













ENVIRONMENTAL ASSESSMENT FOR THE MARATHON PGM-Cu PROJECT AT MARATHON, ONTARIO

MARATHON PGM-Cu PROJECT SUPPORTING DOCUMENT - BASELINE AQUATIC RESOURCES CHARACTERIZATION

STILLWATER CANADA INC.
1000, 715 Hewitson Ave
Thunder Bay, ON, P7B 4A3

STILLWATER
CANADA INC.

MARATHON PGM-Cu Project Site ï Aquatic Resources Baseline Report

Report prepared for:

STILLWATER CANADA INC.
90 Peninsula Road
P.O. Box 1508
Marathon, ON, P0T 2E0

Report prepared by:

ECOMETRIX INCORPORATED
6800 Campobello Road
Mississauga, Ontario
L5N 2L8

09-1630
December 2011

Marathon PGM-Cu Project Site - Aquatic Resources Baseline Report

Joseph Tetreault
Fisheries Biologist

Robert Eakins
Associate, Senior Fisheries Ecologist

Karen Petersen
Aquatic Biologist

Michelle McKinley
Aquatic Biologist

Brian Fraser
Principal, Project Manager

EXECUTIVE SUMMARY

Stillwater Canada Inc. (SCI) proposes to develop a platinum group metals (PGMs), copper (Cu) and iron (Fe) open-pit mine and milling operation near Marathon, Ontario (the Project). The Project is being review by a Joint Review Panel established by the Minister of the Environment, Canada and the Minister of the Environment, Ontario. This report details the baseline aquatic resources within the Project study area.

The characterization of aquatic resources at the Project site spanned several years, included data collections in all seasons and addressed the need for the assessment of:

1. water quality of key waterbodies in the Project area, including spatial and seasonal variability (spring high-flow period, early summer high-flow period, the late summer low-flow period, and under-ice in winter);
2. sediment quality of key waterbodies in the Project area;
3. species composition, abundance, spatial distribution and biological characteristics of the fish and benthic invertebrate communities of the local aquatic ecosystem; and
4. fish habitat characteristics of waterbodies in the Project area.

The Project site is drained by a total of six primary subwatersheds, four of which drain to the Pic River whereas the remaining two drain directly to Lake Superior. Waterbodies and watercourses in the interior of the Project site include small streams, ponds and lakes, many of which are maintained by active or inactive beaver dams, or debris jams. The interior of the Project site is isolated from both the Pic River and Lake Superior by steep relief (i.e., topography) and therefore much of this area is fishless. In the instances where fish do occur the community is limited to small-bodied (forage) fish.

The Pic River watershed tributaries afforded limited coldwater spawning and/or nursery habitats within their lowest reaches for migratory species (e.g., Rainbow Trout, Chinook Salmon), as well as resident species (e.g. Brook Trout, Slimy Sculpin). The fish community of the Pic River is diverse, with a variety of coolwater and coldwater fish species reported including Lake Sturgeon and Walleye. Lake Sturgeon move extensively up and down the Pic River during spawning migration and utilize the lower river for foraging. Lake Sturgeon are designated as threatened and therefore protected under the Ontario Endangered Species Act and federal Species at Risk Act.

Bamoos Lake supports a diverse coldwater community, including Lake Trout, Brook Trout and Cisco. The Hare Lake fish community is comprised primarily of coolwater species, including Northern Pike and Yellow Perch. Hare Creek (Stream 5), below the Highway No. 17 crossing, supports a coldwater fish community and affords spawning and nursery habitats for both migratory and resident salmonids. Within its lowest reaches, below a cascade barrier, Stream 6 provides a limited amount of nursery and spawning habitat for coldwater migratory species from Lake Superior.

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1.1
1.1 Project Location 1.1
1.2 Surrounding Land Uses 1.1
1.3 Exploration History of the Site 1.2
1.4 Project Overview 1.4
1.5 Background Aquatic Environmental Information 1.6
1.6 Current Aquatic Environmental Survey 1.6
1.6.1 Scope of Work 1.7
1.7 Report Format 1.7
2.0 STUDY METHODOLOGY 2.1
2.1 Aquatic Habitat 2.1
2.1.1 Water Quality 2.1
2.1.2 Bathymetry 2.1
2.1.3 Fish Habitat 2.1
2.2 Benthic Invertebrate and Sediment Collections 2.2
2.2.1 Benthic Invertebrates 2.2
2.2.2 Sediment Collections 2.6
2.3 Fish Community Survey 2.7
2.3.1 Fish Collections 2.7
2.4 Tissue Chemistry 2.8
2.4.1 Fish Tissue Chemistry 2.8
2.4.2 Aquatic Plant Tissue Chemistry 2.9
2.4.3 Lab Tissue Chemistry Analysis 2.9
3.0 RESULTS 3.1
3.1 Stream 1 Watershed 3.1
3.1.1 Station L1 ..... 3.1
3.1.2 Stream 1 (Station S54) 3.3
3.1.3 Station L2 ..... 3.4
3.1.4 Stream 1 (Station S55) 3.5
3.1.5 Stream 1 (Station S58) 3.6
3.1.6 Stream 1 (Station 79) 3.7
3.1.7 Stream 1 (Station S1) 3.7
3.1.8 Stream 1 (Station S56) 3.9
3.1.9 Stream 1 (Station S57) 3.9
3.1.10 Station L29 ..... 3.10

