2		0-10 cm Sand		10-80 cm Sandy gravel
CW3		0-12 cm Loamy sand	12-70 cm Sandy clay loam	70-90 cm Silty clay loam
CW4		0-10 cm Sandy clay loam		10-70 cm Sandy clay loam
CW5		0-25 cm Sandy loam		25-50 cm Sandy gravel
CW6				0-25 cm Sand
CW7		0-5 cm Silty sand		5-30 cm Silty sand
CW8				0-30 cm Sandy gravel

Soil Photography

Site 1

Site 2

Site 3

Site 4

Site 5

Site 6

Site 7

Site 8

Appendix B:

Common and Scientific Names of Identified Flora and Fauna

Appendix B: Common and Scientific Names of Identified Flora and Fauna

Flora	
Common Name	**Scientific (Latin) Name**
Trees	
Apple spp.	*Malus spp.*
Balsam fir	*Abies balsamea*
Balsam poplar	*Populus balsamifera*
Black ash	*Fraxinus nigra*
Black spruce	*Picea mariana*
Eastern White Cedar	*Thuja occidentalis*
Jack pine	*Pinus banksiana*
Tamarack	*Larix laricina*
Trembling aspen	*Populus tremuloides*
White birch	*Betula papyrifera*
White pine	*Pinus strobus*
White spruce	*Picea glauca*
Shrubs	
Beaked hazel	*Corylus cornuta*
Bush honeysuckle	*Diervilla lonicera*
Canada goldenrod	*Solidago canadensis*
Fringed bindweed	*Polygonum cilinode*
Green alder	*Alnus viridis*
Highbush cranberry	*Viburnum trilobum*
Showy mountain-ash	*Sorbus americana*
Mountain maple	*Acer spicatum*
Northern wild black current	*Ribes hudsonianum*
Pin cherry	*Prunus pensylvanica*
Prickly wild rose	*Rosa acicularis*
Red-osier dogwood	*Cornus stolonifera*
Saskatoon (serviceberry)	*Amelanchier alnifolia*
Speckled alder	*Alnus rugosa*
Virginia creeper	*Parthenocissus quinquefolia*
Wild red raspberry	*Rubus idaeus*
Willow spp.	*Salix spp.*
Herbs	
American vetch	*Vicia americana*
Bog Laurel	*Kalmia polifolia*
Broadleaf arrowhead	*Sagittaria latifolia*
Canada anemone	*Anemone canadensis*
Canada goldenrod	*Solidago canadensis*
Common strawberry	*Fragaria virginiana*

Flora	
Common Name	**Scientific (Latin) Name**
Herbs	
Common Bluebell	*Hyacinthoides non-scripta*
Cow parsnip	*Heracleum lanatum*
Cow vetch	*Vivia cracca*
Dandelion	*Taraxacum officinale*
Dwarf raspberry	*Rubus pubescens*
Marsh marigold	*Caltha palustris*
Mullein	*Verbascum thapsus*
Northern bluebell	*Mertensia paniculata*
Large leaved aster	*Eurybia macrophyllus*
Lupines	*Lupinus albus*
Orange hawkweed	*Hieracium aurantiacum*
Ox-eye daisy	*Leucanthemum vulgare*
Pyrola	*Pyrola spp.*
Red clover	*Trifolium pratense*
Rose-twisted stalk	*Streptopus amplexifolius*
Rough Bedstraw	*Galium asprellum*
Sweet coltsfoot	*Petasites frigidus*
Swamp thistle	*Cirsium muticum*
Viola	*Viola spp.*
Wild Columbine	*Aquilegia canadensis*
Wild Pea	*Lathyrus palustris*
Woodland strawberry	*Fragaria vesca*
Yarrow	*Achillea millefolium*
Yellow hawkweed	*Hieracium pratense*
Ferns/Mosses/Graminoids/Lichens	
Bulrush spp.	*Scirpus spp.*
Common reed	*Phragmites australis*
Dog's tooth lichen	*Peltigera canina*
Horsetail - field	*Equisetum arvense*
Horsetail - swamp	*Equisetum fluviatile*
Horsetail - woodland	*Equisetum sylvaticum*
Lady fern	*Athyrium filix-femina*
Oak fern	*Gymnocarpium dryopteris*
Plume moss	*Ptilium crista-castrensis*
Sedge spp.	*Carex spp.*
Sphagnum spp.	*Sphagnum spp.*
Aquatic Plants	
Common cattail	*Typha latifolia*

Fauna	
Common Name	**Scientific (Latin) Name**
Fish	
Emerald Shiner	*Notropis atherinoides*
Smallmouth bass	*Micropterus dolomieu*
Shiner spp.	*Notropis spp.*
Speckled Trout	*Cynoscion nebulosus*
Invertebrates	
Black flies	*Simuliidae spp.*
Canada Darner	*Aeshna canadensis*
Deer flies	*Chrysops spp.*
Eastern tiger swallowtail	*Papilio glaucus*
Grasshopper	*Melanoplus spp.*
Honeybees	*Apis spp.*
Horse flies	*Hybomitra spp.*
Midges	*Pseudochironomus spp.*
Monarch butterfly	*Danaus plexippus*
Mosquitoes	*Culicidae spp.*
Red ants	*Solenopsis spp.*
Spring azure	*Celastrina ladon*
Summer azure	*Celastrina neglecta*
Wasps	*Vespula spp.*
Water spider	*Papilio glaucus*
Water strider	*Gerridae spp.*
Aves	
Canada goose	*Branta canadensis*
Common merganser	*Mergus merganser*
Ruffled grouse	*Bonasa umbellus*
Mammals	
Black bear	*Ursus americanus*
Eastern chipmunk	*Tamias striatus*
Moose	*Alces alces*
White tail deer	*Odocoileus virginianus*

Appendix C:

Techniques for Data Collection

Appendix C: Techniques for Data Collection

Air Temperature
The air temperature was measured with a basic mercury thermometer.

Channel Width & Depth
The width of the stream was measured using a nylon measuring-tape reel. Channel depth was measured by using a stainless steel meter stick.

Conductivity
Conductivity was measured with the YSI Pro DSS. The accuracy of the reading was ±0.001 mS/cm or ±1.0%; whichever was greater. The readings were recorded once the probe was completely submerged and all readings stabilized. In addition to conductivity readings taken in the field, laboratory analysis of the samples provided a second reading of conductivity which is included within the results.

Dissolved Oxygen
The YSI Pro DSS measured dissolved oxygen for the samples. The readings were recorded once the probe was submerged in the water and all variables were stabilized.

Flora and Fauna Identification
Identification was made in the vicinity of the sample sites, no transects were made. Observations were made approximately 50 metres from either stream edge. Field guides were used to accurately identify species.

Flow
The velocity of river flow at sites was measured using a stick and nylon measuring-tape reel. Distances measured varied depending upon stream obstructions and variable depth. The flow was then calculated using the equation **Q=V*A**, where **Q** is flow/ discharge, **V** is velocity (distance divided by time), and **A** is the cross sectional area of the stream.

Latitude, Longitude, and Elevation
The Universal Transverse Mercator (UTM) coordinates for each site were measured with a Trimble Geo XH 2008 hand held GPS unit.

Location
The sample sites were chosen using a 1:50,000 scale topographic map. The sample sites were also described in terms of road access and road crossings.

pH
The YSI Pro DSS measured pH for the water sample sites. The readings were recorded once the probe was submerged in the water and all the variables were stabilized. A pH reading was also analysed during laboratory testing.

Photographs
Photographs were taken at each site using the Stylus 1030SW shock and water proof camera. Upstream and downstream photographs as well as culvert, bridge, and outstanding litter or erosion photographs were all taken at each site. Substrate photographs were attempted at each site with the waterproof camera.

Surface Water Sampling
Samples were taken at the same position at each site wherever possible. Grab sampling technique was used when conducting surface water sampling. Sample bottles were submerged 15 to 30 centimetres below the surface of the water body and positioned towards the flow of the water source. Samples were kept cool and delivered to ALS Laboratory for analyzing.

Total Dissolved Solids
The total dissolved solids (TDS) were measured in the laboratory.

Turbidity
Turbidity of the water was measured with the YSI Pro DSS. The readings were taken after the probe was submerged and all variables on the meter were stabilized.

Water Temperature
Water temperature was measured with the YSI Pro DSS. The readings were taken after the probe was submerged and all variables on the meter were stabilized.

OBBN In-Stream Materials Key

Soil Type
Like stream bed description, soil type on land will impact vegetation and erosion potential. Soil type was categorized based on its grain size using the FEC Manual for North Western Ontario.

Stream Bed Description
The bed description was described by means of a visual scan of the sample site area, with percentages assigned to the appropriate categories of varying grain sizes:

Grain Size	Description
Boulder	> 25.6 cm in diameter
Cobbles	6.4 - 25.6 cm in diameter

Grain Size	Description
Gravel	0.2 – 6.4 cm in diameter
Sand	< 0.2 cm in diameter
Silt	Finer inorganic material than sand
Organic	Mainly organic combination of silt and clay
Clay	Inorganic origin with no apparent structure

Stream Cover

Stream cover describes the vegetation density along the river bank no more than 5 metres from the water's edge. Stream cover was divided into three categories of density:

Description	% Cover
Dense	75-100% shaded by canopy
Partly Open	25-75% shaded by canopy
Open	0-25% shaded by canopy

Appendix D:

Summary of Water Quality Parameters

Appendix D: Summary of Water Quality Parameters

Physical Properties

The abiotic factors of water quality are very influential on aquatic plants and animals and can have a significant impact on the ecosystem. The following physical parameters were measured either in the field or in the laboratory.

Conductivity
Conductivity is the measure of the ability of water to carry an electrical current expressed in micro seimens per centimetre. The reading is used to determine the total dissolved solids (TDS) in the water sample. There is no PWQO for conductivity.

Dissolved Oxygen
Like terrestrial animals, fish and other aquatic species require oxygen to breathe. It is not the mere presence of dissolved oxygen that is important; the gas has to be above a certain concentration in order to sustain life. As well, oxygen is required to decompose organic matter in the stream. Dissolved oxygen levels will be highest if the water is colder, turbulent (a lot of mixing at the air-water interface) and during the day when aquatic plants have had time to produce oxygen during photosynthesis. PWQO's have an acceptable range for dissolved oxygen in water dependent upon temperature. At 20 degrees Celsius the minimum amount of dissolved oxygen is 5 milligrams per litre for cold water biota.

pH
The pH measures the concentration of hydrogen ions in the water based on a logarithmic scale of 0 to 14. Lower pH is acidic (many free hydrogen ions) and higher pH is alkaline (few free hydrogen ions). The pH of water determines the solubility and biological availability of chemicals constituents such as nutrients (eg. nitrogen, phosphorus) and heavy metals (eg. lead, copper). Geology of the watershed can give the river some buffering capacity to resist changes in pH but overall the range has to stay between 6.5 and 8.5 to protect aquatic life.

Temperature
Water temperature is important because it dictates the kind of aquatic life that can live in a stream. Fish, insects, plankton and other aquatic species all have a preferred temperature range. If the temperature goes too far above or below their preferred range, then the number of species will decrease until there is none. Temperature also influences water chemistry which in turn affects biological activity. Chemical reactions generally speed up with warmer temperatures. Temperature is important, as warmer water holds less dissolved oxygen and warmer water will allow bacteria to reproduce and grow more quickly. Temperature can vary depending on the source of the water,

depth and velocity of the stream, sunlight intensity and the amount of shade by the shoreline vegetation.

Total Dissolved Solids

Total dissolved solids (TDS) measure the amount of inorganic salts and small amounts of organic matter that is dissolved in water. The principal constituents are usually calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, sulphate, and nitrate (from agricultural use). Most of these originate from natural geological sources yet high levels may indicate runoff from of road salts, runoff from agricultural and erosion from exposed soil/no stream bank vegetation. There is no PWQO for TDS.

Turbidity

Turbidity is the measure of the relative clarity of water. Turbidity in water is caused by suspended matter such as silt, clay and algae that scatter the sunlight. The diversity of species will be affected by how far the sunlight can penetrate the water column. Fish gills will become clogged with a lot of suspended material, as well the material can settle on top of fish spawning grounds (and their eggs). Highly turbid water will appear murky or dirty. Turbidity will be higher after heavy rainfall, but high levels may also indicate soil erosion.

Nutrients

Like terrestrial plants, aquatic plants and algae require nutrients for growth and productivity. The main nutrients of concern are nitrogen and phosphorus.

Nitrogen

Nitrogen (N) is one of the most common gases in our atmosphere. It makes up approximately 78 percent of the earth's atmosphere. Like phosphorus, these nutrients are often applied to agricultural crops as fertilizers and having too much in the river can increase plant growth and productivity to unhealthy levels. Nitrogen is constantly being recycled through the environment through decomposition, etc. The most important forms that plants can readily use are ammonia, nitrate (NO_3) and nitrite (NO_2). There are many different ways to report nitrogen so it is necessary to note that the results from ALS Laboratory Group were given in Total ammonia-nitrogen (mg/L), Nitrate-nitrogen (NO_3-N mg/L), and Nitrite-nitrogen (NO_2-N mg/L).

Phosphorus

Total phosphorus gives a measurement of all forms of phosphorus in the water, but the most important form within this measurement is soluble inorganic phosphate (PO_4) or orthophosphate ion (PO_4^{-3}) because it is the fraction utilized by aquatic plants. While phosphorus is essential to life, too much of it will increase algae growth attached to rocks in the river. Excessive growths of attached algae can use up all the dissolved oxygen leaving other species, like fish, with anoxic (no oxygen) conditions.

Nutrient loading may cause a decrease in biodiversity and a decrease in the most ecologically sensitive species. Natural decomposition of organic matter such as leaves, twigs, grass that is washed into the stream during the winter does constitute an important source of nutrients. However, high levels of phosphorus may indicate unnatural sources such as detergent, pesticide and fertilizer runoff from developed watersheds. Milk house waste from dairy farms is also a large source of phosphorus and has become one of the main environmental issues surrounding dairy farming. The PWQO criteria for phosphorus is 0.03 mg/L.

Bacteria

Escherichia coli

Escherichia coli (*E. coli*) are naturally found in the intestines of humans and warm-blooded animals. Unlike other bacteria in this family, *E. coli* does not usually occur naturally on plants or in soil and water. The inability of *E. coli* to grow in water combined with its short survival time in water environments means that the detection of *E. coli* in a water system is a good indicator of recent fecal contamination. Potential sources of *E. coli* include: leaking septic systems, runoff from manure storage facilities or wild animal waste (i.e. beavers and Canadian Geese). These bacteria can cause irritation of the skin and eyes when contact is made and can cause gastro-intestinal disorders. The PWQO for *E. coli* is 100 *E. coli* per 100 mL.

Total Coliforms

Total coliforms are a group of bacteria that are naturally found on plants and in soils, water, and in the intestines of humans and warm-blooded animals. Because total coliforms are widespread in the environment, they can be used as one of the many operational tools to determine the efficacy of a drinking water treatment system. The total coliform group contains various species of the genera *Escherichia, Klebsiella, Enterobacte, Citrobacter, Serratia,* and many others. There is no current PWQO for total coliforms; however, the previous guideline was 1000 MPN per 100 mL.

Metals

Most of the metals listed below are found naturally within the earth's crust and weathering of rock can transport them into surface water. The following is a complete list of the metals analysis performed on the water samples and their qualities.

Aluminum

Aluminum is the most abundant metal on Earth, comprising about 8 percent of the Earth's crust. It is found in a variety of minerals, such as feldspars and micas, which, with time, weather to clays and exposure is inevitable. High levels of aluminum will put strain on the kidneys of animals when they attempt to excrete it but it is not normally fatal. Aluminum and its compounds are often used in food as additives, in

drugs, in consumer products and in the treatment of drinking water. Aluminum poisoning has been linked to neurological dementia in kidney dialysis patients and, in recent years, its role in Alzheimer's disease, Parkinson's disease and Lou Gehrig's disease. The intake of large amounts of aluminum can also cause anaemia, osteomalacia (brittle or soft bones), glucose intolerance, and cardiac arrest in humans. The PWQO guideline for aluminum varies with pH, the maximum concentration being 75 μg/L.

Antimony

Antimony is a metallic element that is a blue-white colour in its stable form. Acute intoxication is characterized by abdominal pain, vomiting, diarrhea, dehydration, muscular pain, shock, haemoglobinuria, anuria and uraemia. In addition, severe myocardial symptoms and convulsions have been observed with acute doses of antimonials, as well some deaths were attributed to liver necrosis. The maximum concentration of antimony under PWQO guidelines is 20 μg/L.

Arsenic

Arsenic is a natural element abundantly found within the earth's crust. It may be found in some drinking water supplies, including wells. Long-term exposure (over many years or decades) to high levels of arsenic in drinking water may cause thickening and discoloration of the skin; nausea and diarrhea; decreased production of blood cells; abnormal heart rhythm and blood vessel damage, or numbness in the hands and feet. Short term exposure (days/weeks) to very high levels of arsenic can result in abdominal pain, vomiting and diarrhea, muscular cramping or pain, weakness and flushing of skin, skin rash, numbness, burning or tingling sensation on the palms of the hands and soles of the feet, or loss of movement and sensory response. The maximum concentration of arsenic under the PWQO guidelines is 5 μg/L.

Barium

Barium is present as a trace element in both igneous and sedimentary rocks. Although it is not found free in nature, barium occurs in a number of compounds. Barium compounds have a wide variety of industrial applications. They are used in the plastics, rubber, electronics and textiles industries. At high concentrations, barium causes strong vasoconstriction by its direct stimulation of arterial muscle, peristalsis due to the violent stimulation of smooth muscle, and convulsions and paralysis following stimulation of the central nervous system. Depending on the dose and solubility of the barium salt, death may occur in a few hours or a few days. There are currently no PWQO guidelines for barium.

Beryllium

Beryllium is a hard grey metal that is extracted from the earth, refined and reduced to a very fine powder. It occurs as a chemical component of certain rocks, coal and oil, soil, and volcanic dust. People exposed to beryllium are at risk of developing serious

debilitating diseases. Chronic beryllium disease (CBD or berylliosis) is a painful scarring of the lung tissue. Less common than CBD, acute (short—term) beryllium disease, causes lung inflammation resembling pneumonia. In severe cases, both diseases may be fatal. The maximum concentration of beryllium under PWQO guidelines depends on hardness. If $CaCO_3$ is >75 mg/L, the maximum concentration of beryllium is 1100 μg/L, and if the $CaCO_3$ is <75 mg/L, the maximum concentration of Beryllium is 11 μg/L.

Bismuth

Bismuth is a brittle metal with a pinkish colour, often found in its native form. Exposure to bismuth at low doses may cause gastrointestinal disorders, low stomach acid, heartburn, bloating, calcification, warts, diarrhea, and gastric ulcers. At large doses it may cause mental confusion, memory problems, tremors, staggering gait, muscle twitching, slurring speech, joint problems, hypoadrenalism, hearing and visual disturbances, hallucinations and coma. There are currently no PWQO guidelines limiting the intake of bismuth.

Boron

Boron is a non-metallic element that is not found in nature in its elemental form but can be found in a number of compounds. Exposure to boron in small doses may cause irritation to the nose, throat and eyes. In larger doses, boron can affect the stomach, liver, kidneys and brain, and may eventually lead to death. The maximum level of boron under PWQO guidelines is 200 μg/L.

Cadmium

Cadmium is an extremely toxic metal even in low concentrations. It is used commercially as a stabilizer in plastic, fungicides for golf courses, television picture tube phosphors, nickel–cadmium batteries, motor oils, and curing agents for rubber. Cadmium poisoning can lead to itai-itai disease, which initiates bone softening, joint pain and kidney failure. The interim PWQO guideline states if hardness as $CaCO_3$ is 0-100, the maximum cadmium concentration is 0.1 μg/L, and if hardness is >100, the maximum cadmium concentration is 0.5 μg/L.

Calcium

Calcium is the third most abundant metal in the Earth's crust. Calcium is also the most abundant metal in the human body and is the main constituent of bones. Calcium is a dietary requirement and there are no adverse health effects from intake of large doses of calcium. There are currently no PWQO guidelines for calcium.

Chromium

Chromium is a lustrous, hard metal. Chromium (III) is an essential nutrient, but higher intake may cause skin rashes. Chromium (VI) is known to cause various health effects such as skin rashes, upset stomachs and ulcers, respiratory problems, weakened

immune systems, kidney and liver damage, alteration of genetic material, lung cancer and death. The maximum concentration of chromium under PWQO guidelines is 1 μg/L for Chromium (VI) and 8.9 μg/L for Chromium (III).

Cobalt
Cobalt is a hard, lustrous, silver-grey metal and is found in various ores. Health effects resulting from exposure to high concentrations include vomiting and nausea, vision problems, heart problems and thyroid damage. The maximum concentration of cobalt under PWQO guidelines is 0.9 μg/L.

Copper
Copper occurs in nature as a metal and in minerals. Copper is an essential element to human metabolism, although intake at higher doses can cause adverse health effects. Acute copper poisoning health effects include vomiting, diarrhea, jaundice, haemolysis, haemoglobinuria, haematuria, and oliguria. In severe cases, the stool and saliva may appear green or blue. In the terminal phases, anuria, hypotension, and coma precede death. The PWQO criterion for copper is dependent upon the hardness of the water and so varies between 0.001 mg/L to 0.005 mg/L.