3.1.11 Stream 1 (Station S27) 3.11
3.1.12 Stream 1 (Station S2) 3.12
3.1.13 Stream 1 Watershed Summary 3.13
3.2 Stream 2 (Canoe Lake) Watershed 3.14
3.2.1 Station L3 ..... 3.14
3.2.2 Stream 2 (Station S59) 3.16
3.2.3 Station L7 ..... 3.17
3.2.4 Station L6 ..... 3.18
3.2.5 Canoe Lake (Station L5) 3.20
3.2.6 Station L14 ..... 3.21
3.2.7 Stream 2 (Station S74) 3.23
3.2.8 Stream 2 (Station S75) 3.23
3.2.9 Terru Lake (Station L20) 3.24
3.2.10 Stream 2 (Station S76) 3.25
3.2.11 Stream 2 (Station S77) 3.26
3.2.12 Station L8 ..... 3.26
3.2.13 Stream 2 (Station S78) 3.28
3.2.14 Station L15 ..... 3.29
3.2.15 Stream 2 (Station S3) 3.30
3.2.16 Stream 2 (Station 69) 3.31
3.2.17 Stream 2 (Station S53) 3.32
3.2.18 Stream 2 (Station S66) 3.33
3.2.19 Stream 2 (Station S4) 3.33
3.2.20 Stream 2 Watershed Summary 3.35
3.3 Stream 3 (Two Duck Lake) Watershed 3.36
3.3.1 Station L9 (and L9a) 3.36
3.3.2 Two Duck Lake (Stations L10 and L11) 3.38
3.3.3 Stream 3 (Station S19) 3.41
3.3.4 Station L12 ..... 3.41
3.3.5 Stations L13 and L13a 3.43
3.3.6 Station L16 ..... 3.45
3.3.7 Stream 3 (Station S18) 3.47
3.3.8 Stream 3 (Station S52) 3.47
3.3.9 Stream 3 (Station S6) 3.48
3.3.10 Stream 3 Watershed Summary 3.49
3.4 Stream 4 (Claw Lake) Watershed 3.50
3.4.1 Stream 4 (Station S72) 3.50
3.4.2 Station L21 ..... 3.51
3.4.3 Stream 4 (Station S73) 3.52

3.4.4 Stream 4 (Station S71) 3.53
3.4.5 Station L22 ..... 3.54
3.4.6 Stream 4 (Station S70) 3.55
3.4.7 Stream 4 (Station S51) 3.56
3.4.8 Station L18 ..... 3.57
3.4.9 Claw Lake (Station L19) 3.59
3.4.10 Stream 4 (Station S8) 3.61
3.4.11 Stream 4 (Station S43) 3.62
3.4.12 Stream 4 Watershed Summary 3.63
3.5 Stream 5 (Hare Creek) Watershed 3.64
3.5.1 Station L25 ..... 3.65
3.5.2 Stream 5 (Station S60) 3.66
3.5.3 Stream 5 (Station S61) 3.67
3.5.4 Station L4 ..... 3.68
3.5.5 Stream 5 (Station S20) 3.69
3.5.6 Station L27 ..... 3.70
3.5.7 Stream 5 (Station S62) 3.72
3.5.8 Station L17 ..... 3.72
3.5.9 Stream 5 (Station S22) 3.74
3.5.10 Station L23 ..... 3.74
3.5.11 Stream 5 (Station S9) 3.76
3.5.12 Stream 5 (Station S10) 3.77
3.5.13 Bamoos Lake 3.77
3.5.14 Bamoos Creek (Station S41) 3.81
3.5.15 Hare Lake 3.82
3.5.16 Hare Creek (Station S11) 3.85
3.5.17 Hare Creek (Station S30) 3.87
3.5.18 Stream 5 (Hare Creek) Watershed Summary 3.88
3.6 Stream 6 Watershed 3.89
3.6.1 Station L26 ..... 3.90
3.6.2 Stream 6 (Station S63) 3.91
3.6.3 Stream 6 (Station S64) 3.92
3.6.4 Stream 6 (Station S15) 3.93
3.6.5 Station L24 ..... 3.94
3.6.6 Stream 6 (Station S12) 3.95
3.6.7 Stream 6 (Station S14) 3.96
3.6.8 Stream 6 (Station S42) 3.97
3.6.9 Stream 6 (Station S31) 3.99
3.6.10 Stream 6 Watershed Summary 3.100

3.7 Stream 7 (Shack Creek) Watershed 3.101
3.7.1 Rag Lakes 3.101
3.7.2 Shack Lake 3.101
3.7.3 Shack Creek (Station S23) 3.101
3.7.4 Stream 7 (Shack Creek) Watershed Summary 3.102
3.8 Pic River and Small Tributaries 3.102
3.8.1 Pic River 3.103
3.8.2 Malpa Lake 3.105
3.8.3 Malpa Creek (Station S49) 3.106
3.8.4 Pic River Tributaries (Stations S68, S32, S44, S67, S45, and S24) 3.107
3.8.5 Intermittent Pic River Tributaries (Stations S25, S46, S47, S48 and S50) 3.113
3.8.6 Pic River and Small Tributaries Summary 3.114
3.9 Lake Superior 3.115
3.9.1 Port Munro (mouth of Hare Creek) 3.115
3.9.2 Sturdee Cove (mouth of Stream 6) 3.117
3.9.3 Peninsula Harbour 3.118
3.9.4 Lake Superior Summary 3.119
4.0 METALS IN AQUATIC VEGETATION 4.1
5.0 REFERENCES 5.1

LIST OF TABLES (provided under separate tab following the reference section)