Iron
Iron is also an abundant metal found in rock. The precipitation of excessive iron creates an objectionable reddish-brown colour to water. Iron may also stain laundry and plumbing fixtures, produce undesirable tastes in beverages, and promote the growth of certain iron-bacteria, leading to the deposition of a slimy coating in water distribution pipes. The PWQO guideline stipulates that the levels of iron in the water must be below 300 μg/L.

Lead
Lead is a very toxic metal to all forms of life, causing neurological damage and even death. Although natural occurrences can occur from precipitation and the weathering of ores, the majority of lead in watercourses comes from anthropogenic sources. The PWQO requirement for lead varies with different alkalinity as $CaCO_3$ (mg/L). The maximum lead concentration is 25 μg/L.

Lithium
Lithium is a soft, silver-white metal belonging to the alkali metal group of chemical elements. Under standard conditions, it is the lightest metal and the least dense solid element. Like all alkali metals, lithium is highly reactive and flammable. Lithium forms a minor part of igneous rocks, with the largest concentrations in granites. Lithium and its compounds have a range of effects on the human body. For instance, compounds of lithium tend to harm the kidneys and lithium carbonate can affect a person's mental health. There are no current PWQO guidelines for lithium.

Magnesium
Magnesium is very abundant in nature and is found in many minerals. It is a dietary requirement, but too much can lead to muscle weakness, lethargy and confusion. There are no current PWQO guidelines for magnesium.

Manganese
Manganese is a very common compound that can be found everywhere on earth. It is essential for humans to survive, but toxic when concentrations in the body are too high. Manganese can cause Parkinson, lung embolism and bronchitis. There are currently no PWQO guidelines for manganese.

Molybdenum
Molybdenum is a by-product of copper and tungsten mining. It is used as an alloy for various metals and occurs naturally in soil and rock. Potential health impacts associated with molybdenum include neurotoxicity and reproductive toxicity. The maximum concentration of molybdenum under PWQO guidelines is 40 μg/L.

Nickel
Nickel is a compound that occurs in the environment only at very low levels. An uptake of large quantities of nickel may cause higher risks of cancer, respiratory failure, birth defects and heart disorders. The maximum concentration of nickel under PWQO guidelines is 25 μg/L.

Potassium:
Potassium is a soft silvery white metal, which is a key plant element and is found in most fertilizers. Potassium is also a dietary requirement, but many potassium compounds may cause adverse health effects. Such compounds include potassium alum or potassium cyanide. There are currently no PWQO guidelines for potassium.

Selenium
Selenium is one of the rarer elements on the surface of the earth. It occurs naturally in the environment and is also released by human activities. The health effects of various forms of selenium can vary from brittle hair and deformed nails, to rashes, heat, swelling of the skin and severe pains. Selenium poisoning may become so severe in some cases that it can even cause death. The maximum concentration of selenium under PWQO guidelines is 100 μg/L.

Silver
Silver does not react with pure water. It is stable in both water and air. Moreover, it is acid and base resistant, but it corrodes when it comes in contact with sulphur compounds. Silver oxide is harmful upon swallowing, because it irritates the eyes, respiratory tract and skin. Silver nitrate is much more harmful, because it is a strong

oxidant. It causes corrosion, and an oral uptake can lead to vomiting, dizziness and diarrhea. The maximum concentration of silver under PWQO guidelines is 0.1 μg/L.

Sodium
Sodium is a soft, silvery-white, highly reactive metal. It is the sixth most abundant element in the Earth's crust, and exists in numerous minerals such as feldspars, sodalite and rock salt. Sodium has a number of important functions in plants, humans, and animals. In humans, it is involved in controlling the amount of fluid present in cells. An excess or lack of sodium can cause cells to gain or lose water. Either of these changes can prevent cells from carrying out their normal functions. There are currently no PWQO guidelines for sodium.

Strontium
Strontium is a bright silvery metal that is softer than calcium and even more reactive in water. Acute effects of strontium include vomiting and diarrhea if ingested, and may also cause irritation to the skin. Chronic skin contact may cause dermatitis. There are currently no PWQO guidelines for strontium.

Tellurium
Tellurium is a brittle, mildly toxic, rare, silver-white metalloid. It is chemically related to selenium and sulfur. It is occasionally found in native form as elemental crystals. Tellurium is far more common in the universe as a whole than on Earth. When taken internally, tellurium can have harmful effects. It may cause nausea, vomiting, and damage to the central nervous system. One interesting side effect is that it gives a garlicky-odor to the breath. There are currently no PWQO guidelines for tellurium.

Thallium
Thallium is a silvery-grey metal that is very toxic by inhalation, ingestion and skin absorption. It may act as a systemic poison, neurotoxin, and may cause birth abnormalities. It is also a respiratory and eye irritant. The maximum concentration of thallium under PWQO guidelines is 0.3 μg/L.

Tin
Tin is a soft, pliable, silvery-white metal. Acute effects of tin include skin or eye irritation, headaches, stomach aches, dizziness, and breathlessness. Long-term effects include liver damage, malfunctioning of immune systems, chromosomal damage, shortage of red blood cells, and brain damage. There are currently no PWQO guidelines limiting the intake of tin.

Titanium
Titanium is a white-silvery metallic colour and is always found bound to other elements in nature. There are no known health hazards of titanium in water, but it is

known to have adverse health effects in powder form. There are currently no PWQO guidelines for titanium.

Tungsten
Tungsten is a lustrous, silvery-white metal. Acute health effects include irritation to the skin and eyes causing watering and redness. There are no known long-term health effects. The maximum concentration of tungsten under PWQO guidelines is 30 μg/L.

Uranium
Uranium is a hard, dense, malleable, ductile, silver-white, radioactive metal. No harmful radiation effects of natural levels of uranium have been found. However, chemical effects may occur after the uptake of large amounts of uranium, which can cause health effects such as kidney disease. Exposure to uranium radionuclides that form during radioactive decay may cause cancer. The maximum concentration of uranium under PWQO guidelines is 5 μg/L.

Vanadium
Vanadium is a rare, soft, ductile grey-white element found combined in certain minerals and used mainly to produce certain alloys. The uptake of vanadium by humans mainly takes place through foodstuffs, such as buckwheat, soy beans, olive oil, sunflower oil, apples and eggs. Some acute health effects associated with the high intake of vanadium include inflammation of stomach and intestines, sickness and headaches, dizziness, skin rashes, nosebleeds and throat pain. Chronic exposure may cause eye, skin and respiratory problems. The maximum concentration of vanadium under PWQO guidelines is 6 μg/L.

Zinc
Zinc is a lustrous bluish-white metal. Overdoses do not occur very often. Symptoms include nausea, vomiting, dizziness, fevers and diarrhea. The maximum concentration of zinc under PWQO guidelines is 20 μg/L.

Zirconium
Zirconium is a very strong, malleable, ductile, lustrous silver-grey metal. Zirconium and its salts generally have low systemic toxicity. The maximum concentration of Zinc under PWQO guidelines is 4 μg/L.

Appendix E:
Water Quality Guidelines

Appendix E: Water Quality Guidelines

The following are taken from the Ministry of the Environment, Provincial Water Quality Objectives (PWQO), July 1994.

Physical

Alkalinity:
Alkalinity should not be decreased by more than 25% of the natural concentration.

Dissolved Oxygen:
Dissolved oxygen concentrations should not be less than the values specified below for cold water biota (e.g. salmonid fish communities) and warm water biota (e.g. centrarchid fish communities):

Dissolved Oxygen Concentration				
Temperature	Cold Water Biota		Warm Water Biota	
°C	% Saturation	mg/L	% Saturation	mg/L
0	54	8	47	7
5	54	7	47	6
10	54	6	47	5
15	54	6	47	5
20	57	5	47	4
25	63	5	48	4

In waters inhabited by sensitive biological communities, or in situations where additional physical or chemical stressors are operating, more stringent criteria may be required. For example, a sensitive species such as lake trout may require more specific water quality objectives.

In some hypolimnetic waters, dissolved oxygen is naturally lower than the concentrations specified in the above table. Such a condition should not be altered by adding oxygen-demanding materials causing a depletion of oxygen.

pH:
The pH should be in the range of 6.5 – 8.5:

- to protect aquatic life
- both alkaline and acidic waters may cause irritation to anyone using the water for recreational purposes

Temperature:
The natural thermal regime of any body of water shall not be altered so as to impair the quality of the natural environment. In particular, the diversity, distribution and abundance of plant and animal life shall not be significantly changed.

Waste Heat Discharge

1. Ambient Temperature Changes

   The temperature at the edge of a mixing zone shall not exceed the natural ambient water temperature at a representative control location by more than 10°C (18°F). However, in special circumstances, local conditions may require a significantly lower temperature difference than 10°C (18°F). Potential dischargers are to apply to the MOECC for guidance as to the allowable temperature rise for each thermal discharge. This ministry will also specify the nature of the mixing zone and the procedure for the establishment of a representative control location for temperature recording on a case-by-case basis.

2. Discharge Temperature Permitted

   The maximum temperature of the receiving body of water, at any point in the thermal plume outside a mixing zone, shall not exceed 30°C (86°F) or the temperature of a representative control location plus 10°C (18°F) or the allowed temperature difference, whichever is the lesser temperature. These maximum temperatures are to be measured on a mean daily basis from continuous records.

3. Taking and Discharging of Cooling Water

   Users of cooling water shall meet both the Objectives for temperature outlined above and the "Procedures for the Taking and Discharge of Cooling Water" as outlined in the MOEE publication *Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters (1994).*

Nutrients

Ammonia (un-ionized):
The amount of un-ionized ammonia should not exceed 20 µg/L.

The percentages of un-ionized ammonia (NH3) in aqueous ammonia solution for different temperature and pH conditions are listed in the table below. For example, at 20°C and pH of 8.0, a total ammonia concentration of 500 µg/L would give an un-

ionized ammonia concentration of 500 x 3.8/100 = 19 µg/L which is less than the un-ionized ammonia Objective of 20 µg/L.

The table below is taken from the PWQO; percentages are rounded to two significant figures. The equations given by may be used to interpolate values between those given in the table:

$f = 1/(10^{pKa-pH}+1)$, where ***f* is the fraction of NH3**

pKa = 0.09018 + 2729.92/T, where T = ambient water temperature in Kelvin (K = °C + 273.16)

Results should be converted to percent and rounded to two significant figures. Extrapolations should not be made beyond the ranges of the table.

Note: Under certain temperature and pH conditions, the total ammonia criteria for the protection of aquatic life may be less stringent than the criteria for other beneficial uses (e.g. public water supply).

Percent NH3 in aqueous ammonia solutions for 0-30 °C and pH 6-10

Temp.	**pH**								
°C	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**
0	.0083	.026	.083	.26	.82	2.6	7.6	21.	45.
1	.0090	.028	.090	.28	.89	2.8	8.3	22.	47.
2	.0098	.031	.098	.31	.97	3.0	8.9	24.	49.
3	.011	.034	.11	.34	1.1	3.3	9.6	25.	52.
4	.012	.036	.12	.36	1.1	3.5	10.	27.	54.
5	.013	.040	.13	.39	1.2	3.8	11.	28.	56.
6	.014	.043	.14	.43	1.3	4.1	12.	30.	58.
7	.015	.046	.15	.46	1.5	4.4	13.	32.	60.
8	.016	.050	.16	.50	1.6	4.8	14.	34.	61.
9	.017	.054	.17	.54	1.7	5.2	15.	35.	63.
10	.019	.059	.19	.59	1.8	5.6	16.	37.	65.
11	.020	.064	.20	.63	2.0	6.0	17.	39.	67.
12	.022	.069	.22	.68	2.1	6.4	18.	41.	69.
13	.024	.074	.24	.74	2.3	6.9	19.	43.	70.
14	.025	.080	.25	.80	2.5	7.4	20.	45.	72.
15	.027	.087	.27	.86	2.7	8.0	22.	46.	73.
16	.030	.093	.29	.93	2.9	8.5	23.	48.	75.
17	.032	.10	.32	1.0	3.1	9.1	24.	50.	76.
18	.034	.11	.34	1.1	3.3	9.8	26.	52.	77.

Temp.	pH								
°C	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
19	.037	.11	.37	1.2	3.6	11.	27.	54.	79.
20	.040	.13	.40	1.2	3.8	11.	28.	56.	80.
21	.043	.14	.43	1.3	4.1	12.	30.	58.	81.
22	.046	.15	.46	1.4	4.4	13.	32.	59.	82.
23	.049	.16	.49	1.5	4.7	14.	33.	61.	83.
24	.053	.17	.53	1.7	5.0	14.	35.	63.	84.
25	.057	.18	.57	1.8	5.4	15.	36.	64.	85.
26	.061	.19	.61	1.9	5.8	16.	38.	66.	86.
27	.065	.21	.65	2.0	6.2	17.	40.	67.	87.
28	.070	.22	.70	2.2	6.6	18.	41.	69.	88.
29	.075	.24	.75	2.3	7.0	19.	43.	70.	88.
30	.081	.25	.80	2.5	7.5	20.	45.	72.	89.

Phosphorus:
Current scientific evidence is insufficient to develop a firm objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines, which should be supplemented by site-specific studies:

- To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 µg/L;
- A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 µg/L or less. This should apply to all lakes naturally below this value;
- Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 µg/L.

Bacteriological

***Escherichia coli*:**
The amount of *Escherichia coli* should not exceed 100 counts per 100 mL of water (based on a geometric mean of at least 5 samples).

Based on a recreational water quality guideline published by the Ontario Ministry of Health in 1992, this Ministry of Health guideline was specifically intended for application by the local Medical Officer of Health to swimming and bathing beaches. It is based upon a geometric mean of levels of *E. coli* determined from a minimum of 5 samples per site taken within a given swimming area and collected within a one month period. If the geometric mean *E. coli* level for the sample series at a given site exceeds 100 per 100 mL, the site should be considered unsuitable for swimming and bathing. *E. coli* was selected for the guideline because studies have determined that, among bacteria of the coliform group, *E. coli* is the

most suitable and specific indicator of fecal contamination.

An analytical test with a high degree of specificity for *E. coli* regardless of water sample source, requiring no confirmation procedures, and which produces results in 21 hours has been developed and adopted by both the Ministry of Health, and Ministry of Environment and Energy laboratories.

Where testing indicates sewage or fecal contamination, a site-specific judgment must be made as to the severity of the problem and the appropriate course of action.

As of May 1, 1994, MOEE staff has been advised to base all **new** compliance, enforcement and monitoring activities on the *E. coli* test. Some water managers may find it necessary to continue testing for fecal coliforms or total coliforms. For example, where testing at a long term water quality monitoring station requires a continuous record of results using either the fecal or total coliform test to monitor trends in water quality. As a benchmark for the long term monitoring results, the former objectives for fecal coliforms and total coliforms are referenced for your information. For fecal coliforms the objective was 100 counts per 100 ml (based on a geometric mean density for a series of water samples). For total coliforms the objective was 1000 counts per 100 ml (based on a geometric mean density for a series of water samples).

Metals

Aluminum:
Aluminum amounts should not exceed the following:

PH values	Interim PWQO (µg/L)
4.5 to 5.5	15
>5.5 to 6.5	No more than 10 % of natural background
> 6.5 to 9.0	75

Antimony:
The amount of Antimony should not exceed 20 µg/L.

Arsenic:
The amount of Arsenic should not exceed 5 µg/L.

Barium:
There are currently no PWQO guidelines for Barium.

Beryllium:
Beryllium amounts should not exceed the following:

Hardness as CaCO3 (mg/L)	Interim PWQO (µg/L)
< 75	11
>75	1100

Bismuth:
There are currently no PWQO guidelines for Bismuth.

Boron:
The amount of Boron should not exceed 200 µg/L.

Cadmium:
Cadmium amounts should not exceed the following:

Hardness as CaCO3 (mg/L)	Interim PWQO (µg/L)
0 – 100	0.1
>100	0.5

Calcium:
There are currently no PWQO guidelines for Calcium.

Chromium:
Chromium amounts should not exceed the following:

	Interim PWQO (µg/L)
Hexavalent Chromium (Cr VI)	1
Trivalent Chromium (Cr III)	8.9

Cobalt:
The amount of Cobalt should not exceed 0.9 µg/L.

Copper:
The amount of Copper should not exceed 5 µg/L.

Hardness as CaCO3 (mg/L)	Interim PWQO (µg/L)
0-20	1
>20	5

Iron:
The amount of Iron should not exceed 300µg/L.

Lead:
Lead amounts should not exceed the following:

Hardness as CaCO3 (mg/L)	Interim PWQO (µg/L)
< 30	1
30 to 80	3
> 80	5

Lithium:
There are currently no PWQO guidelines for Lithium.

Magnesium:
There are currently no PWQO guidelines limiting the intake of Magnesium.

Manganese:
There are currently no PWQO guidelines for Manganese.

Molybdenum:
The amount of Molybdenum should not exceed 40 µg/L.

Nickel:
The amount of Nickel should not exceed 25 µg/L.

Potassium:
There are currently no PWQO guidelines for Potassium.

Selenium:
The amount of Selenium should not exceed 100 µg/L.

Silicon:
There are currently no PWQO guidelines for Silicon.

Silver:
The amount of Silver should not exceed 0.1 µg/L.

Sodium:
There are currently no PWQO guidelines for Sodium.

Strontium:
There are currently no PWQO guidelines for Strontium.

Tellurium:
There are currently no PWQO guidelines for Tellurium.

Thallium:
The amount of Thallium should not exceed 0.3 μg/L.

Tin:
There are currently no PWQO guidelines for Tin.

Titanium:
There are currently no PWQO guidelines for Titanium.

Tungsten:
The amount of Tungsten should not exceed 30 μg/L.

Uranium:
The amount of Uranium should not exceed 5 μg/L.

Vanadium:
The amount of Vanadium should not exceed 6 μg/L.

Zinc:
The amount of Zinc should not exceed 20 μg/L.

Zirconium:
The amount of Zirconium should not exceed 4 μg/L.

Appendix F:

Forest Ecosystem Classification

Appendix F: Forest Ecosystem Classification

Site 1, Site 4: V7 Trembling Aspen – Balsam Fir/Balsam Fir Shrub

Description: Hardwood mixedwoods, typically with a two-tiered canopy. In general, trembling aspen constitutes the overstory with balsam fir in the secondary canopy. Understory development is variable with balsam fir, *Atalia nudicaulis* and *Diervilla linicera* often abundant. Occuring mainly on deep, fresh, well-drained, fine textured mineral soils.

Site 1

Site 4

Common Overstory Species (in descending order):
balsam fir, trembling aspen, white birch, white spruce, black spruce, jack pine

Common Understory Species:

Shrubs:	balsam fir, *Rubus pubescens, Diervilla lonicera, Acer spicatum, Rosa acicularis,* trembling aspen, *Corylus cornuta, Linnaea borealis, Sorbus decora*
Herbs:	*Maianthemum canadense, Aralia nudicaulis, Cornus Canadensis, Clintonia borealis, Streptopus roseus, Cornus canadensis, Trientalis borealis, Viola renifolia, Mitella nuda, Aster macrophyllus, Galium triflorum, Petasites palmatus, Anemone quinquefolia*
Mosses:	*Pleurozium schreberi, Rhytidiadelphus triquetrus*

Forest Floor Cover:

Species	Broadleaf Litter	Moss	Conifer Litter	Wood
Forest Floor Cover (%)	81	7	6	5

Site 2: V24 White Spruce – Balsam Fir/Shrub Rich

Description: A conifer Type with white spruce and/or balsam fir as the main canopy species. The understory tends to be shrub rich with a balsam fir, *Acer spicatum*, *Corylus cornuta* and, on the wetter sites, *Alnus rugosa* potentially abundant. The herb layer varies from rich to poor. Occurring on deep, fresh to moist, mineral soils across a range of texture classes.

Common Overstory Species (in descending order):
white spruce, balsam fir, black spruce, jack pine, white birch

Common Understory Species:

Shrubs:	balsam fir, *Acer spicatum, Rubus pubescens, Corylus cornuta, Sorbus decora, Linnaea borealis, Diervilla lonicera, Rosa acicularis, Amelanchier* spp.,
Herbs:	*Aralia nudicaulis, Cornus canadensis, Clintonia borealis, Maianthemum canadense, Streptopus roseus, Trientalis borealis, Galium triflorum, Aster macrophyllus, Mitella nuda, Viola renifolia, Anemone quinquefolia, Petasites palmatus, Fragaria virginiana*
Mosses:	*Pleurozium schreberi, Ptilium crista-castrensis, Rhytidiadelphus triquetrus, Dicranum polysetum*

Forest Floor Cover:

Cover Type	Conifer Litter	Moss	Broadleaf Litter	Wood
Forest Floor Cover (%)	34	32	23	7

Site 3: V19 Black Spruce Mixedwood/Herb Rich

Description: A black spruce mixedwood Type with several potential species in the overstory. The understory is typically dominated by an herb rich/dwarf shrub layer. The shrub stratum ranges from dense to open, usually with balsam fir and black spruce as important components. Forest floor cover varies from moss rich to mainly broadleaf litter. Occurring on a range on site conditions mostly on fresh to moist, mineral soils.

Common Overstory Species (in descending order):
black spruce, white birch, jack pine, trembling aspen, balsam fir

Common Understory Species:

Shrubs:	black spruce, *Vaccinium myrtilloides, Gaultheria hispidula, Ledum groenlandicum, Vaccinium angustifolium, Alnus crispa, Linnaea borealis*
Herbs:	*Cornus Canadensis, Maianthemum canadense*
Mosses:	*Pleurozium schreberi, Dicranum polysetum, Ptilium crista-castrensis, Hylocomium splendens*
Lichens	*Cladina rangiferina*

Forest Floor Cover:

Species	Moss	Broadleaf litter	Conifer litter
Forest Floor Cover (%)	82	7	12

Site 5: V9 Trembling Aspen Mixedwood

Description: Hardwood mixedwoods with a shrub and herb rich understory. Typically, trembling aspen is the main tree species. *Corylus cornuta*, balsam fir, *Alnus crispa, Diervilla lonicera, Aralia nudicaulis* and *Aster macrophyllus* can be abundant in the understory. Occuring mainly on deep, fresh, well-drained mineral soils.

Common Overstory Species (in descending order):
trembling aspen, white spruce, white birch, balsam fir, black spruce, jack pine, red maple

Common Understory Species:

Shrubs:	*Rubus pubescens, Acer spicatum*, balsam fir, *Corylus cornuta, Diervilla lonicera, Amelanchier* spp., *Rosa acicularis*, trembling aspen, *Linnaea borealis*
Herbs:	*Viola renifolia, Mitella nuda, Maianthemum canadense, Cornus Canadensis, Aralia nudicaulis, Aster macrophyllus, Streptopus roseus, Clintonia borealis, Trientalis borealis, Galium triflorum, Viola renifolia, Petasites palmatus, Anemone quinquefolia*
Mosses:	*Plagiomnium cuspidatum, Pleurozium schreberi, Rhytidiadelphus triquetrus, Ptilium crista-castrensis*

Forest Floor Cover:

Species	Broadleaf Litter	Conifer litter	Moss
Forest Floor Cover (%)	84	5	5

Site 6: V8 Trembling Aspen (White Birch)/Mountain Maple

Description: Hardwood mixedwood stands with an abundance of broadleaved herbs and shrubs in the understory. Dense thickets of *Acer spicatum* are characteristic. Occurring mainly on deep, fresh to dry, well to rapidly drained mineral soils.

Common Overstory Species (in descending order):
trembling aspen, white birch, white spruce, black spruce, jack pine, balsam fir

Common Understory Species:

Shrubs:	*Rubus pubescens, Acer spicatum,* balsam fir, *Corylus cornuta, Diervilla lonicera,* trembling aspen, *Rosa acicularis, Amelanchier* spp., *Linnaea borealis, Sorbus decora, Lonicera canadensis*
Herbs:	*Viola renifolia, Mitella nuda, Galium trijlorum, Maianthemum canadense, Aralia nudicaulis, Aster macrophyllus, Trientalis borealis, Streptopus roseus, Clintonia borealis, Cornus Canadensis, Lycopodium clavatum, Coptis trifolia*
Mosses:	*Plagiomnium cuspidatum, Pleurozium schreberi, Ptilium crista-castrensis, Rhytidiadelphus triquetrus, Plagiomnium cuspidatum*

Forest Floor Cover:

Species	Broadleaf Litter	Moss	Wood
Forest Floor Cover (%)	84	7	5

Site 7, Site 8: V2 Black Spruce/Speckled Alder/*Sphagnum*

Description: Wet, shrub rich black spruce stands, occasionally with other conifers in the canopy. *Alnus rugose*, often in association with black spruce and balsam fir, is abundant in the tall shrub layer. Species diversity in the herb/dwarf shrub layer can be high. Ground cover consists of *Sphagnum* and feathermoss, often with large patches of broadleaf litter. Occurring on wet, lowland sites.

Site 7

Site 8

Common Overstory Species (in descending order):
black spruce, balsam fir, tamarack, white cedar

Common Understory Species:

Shrubs:	*Rubus pubescens, Acer spicatum, Alnus rugosa, Gaultheria hispidula, Ledum groenlandicum,* black spruce, *Linnaea borealis, Vaccinium myrtilloides,* balsam fir, *Vaccinium angustifolium, Sorbus decora, Oxycoccus microcarpus*
Herbs:	*Cornus canadensis, Equisetum sylvaticum, Smilacina trifolia, Trientalis borealis, Mitella nuda, Coptis trifolia, Maianthemum canadense, Viola renifolia, Clintonia borealis, Petasites palmatus, Carex trisperma*
Mosses:	*Pleurozium schreberi, Sphagnum girgensohnii, S. nemoreum, Ptilium crista-castrensis, Sphagnum magellancium, Hylocomium splendens, Aulacomnium palustre, Dicranumpolysetum*

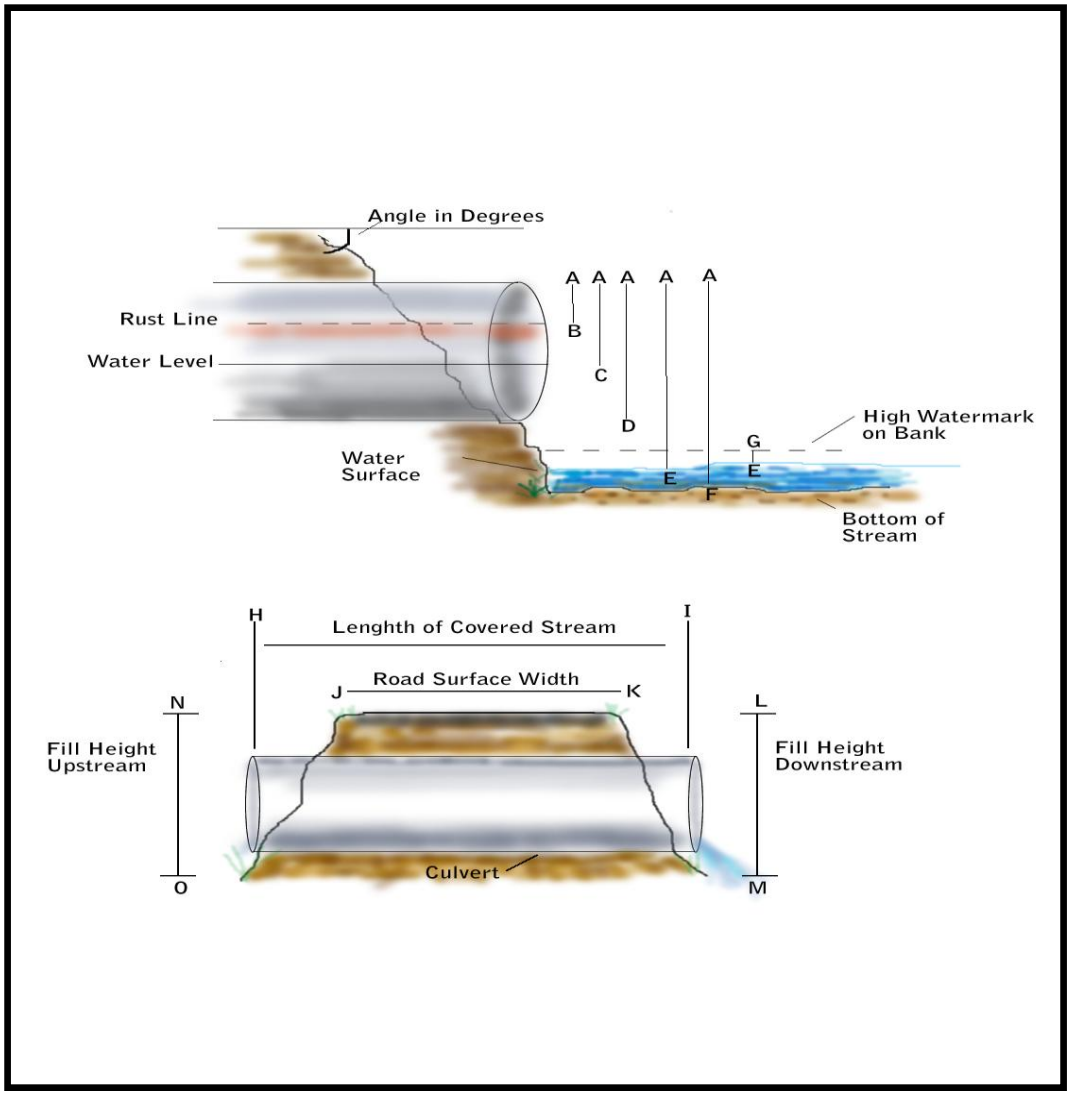
Forest Floor Cover:

Species	Broadleaf Litter	Moss	Conifer Litter	Graminoid Litter
Forest Floor Cover (%)	5	79	5	6

Appendix G:

Culvert Assessments

Appendix G: Culvert Assessments



Coldwater Creek 2017 Culvert Assessments

Culvert Number/ Site Number	**J-K** Road Surface Width (m)	**H-I** Length of Covered Stream (m)	**N-O** Fill Height Upstream (m)	**L-M** Fill Height Downstream (m)		**A-D** Width of Opening (m)	**A-B** Inside Top to Rust Line (m)	**A-C** Inside Top to Water Surface (m)	**A-E** Height Above Outlet Pool (m)	**E-G** Water Surface to High Water Mark (m)	**A-F** Inside Top to Bottom of Stream (m)
C1/Site 4											
Culvert	7.1	20.3	2.1	2.4	Upstream	1.75	1.22	1.90	1.90	0.65	2.05
					Downstream	1.55	1.27	2.13	2.73	1.00	2.40
C2/Site 6											
Culvert	6.1	21.5	2.48	3.17	Upstream	2.28	1.15	1.38	1.38	0.36	2.28
					Downstream	2.35	1.01	1.20	1.20	0.18	3.00
C3/Site 7											
Culvert	6.8	12.3	0.55	1.01	Upstream	1.57	0.96	1.04	1.04	0.22	1.61
					Downstream	1.49	0.98	1.28	1.28	0.44	1.51
C4/Site 8											
Culvert	7.5	12.3	2.1	2.4	Upstream	2.03	1.60	1.86	1.86	0.40	2.10
					Downstream	2.05	1.72	2.11	2.11	0.25	2.27

Culvert 1 / Site 4

Location: Valley Road near property #250, approximately 2.8 kilometres North from Ouimet Canyon Road

GPS Coordinates: Northing 5405531 Easting 381356

Description: The large corrugated steel culvert is in good condition with some minor structural damage on the upstream opening. It seemed large enough to be able to support water flow during times of both high water level and low water level however the downstream portion of the culvert was perched. The water level was relatively low compared to the size of the culvert opening. There is abundant vegetation surrounding the culvert and the banks appear to be stable.

Upstream

Downstream

Culvert 2 / Site 6

Location: Gulch Creek, approximately 140 metres East from intersection of Greenwich Lake Road and Ouimet Canyon Road

GPS Coordinates: Northing 5402829 Easting 377372

Description: The corrugated steel culvert is the largest with respect to the other sites. The culvert is large enough to handle both low and high water levels efficiently. Vegetation is almost not existent with exception of some small shrubs and grasses but erosion was not detected in the area. The low slope of the area helps prevent erosion of the culvert.

Upstream

Downstream

Culvert 3 / Site 7

Location: Southside of Goodmorning Lakes along Greenwich Lake Road, approximately 1 kilometre from Innes Lake Road turnoff

GPS Coordinates: Northing 5403939 Easting 375392

Description: The corrugated steel culvert is in relatively good condition however there was vegetation blocking the opening on the upstream side (south side of Goodmorning Lakes). The culvert seems to be efficient at transmitting water during both high and low water levels. The slope of the culvert placement could be a potential issue for erosion in the future as one of the banks in on the proximity of a lake.

Upstream

Downstream

Culvert 4 / Site 8

Location: Greenwich Lake Road, approximately 0.5 kilometres from Innes Lake Road turnoff

GPS Coordinates: Northing 5404176 Easting 374944

Description: This steel corrugated culvert was in excellent condition despite some minor structural bending inwards on the downstream opening. There was abundant vegetation both upstream and downstream and the culvert was to able transmit water efficiently during both high and low water levels. In the future the large boulders downstream may cause further structural damage.

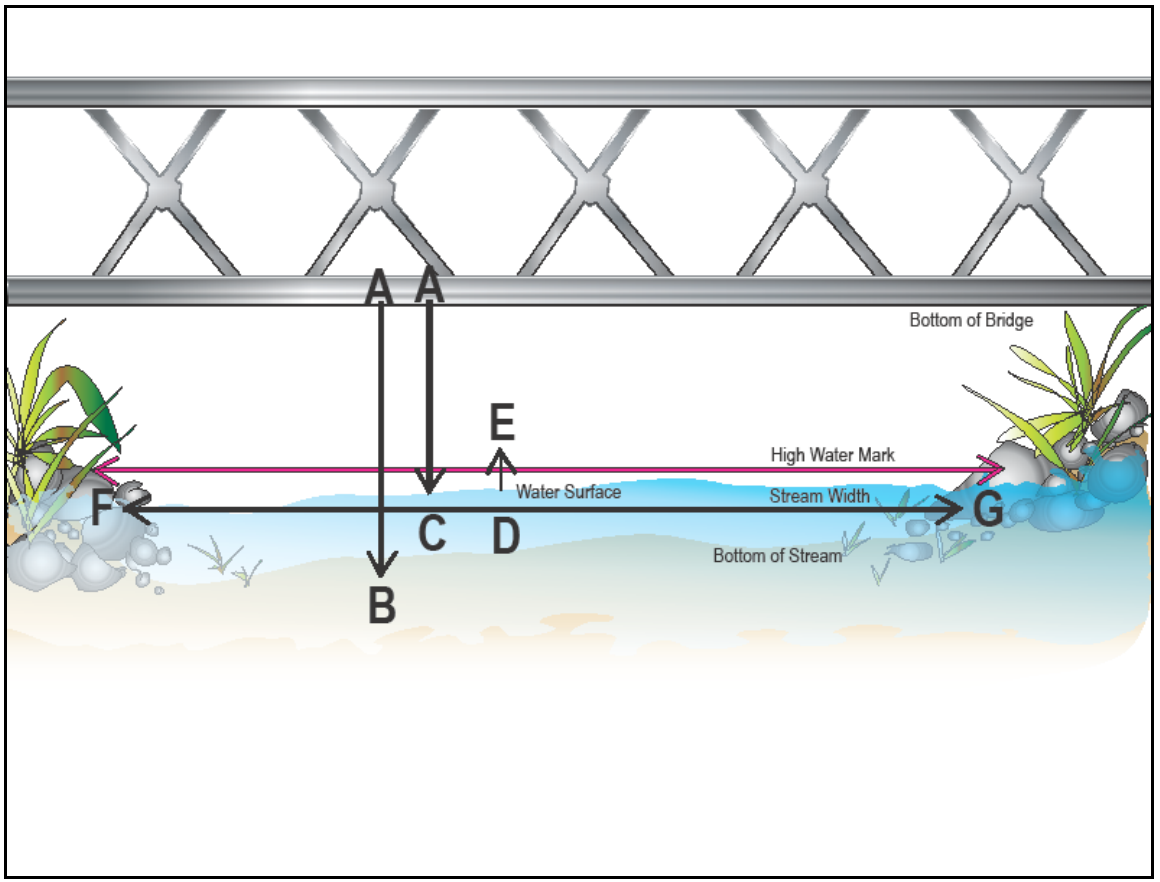
Upstream

Downstream

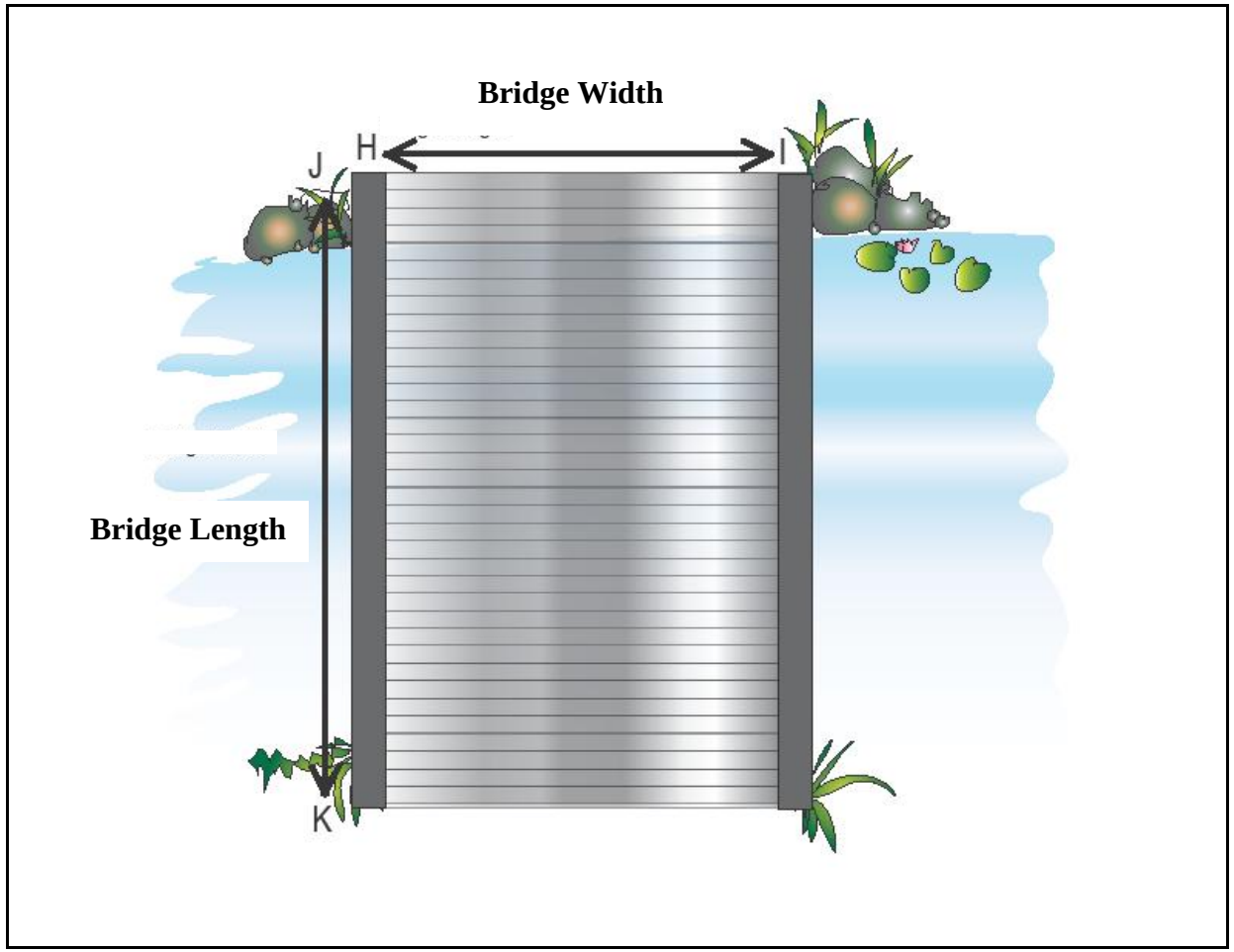
Appendix H:

Bridge Assessments

Appendix H: Bridge Assessments



Bridge Measurement Parameters


Bridge Width
H
I
J
K
Bridge Length

Coldwater Creek 2017 Bridge Measurements

Site Number	Bridge Number	**A-C** Bottom of Bridge to Water Surface (m)	**A-B** Bottom of Bridge to Bottom of Stream (m)	**D-E** Outlet Pool Water Surface to Outlet Pool High Water Mark (m)	**F-G** Width of Stream (m)	**H-I** Length of Bridge (m)	**J-K** Width of Bridge (m)
1	B1	5.63	N/A	N/A	12.6	54.7	3.54
2	B2	4.67	5.38	0.28	10.7	27.8	5.38
5	B3	4.47	5.89	0.87	7.65	20.9	8.65

*Some bridge measurements were not completed due to safety concerns

Bridge 1 / Site 1

Location: South of Bible Camp Road, approximately 1.8 kilometres from confluence of Coldwater Creek and Lake Superior

GPS Coordinates: Northing 5407383 Easting 388274

Description: This bridge is an old decommissioned railway bridge made with creosote timbers, a steel undercarriage, and concrete footings. The condition of the bridge was excellent and there was abundant vegetation on both banks. The concrete footing on the north side of the creek seemed to alter flow slightly. The creosote present in the timbers could provide a source of environmental degradation in the future and should be monitored.

Upstream

Downstream

Bridge 2 / Site 2

Location: Coldwater Drive at the wooden bridge over the confluence of Spring Creek and Coldwater Creek

GPS Coordinates: Northing 5407159 Easting 385484

Description: This bridge is a four-span structure made entirely out of timber with rip-rap placed underneath to aid in erosion mitigation. There was evidence of significant erosion downstream of the bridge which could be caused because of the combining waterways, resulting in an increase of force and, therefore, erosion potential. This is a relatively high traffic bridge and should be monitored and maintained properly.

Upstream

Downstream

Bridge 3 / Site 5

Location: Coldwater Creek bridge on Ouimet Canyon Road, approximately 2.5 kilometres Northwest from Highway 11/17

GPS Coordinates: Northing 5402311 Easting 382048

Description: This bridge is a single-span structure made of a steel undercarriage, wooden decking, and steel guardrails. The banks had significant amounts of vegetation which most likely is why there is little to no erosion present. Riprap was placed underneath the bridge to help mitigate erosion. This is a relatively high traffic bridge and should be monitored and maintained in the future.