3.1 Sediment Quality for the Stream 1 Watershed
3.2 Fishing Effort and Fish Species Identified for the Stream 1 Watershed
3.3 Benthic Macroinvertebrate Data for the Stream 1 Watershed
3.4 Benthic Macroinvertebrate data for the Stream 1 Watershed
3.5 Sediment Quality for the Stream 2 Watershed
3.6 Fishing Effort and Fish Species Identified for the Stream 2 Watershed
3.7 Benthic Macroinvertebrate Data for the Stream 2 Watershed
3.8 Benthic Macroinvertebrate Data for the Stream 2 Watershed
3.9 Sediment Quality for the Stream 3 Watershed
3.10 Fishing Effort and Fish Species Identified for the Stream 3 Watershed
3.11 Benthic Macroinvertebrate Data for the Stream 3 Watershed
3.12 Benthic Macroinvertebrate Data for the Stream 3 Watershed
3.13 Sediment Quality for the Stream 4 Watershed
3.14 Fishing Effort and Fish Species Identified for the Stream 4 Watershed
3.15 Benthic Macroinvertebrate Data for the Stream 4 Watershed
3.16 Benthic Macroinvertebrate Data for the Stream 4 Watershed
3.17 Sediment Quality for the Stream 5 Watershed
3.18 Fishing Effort and Fish Species Identified for the Stream 5 Watershed
3.19 Benthic Macroinvertebrate Data for the Stream 5 Watershed
3.20 Benthic Macroinvertebrate Data for the Stream 5 Watershed
3.21 Mean Fish Tissue Metal Concentrations
3.22 Sediment Quality for the Stream 6 Watershed
3.23 Fishing Effort and Fish Species Identified for the Stream 6 Watershed
3.24 Benthic Macroinvertebrate Data for the Stream 6 Watershed
3.25 Benthic Macroinvertebrate Data for the Stream 6 Watershed
3.26 Fishing Effort and Fish Species Identified for the Stream 7 Watershed
3.27 Sediment Quality for the Pic River and Small Tributaries
3.28 Fishing Effort and Fish Species Identified for the Pic River and Small Tributaries
3.29 Benthic Macroinvertebrate Data for the Pic River and Small Tributaries
3.30 Benthic Macroinvertebrate Data for the Pic River and Small Tributaries
3.31 Sediment Quality for the Lake Superior Embayments
3.32 Fishing Effort and Fish Species Identified for the Lake Superior Embayments
3.33 Benthic Macroinvertebrate Data for the Lake Superior Embayments
3.34 Benthic Macroinvertebrate Data for the Lake Superior Embayments

4.1 Summary of Key Metals in Composite Aquatic Vegetation Samples

LIST OF FIGURES (provided under separate tab following the reference section)

1.1 Location of the Proposed Marathon PGM-Cu Project Site near Marathon, Ontario
1.2 Existing Conditions at the Marathon PGM-Cu Project Site
1.3 Marathon PGM-Cu Project General Site Layout

2.1 Aquatic Resources Station Locations on and Around the Project Area

3.1 Major Watersheds Draining the Project Area
3.2 Summary of Fisheries Resources in the Project Area
3.3 Map of Stream 1 Watershed
3.4 L1 Aquatic Habitat and Bathymetry
3.5 L2 Aquatic Habitat and Bathymetry
3.6 Station L29 Aquatic Habitat and Bathymetry
3.7 Map of Stream 2 Watershed
3.8 L3 Aquatic Habitat and Bathymetry
3.9 L7 Aquatic Habitat and Bathymetry
3.10 L6 Aquatic Habitat and Bathymetry
3.11 L5 (Canoe Lake) Aquatic Habitat and Bathymetry
3.12 L14 Aquatic Habitat and Bathymetry
3.13 L20 (Terru Lake) Aquatic Habitat and Bathymetry
3.14 L8 Aquatic Habitat and Bathymetry
3.15 L15 Aquatic Habitat and Bathymetry
3.16 Map of Stream 3 Watershed
3.17 L9 Aquatic Habitat and Bathymetry
3.18 L10 and L11 (Two Duck Lake) Aquatic Habitat and Bathymetry
3.19 L12 Aquatic Habitat and Bathymetry
3.20 L13 and L13a Aquatic Habitat and Bathymetry
3.21 L16 Aquatic Habitat and Bathymetry
3.22 Map of Stream 4 Watershed
3.23 L21 Aquatic Habitat and Bathymetry
3.24 L22 Aquatic Habitat and Bathymetry
3.25 L18 Aquatic Habitat and Bathymetry
3.26 L19 (Claw Lake) Aquatic Habitat and Bathymetry
3.27 Map of Stream 5 Watershed
3.28 L25 Aquatic Habitat and Bathymetry
3.29 L4 Aquatic Habitat and Bathymetry
3.30 L27 Aquatic Habitat and Bathymetry

3.31 L17 Aquatic Habitat and Bathymetry
3.32 L23 Aquatic Habitat and Bathymetry
3.33 Bamoos Lake Aquatic Habitat and Bathymetry
3.34 Hare Lake Aquatic Habitat and Bathymetry
3.35 Map of Stream 6 Watershed
3.36 L26 Aquatic Habitat and Bathymetry
3.37 L24 Aquatic Habitat and Bathymetry
3.38 Map of Stream 7 Watershed
3.39 Pic River and Tributaries
3.40 Pic River Habitat Mapping
3.41 Pic River Habitat Mapping
3.42 Pic River Habitat Mapping
3.43 Pic River Habitat Mapping
3.44 Pic River Habitat Mapping
3.45 Pic River Habitat Mapping
3.46 Pic River Habitat Mapping
3.47 Pic River Habitat Mapping
3.48 Pic River Habitat Mapping Lower Rapids
3.49 Pic River Habitat Mapping Lower Rapids
3.50 Pic River Habitat Mapping Lower Rapids
3.51 Pic River Habitat Mapping Lower Rapids
3.52 Malpa Lake Aquatic Habitat and Bathymetry
3.53 Port Munro Aquatic Habitat and Bathymetry
3.54 Sturdee Cove Aquatic Habitat and Bathymetry

LIST OF APPENDICES

APPENDIX 1: Photographs

Part A: Aquatic Resources Baseline Survey Stations

Part B: Fish Species Collected within the Project Area

APPENDIX 2: Field Data Sheets

APPENDIX 3: Laboratory Reports for Sediment, Fish and Plant Tissue Analyses

APPENDIX 4: Supporting Benthic Invertebrate Data

ABBREVIATIONS AND ACRONYMS

As	Arsenic
BHP	BHP Engineering Pty. Ltd.
CALA	Canadian Association for Laboratory Accreditation Inc.
CARs	Canadian Aviation Regulations
Cd	Cadmium
Corp.	Corporation
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CPR	Canadian Pacific Railway
Cu	Copper
°C	Degrees Celsius
CVAA	Cold Vapour Atomic Absorption
D	Simpson's Diversity
DFO	Department of Fisheries and Ocean Canada
DO	Dissolved Oxygen
E	Simpson's Evenness
EA	Environmental Assessment
EC	Environment Canada
EcoMetrix	EcoMetrix Incorporated
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
EMRD	Extraction Metallurgy Research Division
EPT	Emphemeroptera, Plecoptera, Trichoptera,
EPT/C	Emphemeroptera, Plecoptera, Trichoptera/Chironomid ratio
ESA	Endangered Species Act
Euralia	Euralia Mining Ltd.
Fe	Iron
ft	Foot
FWIN	Fall Walleye Index Net
Geostat	Geostat Systems International
Golder	Golder Associates Limited
GPS	Global Positioning System
HBI	Hilsenhoff Biotic Index
HO	Harmonization Order
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
Inc.	Incorporated

JRP	Joint Review Panel
km	Kilometre
LEL	Lowest Effect Level
Ltd.	Limited
m	Metre
MMER	Metal Mining Effluent *Regulations* (Canada)
MPGM	Marathon PGM Corporation
MRSAs	Mine Rock Storage Areas
m^2	Square Meters
m^3	Cubic meters
mg/L	Milligrams/liter
m/s	Meters/second
NAR	N.A.R. Consultants Ltd.
Ni	Nickel
No.	Number
NoC	Notice of Commencement
O.Reg.	Ontario Regulation
OBBN	Ontario Benthos Biomonitoring Network
ODLF	Ontario Department of Lands & Forests
OE Act	Ontario Environmental Assessment Act
OMNR	Ontario Ministry of Natural Resources
OMOE	Ontario Ministry of Environment
OMOEE	Ontario Ministry of Environment and Energy
Pb	Lead
PGE	Platinum Group Element
PGM	Platinum Group Metals
PSMF	Process Solids Management Facility
PSQG	Provincial Sediment Quality Guidelines
PWQO	Provincial Water Quality Objectives
QA	Quality Assurance
QC	Quality Control
SARA	Species at Risk Act
SCI	Stillwater Canada Inc.
SEL	Severe Effect Level
SOPs	Standard Operation Procedures
Sp.	Species
Spp.	Species plural
SWC	Stillwater Mining Company

TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
ToR	Terms of Reference
TP	Total Phosphorus
µg/g	Microgram/gram
µm	Micrometer
µS/cm	Microsiemens/centimetre
VA	Voluntary Agreement
WAAS	Wide Area Augmentation System
YOY	Young of the Year
ZEAS	Zaranko Environmental Services
Zn	Zinc

1.0 INTRODUCTION

Stillwater Canada Inc. (SCI) proposes to develop a platinum group metals (PGMs), copper (Cu) and iron (Fe) open-pit mine and milling operation near Marathon, Ontario. A Notice of Commencement (NoC) of an environmental assessment (EA) in relation to the proposed Marathon PGM-Cu Project (the "Project") was filed by the Canadian Environmental Assessment Agency (CEA Agency) under Section 5 of the *Canadian Environmental Assessment Act* on April 29, 2010 (updated July 19, 2010). The EA was referred to an independent Review Panel by the Minister of the Environment on October 7, 2010. On March 23, 2011 SCI entered into a Voluntary Agreement (VA) with the Province of Ontario to have the Project subject to the Ontario Environmental Assessment Act (OEA Act). This agreement was the instrument that permitted provincial government to issue a Harmonization Order (HO) under Section 18(2) of the Canada-Ontario Agreement on Environmental Assessment Cooperation to Establish a Joint Review Panel for the Project between the Minister of the Environment, Canada and the Minister of the Environment, Ontario. The HO was issued on March 25, 2011. The Terms of Reference (ToR) for the Project Environmental Impact Statement (EIS) and the agreement establishing the Joint Review Panel (JRP) were issued on August 8, 2011.

The following provides an overview of the proposed development including its location, surrounding land uses, the exploration history of the site and the primary features of the mining and milling facilities.

1.1 Project Location

The Marathon PGM-Cu Project (the Project) is located approximately 10 km north of the Stillwater Canada Inc.'s Marathon PGM-Cu Project is located approximately 10 km north of the Town of Marathon, Ontario (Figure 1.1). The town, population approximately 4,000, is situated adjacent to the Trans-Canada Highway (Hwy 17) on the northeast shore of Lake Superior, about 300 km east and 400 km northwest (by highway) of Thunder Bay and Sault Ste-Marie, respectively.

The center of the Project footprint sits at approximately 48° 47' N latitude, 86° 19' W longitude. The Project site is in an area characterized by relatively dense vegetation, comprised largely of a birch- and, to a lesser extent, spruce-dominated mixed wood forest. The terrain is moderate to steep, with frequent bedrock outcrops and prominent east-west oriented valleys. The climate of this area is typical of northern areas within the Canadian Shield, with long winters and short, warm summers.

1.2 Surrounding Land Uses

The Project site lies partially within the municipal boundaries of the Town of Marathon, as well as partially within the unorganized townships of Pic, O'Neil and McCoy. The primary zoning designation within the Project Site is "rural".

In the immediate vicinity of the Project there are several authorized aggregate sites, including SCI's licensed aggregate site located to the east of Hwy 17 along the existing site access road.

The Marathon Municipal Airport (CYSP), which operates as a Registered Airport (Aerodrome class) under the Canadian Aviation Regulations (CARs; Subsection 302), is adjacent to, and south of the Project site. The airport occupies a land area of approximately 219 hectares and is accessed from Hwy 17.

Several First Nations and Métis groups claim the Project site as falling within their traditional land use boundaries, though no formal land claim for the area has been accepted by the Canadian government at this time. Historically, as is the case today, land and water uses associated with (or close to) the site would have typically been limited to the Pic River corridor, the Bamoos Lake-Hare Lake-Lake Superior corridor and the Lake Superior shoreline and near-shore area, rather than the interior of the Project site. Traditional land and water uses (or rights conferred by Treaty) that can be ascribed to the site include:

- Hunting;
- Trapping;
- Fishing;
- Plant harvesting for food (e.g., blueberries) or cultural/medicinal uses; and
- Occupancy.