Upstream

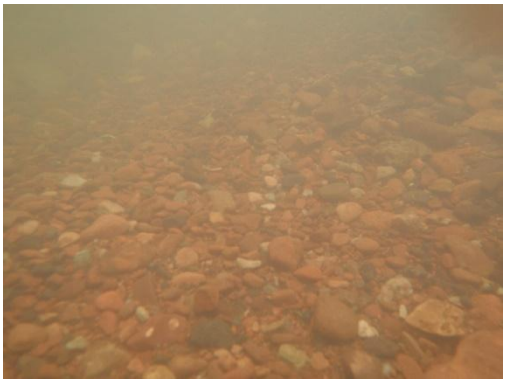
Downstream

Appendix I:

Site Photography

Appendix I: Site Photography

Site 1 – South of Bible Camp Road, approximately 1.8 kilometres from confluence of Coldwater Creek and Lake Superior	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Site 2 – Coldwater Drive at the wooden bridge over the confluence of Spring Creek and Coldwater Creek	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Site 3 – Fish Hatchery Road on Spring Creek, approximately 500 metres Southeast of Dorion Fish Culture Station	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Site 4 – Valley Road near property #250, approximately 2.8 kilometres North from Ouimet Canyon Road	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Site 5 – Coldwater Creek bridge on Ouimet Canyon Road, approximately 2.5 kilometres Northwest from Highway 11/17	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Site 6 – Gulch Creek, approximately 140 metres East from intersection of Greenwich Lake Road and Ouimet Canyon Road	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Site 7 – Southside of Goodmorning Lakes along Greenwich Lake Road, approximately 1 kilometre from Innes Lake Road turnoff	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Site 8 – North side of Greenwich Lake Road, approximately 0.5 kilometres from Innes Lake Road turnoff	
A: Upstream	**B: Downstream**
	
C: Vegetation	**D: Substrate**
	

Appendix J:

Laboratory Water Quality Results Summary Tables

Coldwater Creek Watershed Assessment 2017
Laboratory Water Quality Results Summary Tables

Laboratory Water Quality Results for June 13, 2017

Parameter	Units	PWQO Criterion	CW1 Coldwater Creek - SITE#1 13-Jun-17	CW2 Coldwater Creek - SITE#2 13-Jun-17	CW3 Coldwater Creek - SITE#3 13-Jun-17	CW4 Coldwater Creek - SITE#4 13-Jun-17	CW5 Coldwater Creek - SITE#5 13-Jun-17	CW6 Coldwater Creek - SITE#6 13-Jun-17	CW7 Coldwater Creek - SITE#7 13-Jun-17	CW8 Coldwater Creek - SITE#8 13-Jun-17	Average June
Physical Tests											
Conductivity (EC)	(uS/cm)	N/A	273	251	331	86.3	186	102	78.3	53.3	170
pH		6.5-8.5	8.24	8.16	8.16	7.55	7.98	7.64	7.55	7.37	7.83
Total Dissolved Solids	(mg/L)	N/A	160	147	179	71	108	70	57	41	104
Turbidity	(NTU)	N/A	5.83	6.27	1.50	2.18	1.70	2.36	0.77	0.54	2.64
Anions and Nutrients											
Alkalinity, Total (as $CaCO_3$)*	(mg/L)	26.5	153	142	199	43.5	105	54.2	41.0	29.7	95.9
Ammonia-N, Total	(mg/L)	N/A	0.240	<0.020	0.052	<0.020	<0.020	<0.020	0.044	<0.020	0.0545
Un-ionized Ammonia (calculated)**	(mg/L)	0.02	0.0109	N/A	0.0014	N/A	N/A	N/A	0.0005	N/A	0.0043
Chloride (Cl)	(mg/L)	N/A	1.90	0.93	0.91	0.13	0.76	0.31	0.35	0.22	0.69
Nitrate-N (NO_3-N)	(mg/L)	N/A	0.023	0.026	0.024	0.070	0.037	0.052	0.095	<0.020	0.043
Nitrite-N (NO_2-N)	(mg/L)	N/A	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	(mg/L)	N/A	0.380	<0.25	<0.25	0.35	<0.25	<0.25	0.44	0.31	0.31
Phosphorus (P)-Total	(mg/L)	0.03	0.0116	0.0126	0.0117	0.0112	0.0066	0.0041	0.0106	0.0056	0.0093
Sulphate (SO_4)	(mg/L)	N/A	1.79	1.49	1.46	1.18	1.02	0.87	1.02	0.76	1.20
Bacteriological Tests											
Escherichia Coli	(MPN/100mL)	100	25	28	1	0	84	2	1	29	21
Total Coliforms	(MPN/100mL)	1000 (prior to 1994)	435	687	210	**>2420**	**1050**	770	178	**1120**	859
Total Metals											
Aluminum (Al)-Total***	(mg/L)	0.075	**0.254**	**0.287**	**0.085**	**0.221**	0.069	0.036	0.051	0.060	**0.133**
Antimony (Sb)-Total	(mg/L)	0.02	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	(mg/L)	0.005 (interim)	0.00047	0.00046	0.00045	0.00037	0.00030	0.00030	0.00026	0.00023	0.00036
Barium (Ba)-Total	(mg/L)	N/A	0.253	0.210	0.395	0.0323	0.164	0.0797	0.0633	0.0341	0.1539
Beryllium (Be)-Total****	(mg/L)	0.011 (<75 mg/L $CaCO_3$)	N/A	N/A	N/A	<0.00010	N/A	<0.00010	<0.00010	<0.00010	<0.00010
	(mg/L)	1.10 (>75 mg/L $CaCO_3$)	<0.00010	<0.00010	<0.00010	N/A	<0.00010	N/A	N/A	N/A	<0.00010
Bismuth (Bi)-Total	(mg/L)	N/A	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	(mg/L)	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total****	(mg/L)	0.0001 (0-100 mg/L $CaCO_3$)	N/A	N/A	N/A	0.0000055	N/A	0.0000065	0.0000051	<0.0000050	0.0000057
	(mg/L)	0.0005 (>100 mg/L $CaCO_3$)	0.0000058	0.0000057	<0.0000050	N/A	<0.0000050	N/A	N/A	N/A	0.00000545
Calcium (Ca)-Total	(mg/L)	N/A	38.4	34.4	44.1	12.9	23.1	12.0	9.02	6.02	22.5
Chromium (Cr)-Total	(mg/L)	0.0089	0.00059	0.00068	0.00034	0.00061	0.00030	0.00023	0.000022	0.00028	0.00038
Cobalt (Co)-Total	(mg/L)	0.0009	0.00016	0.00018	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	0.0002
Copper (Cu)-Total****	(mg/L)	0.005	0.00197	0.00184	0.00168	0.00333	0.00112	0.00102	0.00103	0.00073	0.0016
Iron (Fe)-Total	(mg/L)	0.3	**0.302**	**0.370**	0.096	0.275	0.176	0.094	0.115	0.181	0.201

Notes:

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** - indicates criterion is pH and temperature dependent

*** - indicates criterion is pH dependent

**** - indicates criteria are Alkalinity dependent

Coldwater Creek Watershed Assessment 2017
Laboratory Water Quality Results Summary Tables

Laboratory Water Quality Results for June 13, 2017

Parameter	Units	PWQO Criterion	CW1 Coldwater Creek - SITE#1 13-Jun-17	CW2 Coldwater Creek - SITE#2 13-Jun-17	CW3 Coldwater Creek - SITE#3 13-Jun-17	CW4 Coldwater Creek - SITE#4 13-Jun-17	CW5 Coldwater Creek - SITE#5 13-Jun-17	CW6 Coldwater Creek - SITE#6 13-Jun-17	CW7 Coldwater Creek - SITE#7 13-Jun-17	CW8 Coldwater Creek - SITE#8 13-Jun-17	Average June
Total Metals Continued											
Lead (Pb)-Total****	(mg/L)	0.001 (<30 mg/L CaCO3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<0.000050	<0.000050
	(mg/L)	0.003 (30-80 mg/L CaCO3)	N/A	N/A	N/A	0.000057	N/A	<0.000050	<0.000050	N/A	0.00006
	(mg/L)	0.005 (>80 mg/L $CaCO_3$)	0.000082	0.000097	<0.000050	N/A	<0.000050	N/A	N/A	N/A	0.00008950
Lithium (Li)-Total	(mg/L)	N/A	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
Magnesium (Mg)-Total	(mg/L)	N/A	14.50	12.80	18.70	3.15	9.90	5.43	4.66	2.82	9.00
Manganese (Mn)-Total	(mg/L)	N/A	0.018	0.0203	0.00803	0.0210	0.0233	0.0217	0.0111	0.0188	0.0178
Molybdenum (Mo)-Total	(mg/L)	0.04	0.000164	0.000143	0.000189	0.000066	0.000093	0.000122	0.000078	0.000218	0.000134125
Nickel (Ni)-Total	(mg/L)	0.025	0.00066	0.00068	<0.00050	0.00061	<0.00050	<0.00050	<0.00050	<0.00050	0.000556
Potassium (K)-Total	(mg/L)	N/A	0.899	0.833	0.869	0.551	0.480	0.334	0.224	0.221	0.5514
Selenium (Se)-Total	(mg/L)	0.1	0.000145	0.000102	0.000091	0.000102	0.000086	0.000092	<0.000050	0.000104	0.000097
Silver (Ag)-Total	(mg/L)	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	(mg/L)	N/A	2.23	1.69	1.62	0.770	1.27	0.945	0.823	0.920	1.28
Strontium (Sr)-Total	(mg/L)	N/A	0.0516	0.0472	0.0502	0.0203	0.0353	0.0199	0.0144	0.0121	0.0314
Tellurium (Te)-Total	(mg/L)	N/A	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	(mg/L)	0.0003	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	(mg/L)	N/A	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	(mg/L)	N/A	0.00988	0.0112	0.00365	0.00659	0.00199	0.00032	0.00078	0.00046	0.0044
Tungsten (W)-Total	(mg/L)	0.03	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	0.00012	0.00013	0.0001075
Uranium (U)-Total	(mg/L)	0.005	0.000468	0.000436	0.000428	0.000167	0.000299	0.000168	0.000104	0.000271	0.0003
Vanadium (V)-Total	(mg/L)	0.006	0.00237	0.00227	0.00198	0.00143	0.00122	0.00069	0.00059	0.00067	0.00140
Zinc (Zn)-Total	(mg/L)	0.02 (interim)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total	(mg/L)	0.004	0.000209	0.000244	0.000093	0.000254	0.000097	0.000087	0.000084	0.000116	0.00031

Notes:

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*** - indicates criterion is pH dependent

**** - indicates criteria are Alkalinity dependent

Coldwater Creek Watershed Assessment 2017
Laboratory Water Quality Results Summary Tables

Laboratory Water Quality Results for July 13, 2017

Parameter	Units	PWQO Criterion	CW1 Coldwater Creek - SITE#1 13-Jul-17	CW2 Coldwater Creek - SITE#2 13-Jul-17	CW3 Coldwater Creek - SITE#3 13-Jul-17	CW4 Coldwater Creek - SITE#4 13-Jul-17	CW5 Coldwater Creek - SITE#5 13-Jul-17	CW6 Coldwater Creek - SITE#6 13-Jul-17	CW7 Coldwater Creek - SITE#7 13-Jul-17	CW8 Coldwater Creek - SITE#8 13-Jul-17	Average July
Physical Tests											
Conductivity (EC)	(uS/cm)	N/A	263	228	324	91.5	164	162	83.6	55.7	171.5
pH		6.5-8.5	8.18	8.15	8.1	7.68	7.99	7.8	7.62	7.33	7.9
Total Dissolved Solids	(mg/L)	N/A	150	128	180	63	95	97	57	49	102.4
Turbidity	(NTU)	N/A	18.7	15.8	1.84	3.33	2.57	0.54	0.88	0.7	5.5
Anions and Nutrients											
Alkalinity, Total (as $CaCO_3$)*	(mg/L)	27.5	145	126	183	45.5	89.8	88.3	43.9	29.3	93.9
Ammonia-N, Total	(mg/L)	N/A	0.021	0.135	0.05	<0.020	0.114	0.076	0.05	0.087	0.0761
Un-ionized Ammonia (calculated)**	(mg/L)	0.02	0.0008	0.0054	0.0012	N/A	0.0032	0.0013	0.0007	0.0005	0.0019
Chloride (Cl)	(mg/L)	N/A	1.93	0.96	0.72	0.1	0.79	0.58	0.39	0.22	0.71
Nitrate-N (NO_3-N)	(mg/L)	N/A	0.041	0.029	0.087	0.051	0.033	<0.020	<0.020	0.059	0.05
Nitrite-N (NO_2-N)	(mg/L)	N/A	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Kjeldahl Nitrogen	(mg/L)	N/A	0.270	0.3	<0.25	0.33	0.37	0.42	0.38	0.45	0.36
Phosphorus (P)-Total	(mg/L)	0.03	0.0234	0.0184	0.0147	0.0098	0.0064	0.0102	0.0073	0.0054	0.01
Sulphate (SO_4)	(mg/L)	N/A	2.38	2.14	2.96	2.14	1.85	1.55	1.96	1.59	2.07
Bacteriological Tests											
Escherichia Coli	(MPN/100mL)	100	77	**179**	9	5	67	5	9	16	46
Total Coliforms	(MPN/100mL)	1000 (prior to 1994)	**1990**	**>2420**	435	**>2420**	**>2420**	770	**>2420**	**>2420**	**1065**
Total Metals											
Aluminum (Al)-Total***	(mg/L)	0.075	**0.719**	**0.655**	0.057	**0.170**	**0.080**	**0.180**	0.015	**0.106**	**0.248**
Antimony (Sb)-Total	(mg/L)	0.02	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	(mg/L)	0.005 (interim)	0.00051	0.00048	0.00042	0.00040	0.00031	0.00041	0.00025	0.00029	0.00038
Barium (Ba)-Total	(mg/L)	N/A	0.246	0.190	0.398	0.0353	0.141	0.148	0.0729	0.0391	0.15879
Beryllium (Be)-Total****	(mg/L)	0.011 (<75 mg/L $CaCO_3$)	N/A	N/A	N/A	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	(mg/L)	1.10 (>75 mg/L $CaCO_3$)	<0.00011	<0.00010	<0.00010	N/A	N/A	N/A	N/A	N/A	<0.00010
Bismuth (Bi)-Total	(mg/L)	N/A	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	(mg/L)	0.2	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total****	(mg/L)	0.0001 (0-100 mg/L $CaCO_3$)	N/A	N/A	N/A	0.0000066	<0.0000050	0.000008	<0.0000050	0.000008	0.000007
	(mg/L)	0.0005 (>100 mg/L $CaCO_3$)	0.0000088	0.000010	<0.0000050	N/A	N/A	N/A	N/A	N/A	0.0000096
Calcium (Ca)-Total	(mg/L)	N/A	35	31.7	42.7	13.3	21.4	21.3	10.6	7.09	22.9
Chromium (Cr)-Total	(mg/L)	0.0089	0.00145	0.00134	0.00031	0.00056	0.00061	0.00045	0.00019	0.00028	0.00065
Cobalt (Co)-Total	(mg/L)	0.0009	0.00045	0.00035	<0.00010	0.00013	<0.00010	0.0001	<0.00010	0.0001	0.00023
Copper (Cu)-Total****	(mg/L)	0.005	0.00303	0.00230	0.00178	0.00299	0.00120	0.00260	0.00099	0.00096	0.00198
Iron (Fe)-Total	(mg/L)	0.3	**0.836**	**0.761**	0.077	0.293	0.248	0.270	0.113	**0.362**	**0.370**

Notes:

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**** - indicates criteria are Alkalinity dependent

Laboratory Water Quality Results for July 13, 2017

Parameter	Units	PWQO Criterion	CW1 Coldwater Creek - SITE#1 13-Jul-17	CW2 Coldwater Creek - SITE#2 13-Jul-17	CW3 Coldwater Creek - SITE#3 13-Jul-17	CW4 Coldwater Creek - SITE#4 13-Jul-17	CW5 Coldwater Creek - SITE#5 13-Jul-17	CW6 Coldwater Creek - SITE#6 13-Jul-17	CW7 Coldwater Creek - SITE#7 13-Jul-17	CW8 Coldwater Creek - SITE#8 13-Jul-17	Average July
Total Metals Continued											
Lead (Pb)-Total****	(mg/L)	0.001 (<30 mg/L CaCO3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.00009	0.00009
	(mg/L)	0.003 (30-80 mg/L CaCO3)	N/A	N/A	N/A	0.00008	N/A	N/A	<0.000050	N/A	0.00008
	(mg/L)	0.005 (>80 mg/L $CaCO_3$)	0.00029	0.00025	<0.000050	N/A	<0.000050	0.00014	N/A	N/A	0.000225
Lithium (Li)-Total	(mg/L)	N/A	0.0017	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0015
Magnesium (Mg)-Total	(mg/L)	N/A	13.10	11.20	17.40	3.39	8.39	8.66	4.74	3.04	8.7400
Manganese (Mn)-Total	(mg/L)	N/A	0.0357	0.0362	0.00675	0.0269	0.0271	0.0340	0.0203	0.0345	0.0277
Molybdenum (Mo)-Total	(mg/L)	0.04	0.00016	0.00012	0.000183	0.000077	0.000089	0.000232	0.000079	0.00021	0.0001
Nickel (Ni)-Total	(mg/L)	0.025	0.00195	0.00110	<0.00050	0.00057	0.00051	0.00050	<0.00050	<0.00050	0.0009
Potassium (K)-Total	(mg/L)	N/A	0.925	0.830	0.885	0.473	0.464	0.550	0.301	0.242	0.5838
Selenium (Se)-Total	(mg/L)	0.1	0.000097	0.000074	0.000102	0.00015	0.000079	0.000127	0.000063	0.00007	0.0001
Silver (Ag)-Total	(mg/L)	0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	(mg/L)	N/A	2.35	1.64	1.56	0.817	1.09	0.922	0.858	0.877	1.26
Strontium (Sr)-Total	(mg/L)	N/A	0.051	0.0453	0.0492	0.0217	0.0328	0.0333	0.0160	0.0128	0.03
Tellurium (Te)-Total	(mg/L)	N/A	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	(mg/L)	0.0003	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	(mg/L)	N/A	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	(mg/L)	N/A	0.0302	0.0268	0.00250	0.00605	0.00263	0.00378	<0.00030	0.00090	0.0104
Tungsten (W)-Total	(mg/L)	0.03	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	(mg/L)	0.005	0.000384	0.000333	0.000396	0.000159	0.000229	0.000246	0.000083	0.0003	0.0003
Vanadium (V)-Total	(mg/L)	0.006	0.00295	0.00256	0.00162	0.00105	0.0008	0.00090	<0.00050	0.00051	0.0015
Zinc (Zn)-Total	(mg/L)	0.02 (interim)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0056	<0.0030	<0.0030	0.0056
Zirconium (Zr)-Total	(mg/L)	0.004	0.000411	0.000449	0.000076	0.000261	0.000102	0.000161	0.000154	0.000126	0.0002

Notes:

PWQO - Provincial Water Quality Objectives. **Bold indicates exceedance of PWQO criteria**

* - Alkalinity should not be decreased by more than 25% of the natual conditions (Site 7 & 8)

** - indicates criterion is pH and temperature dependent

*** - indicates criterion is pH dependent

**** - indicates criteria are Alkalinity dependent

Appendix K:

Laboratory Certificates of Analysis and Test Results

LAKEHEAD REGION CONSERVATION AUTHORITY
ATTN: Scott Drebit / Gene Kent
130 Conservation Road
P.O. Box 10427
Thunder Bay ON P7B 6T8

Date Received: 14-JUN-17
Report Date: 22-JUN-17 12:26 (MT)
Version: FINAL

Client Phone: 807-344-5857

Certificate of Analysis

Lab Work Order #: L1941445

Project P.O. #: NOT SUBMITTED
Job Reference: COLDWATER CREEK
C of C Numbers:
Legal Site Desc:

Christine Paradis
Project Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-1 COLDWATER CREEK - SITE #8 Sampled By: MD on 13-JUN-17 @ 11:30 Matrix: Grab							
Physical Tests							
Conductivity (EC)	53.3		3.0	uS/cm		14-JUN-17	R3747599
Hardness (as CaCO3)	26.6	HTC	0.50	mg/L		22-JUN-17	
pH	7.37		0.10	pH		14-JUN-17	R3747599
Total Dissolved Solids	41		10	mg/L		17-JUN-17	R3750159
Turbidity	0.54		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	29.7		2.0	mg/L		14-JUN-17	R3747599
Ammonia, Total (as N)	<0.020		0.020	mg/L		16-JUN-17	R3749833
Chloride (Cl)	0.22		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	<0.020		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971
Total Kjeldahl Nitrogen	0.31		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0056		0.0030	mg/L	16-JUN-17	18-JUN-17	R3750190
Sulfate (SO4)	0.76		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	29		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	1120		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.0595		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00023		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.0341		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	6.02		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00028		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Copper (Cu)-Total	0.00073		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.181		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Lithium (Li)-Total	<0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	2.82		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.0188		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000218		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.221		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00076		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	0.000104		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-1 COLDWATER CREEK - SITE #8 Sampled By: MD on 13-JUN-17 @ 11:30 Matrix: Grab							
Total Metals							
Silicon (Si)-Total	1.95		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	0.920		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0121		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.00046		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965
Tungsten (W)-Total	0.00013		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000271		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00067		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000116		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965
L1941445-2 COLDWATER CREEK - SITE #7 Sampled By: MD on 13-JUN-17 @ 12:15 Matrix: Grab							
Physical Tests							
Conductivity (EC)	78.3		3.0	uS/cm		14-JUN-17	R3747599
Hardness (as CaCO3)	41.7	HTC	0.50	mg/L		22-JUN-17	
pH	7.55		0.10	pH		14-JUN-17	R3747599
Total Dissolved Solids	57		20	mg/L		17-JUN-17	R3750157
Turbidity	0.77		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	41.0		2.0	mg/L		14-JUN-17	R3747599
Ammonia, Total (as N)	0.044		0.020	mg/L		16-JUN-17	R3749833
Chloride (Cl)	0.35		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	0.095		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971
Total Kjeldahl Nitrogen	0.44		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0106		0.0030	mg/L	16-JUN-17	18-JUN-17	R3750190
Sulfate (SO4)	1.02		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	1		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	178		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.0512		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00026		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.0633		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-2 COLDWATER CREEK - SITE #7 Sampled By: MD on 13-JUN-17 @ 12:15 Matrix: Grab							
Total Metals							
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	0.0000051		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	9.02		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00022		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Copper (Cu)-Total	0.00103		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.115		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Lithium (Li)-Total	<0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	4.66		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.0111		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000078		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.224		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00045		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Silicon (Si)-Total	1.23		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	0.823		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0144		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.00078		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965
Tungsten (W)-Total	0.00012		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000104		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00059		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000084		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965
L1941445-3 COLDWATER CREEK - SITE #6 Sampled By: MD on 13-JUN-17 @ 12:35 Matrix: Grab							
Physical Tests							
Conductivity (EC)	102		3.0	uS/cm		14-JUN-17	R3747599
Hardness (as CaCO3)	52.3	HTC	0.50	mg/L		22-JUN-17	
pH	7.64		0.10	pH		14-JUN-17	R3747599
Total Dissolved Solids	70		13	mg/L		18-JUN-17	R3750934

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-3 COLDWATER CREEK - SITE #6 Sampled By: MD on 13-JUN-17 @ 12:35 Matrix: Grab							
Physical Tests							
Turbidity	2.36		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	54.2		2.0	mg/L		14-JUN-17	R3747599
Ammonia, Total (as N)	<0.020		0.020	mg/L		16-JUN-17	R3749833
Chloride (Cl)	0.31		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	0.052		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971
Total Kjeldahl Nitrogen	<0.25		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0041		0.0030	mg/L	16-JUN-17	18-JUN-17	R3750190
Sulfate (SO4)	0.87		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	2		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	770		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.0356		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00030		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.0797		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	0.0000065		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	12.0		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00023		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Copper (Cu)-Total	0.00102		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.094		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Lithium (Li)-Total	<0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	5.43		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.0217		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000122		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.334		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00096		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	0.000092		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Silicon (Si)-Total	1.54		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	0.945		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0199		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-3 COLDWATER CREEK - SITE #6 Sampled By: MD on 13-JUN-17 @ 12:35 Matrix: Grab							
Total Metals							
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.00032		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965
Tungsten (W)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000168		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00069		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000087		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965
L1941445-4 COLDWATER CREEK - SITE #5 Sampled By: MD on 13-JUN-17 @ 13:15 Matrix: Grab							
Physical Tests							
Conductivity (EC)	186		3.0	uS/cm		14-JUN-17	R3747599
Hardness (as CaCO3)	98.5	HTC	0.50	mg/L		22-JUN-17	
pH	7.98		0.10	pH		14-JUN-17	R3747599
Total Dissolved Solids	108		13	mg/L		18-JUN-17	R3750934
Turbidity	1.70		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	105		2.0	mg/L		14-JUN-17	R3747599
Ammonia, Total (as N)	<0.020		0.020	mg/L		16-JUN-17	R3749833
Chloride (Cl)	0.76		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	0.037		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971
Total Kjeldahl Nitrogen	<0.25		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0066		0.0030	mg/L	17-JUN-17	19-JUN-17	R3751200
Sulfate (SO4)	1.02		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	84		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	1050		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.0689		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00030		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.164		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	23.1		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-4 COLDWATER CREEK - SITE #5 Sampled By: MD on 13-JUN-17 @ 13:15 Matrix: Grab							
Total Metals							
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00030		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Copper (Cu)-Total	0.00112		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.176		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Lithium (Li)-Total	<0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	9.90		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.0233		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000093		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.480		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00097		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	0.000086		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Silicon (Si)-Total	2.84		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	1.27		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0353		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.00199		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965
Tungsten (W)-Total	0.00011		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000299		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00122		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000097		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965
L1941445-5 COLDWATER CREEK - SITE #4 Sampled By: MD on 13-JUN-17 @ 13:30 Matrix: Grab							
Physical Tests							
Conductivity (EC)	86.3		3.0	uS/cm		14-JUN-17	R3747599
Hardness (as CaCO3)	45.1	HTC	0.50	mg/L		22-JUN-17	
pH	7.55		0.10	pH		14-JUN-17	R3747599
Total Dissolved Solids	71		13	mg/L		18-JUN-17	R3750934
Turbidity	2.18		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	43.5		2.0	mg/L		14-JUN-17	R3747599
Ammonia, Total (as N)	<0.020		0.020	mg/L		16-JUN-17	R3749833

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-5 COLDWATER CREEK - SITE #4 Sampled By: MD on 13-JUN-17 @ 13:30 Matrix: Grab							
Anions and Nutrients							
Chloride (Cl)	0.13		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	0.070		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971
Total Kjeldahl Nitrogen	0.35		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0112		0.0030	mg/L	17-JUN-17	19-JUN-17	R3751200
Sulfate (SO4)	1.18		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	0		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	>2420		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.221		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00037		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.0323		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	0.0000055		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	12.9		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Cesium (Cs)-Total	0.000014		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00061		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	0.00014		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Copper (Cu)-Total	0.00333		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.275		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	0.000057		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Lithium (Li)-Total	<0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	3.15		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.0210		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000066		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	0.00061		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.551		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00142		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	0.000102		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Silicon (Si)-Total	2.32		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	0.770		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0203		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-5 COLDWATER CREEK - SITE #4 Sampled By: MD on 13-JUN-17 @ 13:30 Matrix: Grab							
Total Metals							
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.00659		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965
Tungsten (W)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000167		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00143		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000254		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965
L1941445-6 COLDWATER CREEK - SITE #3 Sampled By: MD on 13-JUN-17 @ 14:15 Matrix: Grab							
Physical Tests							
Conductivity (EC)	331		3.0	uS/cm		14-JUN-17	R3747599
Hardness (as CaCO3)	187	HTC	0.50	mg/L		22-JUN-17	
pH	8.16		0.10	pH		14-JUN-17	R3747599
Total Dissolved Solids	179		13	mg/L		18-JUN-17	R3750934
Turbidity	1.50		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	199		2.0	mg/L		14-JUN-17	R3747599
Ammonia, Total (as N)	0.052		0.020	mg/L		16-JUN-17	R3749833
Chloride (Cl)	0.91		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	0.024		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971
Total Kjeldahl Nitrogen	<0.25		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0117		0.0030	mg/L	17-JUN-17	19-JUN-17	R3751200
Sulfate (SO4)	1.46		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	1		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	210		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.0851		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00045		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.395		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	44.1		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Cesium (Cs)-Total	0.000011		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00034		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-6 COLDWATER CREEK - SITE #3 Sampled By: MD on 13-JUN-17 @ 14:15 Matrix: Grab							
Total Metals							
Copper (Cu)-Total	0.00168		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.096		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Lithium (Li)-Total	<0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	18.7		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.00803		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000189		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.869		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00114		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	0.000091		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Silicon (Si)-Total	4.13		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	1.62		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0502		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.00365		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965
Tungsten (W)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000428		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00198		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000093		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965
L1941445-7 COLDWATER CREEK - SITE #2 Sampled By: MD on 13-JUN-17 @ 14:35 Matrix: Grab							
Physical Tests							
Conductivity (EC)	251		3.0	uS/cm		16-JUN-17	R3749839
Hardness (as CaCO3)	139	HTC	0.50	mg/L		22-JUN-17	
pH	8.16		0.10	pH		16-JUN-17	R3749839
Total Dissolved Solids	147		13	mg/L		18-JUN-17	R3750934
Turbidity	6.27		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	142		2.0	mg/L		16-JUN-17	R3749839
Ammonia, Total (as N)	<0.020		0.020	mg/L		16-JUN-17	R3749833
Chloride (Cl)	0.93		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	0.026		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-7 COLDWATER CREEK - SITE #2 Sampled By: MD on 13-JUN-17 @ 14:35 Matrix: Grab							
Anions and Nutrients							
Total Kjeldahl Nitrogen	<0.25		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0126		0.0030	mg/L	17-JUN-17	19-JUN-17	R3751200
Sulfate (SO4)	1.49		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	28		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	687		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.287		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00046		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.210		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	0.0000057		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	34.4		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Cesium (Cs)-Total	0.000025		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00068		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	0.00018		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Copper (Cu)-Total	0.00184		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.370		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	0.000097		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Lithium (Li)-Total	<0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	12.8		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.0203		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000143		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	0.00068		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.833		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00167		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	0.000102		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Silicon (Si)-Total	4.09		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	1.69		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0472		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.0112		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-7 COLDWATER CREEK - SITE #2 Sampled By: MD on 13-JUN-17 @ 14:35 Matrix: Grab							
Total Metals							
Tungsten (W)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000436		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00227		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000244		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965
L1941445-8 COLDWATER CREEK - SITE #1 Sampled By: MD on 13-JUN-17 @ 15:10 Matrix: Grab							
Physical Tests							
Conductivity (EC)	273		3.0	uS/cm		16-JUN-17	R3749839
Hardness (as CaCO3)	156	HTC	0.50	mg/L		22-JUN-17	
pH	8.24		0.10	pH		16-JUN-17	R3749839
Total Dissolved Solids	160		13	mg/L		18-JUN-17	R3750934
Turbidity	5.83		0.10	NTU		14-JUN-17	R3747282
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	153		2.0	mg/L		16-JUN-17	R3749839
Ammonia, Total (as N)	0.240		0.020	mg/L		16-JUN-17	R3749833
Chloride (Cl)	1.90		0.10	mg/L		14-JUN-17	R3747971
Nitrate (as N)	0.023		0.020	mg/L		14-JUN-17	R3747971
Nitrite (as N)	<0.010		0.010	mg/L		14-JUN-17	R3747971
Total Kjeldahl Nitrogen	0.38		0.25	mg/L	17-JUN-17	18-JUN-17	R3750219
Phosphorus (P)-Total	0.0116		0.0030	mg/L	17-JUN-17	19-JUN-17	R3751200
Sulfate (SO4)	1.79		0.30	mg/L		14-JUN-17	R3747971
Bacteriological Tests							
Escherichia Coli	25		0	MPN/100mL		14-JUN-17	R3748455
Total Coliforms	435		0	MPN/100mL		14-JUN-17	R3748455
Total Metals							
Aluminum (Al)-Total	0.254		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Arsenic (As)-Total	0.00047		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Barium (Ba)-Total	0.253		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Boron (B)-Total	<0.010		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cadmium (Cd)-Total	0.0000058		0.0000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Calcium (Ca)-Total	38.4		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Cesium (Cs)-Total	0.000021		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Chromium (Cr)-Total	0.00059		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Cobalt (Co)-Total	0.00016		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Copper (Cu)-Total	0.00197		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Iron (Fe)-Total	0.302		0.010	mg/L	20-JUN-17	21-JUN-17	R3752965
Lead (Pb)-Total	0.000082		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1941445-8 COLDWATER CREEK - SITE #1 Sampled By: MD on 13-JUN-17 @ 15:10 Matrix: Grab							
Total Metals							
Lithium (Li)-Total	0.0010		0.0010	mg/L	20-JUN-17	21-JUN-17	R3752965
Magnesium (Mg)-Total	14.5		0.0050	mg/L	20-JUN-17	21-JUN-17	R3752965
Manganese (Mn)-Total	0.0180		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Molybdenum (Mo)-Total	0.000164		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Nickel (Ni)-Total	0.00066		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Phosphorus (P)-Total	<0.050		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Potassium (K)-Total	0.899		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Rubidium (Rb)-Total	0.00151		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Selenium (Se)-Total	0.000145		0.000050	mg/L	20-JUN-17	21-JUN-17	R3752965
Silicon (Si)-Total	4.06		0.10	mg/L	20-JUN-17	21-JUN-17	R3752965
Silver (Ag)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Sodium (Na)-Total	2.23		0.050	mg/L	20-JUN-17	21-JUN-17	R3752965
Strontium (Sr)-Total	0.0516		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Sulfur (S)-Total	<0.50		0.50	mg/L	20-JUN-17	21-JUN-17	R3752965
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	20-JUN-17	21-JUN-17	R3752965
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Thorium (Th)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Tin (Sn)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Titanium (Ti)-Total	0.00988		0.00030	mg/L	20-JUN-17	21-JUN-17	R3752965
Tungsten (W)-Total	<0.00010		0.00010	mg/L	20-JUN-17	21-JUN-17	R3752965
Uranium (U)-Total	0.000468		0.000010	mg/L	20-JUN-17	21-JUN-17	R3752965
Vanadium (V)-Total	0.00237		0.00050	mg/L	20-JUN-17	21-JUN-17	R3752965
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	20-JUN-17	21-JUN-17	R3752965
Zirconium (Zr)-Total	0.000209		0.000060	mg/L	20-JUN-17	21-JUN-17	R3752965

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Barium (Ba)-Total	B	L1941445-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Aluminum (Al)-Total	MS-B	L1941445-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L1941445-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Total	MS-B	L1941445-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1941445-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L1941445-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L1941445-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Phosphorus (P)-Total	MS-B	L1941445-4, -5, -6, -7, -8

Sample Parameter Qualifier key listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-TB	Water	Alkalinity	APHA 2320B modified

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

CL-L-IC-N-TB	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-TITR-TB	Water	Conductivity	APHA 2510 B

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-TB	Water	Hardness (as CaCO3)	CALCULATION
MET-T-CCMS-TB	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-COL-TB	Water	Ammonia by Discrete Analyzer	APHA 4500-NH3 G. (modified)

Ammonia in aqueous matrices is analyzed using discrete analyzer with colourimetric detection.

NO2-IC-N-TB	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-TB	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-TB	Water	Total Phosphorus by Discrete Analyzer	APHA 4500-P B, F, G (modified)

Phosphorus in aqueous matrices is analyzed using discrete Analyzer with colourimetric detection.

PH-TITR-TB	Water	pH	APHA 4500-H

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

SO4-IC-N-TB	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TC,EC-QT97-TB	Water	Total Coliform and E.coli	APHA 9223 B

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture of hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

TDS-TB	Water	Total Dissolved Solids	APHA 2540 C (modified)

Aqueous matrices are analyzed using gravimetry and evaporation

TKN-COL-TB	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg (modified)

Total Kjeldahl Nitrogen in aqueous matrices is analyzed using a discrete analyzer with colourimetric detection.

		Turbidity	APHA 2130 B-Nephelometer

Reference Information

TURBIDITY-TB Water
Aqueous matrices are analyzed using nephelometry with the light scatter measured at a 90” angle.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
TB	ALS ENVIRONMENTAL - THUNDER BAY, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS
Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1941445 Report Date: 22-JUN-17

Client: LAKEHEAD REGION CONSERVATION AUTHORITY
130 Conservation Road P.O. Box 10427
Thunder Bay ON P7B 6T8
Contact: Scott Drebit / Gene Kent