Primary industries supporting the Town of Marathon, as well as the region, have historically been forestry, pulp and paper and mining. The Project site is located within the Big Pic Forest Management Area. The Big Pic Forest includes Crown land east and north of Lake Superior and is generally north, south and west of the community of Manitouwadge and includes the communities of Marathon, Caramat and Hillsport. Until July 2010 the forest was managed under the authority of a Sustainable Forest License (SFL), which was held by Marathon Pulp Inc. This SFL was revoked, with the forest reverting to the Crown as a Crown Forest. Until recently, Marathon Pulp Inc. (MPI) operated a Kraft pulp mill in Marathon on the shore of Peninsula Harbour. The mill announced its indefinite shut down (effective at the end of February 2009) on February 11, 2009, and as a result there has been a significant downturn in the local economy. The Hemlo Mining Camp is located 30 km to the southeast. There are currently two mines in production at the Camp (David Bell Mine, Williams Mine).

1.3 Exploration History of the Site

Exploration for copper and nickel deposits on the Project site started in the 1920s and continued until the 1940s with the discovery of titaniferous magnetite and disseminated chalcopyrite occurrences. During the past four decades, the site has undergone several phases of exploration and economic evaluation, including geophysical surveys,

prospecting, trenching, diamond drilling programs, geological studies, resource estimates, metallurgical studies, mining studies, and economic analyses. These studies successively enhanced the knowledge base of the deposit.

In 1963, Anaconda acquired the Marathon property and carried out systematic exploration work including diamond drilling of 36,531 m in 173 drill holes. This culminated in the discovery of a large copper-PGM deposit. Many of the holes were drilled in areas off the present Marathon property. Anaconda carried out a test pitting program that recovered 350 tonnes of material and had it tested at its Extraction Metallurgy Research Division (EMRD) facilities. Anaconda conducted a number of metallurgical tests intermittently from 1965 to 1982. Anaconda's primary objective was to improve metallurgical recoveries of copper and increase the copper concentrate grade. Anaconda discontinued further work on the project in the early 1980s due to low metal prices at the time.

In 1985, Fleck purchased a 100% interest in the Marathon PGM-Cu Project with the objective of improving the project economics by focusing on the platinum group element (PGE) values of the deposit. Fleck carried out an extensive program which included re-assaying of the Anaconda drill core, further diamond drilling, surface trenching of the mineralized zones, bulk sampling and a pilot plant test program at Lakefield Research Limited. The Fleck drilling totaled 3,615 m in 37 diamond drill holes. On June 10, 1998, Fleck changed its name to PolyMet Mining Corp.

In 1986, H.A. Symons carried out a feasibility study for Fleck based on a 9,000 tonnes per day conventional flotation plant with marketing of copper concentrate. The study indicated a low internal rate of return. Also in 1986, Kilborn Limited carried out a prefeasibility review for Fleck that included preliminary results from the Lakefield pilot plant tests. The study envisaged a 13,400 tonnes/day conventional flotation plant with marketing of copper concentrate. In late 1986 Teck Corporation prepared a preliminary economic feasibility report on Fleck's Marathon PGM-Cu Project based on a conventional open pit operation and concluded that the project was uneconomic due to low metal prices at that time.

In 1989, BHP Engineering Pty Ltd. (BHP) carried out a prefeasibility study for Euralba Mining Ltd. (Euralba), an Australian Junior mining company that had entered into a joint venture agreement with Fleck in 1987. Euralba re-sampled some 2,500 samples of drill core and had them assayed at Lakefield. Euralba retained Geostat Systems International (Geostat) to develop a block model of the Marathon deposit that was used by BHP to design an optimized open pit. BHP considered several metallurgical processes, including an on-site smelter process.

In 2000, Geomaque acquired certain rights to the Marathon PGM-Cu Project through an option agreement with Polymet. Geomaque and its consultants carried out a study of the economic potential of the Marathon PGM-Cu Project. The study included a review of the geology and drill-hole database, interpretation of the mineralized zones, statistics and

geostatistics, computerized block model, resource estimation, open pit design and optimization, metallurgy, process design, environmental aspects, capital and operating cost.

Marathon PGM Corp. (MPGM) acquired the Marathon PGM-Cu deposit from Polymet in December 2003. MPGM funded programs of advanced exploration and diamond drilling on a continuous basis between June 2004 and 2009. Over this period a total of 100,694 metres was drilled in 511 holes. Drilling was conducted across the Project site for various purposes including: to upgrade or expand the resource; for condemnation holes at the process solids management area, crusher and mills sites; and, to further define the resource, improving drill density and to reduce the strip ration of the planned open pits. MPGM did not drill any holes in the Project area during 2010.

Stillwater Mining Company (SWC) and Marathon PGM Corp. entered into an agreement on September 7, 2010 pursuant to which SWC would acquire all of the outstanding shares of MPGM. The acquisition agreement received ministerial approval under the Investment Canada Act on November 24, 2010 and the agreement closed on November 30, 2010. On December 31, 2010 Stillwater Mining Company formed a Canadian corporation, Stillwater Canada Inc. (SCI), who officially became the new proponent of the Marathon PGM-Cu Project. In 2011, SCI drilled 25 holes totalling 6,550 metres at the Marathon PGM-Cu deposit. Of the 25 holes, nineteen were drilled to improve the ore zone definition within the potential open pit, and six holes were drilled beneath the planned process water treatment plant to evaluate the nature of the rock and to test the size of a small sulphide zone.

1.4 Project Overview

The Project consists of the development of an open pit mining and milling operation. One primary pit (approximately 2 km in length, 600 m maximum width and 340 m maximum depth) and smaller satellite pits will be mined. Ore will be processed (crushed, ground, concentrated) at on-site processing facilities. Final concentrates containing copper, platinum group metals (gold, platinum, palladium) and iron will be transported off-site via road and/or rail to a smelter and refinery for subsequent metal extraction and separation. The total mineral reserve is estimated to be about 91 million tonnes.

Mine construction is anticipated to begin in 2013. During the operations phase of the Project, production will be on average approximately 22,000 tonnes per day. The operating life of the mine is proposed to be 11.5 years. A construction workforce of about 400 people will be required for between 18 and 24 months. The mine will create as many as 350 full time positions during the height of operations. The mine workforce will reside in local and surrounding communities, as there will be no living facilities on-site.

Approximately 288 x 10^6 tonnes of mine rock[1] will be produced and permanently stored in a purposefully built Mine Rock Storage Area (MRSA) located east of the main pit. Low-sulphur, non-acid generating and non-metal leaching mine rock will be used in the construction of access roads, dams and other site infrastructure as needed. Process solids[2] will be managed in the Process Solids Management Facility (PSMF). The PSMF will be designed to hold approximately 61 x10^6 m^3 of process solids material. Creation of the PSMF will require the construction of a number of dams. Water collected in the PSMF, as well as water collected around the mine site (e.g., water pumped from the pits), will be directed to a Process Water Pond for eventual reclamation in the milling process. Excess water not needed in the mill will be discharged (monitored and controlled) to the environment through an existing surface water course after meeting federal and provincial requirements.

Access to the Project site is currently provided by the Camp 19 Road, opposite the Peninsula Road at Highway #17. The existing road runs east towards the Pic River before turning north along the river to the Project site (approximately 8 km). The existing road will be upgraded and utilized from its junction with Highway #17 for approximately 1.0 km. At this point a new road running north will be constructed to the future plant site. The primary rationale for developing the new road is to move traffic away from the Pic River, where erosion of the existing road is a safety and environmental concern. The new section of road will link two sections of abandoned forest access roads located on the site.

Power to the Project site will be provided via a new 115 kV transmission line that will be constructed from a purposefully built junction point on the Marathon-Manitouwadge transmission line located to the northwest of the primary pit. The new transmission line will run approximately 3.8 km to a transformer station at the mill site. The width of the transmission corridor will be approximately 30 m.

Disturbed areas of the Project footprint will be reclaimed in a progressive manner during all Project phases. The ultimate goal of mine decommissioning will be to reclaim land within the Project footprint to permit future use by resident biota and for traditional land-use activities. A certified Closure Plan for the Project will be prepared as required by Ontario Regulation (O.Reg.) 240/00 as amended by O.Reg.194/06 “Mine Development and Closure under Part VII of the Mining Act” and “Mine Rehabilitation Code of Ontario”.

Maps showing the existing features and topography of the site, as well as the proposed development of the site are provided in Figure 1.2 and 1.3.

[1] Mine rock is rock that has been excavated from active mining areas but does not have sufficient ore grades to permit economically viable extraction.
[2] Process solids are solids generated during the ore milling process following extraction of the ore (minerals) from the host material.

1.5 Background Aquatic Environmental Information

There was limited historical aquatic environmental information available for the site location prior to the development of The Project by Marathon PGM Corp. The majority of these data were collected by the Ontario Ministry of Natural Resources (Department of Lands and Forests) and were limited mainly to lake and stream survey summaries of some of the larger lakes and streams within the Project footprint. Historical data were available for Hare Lake, the Rag Lakes, Shack Lake, Shack Creek and Angler Creek.

Baseline environmental research relevant to the current proposed development was initiated by Marathon PGM Corp. in 2001. The overarching objective of the research was and continues to be to provide the necessary information to develop an EIA and ultimately deliver the EIS for the Marathon PGM-Cu Project.

In 2006 N.A.R. Environmental Consultants Ltd. (NAR) was retained by Marathon PGM to conduct an Environmental Baseline Assessment (NAR, 2007), in relation to advanced exploration at the site. This environmental baseline survey comprised sampling at a total of 16 small lakes and ponds and included the characterization of the water and sediment quality, benthic macroinvertebrate communities, the fisheries communities, and prominent shoreline features.

Subsequent to the NAR report and after the decision was made by Marathon PGM to move forward with the development of the Project, Golder Associates Limited (Golder) was retained to conduct a baseline assessment of the aquatic and terrestrial environments associated with the proposed Marathon PGM-Cu Mining Project to support a Feasibility Study (Golder, 2009). Using an updated site plan the potential environmental impacts associated with the Project were assessed with the purpose of characterizing the aquatic biological community within the Project footprint, identify environmental constraints associated with the Project and to gather information to support permit applications required as the mine development progressed. This aquatic baseline assessment included a number of small lakes and streams on the property as well as the Pic River and included the characterization of water and sediment quality, benthic community, fish community and fish habitat.

1.6 Current Aquatic Environmental Survey

In 2008, EcoMetrix Incorporated (EcoMetrix) was retained by Marathon PGM Corp. to complete additional aquatic environment baseline studies. EcoMetrix continued to work on describing the aquatic environment after the 2010 sale of MPGM to SCI. The purpose of this additional work was to address temporal and spatial deficiencies in the existing data compiled during previous works at the site. To this end, further studies were undertaken by EcoMetrix in 2009, 2010 and 2011.

1.6.1 Scope of Work

As mentioned above, previous aquatic assessments have occurred on the SCI Marathon PGM-Cu mine project property. Studies conducted by EcoMetrix generally were consistent with these works such that surveys addressed the need for assessment of:

1) water quality of key waterbodies in the Project area, including spatial and seasonal variability (spring high-flow period, early summer high-flow period, the late summer low-flow period, and under-ice in winter);
2) sediment quality of key waterbodies in the Project area;
3) species composition, abundance, spatial distribution and biological characteristics of the fish and benthic invertebrate communities of the local aquatic ecosystem; and
4) fish habitat characteristics of waterbodies in the Project area.