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-TB	**Water**							
Batch R3747599								
WG2548092-11 LCS								
Alkalinity, Total (as CaCO3)			102.8		%		85-115	14-JUN-17
WG2548092-10 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	14-JUN-17
Batch R3749839								
WG2549966-5 LCS								
Alkalinity, Total (as CaCO3)			100.5		%		85-115	16-JUN-17
WG2549966-4 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	16-JUN-17
CL-L-IC-N-TB	**Water**							
Batch R3747971								
WG2548264-7 DUP		**L1941445-1**						
Chloride (Cl)		0.22	0.20		mg/L	9.6	20	14-JUN-17
WG2548264-6 LCS								
Chloride (Cl)			102.1		%		90-110	14-JUN-17
WG2548264-5 MB								
Chloride (Cl)			<0.10		mg/L		0.1	14-JUN-17
WG2548264-8 MS		**L1941445-1**						
Chloride (Cl)			106.4		%		75-125	14-JUN-17
EC-TITR-TB	**Water**							
Batch R3747599								
WG2548092-11 LCS								
Conductivity (EC)			99.3		%		90-110	14-JUN-17
WG2548092-10 MB								
Conductivity (EC)			<3.0		uS/cm		3	14-JUN-17
Batch R3749839								
WG2549966-5 LCS								
Conductivity (EC)			96.0		%		90-110	16-JUN-17
WG2549966-4 MB								
Conductivity (EC)			<3.0		uS/cm		3	16-JUN-17
MET-T-CCMS-TB	**Water**							
Batch R3752965								
WG2552253-3 DUP		**L1941445-8**						
Aluminum (Al)-Total		0.254	0.259		mg/L	2.3	20	21-JUN-17
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-JUN-17
Arsenic (As)-Total		0.00047	0.00044		mg/L	6.0	20	21-JUN-17
Barium (Ba)-Total		0.253	0.246		mg/L	2.6	20	21-JUN-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3752965								
WG2552253-3 DUP		**L1941445-8**						
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-JUN-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	21-JUN-17
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	21-JUN-17
Cadmium (Cd)-Total		0.0000058	0.0000066		mg/L	13	20	21-JUN-17
Calcium (Ca)-Total		38.4	38.9		mg/L	1.4	20	21-JUN-17
Cesium (Cs)-Total		0.000021	0.000023		mg/L	7.2	20	21-JUN-17
Chromium (Cr)-Total		0.00059	0.00062		mg/L	3.6	20	21-JUN-17
Cobalt (Co)-Total		0.00016	0.00018		mg/L	7.9	20	21-JUN-17
Copper (Cu)-Total		0.00197	0.00198		mg/L	0.2	20	21-JUN-17
Iron (Fe)-Total		0.302	0.314		mg/L	4.0	20	21-JUN-17
Lead (Pb)-Total		0.000082	0.000080		mg/L	2.4	20	21-JUN-17
Lithium (Li)-Total		0.0010	<0.0010	RPD-NA	mg/L	N/A	20	21-JUN-17
Magnesium (Mg)-Total		14.5	14.2		mg/L	2.3	20	21-JUN-17
Manganese (Mn)-Total		0.0180	0.0186		mg/L	2.9	20	21-JUN-17
Molybdenum (Mo)-Total		0.000164	0.000165		mg/L	0.4	20	21-JUN-17
Nickel (Ni)-Total		0.00066	0.00067		mg/L	1.4	20	21-JUN-17
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	21-JUN-17
Potassium (K)-Total		0.899	0.908		mg/L	0.9	20	21-JUN-17
Rubidium (Rb)-Total		0.00151	0.00161		mg/L	6.4	20	21-JUN-17
Selenium (Se)-Total		0.000145	0.000094	J	mg/L	0.000052	0.0001	21-JUN-17
Silicon (Si)-Total		4.06	4.18		mg/L	2.8	20	21-JUN-17
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-JUN-17
Sodium (Na)-Total		2.23	2.33		mg/L	4.2	20	21-JUN-17
Strontium (Sr)-Total		0.0516	0.0522		mg/L	1.3	20	21-JUN-17
Sulfur (S)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	21-JUN-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	21-JUN-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	21-JUN-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-JUN-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-JUN-17
Titanium (Ti)-Total		0.00988	0.0102		mg/L	3.1	20	21-JUN-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	21-JUN-17
Uranium (U)-Total		0.000468	0.000456		mg/L	2.7	20	21-JUN-17
Vanadium (V)-Total		0.00237	0.00235		mg/L	0.7	20	21-JUN-17
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	21-JUN-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3752965								
WG2552253-3 DUP		**L1941445-8**						
Zirconium (Zr)-Total		0.000209	0.000232		mg/L	10	20	21-JUN-17
WG2552253-2 LCS								
Aluminum (Al)-Total			105.3		%		80-120	21-JUN-17
Antimony (Sb)-Total			100.6		%		80-120	21-JUN-17
Arsenic (As)-Total			102.3		%		80-120	21-JUN-17
Barium (Ba)-Total			100.4		%		80-120	21-JUN-17
Beryllium (Be)-Total			101.1		%		80-120	21-JUN-17
Bismuth (Bi)-Total			98.0		%		80-120	21-JUN-17
Boron (B)-Total			95.1		%		80-120	21-JUN-17
Cadmium (Cd)-Total			102.3		%		80-120	21-JUN-17
Calcium (Ca)-Total			99.96		%		80-120	21-JUN-17
Cesium (Cs)-Total			100.9		%		80-120	21-JUN-17
Chromium (Cr)-Total			102.6		%		80-120	21-JUN-17
Cobalt (Co)-Total			101.2		%		80-120	21-JUN-17
Copper (Cu)-Total			102.6		%		80-120	21-JUN-17
Iron (Fe)-Total			105.3		%		80-120	21-JUN-17
Lead (Pb)-Total			95.6		%		80-120	21-JUN-17
Lithium (Li)-Total			101.7		%		80-120	21-JUN-17
Magnesium (Mg)-Total			105.1		%		80-120	21-JUN-17
Manganese (Mn)-Total			102.2		%		80-120	21-JUN-17
Molybdenum (Mo)-Total			95.9		%		80-120	21-JUN-17
Nickel (Ni)-Total			100.9		%		80-120	21-JUN-17
Phosphorus (P)-Total			105.8		%		70-130	21-JUN-17
Potassium (K)-Total			100.5		%		80-120	21-JUN-17
Rubidium (Rb)-Total			98.7		%		80-120	21-JUN-17
Selenium (Se)-Total			98.3		%		80-120	21-JUN-17
Silicon (Si)-Total			123.0		%		60-140	21-JUN-17
Silver (Ag)-Total			95.7		%		80-120	21-JUN-17
Sodium (Na)-Total			108.4		%		80-120	21-JUN-17
Strontium (Sr)-Total			100.7		%		80-120	21-JUN-17
Sulfur (S)-Total			93.7		%		80-120	21-JUN-17
Tellurium (Te)-Total			97.8		%		80-120	21-JUN-17
Thallium (Tl)-Total			99.6		%		80-120	21-JUN-17
Thorium (Th)-Total			99.9		%		80-120	21-JUN-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3752965								
WG2552253-2 LCS								
Tin (Sn)-Total			99.8		%		80-120	21-JUN-17
Titanium (Ti)-Total			98.7		%		80-120	21-JUN-17
Tungsten (W)-Total			97.8		%		80-120	21-JUN-17
Uranium (U)-Total			101.0		%		80-120	21-JUN-17
Vanadium (V)-Total			102.6		%		80-120	21-JUN-17
Zinc (Zn)-Total			94.0		%		80-120	21-JUN-17
Zirconium (Zr)-Total			96.9		%		80-120	21-JUN-17
WG2552253-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	21-JUN-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Barium (Ba)-Total			0.000354	B	mg/L		0.00005	21-JUN-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	21-JUN-17
Boron (B)-Total			<0.010		mg/L		0.01	21-JUN-17
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	21-JUN-17
Calcium (Ca)-Total			<0.050		mg/L		0.05	21-JUN-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	21-JUN-17
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Copper (Cu)-Total			<0.00050		mg/L		0.0005	21-JUN-17
Iron (Fe)-Total			<0.010		mg/L		0.01	21-JUN-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	21-JUN-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	21-JUN-17
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	21-JUN-17
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	21-JUN-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	21-JUN-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	21-JUN-17
Potassium (K)-Total			<0.050		mg/L		0.05	21-JUN-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	21-JUN-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	21-JUN-17
Silicon (Si)-Total			<0.10		mg/L		0.1	21-JUN-17
Silver (Ag)-Total			<0.000010		mg/L		0.00001	21-JUN-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3752965								
WG2552253-1 MB								
Sodium (Na)-Total			<0.050		mg/L		0.05	21-JUN-17
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	21-JUN-17
Sulfur (S)-Total			<0.50		mg/L		0.5	21-JUN-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	21-JUN-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	21-JUN-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	21-JUN-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	21-JUN-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	21-JUN-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	21-JUN-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	21-JUN-17
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	21-JUN-17
WG2552253-4 MS		**L1941445-8**						
Aluminum (Al)-Total			N/A	MS-B	%		-	21-JUN-17
Antimony (Sb)-Total			105.0		%		70-130	21-JUN-17
Arsenic (As)-Total			105.9		%		70-130	21-JUN-17
Barium (Ba)-Total			N/A	MS-B	%		-	21-JUN-17
Beryllium (Be)-Total			96.7		%		70-130	21-JUN-17
Bismuth (Bi)-Total			101.8		%		70-130	21-JUN-17
Boron (B)-Total			100.5		%		70-130	21-JUN-17
Cadmium (Cd)-Total			108.9		%		70-120	21-JUN-17
Calcium (Ca)-Total			N/A	MS-B	%		-	21-JUN-17
Cesium (Cs)-Total			105.0		%		70-130	21-JUN-17
Chromium (Cr)-Total			104.4		%		70-130	21-JUN-17
Cobalt (Co)-Total			102.8		%		70-130	21-JUN-17
Copper (Cu)-Total			106.2		%		70-130	21-JUN-17
Iron (Fe)-Total			103.4		%		70-130	21-JUN-17
Lead (Pb)-Total			102.1		%		70-130	21-JUN-17
Lithium (Li)-Total			92.6		%		70-130	21-JUN-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	21-JUN-17
Manganese (Mn)-Total			101.8		%		70-130	21-JUN-17
Molybdenum (Mo)-Total			103.8		%		70-130	21-JUN-17
Nickel (Ni)-Total			102.0		%		70-130	21-JUN-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3752965								
WG2552253-4 MS		**L1941445-8**						
Phosphorus (P)-Total			102.3		%		70-130	21-JUN-17
Potassium (K)-Total			102.6		%		70-130	21-JUN-17
Rubidium (Rb)-Total			104.2		%		70-130	21-JUN-17
Selenium (Se)-Total			115.1		%		70-130	21-JUN-17
Silicon (Si)-Total			98.5		%		70-130	21-JUN-17
Silver (Ag)-Total			100.5		%		70-130	21-JUN-17
Sodium (Na)-Total			N/A	MS-B	%		-	21-JUN-17
Strontium (Sr)-Total			N/A	MS-B	%		-	21-JUN-17
Sulfur (S)-Total			114.1		%		70-130	21-JUN-17
Tellurium (Te)-Total			101.4		%		70-130	21-JUN-17
Thallium (Tl)-Total			106.7		%		70-130	21-JUN-17
Thorium (Th)-Total			113.2		%		70-130	21-JUN-17
Tin (Sn)-Total			103.7		%		70-130	21-JUN-17
Titanium (Ti)-Total			108.5		%		70-130	21-JUN-17
Tungsten (W)-Total			106.3		%		70-130	21-JUN-17
Uranium (U)-Total			109.7		%		70-130	21-JUN-17
Vanadium (V)-Total			106.0		%		70-130	21-JUN-17
Zinc (Zn)-Total			98.0		%		70-130	21-JUN-17
Zirconium (Zr)-Total			102.8		%		70-130	21-JUN-17
NH3-COL-TB	**Water**							
Batch R3749833								
WG2550189-8 DUP		**L1941445-1**						
Ammonia, Total (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	16-JUN-17
WG2550189-6 LCS								
Ammonia, Total (as N)			98.2		%		85-115	16-JUN-17
WG2550189-5 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	16-JUN-17
WG2550189-7 MS		**L1941445-1**						
Ammonia, Total (as N)			93.0		%		75-125	16-JUN-17
NO2-IC-N-TB	**Water**							
Batch R3747971								
WG2548264-7 DUP		**L1941445-1**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	14-JUN-17
WG2548264-6 LCS								
Nitrite (as N)			99.0		%		90-110	14-JUN-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-N-TB	**Water**							
Batch R3747971								
WG2548264-5 MB								
Nitrite (as N)			<0.010		mg/L		0.01	14-JUN-17
WG2548264-8 MS		**L1941445-1**						
Nitrite (as N)			105.0		%		75-125	14-JUN-17
NO3-IC-N-TB	**Water**							
Batch R3747971								
WG2548264-7 DUP		**L1941445-1**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	14-JUN-17
WG2548264-6 LCS								
Nitrate (as N)			103.8		%		90-110	14-JUN-17
WG2548264-5 MB								
Nitrate (as N)			<0.020		mg/L		0.02	14-JUN-17
WG2548264-8 MS		**L1941445-1**						
Nitrate (as N)			112.3		%		75-125	14-JUN-17
P-T-COL-TB	**Water**							
Batch R3750190								
WG2549981-6 LCS								
Phosphorus (P)-Total			99.6		%		80-120	18-JUN-17
WG2549981-5 MB								
Phosphorus (P)-Total			<0.0030		mg/L		0.003	18-JUN-17
Batch R3751200								
WG2550905-2 LCS								
Phosphorus (P)-Total			99.5		%		80-120	19-JUN-17
WG2550905-1 MB								
Phosphorus (P)-Total			<0.0030		mg/L		0.003	19-JUN-17
PH-TITR-TB	**Water**							
Batch R3747599								
WG2548092-11 LCS								
pH			6.02		pH		5.9-6.1	14-JUN-17
Batch R3749839								
WG2549966-5 LCS								
pH			6.01		pH		5.9-6.1	16-JUN-17
SO4-IC-N-TB	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-TB	**Water**							
Batch R3747971								
WG2548264-7 DUP		**L1941445-1**						
Sulfate (SO4)		0.76	0.75		mg/L	2.4	20	14-JUN-17
WG2548264-6 LCS								
Sulfate (SO4)			103.0		%		90-110	14-JUN-17
WG2548264-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	14-JUN-17
WG2548264-8 MS		**L1941445-1**						
Sulfate (SO4)			106.9		%		75-125	14-JUN-17
TC,EC-QT97-TB	**Water**							
Batch R3748455								
WG2548270-1 MB								
Total Coliforms			0		MPN/100mL		1	14-JUN-17
Escherichia Coli			0		MPN/100mL		1	14-JUN-17
TDS-TB	**Water**							
Batch R3750157								
WG2551046-2 LCS								
Total Dissolved Solids			99.7		%		85-115	17-JUN-17
WG2551046-1 MB								
Total Dissolved Solids			<10		mg/L		10	17-JUN-17
Batch R3750159								
WG2550862-2 LCS								
Total Dissolved Solids			100.1		%		85-115	17-JUN-17
WG2550862-1 MB								
Total Dissolved Solids			<10		mg/L		10	17-JUN-17
Batch R3750934								
WG2551164-2 LCS								
Total Dissolved Solids			102.2		%		85-115	18-JUN-17
WG2551164-1 MB								
Total Dissolved Solids			<10		mg/L		10	18-JUN-17
TKN-COL-TB	**Water**							
Batch R3750219								
WG2550492-7 DUP		**L1941445-5**						
Total Kjeldahl Nitrogen		0.35	0.30		mg/L	15	20	18-JUN-17
WG2550492-6 LCS								
Total Kjeldahl Nitrogen			91.5		%		75-125	18-JUN-17
WG2550492-5 MB								
Total Kjeldahl Nitrogen			<0.25		mg/L		0.25	18-JUN-17
WG2550492-8 MS		**L1941445-5**						

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-COL-TB	**Water**							
Batch R3750219								
WG2550492-8 MS		**L1941445-5**						
Total Kjeldahl Nitrogen			98.1		%		70-130	18-JUN-17
TURBIDITY-TB	**Water**							
Batch R3747282								
WG2548335-3 DUP		**L1941445-3**						
Turbidity		2.36	2.33		NTU	1.3	15	14-JUN-17
WG2548335-2 LCS								
Turbidity			110.1		%		85-115	14-JUN-17
WG2548335-1 MB								
Turbidity			<0.10		NTU		0.1	14-JUN-17

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environ

L1941445-COFC

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Group A Campbell Brothers Limited Company www.alsglobal.com

L1941445

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Page 1 of 1

Company:	Lakehead Region Conservation Authority		Regulatory Information	Both questions below must answered for water samples	
Contact:	Scott Drebit		☐ O. Reg 153 (O. Reg 511 Amend) Table:____	Are any samples taken from a regulated DW System?	☐ Yes ☒ No
Address:	130 Conservation Road		Record of Site Condition ☐ Yes ☐ No	If yes, an authorized DW COC must be used.	
			PWQO ☐ MISA ☐ MMER ☐ CCME ☐	Is the water sampled Intended for human consumption?	☐ Yes ☒ No
Phone:	807-344-5857	Fax: 807 345 9156	Guideline Required:		
Email:	Scott@lakeheadca.com		TCLP Regulation 558 ☐ Other:		
Project:	Coldwater Creek	PO:	Service Requested	Analysis Request	
Quote #	Q62558		☒ Regular TAT (7 Days)	Please indicate below Filtered, Preserved or both (F, P, F/P)	
Invoice To:		Same as Report: ☒ Yes ☐ No	☐ Priority TAT 50% Surcharge (3-5 Days)		
Company:			☐ Emergency TAT 100% Surcharge (1-2 Days)		
Contact:			Specify Date Required:		
Address:			All TAT quoted material is in business days which exclude statutory holidays and weekends. Samples received past 3:00pm or Saturday/Sunday begin the next day.		
Email:					
Account Manager		Sampler: MD			

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Alkalinity, Conductivity, pH	Chloride, Nitrate, Nitrite, Sulphate	TDS, Turbidity	NH3, TKN, TP	Metals, Total + Hardness	TC/EC								Number of Containers
CW8	Coldwater Creek - Site #8	13-June-17	11:30	Grab	X	X	X	X	X	X								5
CW7	Coldwater Creek - Site #7	13-June-17	12:15	Grab	X	X	X	X	X	X								5
CW6	Coldwater Creek - Site #6	13-June-17	12:35	Grab	X	X	X	X	X	X								5
CW5	Coldwater Creek - Site #5	13-June-17	13:15	Grab	X	X	X	X	X	X								5
CW4	Coldwater Creek - Site #4	13-June-17	13:30	Grab	X	X	X	X	X	X								5
CW3	Coldwater Creek - Site #3	13-June-17	14:15	Grab	X	X	X	X	X	X								5
CW2	Coldwater Creek - Site #2	13-June-17	14:35	Grab	X	X	X	X	X	X								5
CW1	Coldwater Creek - Site #1	13-June-17	15:10	Grab	X	X	X	X	X	X								5

Special Instructions / Comments

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time	Received by:	Date & Time	Temp	Cooling Initiated	Verified by:	Date & Time	Observations: Yes / No ? If Yes add SIF
Michael Dykstra	June 14/17 09:30	MM	14 June 17 935	8.0	☒ Yes ☐ No			

Failure to complete all portions of this form may delay analysis. **TAT may vary dependant on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs. Any known or suspected hazards relating to a sample must be noted on the chain of custody in the comments section. By use of the form the user acknowledges and agrees with the Terms and Conditions as specified on the back page.

JRR

LAKEHEAD REGION CONSERVATION AUTHORITY
ATTN: Scott Drebit
130 Conservation Road
P.O. Box 10427
Thunder Bav ON P7B 6T8

Date Received: 13-JUL-17
Report Date: 20-JUL-17 14:33 (MT)
Version: FINAL

Client Phone: 807-344-5857

Certificate of Analysis

Lab Work Order #: L1958096

Project P.O. #: 8118
Job Reference: COLD WATER
C of C Numbers:
Legal Site Desc:

Christina Shepherd
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-1 COLDWATER CREEK SITE 8 Sampled By: MD on 13-JUL-17 @ 12:15 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	55.7		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	30.2	HTC	0.50	mg/L		19-JUL-17	
pH	7.33		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	49		10	mg/L		14-JUL-17	R3772598
Turbidity	0.70		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	29.3		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	0.087		0.020	mg/L		14-JUL-17	R3772596
Chloride (Cl)	0.22		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	0.059		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918
Total Kjeldahl Nitrogen	0.45		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0054		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	1.59		0.30	mg/L		14-JUL-17	R3771918
Bacteriological Tests							
Escherichia Coli	16		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	>2420		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.106		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Arsenic (As)-Total	0.00029		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Barium (Ba)-Total	0.0391		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Boron (B)-Total	<0.010		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cadmium (Cd)-Total	0.0000080		0.0000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Calcium (Ca)-Total	7.09		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Chromium (Cr)-Total	0.00028		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cobalt (Co)-Total	0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Copper (Cu)-Total	0.00096		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Iron (Fe)-Total	0.362		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Lead (Pb)-Total	0.000085		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Lithium (Li)-Total	<0.0010		0.0010	mg/L	16-JUL-17	17-JUL-17	R3776966
Magnesium (Mg)-Total	3.04		0.0050	mg/L	16-JUL-17	17-JUL-17	R3776966
Manganese (Mn)-Total	0.0345		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Molybdenum (Mo)-Total	0.000210		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Phosphorus (P)-Total	<0.050		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Potassium (K)-Total	0.242		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Rubidium (Rb)-Total	0.00087		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Selenium (Se)-Total	0.000070		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-1 COLDWATER CREEK SITE 8 Sampled By: MD on 13-JUL-17 @ 12:15 Matrix: GRAB							
Total Metals							
Silicon (Si)-Total	3.09		0.10	mg/L	16-JUL-17	17-JUL-17	R3776966
Silver (Ag)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Sodium (Na)-Total	0.877		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Strontium (Sr)-Total	0.0128		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Sulfur (S)-Total	0.52		0.50	mg/L	16-JUL-17	17-JUL-17	R3776966
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Thorium (Th)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Tin (Sn)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Titanium (Ti)-Total	0.00090		0.00030	mg/L	16-JUL-17	17-JUL-17	R3776966
Tungsten (W)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Uranium (U)-Total	0.000300		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Vanadium (V)-Total	0.00051		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Zirconium (Zr)-Total	0.000126		0.000060	mg/L	16-JUL-17	17-JUL-17	R3776966
L1958096-2 COLDWATER CREEK SITE 7 Sampled By: MD on 13-JUL-17 @ 12:30 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	83.6		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	45.9	HTC	0.50	mg/L		20-JUL-17	
pH	7.62		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	57		10	mg/L		14-JUL-17	R3772598
Turbidity	0.88		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	43.9		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	0.050		0.020	mg/L		14-JUL-17	R3772596
Chloride (Cl)	0.39		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	<0.020		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918
Total Kjeldahl Nitrogen	0.38		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0073		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	1.96		0.30	mg/L		14-JUL-17	R3771918
Bacteriological Tests							
Escherichia Coli	9		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	>2420		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.0149		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Arsenic (As)-Total	0.00025		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Barium (Ba)-Total	0.0729		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-2 COLDWATER CREEK SITE 7 Sampled By: MD on 13-JUL-17 @ 12:30 Matrix: GRAB							
Total Metals							
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Boron (B)-Total	<0.010		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Calcium (Ca)-Total	10.6		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Chromium (Cr)-Total	0.00019		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Copper (Cu)-Total	0.00099		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Iron (Fe)-Total	0.113		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Lead (Pb)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Lithium (Li)-Total	<0.0010		0.0010	mg/L	16-JUL-17	17-JUL-17	R3776966
Magnesium (Mg)-Total	4.74		0.0050	mg/L	16-JUL-17	17-JUL-17	R3776966
Manganese (Mn)-Total	0.0203		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Molybdenum (Mo)-Total	0.000079		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Phosphorus (P)-Total	<0.050		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Potassium (K)-Total	0.301		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Rubidium (Rb)-Total	0.00055		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Selenium (Se)-Total	0.000063		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Silicon (Si)-Total	1.11		0.10	mg/L	16-JUL-17	17-JUL-17	R3776966
Silver (Ag)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Sodium (Na)-Total	0.858		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Strontium (Sr)-Total	0.0160		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Sulfur (S)-Total	0.60		0.50	mg/L	16-JUL-17	17-JUL-17	R3776966
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Thorium (Th)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Tin (Sn)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Titanium (Ti)-Total	<0.00030		0.00030	mg/L	16-JUL-17	17-JUL-17	R3776966
Tungsten (W)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Uranium (U)-Total	0.000083		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Vanadium (V)-Total	<0.00050		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Zirconium (Zr)-Total	0.000154		0.000060	mg/L	16-JUL-17	17-JUL-17	R3776966
L1958096-3 COLDWATER CREEK SITE 6 Sampled By: MD on 13-JUL-17 @ 13:00 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	162		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	88.7	HTC	0.50	mg/L		19-JUL-17	
pH	7.80		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	97		13	mg/L		14-JUL-17	R3772598