Survey locations and the parameters assessed at each site were chosen to ensure that at least a single study [i.e., EcoMetrix (present) or historic] had investigated all of the above mentioned components of the aquatic environment for each of the major points of interest. This included streams, ponds and lakes within the footprint of the mine proper and those that had the potential to be affected by continued mine development and/or discharged water (treated and controlled) from mine site.

1.7 Report Format

Following this introductory section, the remainder of the report is organized as follows. In Section 2.0, the methodology of the separate components of the current aquatic survey is outlined. In Section 3.0, the results of the 2009, 2010 and 2011 aquatic surveys [as well as previous work conducted at the site (e.g., NAR, 2007; Golder, 2009)] are provided on a watershed-by-watershed basis. In Section 4.0, metals data pertaining specifically to aquatic vegetation are presented. In Section 5.0, the references consulted in the preparation of this report are provided.

Appendix 1 is a photographic appendix with Part A consisting of aquatic baseline survey station photographs depicting site conditions. Part B presents photographs of fish species collected during aquatic baseline surveys. Appendix 2 contains field sheets for surveyed stations including fish collection records and habitat assessment forms. Laboratory reports for sediment, fish and plant tissues are provided in Appendix 3. Appendix 4 provides raw benthic macroinvertebrate data and benthic collection forms for samples collected during the 2009, 2010 and 2011 surveys.

2.0 STUDY METHODOLOGY

Figure 2.1 displays the aquatic baseline survey station locations referred to throughout the remainder of this report

2.1 Aquatic Habitat

2.1.1 Water Quality

Standard water quality parameters were measured concurrent with the benthic and/or fish collections conducted during the 2009, 2010 and 2011 field surveys. The parameters measured included pH, DO, conductivity and water temperature. These conventional measures were collected using a YSI 600 QS Sonde and YSI 650 MDS display-datalogger. The unit was calibrated to manufacturer's specifications prior to commencement of the study and calibration was verified periodically throughout the surveys. If necessary, re-calibration was undertaken. Measured values were compared to the Provincial Water Quality Objectives (PWQO) (OMOE, 1994) where applicable, to determine if they exceeded values set out for the protection of aquatic life.

2.1.2 Bathymetry

Detailed bathymetric surveys were completed on Bamoos Lake in August 2009, as well as Canoe Lake (L5) and Station L3 in October 2009. Bathymetric surveys following a standard method using an integrated recording depth sounder and global positioning system (GPS) with WAAS enabled receiver (Lowrance LC X-17 M). A boat was operated along systematic transects to simultaneously collect depth and position data. The Lowrance unit recorded GPS coordinates at the location of each depth measurement. This provided a high degree of resolution of the bottom profile. Absolute positioning was accurate to within 2 to 3 m (~ 7 to 10 ft.) laterally, although relative positioning (i.e., the distance between point to point measurements) was accurate to within about 1 m (~ 3 ft.).

Processing of the bathymetry data was completed using contouring and 3D surface mapping software (Surfer 8; Golden Software Inc., 2002) employing a kriging geostatistical technique to create bathymetric contours and to provide volume estimates for the lakes.

Hare Lake bathymetry was obtained from an OMNR survey undertaken in August 1975. Bathymetry of smaller lakes and ponds was completed using spot depth measurements (portable depth sounders) combined with GPS location data collected coincident with the fish and benthic invertebrate surveys. Bathymetric profiles for these waterbodies were interpolated manually.

2.1.3 Fish Habitat

The assessment of fish habitat was conducted during the fish and benthic collections throughout the EcoMetrix surveys. Data collected during these surveys were used to

characterize aquatic habitat and/or supplement existing information. Aquatic habitat surveys were previously undertaken in 2006 (NAR 2007), and 2007 and 2008 (Golder, 2009) on many of the waterbodies within the Project site. Habitat surveys undertaken during 2009, 2010 and 2011 included the collection of bathymetric, and water quality data as well as field observations of physical features, fish community and benthic community. Habitat data were recorded on assessment forms which are provided in Appendix 2. For lentic environments (i.e., lakes and ponds) aquatic habitat maps were prepared. Maps depict aquatic habitat features including bathymetry, substrate, water chemistry, fish community, aquatic macrophytes, riparian vegetation, and direction of flow. In addition, the location and type of fishing gear deployed and benthic sampling sites are provided.

2.2 Benthic Invertebrate and Sediment Collections

2.2.1 Benthic Invertebrates

In-field Sampling

Benthic invertebrates have been collected previously from the Project area (and environs) lakes, ponds and streams in 2006, 2007 and 2008 and details associated with these surveys are provided by NAR (2007) and Golder (2009). The EcoMetrix surveys (i.e., 2009, 2010 and 2011) filled identified data gaps to ensure that benthic data were available for the majority of waterbodies that could potentially be affected by the mine development.

Sampling during all EcoMetrix surveys was generally completed in one of two ways depending on the nature of the potential interaction of the watercourse with the mine development. In areas that had been identified as being potentially downstream of a mine effluent discharge, samples were collected in a quantitative manner consistent with the provisions of the Metal Mining Environmental Effects Monitoring (EEM) Program as prescribed under the Metal Mining Effluent Regulations (MMER) (Government of Canada, 2002). That is, multiple (replicate) sites were sampled within a given sampling area, with individual samples comprising multiple subsamples to account for within site variability. Quantitative sampling was conducted on Bamoos Lake, Hare Lake, Hare Creek downstream of Hare Lake, Stream 6 downstream of Highway No. 17 and in two Lake Superior embayments; at Port Munro (mouth of Hare Creek) and Sturdee Cove (mouth of Stream 6). Sampling on Bamoos and Hare Lakes consisted of five littoral and five profundal sampling sites per lake, sampled using a petite Ponar. The Hare Creek samples collected in September 2011 consisted of five replicate sites sampled via Surber sampler. The two Lake Superior Areas consisted of five sites each, also sampled with a petite Ponar. Five replicate sites were sampled on Stream 6 in the vicinity of the power transmission lines using a standard Ekman dredge. Samples collected at individual sites, regardless of sampler type, comprised a composite of three grabs for a total sampled area per site of 0.070 m^2 for the Ekman and Ponar stations and 0.279 m^2 for sites using the Surber sampler. Grabs were sieved in the field using a 500 μm mesh collection net. Once all three grabs were composited they were placed in properly labeled containers (internally

and externally) and the contents were preserved to a level of 10% buffered formalin. All benthic samples were collected following the EcoMetrix SOPs that have been reviewed by Environment Canada and deemed suitable for use in EEM programs across Canada.