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-3 COLDWATER CREEK SITE 6 Sampled By: MD on 13-JUL-17 @ 13:00 Matrix: GRAB							
Physical Tests							
Turbidity	0.54		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	88.3		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	0.076		0.020	mg/L		14-JUL-17	R3772596
Chloride (Cl)	0.58		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	<0.020		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918
Total Kjeldahl Nitrogen	0.42		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0102		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	1.55		0.30	mg/L		15-JUL-17	R3772619
Bacteriological Tests							
Escherichia Coli	5		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	770		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.180		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Arsenic (As)-Total	0.00041		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Barium (Ba)-Total	0.148		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Boron (B)-Total	<0.010		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cadmium (Cd)-Total	0.0000077		0.0000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Calcium (Ca)-Total	21.3		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Cesium (Cs)-Total	0.000036		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Chromium (Cr)-Total	0.00045		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cobalt (Co)-Total	0.00014		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Copper (Cu)-Total	0.00260		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Iron (Fe)-Total	0.270		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Lead (Pb)-Total	0.000138		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Lithium (Li)-Total	<0.0010		0.0010	mg/L	16-JUL-17	17-JUL-17	R3776966
Magnesium (Mg)-Total	8.66		0.0050	mg/L	16-JUL-17	17-JUL-17	R3776966
Manganese (Mn)-Total	0.0340		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Molybdenum (Mo)-Total	0.000232		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Nickel (Ni)-Total	0.00050		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Phosphorus (P)-Total	<0.050		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Potassium (K)-Total	0.550		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Rubidium (Rb)-Total	0.00110		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Selenium (Se)-Total	0.000127		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Silicon (Si)-Total	2.72		0.10	mg/L	16-JUL-17	17-JUL-17	R3776966
Silver (Ag)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Sodium (Na)-Total	0.922		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Strontium (Sr)-Total	0.0333		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-3 COLDWATER CREEK SITE 6 Sampled By: MD on 13-JUL-17 @ 13:00 Matrix: GRAB							
Total Metals							
Sulfur (S)-Total	<0.50		0.50	mg/L	16-JUL-17	17-JUL-17	R3776966
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Thorium (Th)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Tin (Sn)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Titanium (Ti)-Total	0.00378		0.00030	mg/L	16-JUL-17	17-JUL-17	R3776966
Tungsten (W)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Uranium (U)-Total	0.000246		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Vanadium (V)-Total	0.00090		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Zinc (Zn)-Total	0.0056		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Zirconium (Zr)-Total	0.000161		0.000060	mg/L	16-JUL-17	17-JUL-17	R3776966
L1958096-4 COLDWATER CREEK SITE 5 Sampled By: MD on 13-JUL-17 @ 13:20 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	164		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	87.9	HTC	0.50	mg/L		19-JUL-17	
pH	7.99		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	95		13	mg/L		14-JUL-17	R3772598
Turbidity	2.57		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	89.8		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	0.114		0.020	mg/L		14-JUL-17	R3772596
Chloride (Cl)	0.79		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	0.033		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918
Total Kjeldahl Nitrogen	0.37		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0064		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	1.85		0.30	mg/L		14-JUL-17	R3771918
Bacteriological Tests							
Escherichia Coli	67		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	2420		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.0803		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Arsenic (As)-Total	0.00031		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Barium (Ba)-Total	0.141		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Boron (B)-Total	<0.010		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Calcium (Ca)-Total	21.4		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-4 COLDWATER CREEK SITE 5 Sampled By: MD on 13-JUL-17 @ 13:20 Matrix: GRAB							
Total Metals							
Cesium (Cs)-Total	0.000011		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Chromium (Cr)-Total	0.00061		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Copper (Cu)-Total	0.00120		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Iron (Fe)-Total	0.248		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Lead (Pb)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Lithium (Li)-Total	<0.0010		0.0010	mg/L	16-JUL-17	17-JUL-17	R3776966
Magnesium (Mg)-Total	8.39		0.0050	mg/L	16-JUL-17	17-JUL-17	R3776966
Manganese (Mn)-Total	0.0271		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Molybdenum (Mo)-Total	0.000089		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Nickel (Ni)-Total	0.00051		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Phosphorus (P)-Total	<0.050		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Potassium (K)-Total	0.464		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Rubidium (Rb)-Total	0.00105		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Selenium (Se)-Total	0.000079		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Silicon (Si)-Total	2.61		0.10	mg/L	16-JUL-17	17-JUL-17	R3776966
Silver (Ag)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Sodium (Na)-Total	1.09		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Strontium (Sr)-Total	0.0328		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Sulfur (S)-Total	<0.50		0.50	mg/L	16-JUL-17	17-JUL-17	R3776966
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Thorium (Th)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Tin (Sn)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Titanium (Ti)-Total	0.00263		0.00030	mg/L	16-JUL-17	17-JUL-17	R3776966
Tungsten (W)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Uranium (U)-Total	0.000229		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Vanadium (V)-Total	0.00080		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Zirconium (Zr)-Total	0.000102		0.000060	mg/L	16-JUL-17	17-JUL-17	R3776966
L1958096-5 COLDWATER CREEK SITE 4 Sampled By: MD on 13-JUL-17 @ 11:45 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	91.5		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	47.3	HTC	0.50	mg/L		16-JUL-17	
pH	7.68		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	63		10	mg/L		14-JUL-17	R3772598
Turbidity	3.33		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	45.5		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	<0.020		0.020	mg/L		14-JUL-17	R3772596

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-5 COLDWATER CREEK SITE 4 Sampled By: MD on 13-JUL-17 @ 11:45 Matrix: GRAB							
Anions and Nutrients							
Chloride (Cl)	0.10		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	0.051		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918
Total Kjeldahl Nitrogen	0.33		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0098		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	2.14		0.30	mg/L		14-JUL-17	R3771918
Bacteriological Tests							
Escherichia Coli	5		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	>2420		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.170		0.0030	mg/L	15-JUL-17	15-JUL-17	R3772487
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Arsenic (As)-Total	0.00040		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Barium (Ba)-Total	0.0353		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Boron (B)-Total	<0.010		0.010	mg/L	15-JUL-17	15-JUL-17	R3772487
Cadmium (Cd)-Total	0.0000066		0.0000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Calcium (Ca)-Total	13.3		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Cesium (Cs)-Total	0.000014		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Chromium (Cr)-Total	0.00056		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Cobalt (Co)-Total	0.00013		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Copper (Cu)-Total	0.00299		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Iron (Fe)-Total	0.293		0.010	mg/L	15-JUL-17	15-JUL-17	R3772487
Lead (Pb)-Total	0.000081		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Lithium (Li)-Total	<0.0010		0.0010	mg/L	15-JUL-17	15-JUL-17	R3772487
Magnesium (Mg)-Total	3.39		0.0050	mg/L	15-JUL-17	15-JUL-17	R3772487
Manganese (Mn)-Total	0.0269		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Molybdenum (Mo)-Total	0.000077		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Nickel (Ni)-Total	0.00057		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Phosphorus (P)-Total	<0.050		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Potassium (K)-Total	0.473		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Rubidium (Rb)-Total	0.00134		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Selenium (Se)-Total	0.000150		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Silicon (Si)-Total	2.33		0.10	mg/L	15-JUL-17	15-JUL-17	R3772487
Silver (Ag)-Total	<0.000010		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Sodium (Na)-Total	0.817		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Strontium (Sr)-Total	0.0217		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Sulfur (S)-Total	<0.50		0.50	mg/L	15-JUL-17	15-JUL-17	R3772487
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-5 COLDWATER CREEK SITE 4 Sampled By: MD on 13-JUL-17 @ 11:45 Matrix: GRAB							
Total Metals							
Thorium (Th)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Tin (Sn)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Titanium (Ti)-Total	0.00605		0.00030	mg/L	15-JUL-17	15-JUL-17	R3772487
Tungsten (W)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Uranium (U)-Total	0.000159		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Vanadium (V)-Total	0.00105		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	15-JUL-17	15-JUL-17	R3772487
Zirconium (Zr)-Total	0.000261		0.000060	mg/L	15-JUL-17	15-JUL-17	R3772487
L1958096-6 COLDWATER CREEK SITE 3 Sampled By: MD on 13-JUL-17 @ 11:00 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	324		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	178	HTC	0.50	mg/L		19-JUL-17	
pH	8.10		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	180		13	mg/L		14-JUL-17	R3772598
Turbidity	1.84		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	183		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	0.050		0.020	mg/L		14-JUL-17	R3772596
Chloride (Cl)	0.72		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	0.087		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918
Total Kjeldahl Nitrogen	<0.25		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0147		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	2.96		0.30	mg/L		14-JUL-17	R3771918
Bacteriological Tests							
Escherichia Coli	9		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	435		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.0567		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Arsenic (As)-Total	0.00042		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Barium (Ba)-Total	0.398		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Boron (B)-Total	<0.010		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Calcium (Ca)-Total	42.7		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Chromium (Cr)-Total	0.00031		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-6 COLDWATER CREEK SITE 3 Sampled By: MD on 13-JUL-17 @ 11:00 Matrix: GRAB							
Total Metals							
Copper (Cu)-Total	0.00178		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Iron (Fe)-Total	0.077		0.010	mg/L	16-JUL-17	17-JUL-17	R3776966
Lead (Pb)-Total	<0.000050		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Lithium (Li)-Total	<0.0010		0.0010	mg/L	16-JUL-17	17-JUL-17	R3776966
Magnesium (Mg)-Total	17.4		0.0050	mg/L	16-JUL-17	17-JUL-17	R3776966
Manganese (Mn)-Total	0.00675		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Molybdenum (Mo)-Total	0.000183		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Phosphorus (P)-Total	<0.050		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Potassium (K)-Total	0.885		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Rubidium (Rb)-Total	0.00103		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Selenium (Se)-Total	0.000102		0.000050	mg/L	16-JUL-17	17-JUL-17	R3776966
Silicon (Si)-Total	4.47		0.10	mg/L	16-JUL-17	17-JUL-17	R3776966
Silver (Ag)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Sodium (Na)-Total	1.56		0.050	mg/L	16-JUL-17	17-JUL-17	R3776966
Strontium (Sr)-Total	0.0492		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Sulfur (S)-Total	0.83		0.50	mg/L	16-JUL-17	17-JUL-17	R3776966
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	16-JUL-17	17-JUL-17	R3776966
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Thorium (Th)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Tin (Sn)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Titanium (Ti)-Total	0.00250		0.00030	mg/L	16-JUL-17	17-JUL-17	R3776966
Tungsten (W)-Total	<0.00010		0.00010	mg/L	16-JUL-17	17-JUL-17	R3776966
Uranium (U)-Total	0.000396		0.000010	mg/L	16-JUL-17	17-JUL-17	R3776966
Vanadium (V)-Total	0.00162		0.00050	mg/L	16-JUL-17	17-JUL-17	R3776966
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	16-JUL-17	17-JUL-17	R3776966
Zirconium (Zr)-Total	0.000076		0.000060	mg/L	16-JUL-17	17-JUL-17	R3776966
L1958096-7 COLDWATER CREEK SITE 2 Sampled By: MD on 13-JUL-17 @ 11:15 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	228		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	125	HTC	0.50	mg/L		16-JUL-17	
pH	8.15		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	128		13	mg/L		14-JUL-17	R3772598
Turbidity	15.8		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	126		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	0.135		0.020	mg/L		14-JUL-17	R3772596
Chloride (Cl)	0.96		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	0.029		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-7 COLDWATER CREEK SITE 2 Sampled By: MD on 13-JUL-17 @ 11:15 Matrix: GRAB							
Anions and Nutrients							
Total Kjeldahl Nitrogen	0.30		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0184		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	2.14		0.30	mg/L		14-JUL-17	R3771918
Bacteriological Tests							
Escherichia Coli	179		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	>2420		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.655		0.0030	mg/L	15-JUL-17	15-JUL-17	R3772487
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Arsenic (As)-Total	0.00048		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Barium (Ba)-Total	0.190		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Boron (B)-Total	<0.010		0.010	mg/L	15-JUL-17	15-JUL-17	R3772487
Cadmium (Cd)-Total	0.0000104		0.0000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Calcium (Ca)-Total	31.7		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Cesium (Cs)-Total	0.000064		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Chromium (Cr)-Total	0.00134		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Cobalt (Co)-Total	0.00035		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Copper (Cu)-Total	0.00230		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Iron (Fe)-Total	0.761		0.010	mg/L	15-JUL-17	15-JUL-17	R3772487
Lead (Pb)-Total	0.000251		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Lithium (Li)-Total	0.0013		0.0010	mg/L	15-JUL-17	15-JUL-17	R3772487
Magnesium (Mg)-Total	11.2		0.0050	mg/L	15-JUL-17	15-JUL-17	R3772487
Manganese (Mn)-Total	0.0362		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Molybdenum (Mo)-Total	0.000120		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Nickel (Ni)-Total	0.00110		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Phosphorus (P)-Total	<0.050		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Potassium (K)-Total	0.830		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Rubidium (Rb)-Total	0.00221		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Selenium (Se)-Total	0.000074		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Silicon (Si)-Total	4.79		0.10	mg/L	15-JUL-17	15-JUL-17	R3772487
Silver (Ag)-Total	<0.000010		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Sodium (Na)-Total	1.64		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Strontium (Sr)-Total	0.0453		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Sulfur (S)-Total	<0.50		0.50	mg/L	15-JUL-17	15-JUL-17	R3772487
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Thorium (Th)-Total	0.00011		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Tin (Sn)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Titanium (Ti)-Total	0.0268		0.00030	mg/L	15-JUL-17	15-JUL-17	R3772487

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-7 COLDWATER CREEK SITE 2 Sampled By: MD on 13-JUL-17 @ 11:15 Matrix: GRAB							
Total Metals							
Tungsten (W)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Uranium (U)-Total	0.000333		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Vanadium (V)-Total	0.00256		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	15-JUL-17	15-JUL-17	R3772487
Zirconium (Zr)-Total	0.000449		0.000060	mg/L	15-JUL-17	15-JUL-17	R3772487
L1958096-8 COLDWATER CREEK SITE 1 Sampled By: MD on 13-JUL-17 @ 10:15 Matrix: GRAB							
Physical Tests							
Conductivity (EC)	263		3.0	uS/cm		15-JUL-17	R3772513
Hardness (as CaCO3)	141	HTC	0.50	mg/L		16-JUL-17	
pH	8.18		0.10	pH		15-JUL-17	R3772513
Total Dissolved Solids	150		13	mg/L		14-JUL-17	R3772598
Turbidity	18.7		0.10	NTU		13-JUL-17	R3771269
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	145		2.0	mg/L		15-JUL-17	R3772513
Ammonia, Total (as N)	0.021		0.020	mg/L		14-JUL-17	R3772596
Chloride (Cl)	1.93		0.10	mg/L		14-JUL-17	R3771918
Nitrate (as N)	0.041		0.020	mg/L		14-JUL-17	R3771918
Nitrite (as N)	<0.010		0.010	mg/L		14-JUL-17	R3771918
Total Kjeldahl Nitrogen	0.27		0.25	mg/L	14-JUL-17	16-JUL-17	R3772606
Phosphorus (P)-Total	0.0234		0.0030	mg/L	14-JUL-17	18-JUL-17	R3776586
Sulfate (SO4)	2.38		0.30	mg/L		14-JUL-17	R3771918
Bacteriological Tests							
Escherichia Coli	77		0	MPN/100mL		13-JUL-17	R3771606
Total Coliforms	1990		0	MPN/100mL		13-JUL-17	R3771606
Total Metals							
Aluminum (Al)-Total	0.719		0.0030	mg/L	15-JUL-17	15-JUL-17	R3772487
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Arsenic (As)-Total	0.00051		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Barium (Ba)-Total	0.246		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Boron (B)-Total	<0.010		0.010	mg/L	15-JUL-17	15-JUL-17	R3772487
Cadmium (Cd)-Total	0.0000088		0.0000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Calcium (Ca)-Total	35.0		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Cesium (Cs)-Total	0.000068		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Chromium (Cr)-Total	0.00145		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Cobalt (Co)-Total	0.00045		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Copper (Cu)-Total	0.00303		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Iron (Fe)-Total	0.836		0.010	mg/L	15-JUL-17	15-JUL-17	R3772487
Lead (Pb)-Total	0.000285		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1958096-8 COLDWATER CREEK SITE 1 Sampled By: MD on 13-JUL-17 @ 10:15 Matrix: GRAB							
Total Metals							
Lithium (Li)-Total	0.0017		0.0010	mg/L	15-JUL-17	15-JUL-17	R3772487
Magnesium (Mg)-Total	13.1		0.0050	mg/L	15-JUL-17	15-JUL-17	R3772487
Manganese (Mn)-Total	0.0357		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Molybdenum (Mo)-Total	0.000160		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Nickel (Ni)-Total	0.00195		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Phosphorus (P)-Total	<0.050		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Potassium (K)-Total	0.925		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Rubidium (Rb)-Total	0.00224		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Selenium (Se)-Total	0.000097		0.000050	mg/L	15-JUL-17	15-JUL-17	R3772487
Silicon (Si)-Total	5.29		0.10	mg/L	15-JUL-17	15-JUL-17	R3772487
Silver (Ag)-Total	<0.000010		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Sodium (Na)-Total	2.35		0.050	mg/L	15-JUL-17	15-JUL-17	R3772487
Strontium (Sr)-Total	0.0510		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Sulfur (S)-Total	0.52		0.50	mg/L	15-JUL-17	15-JUL-17	R3772487
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	15-JUL-17	15-JUL-17	R3772487
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Thorium (Th)-Total	0.00011		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Tin (Sn)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Titanium (Ti)-Total	0.0302		0.00030	mg/L	15-JUL-17	15-JUL-17	R3772487
Tungsten (W)-Total	<0.00010		0.00010	mg/L	15-JUL-17	15-JUL-17	R3772487
Uranium (U)-Total	0.000384		0.000010	mg/L	15-JUL-17	15-JUL-17	R3772487
Vanadium (V)-Total	0.00295		0.00050	mg/L	15-JUL-17	15-JUL-17	R3772487
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	15-JUL-17	15-JUL-17	R3772487
Zirconium (Zr)-Total	0.000411		0.000060	mg/L	15-JUL-17	15-JUL-17	R3772487

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	B	L1958096-5, -7, -8
Duplicate	Zirconium (Zr)-Total	DUP-H	L1958096-1, -2, -3, -4, -6
Matrix Spike	Barium (Ba)-Total	MS-B	L1958096-1, -2, -3, -4, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L1958096-1, -2, -3, -4, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1958096-1, -2, -3, -4, -6
Matrix Spike	Manganese (Mn)-Total	MS-B	L1958096-1, -2, -3, -4, -6
Matrix Spike	Nitrate (as N)	MS-B	L1958096-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Phosphorus (P)-Total	MS-B	L1958096-1, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L1958096-1, -2, -3, -4, -5, -6, -7, -8

Sample Parameter Qualifier key listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-TB	Water	Alkalinity	APHA 2320B modified

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

CL-L-IC-N-TB	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-TITR-TB	Water	Conductivity	APHA 2510 B

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-TB	Water	Hardness (as CaCO3)	CALCULATION
MET-T-CCMS-TB	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-COL-TB	Water	Ammonia by Discrete Analyzer	APHA 4500-NH3 G. (modified)

Ammonia in aqueous matrices is analyzed using discrete analyzer with colourimetric detection.

NO2-IC-N-TB	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-TB	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-TB	Water	Total Phosphorus by Discrete Analyzer	APHA 4500-P B, F, G (modified)

Phosphorus in aqueous matrices is analyzed using discrete Analyzer with colourimetric detection.

PH-TITR-TB	Water	pH	APHA 4500-H

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

SO4-IC-N-TB	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TC,EC-QT97-TB	Water	Total Coliform and E.coli	APHA 9223 B

This analysis is carried out using procedures adapted from APHA Method 9223 "Enzyme Substrate Coliform Test". E. coli and Total Coliform are determined simultaneously. The sample is mixed with a mixture of hydrolyzable substrates and then sealed in a multi-well packet. The packet is incubated for 18 or 24 hours and then the number of wells exhibiting a positive response are counted. The final result is obtained by comparing the positive responses to a probability table.

TDS-TB	Water	Total Dissolved Solids	APHA 2540 C (modified)

Aqueous matrices are analyzed using gravimetry and evaporation

TKN-COL-TB	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg (modified)

Reference Information

Total Kjeldahl Nitrogen in aqueous matrices is analyzed using a discrete analyzer with colourimetric detection.

TURBIDITY-TB Water Turbidity APHA 2130 B-Nephelometer
Aqueous matrices are analyzed using nephelometry with the light scatter measured at a 90" angle.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
TB	ALS ENVIRONMENTAL - THUNDER BAY, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1958096 Report Date: 20-JUL-17

Client: LAKEHEAD REGION CONSERVATION AUTHORITY
130 Conservation Road P.O. Box 10427
Thunder Bay ON P7B 6T8
Contact: Scott Drebit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-TB	**Water**							
Batch R3772513								
WG2570842-11 LCS								
Alkalinity, Total (as CaCO3)			99.5		%		85-115	15-JUL-17
Alkalinity, Total (as CaCO3)			99.5		%		85-115	15-JUL-17
WG2570842-8 LCS								
Alkalinity, Total (as CaCO3)			98.4		%		85-115	15-JUL-17
WG2570842-10 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	15-JUL-17
WG2570842-7 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	15-JUL-17
CL-L-IC-N-TB	**Water**							
Batch R3771918								
WG2570188-7 DUP		**L1958096-3**						
Chloride (Cl)		0.58	0.57		mg/L	2.5	20	14-JUL-17
WG2570188-10 LCS								
Chloride (Cl)			102.9		%		90-110	14-JUL-17
WG2570188-6 LCS								
Chloride (Cl)			101.0		%		90-110	14-JUL-17
WG2570188-5 MB								
Chloride (Cl)			<0.10		mg/L		0.1	14-JUL-17
WG2570188-9 MB								
Chloride (Cl)			<0.10		mg/L		0.1	14-JUL-17
WG2570188-8 MS		**L1958096-3**						
Chloride (Cl)			94.1		%		75-125	14-JUL-17
EC-TITR-TB	**Water**							
Batch R3772513								
WG2570842-11 LCS								
Conductivity (EC)			97.1		%		90-110	15-JUL-17
WG2570842-8 LCS								
Conductivity (EC)			96.2		%		90-110	15-JUL-17
WG2570842-10 MB								
Conductivity (EC)			<3.0		uS/cm		3	15-JUL-17
WG2570842-7 MB								
Conductivity (EC)			<3.0		uS/cm		3	15-JUL-17
MET-T-CCMS-TB	**Water**							
Batch R3772487								
WG2570802-2 LCS								
Aluminum (Al)-Total			99.4		%		80-120	15-JUL-17
Antimony (Sb)-Total			108.4		%		80-120	15-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3772487								
WG2570802-2 LCS								
Arsenic (As)-Total			100.8		%		80-120	15-JUL-17
Barium (Ba)-Total			106.7		%		80-120	15-JUL-17
Beryllium (Be)-Total			102.0		%		80-120	15-JUL-17
Bismuth (Bi)-Total			99.2		%		80-120	15-JUL-17
Boron (B)-Total			92.3		%		80-120	15-JUL-17
Cadmium (Cd)-Total			103.5		%		80-120	15-JUL-17
Calcium (Ca)-Total			101.3		%		80-120	15-JUL-17
Cesium (Cs)-Total			106.1		%		80-120	15-JUL-17
Chromium (Cr)-Total			102.3		%		80-120	15-JUL-17
Cobalt (Co)-Total			103.3		%		80-120	15-JUL-17
Copper (Cu)-Total			99.4		%		80-120	15-JUL-17
Iron (Fe)-Total			108.3		%		80-120	15-JUL-17
Lead (Pb)-Total			103.3		%		80-120	15-JUL-17
Lithium (Li)-Total			101.0		%		80-120	15-JUL-17
Magnesium (Mg)-Total			103.7		%		80-120	15-JUL-17
Manganese (Mn)-Total			102.6		%		80-120	15-JUL-17
Molybdenum (Mo)-Total			100.9		%		80-120	15-JUL-17
Nickel (Ni)-Total			101.0		%		80-120	15-JUL-17
Phosphorus (P)-Total			105.9		%		70-130	15-JUL-17
Potassium (K)-Total			100.7		%		80-120	15-JUL-17
Rubidium (Rb)-Total			103.1		%		80-120	15-JUL-17
Selenium (Se)-Total			104.5		%		80-120	15-JUL-17
Silicon (Si)-Total			112.2		%		60-140	15-JUL-17
Silver (Ag)-Total			106.8		%		80-120	15-JUL-17
Sodium (Na)-Total			100.6		%		80-120	15-JUL-17
Strontium (Sr)-Total			102.2		%		80-120	15-JUL-17
Sulfur (S)-Total			110.0		%		80-120	15-JUL-17
Tellurium (Te)-Total			98.5		%		80-120	15-JUL-17
Thallium (Tl)-Total			100.7		%		80-120	15-JUL-17
Thorium (Th)-Total			102.6		%		80-120	15-JUL-17
Tin (Sn)-Total			103.8		%		80-120	15-JUL-17
Titanium (Ti)-Total			97.0		%		80-120	15-JUL-17
Tungsten (W)-Total			100.4		%		80-120	15-JUL-17
Uranium (U)-Total			105.2		%		80-120	15-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3772487								
WG2570802-2 LCS								
Vanadium (V)-Total			101.7		%		80-120	15-JUL-17
Zinc (Zn)-Total			95.1		%		80-120	15-JUL-17
Zirconium (Zr)-Total			101.6		%		80-120	15-JUL-17
WG2570802-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	15-JUL-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Barium (Ba)-Total			<0.000050		mg/L		0.00005	15-JUL-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	15-JUL-17
Boron (B)-Total			<0.010		mg/L		0.01	15-JUL-17
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	15-JUL-17
Calcium (Ca)-Total			<0.050		mg/L		0.05	15-JUL-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	15-JUL-17
Chromium (Cr)-Total			0.00011	B	mg/L		0.0001	15-JUL-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Copper (Cu)-Total			<0.00050		mg/L		0.0005	15-JUL-17
Iron (Fe)-Total			<0.010		mg/L		0.01	15-JUL-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	15-JUL-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	15-JUL-17
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	15-JUL-17
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	15-JUL-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	15-JUL-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	15-JUL-17
Potassium (K)-Total			<0.050		mg/L		0.05	15-JUL-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	15-JUL-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	15-JUL-17
Silicon (Si)-Total			<0.10		mg/L		0.1	15-JUL-17
Silver (Ag)-Total			<0.000010		mg/L		0.00001	15-JUL-17
Sodium (Na)-Total			<0.050		mg/L		0.05	15-JUL-17
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	15-JUL-17
Sulfur (S)-Total			<0.50		mg/L		0.5	15-JUL-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	15-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3772487								
WG2570802-1 MB								
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	15-JUL-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	15-JUL-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	15-JUL-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	15-JUL-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	15-JUL-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	15-JUL-17
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	15-JUL-17
Batch R3776966								
WG2571023-3 DUP		**L1958096-2**						
Aluminum (Al)-Total		0.0149	0.0146		mg/L	1.7	20	17-JUL-17
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUL-17
Arsenic (As)-Total		0.00025	0.00024		mg/L	4.1	20	17-JUL-17
Barium (Ba)-Total		0.0729	0.0725		mg/L	0.5	20	17-JUL-17
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUL-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-JUL-17
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-JUL-17
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	17-JUL-17
Calcium (Ca)-Total		10.6	10.7		mg/L	1.7	20	17-JUL-17
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-JUL-17
Chromium (Cr)-Total		0.00019	0.00019		mg/L	0.0	20	17-JUL-17
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUL-17
Copper (Cu)-Total		0.00099	0.00095		mg/L	3.8	20	17-JUL-17
Iron (Fe)-Total		0.113	0.114		mg/L	0.4	20	17-JUL-17
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-JUL-17
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-JUL-17
Magnesium (Mg)-Total		4.74	4.80		mg/L	1.3	20	17-JUL-17
Manganese (Mn)-Total		0.0203	0.0202		mg/L	0.6	20	17-JUL-17
Molybdenum (Mo)-Total		0.000079	0.000083		mg/L	4.5	20	17-JUL-17
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-JUL-17
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-JUL-17
Potassium (K)-Total		0.301	0.301		mg/L	0.2	20	17-JUL-17
Rubidium (Rb)-Total		0.00055	0.00055		mg/L	0.6	20	17-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3776966								
WG2571023-3 DUP		**L1958096-2**						
Selenium (Se)-Total		0.000063	0.000066		mg/L	3.5	20	17-JUL-17
Silicon (Si)-Total		1.11	1.13		mg/L	1.5	20	17-JUL-17
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-JUL-17
Sodium (Na)-Total		0.858	0.869		mg/L	1.3	20	17-JUL-17
Strontium (Sr)-Total		0.0160	0.0162		mg/L	1.4	20	17-JUL-17
Sulfur (S)-Total		0.60	0.60		mg/L	0.5	20	17-JUL-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	17-JUL-17
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-JUL-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUL-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUL-17
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	17-JUL-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-JUL-17
Uranium (U)-Total		0.000083	0.000080		mg/L	3.1	20	17-JUL-17
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-JUL-17
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-JUL-17
Zirconium (Zr)-Total		0.000154	<0.000060	DUP-H	mg/L	N/A	20	17-JUL-17
WG2571023-2 LCS								
Aluminum (Al)-Total			101.4		%		80-120	17-JUL-17
Antimony (Sb)-Total			106.7		%		80-120	17-JUL-17
Arsenic (As)-Total			99.5		%		80-120	17-JUL-17
Barium (Ba)-Total			99.9		%		80-120	17-JUL-17
Beryllium (Be)-Total			90.1		%		80-120	17-JUL-17
Bismuth (Bi)-Total			103.0		%		80-120	17-JUL-17
Boron (B)-Total			86.0		%		80-120	17-JUL-17
Cadmium (Cd)-Total			98.6		%		80-120	17-JUL-17
Calcium (Ca)-Total			101.5		%		80-120	17-JUL-17
Cesium (Cs)-Total			104.9		%		80-120	17-JUL-17
Chromium (Cr)-Total			99.8		%		80-120	17-JUL-17
Cobalt (Co)-Total			99.0		%		80-120	17-JUL-17
Copper (Cu)-Total			96.9		%		80-120	17-JUL-17
Iron (Fe)-Total			105.7		%		80-120	17-JUL-17
Lead (Pb)-Total			103.6		%		80-120	17-JUL-17
Lithium (Li)-Total			90.8		%		80-120	17-JUL-17
Magnesium (Mg)-Total			103.4		%		80-120	17-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3776966								
WG2571023-2 LCS								
Manganese (Mn)-Total			103.4		%		80-120	17-JUL-17
Molybdenum (Mo)-Total			94.1		%		80-120	17-JUL-17
Nickel (Ni)-Total			97.9		%		80-120	17-JUL-17
Phosphorus (P)-Total			107.7		%		70-130	17-JUL-17
Potassium (K)-Total			104.5		%		80-120	17-JUL-17
Rubidium (Rb)-Total			104.7		%		80-120	17-JUL-17
Selenium (Se)-Total			99.8		%		80-120	17-JUL-17
Silicon (Si)-Total			116.8		%		60-140	17-JUL-17
Silver (Ag)-Total			104.0		%		80-120	17-JUL-17
Sodium (Na)-Total			100.2		%		80-120	17-JUL-17
Strontium (Sr)-Total			98.2		%		80-120	17-JUL-17
Sulfur (S)-Total			110.6		%		80-120	17-JUL-17
Tellurium (Te)-Total			95.3		%		80-120	17-JUL-17
Thallium (Tl)-Total			105.2		%		80-120	17-JUL-17
Thorium (Th)-Total			97.1		%		80-120	17-JUL-17
Tin (Sn)-Total			100.2		%		80-120	17-JUL-17
Titanium (Ti)-Total			99.6		%		80-120	17-JUL-17
Tungsten (W)-Total			103.9		%		80-120	17-JUL-17
Uranium (U)-Total			99.96		%		80-120	17-JUL-17
Vanadium (V)-Total			102.8		%		80-120	17-JUL-17
Zinc (Zn)-Total			93.5		%		80-120	17-JUL-17
Zirconium (Zr)-Total			96.4		%		80-120	17-JUL-17
WG2571023-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	17-JUL-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Barium (Ba)-Total			<0.000050		mg/L		0.00005	17-JUL-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	17-JUL-17
Boron (B)-Total			<0.010		mg/L		0.01	17-JUL-17
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	17-JUL-17
Calcium (Ca)-Total			<0.050		mg/L		0.05	17-JUL-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	17-JUL-17
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	17-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3776966								
WG2571023-1 MB								
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Copper (Cu)-Total			<0.00050		mg/L		0.0005	17-JUL-17
Iron (Fe)-Total			<0.010		mg/L		0.01	17-JUL-17
Lead (Pb)-Total			<0.000050		mg/L		0.00005	17-JUL-17
Lithium (Li)-Total			<0.0010		mg/L		0.001	17-JUL-17
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	17-JUL-17
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	17-JUL-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-JUL-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	17-JUL-17
Potassium (K)-Total			<0.050		mg/L		0.05	17-JUL-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	17-JUL-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	17-JUL-17
Silicon (Si)-Total			<0.10		mg/L		0.1	17-JUL-17
Silver (Ag)-Total			<0.000010		mg/L		0.00001	17-JUL-17
Sodium (Na)-Total			<0.050		mg/L		0.05	17-JUL-17
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	17-JUL-17
Sulfur (S)-Total			<0.50		mg/L		0.5	17-JUL-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	17-JUL-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	17-JUL-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	17-JUL-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	17-JUL-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	17-JUL-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	17-JUL-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	17-JUL-17
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	17-JUL-17
WG2571023-4 MS		**L1958096-2**						
Aluminum (Al)-Total			96.9		%		70-130	17-JUL-17
Antimony (Sb)-Total			100.5		%		70-130	17-JUL-17
Arsenic (As)-Total			98.5		%		70-130	17-JUL-17
Barium (Ba)-Total			N/A	MS-B	%		-	17-JUL-17
Beryllium (Be)-Total			101.3		%		70-130	17-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-TB	**Water**							
Batch R3776966								
WG2571023-4 MS		**L1958096-2**						
Bismuth (Bi)-Total			97.0		%		70-130	17-JUL-17
Boron (B)-Total			107.6		%		70-130	17-JUL-17
Cadmium (Cd)-Total			96.8		%		70-120	17-JUL-17
Calcium (Ca)-Total			N/A	MS-B	%		-	17-JUL-17
Cesium (Cs)-Total			102.0		%		70-130	17-JUL-17
Chromium (Cr)-Total			99.5		%		70-130	17-JUL-17
Cobalt (Co)-Total			97.5		%		70-130	17-JUL-17
Copper (Cu)-Total			95.4		%		70-130	17-JUL-17
Iron (Fe)-Total			99.5		%		70-130	17-JUL-17
Lead (Pb)-Total			98.6		%		70-130	17-JUL-17
Lithium (Li)-Total			97.2		%		70-130	17-JUL-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	17-JUL-17
Manganese (Mn)-Total			N/A	MS-B	%		-	17-JUL-17
Molybdenum (Mo)-Total			91.0		%		70-130	17-JUL-17
Nickel (Ni)-Total			95.7		%		70-130	17-JUL-17
Phosphorus (P)-Total			101.3		%		70-130	17-JUL-17
Potassium (K)-Total			97.9		%		70-130	17-JUL-17
Rubidium (Rb)-Total			99.2		%		70-130	17-JUL-17
Selenium (Se)-Total			98.7		%		70-130	17-JUL-17
Silicon (Si)-Total			101.1		%		70-130	17-JUL-17
Silver (Ag)-Total			103.3		%		70-130	17-JUL-17
Sodium (Na)-Total			94.6		%		70-130	17-JUL-17
Strontium (Sr)-Total			94.5		%		70-130	17-JUL-17
Sulfur (S)-Total			107.5		%		70-130	17-JUL-17
Tellurium (Te)-Total			92.9		%		70-130	17-JUL-17
Thallium (Tl)-Total			99.97		%		70-130	17-JUL-17
Thorium (Th)-Total			99.9		%		70-130	17-JUL-17
Tin (Sn)-Total			98.7		%		70-130	17-JUL-17
Titanium (Ti)-Total			98.1		%		70-130	17-JUL-17
Tungsten (W)-Total			102.1		%		70-130	17-JUL-17
Uranium (U)-Total			96.3		%		70-130	17-JUL-17
Vanadium (V)-Total			99.6		%		70-130	17-JUL-17
Zinc (Zn)-Total			91.0		%		70-130	17-JUL-17
Zirconium (Zr)-Total			97.7		%		70-130	17-JUL-17

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-COL-TB	**Water**							
Batch R3772596								
WG2570177-3 DUP		**L1958096-1**						
Ammonia, Total (as N)		0.087	0.080		mg/L	7.9	20	14-JUL-17
WG2570177-2 LCS								
Ammonia, Total (as N)			100.6		%		85-115	14-JUL-17
WG2570177-1 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	14-JUL-17
WG2570177-4 MS		**L1958096-1**						
Ammonia, Total (as N)			91.8		%		75-125	14-JUL-17
NO2-IC-N-TB	**Water**							
Batch R3771918								
WG2570188-7 DUP		**L1958096-3**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	14-JUL-17
WG2570188-10 LCS								
Nitrite (as N)			104.6		%		90-110	14-JUL-17
WG2570188-6 LCS								
Nitrite (as N)			101.8		%		90-110	14-JUL-17
WG2570188-5 MB								
Nitrite (as N)			<0.010		mg/L		0.01	14-JUL-17
WG2570188-9 MB								
Nitrite (as N)			<0.010		mg/L		0.01	14-JUL-17
WG2570188-8 MS		**L1958096-3**						
Nitrite (as N)			98.4		%		75-125	14-JUL-17
NO3-IC-N-TB	**Water**							
Batch R3771918								
WG2570188-7 DUP		**L1958096-3**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	14-JUL-17
WG2570188-10 LCS								
Nitrate (as N)			102.0		%		90-110	14-JUL-17
WG2570188-6 LCS								
Nitrate (as N)			99.9		%		90-110	14-JUL-17
WG2570188-5 MB								
Nitrate (as N)			<0.020		mg/L		0.02	14-JUL-17
WG2570188-9 MB								
Nitrate (as N)			<0.020		mg/L		0.02	14-JUL-17
WG2570188-8 MS		**L1958096-3**						
Nitrate (as N)			93.8		%		75-125	14-JUL-17
P-T-COL-TB	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-COL-TB	**Water**							
Batch R3776586								
WG2570114-2 LCS								
Phosphorus (P)-Total			105.1		%		80-120	18-JUL-17
WG2570114-1 MB								
Phosphorus (P)-Total			<0.0030		mg/L		0.003	18-JUL-17
PH-TITR-TB	**Water**							
Batch R3772513								
WG2570842-11 LCS								
pH			6.03		pH		5.9-6.1	15-JUL-17
WG2570842-8 LCS								
pH			6.03		pH		5.9-6.1	15-JUL-17
SO4-IC-N-TB	**Water**							
Batch R3771918								
WG2570188-10 LCS								
Sulfate (SO4)			105.3		%		90-110	14-JUL-17
WG2570188-6 LCS								
Sulfate (SO4)			103.7		%		90-110	14-JUL-17
WG2570188-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	14-JUL-17
WG2570188-9 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	14-JUL-17
Batch R3772619								
WG2570188-7 DUP		**L1958096-3**						
Sulfate (SO4)		1.55	0.98	J	mg/L	0.58	0.6	15-JUL-17
WG2570868-2 LCS								
Sulfate (SO4)			102.7		%		90-110	15-JUL-17
WG2570868-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-JUL-17
WG2570188-8 MS		**L1958096-3**						
Sulfate (SO4)			96.6		%		75-125	15-JUL-17
TC,EC-QT97-TB	**Water**							
Batch R3771606								
WG2569596-1 MB								
Total Coliforms			0		MPN/100mL		1	13-JUL-17
Escherichia Coli			0		MPN/100mL		1	13-JUL-17
TDS-TB	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TDS-TB	**Water**							
Batch R3772598								
WG2570241-2 LCS								
Total Dissolved Solids			98.9		%		85-115	14-JUL-17
WG2570241-1 MB								
Total Dissolved Solids			<10		mg/L		10	14-JUL-17
TKN-COL-TB	**Water**							
Batch R3772606								
WG2569336-8 DUP		**L1958096-8**						
Total Kjeldahl Nitrogen		0.27	<0.25	RPD-NA	mg/L	N/A	20	16-JUL-17
WG2569336-2 LCS								
Total Kjeldahl Nitrogen			83.0		%		75-125	16-JUL-17
WG2569336-6 LCS								
Total Kjeldahl Nitrogen			100.2		%		75-125	16-JUL-17
WG2569336-1 MB								
Total Kjeldahl Nitrogen			<0.25		mg/L		0.25	16-JUL-17
WG2569336-5 MB								
Total Kjeldahl Nitrogen			<0.25		mg/L		0.25	16-JUL-17
WG2569336-7 MS		**L1958096-8**						
Total Kjeldahl Nitrogen			92.8		%		70-130	16-JUL-17
TURBIDITY-TB	**Water**							
Batch R3771269								
WG2569621-3 DUP		**L1958096-5**						
Turbidity		3.33	3.38		NTU	1.5	15	13-JUL-17
WG2569621-2 LCS								
Turbidity			97.0		%		85-115	13-JUL-17
WG2569621-1 MB								
Turbidity			<0.10		NTU		0.1	13-JUL-17

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

L1958096-COFC

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L1958096 Page 1 of 1

Company:	Lakehead Region Conservation Authority			Regulatory Information	Both questions below must answered for water samples
Contact:	Scott Drebit			☐ O. Reg 153 (O. Reg 511 Amend) Table:_____	Are any samples taken from a regulated DW System? ☐ Yes ☒ No
Address:	130 Conservation Road			Record of Site Condition ☐ Yes ☐ No	If yes, an authorized DW COC must be used.
				PWQO ☐ MISA ☐ MMER ☐ CCME ☐	Is the water sampled intended for human consumption? ☐ Yes ☒ No
Phone:	807 344 5857	Fax:	807 345 9156	Guideline Required:	
Email:	scott@lakeheadca.com			TCLP Regulation 558 ☐ Other:	
Project:	Coldwater	PO:		Service Requested	Analysis Request
Quote #	Q 62558			☒ Regular TAT (7 Days)	Please indicate below Filtered, Preserved or both (F, P, F/P)
Invoice To:		Same as Report:	☒ Yes ☐ No	☐ Priority TAT 50% Surcharge (3-5 Days)	
Company:				☐ Emergency TAT 100% Surcharge (1-2 Days)	
Contact:				Specify Date Required:	
Address:				All TAT quoted material is in business days which exclude statutory holidays and weekends. Samples received past 3:00pm or Saturday/Sunday begin the next day.	
Email:					
Account Manager		Sampler:	MD		

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Alkalinity, Conductivity, pH	Chloride, Nitrate, Nitrite, Sulphate	TPS, Turbidity	NH3, TKN, TP	Metals, Total & Hardness	TC/FEC							Number of Containers
CW8	Coldwater Creek - Site #8	13-July-17	12:15	Grab	X	X	X	X	X	X							5
CW7	Coldwater Creek - Site #7	13-July-17	12:30	Grab	X	X	X	X	X	X							5
CW6	Coldwater Creek - Site #6	13-July-17	13:00	Grab	X	X	X	X	X	X							5
CW5	Coldwater Creek - Site #5	13-July-17	13:20	Grab	X	X	X	X	X	X							5
CW4	Coldwater Creek - Site #4	13-July-17	11:45	Grab	X	X	X	X	X	X							5
CW3	Coldwater Creek - Site #3	13-July-17	11:00	Grab	X	X	X	X	X	X							5
CW2	Coldwater Creek - Site #2	13-July-17	11:15	Grab	X	X	X	X	X	X							5
CW1	Coldwater Creek - Site #1	13-July-17	10:15	Grab	X	X	X	X	X	X							5

Special Instructions / Comments

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time	Received by:	Date & Time	Temp	Cooling Initiated	Verified by:	Date & Time	Observations: Yes / No ? If Yes add SIF
Michael Ostrander	13-7-2017 15:06	BR	7/13/17 15:16	16.5	☐ Yes ☐ No			

Failure to complete all portions of this form may delay analysis. **TAT may vary dependant on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs. Any known or suspected hazards relating to a sample must be noted on the chain of custody in the comments section. By use of the form the user acknowledges and agrees with the Terms and Conditions as specified on the back page.