As an alternative to the quantitative sampling as described above, sampling in areas that may/will be affected by the development of the mine in other ways (e.g., loss of watershed area and flow; draining) was conducted in a consistent semi-quantitative manner to develop species presence/absence and relative abundance profiles. In this case, samples were collected consistent with protocols outlined by the Ontario Benthos Biomonitoring Network (Jones *et al*., 2007). For these samples, a D-net on a pole equipped with a 500 µm mesh bag was used for a ten minute kick and sweep sample that included sampling of all available habitats within a given waterbody. Samples were labelled, stored and preserved in the same manner as the quantitative samples. Semi-quantitative sampling was conducted at stations L9, L13, L13a, L16, L20 (Terru Lake), L24, L25, L26, L27, L29, S12, S15, S18, S20, S24, S32, S41, S43, S44, S45, S46, S51A, S59, S60, S61, S62 and S69.

Laboratory Processing

Detailed taxonomic identifications were completed by Zaranko Environmental Assessment Services (ZEAS) Nobleton, Ontario. The lab's standard operating procedures have been reviewed and approved by Environment Canada for use in federally regulated EEM programs. The quality assurance program for the benthic lab reflects the latest version of the QA/QC requirements for mining EEM programs in Canada (Environment Canada, 2002).

Upon receipt at the lab, all benthic samples were inspected to insure that they were adequately preserved to a minimum level of 10% buffered formalin and correctly labelled. The samples were then stained to improve invertebrate sorting recovery.

Prior to detailed sorting, the samples were washed free of formalin using a 500 µm sieve. The benthic fauna and associated debris were then elutriated free of any sand and gravel in the samples. The remaining sand and gravel fraction was then closely inspected for any of the heavier organisms (e.g., Gastropoda, and Trichoptera with stone cases) that may not have been washed from this fraction.

All benthic samples were processed with the aid of stereomicroscopes. A magnification of at least 10X was used. The benthos were sorted from the debris, enumerated into the major taxonomic groups (typically Order and Family levels) and placed in vials for more detailed taxonomic analysis. All invertebrates were then identified to the lowest taxonomical level by qualified taxonomist using geographically appropriate taxonomic keys.

The quality assurance for recovery of benthic invertebrates from the samples involved the re-sorting of 10% of the samples to ensure > 90% initial sorting recovery. Error associated with subsampling was also determined.

A voucher collection (often referred to as a reference collection) was then complied for this study. The collection will be maintained in ZEAS files for at least six years. The specimens selected for the voucher collection were preserved in such a manner that they will remain intact for many years.

Data Analysis

Benthic Community Metrics

Data were summarized and several benthic invertebrate community metrics were calculated using embedded Microsoft® Excel™ (Microsoft Corporation, 2002) spreadsheet functions. These metrics included those defined as "EEM effect parameters" (Environment Canada, 2002), as well as several others that helped to better reveal patterns of invertebrate community structure:

- total invertebrate density[3];
- invertebrate richness[2];
- Simpson's Diversity (D)[2];
- Simpson's Evenness (E);
- Hilsenhoff Index
- ETP index;
- ETP to Chironomid Ratio (EPT/C);
- density of major taxonomic groups (sum of individuals present within each group); and
- relative density of major invertebrate taxonomic groups (proportion of individuals present within each group relative to the total)

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

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

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

[3] Total invertebrate abundance, richness, D is an "EEM effect parameters". According to EEM technical guidance, during the Initial, Periodic and Focused phases of the monitoring program, an effect on the benthic invertebrate community is said to occur if there are statistical differences between reference and exposure areas in any of the effect parameters.

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

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

Evenness (E) is an expression of how equitably taxa are represented within a given sample. In some cases, disturbance or stress can create conditions whereby relatively few taxa are favored and those taxa become disproportionately abundant in that location. In this instance the effect is manifested as relatively low evenness. Evenness ranges from zero to one (one representing a sample in which all taxa have the same abundance) and is calculated as in Smith and Wilson (1996):

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

where: E = Evenness
p_i = the proportion of the ith taxon (family) at the station
S = the total number of taxa (families) at the station

The Hilsenhoff Index (HBI) was calculated using tolerance values outlined in Mandaville (2002). The Hilsenhoff Index is a metric that accounts for differing organism sensitivity (i.e., enrichment) to help access the current condition of the aquatic environment. For the quantitative samples (including those collected by Golder [2009]) and semi-quantitative samples collected by EcoMetrix, a proportion based index was calculated by multiplying the percent abundance of a taxon by the tolerance value when available. The sum of these values was the biotic index for that replicate and the mean of the replicates was the biotic index for the given waterbody. For historic data collected by NAR (2007), HBI was calculated using the average tolerance values (i.e., summing of the tolerance values available divided by the number of taxa for which tolerance values were available). For consistency the values determined in both cases were compared against criteria outlined in Hilsenhoff (1987):

HBI Value	Water Quality	Degree of Organic Pollution
0.00-3.50	Excellent	No apparent organic pollution
3.51-4.50	Very Good	Slight organic pollution
4.51-5.50	Good	Some organic pollution
5.51-6.50	Fair	Fairly significant organic pollution
6.51-7.50	Fairly Poor	Significant organic pollution
7.51-8.50	Poor	Very significant organic pollution

8.51-10.00	Very Poor	Severe organic pollution

The EPT (Ephemeroptera, Plecoptera, and Trichoptera) index provides a measure of taxa richness within three taxonomic insect orders (mayflies, stoneflies, caddisflies), which are generally sensitive to pollution, and therefore should increase with improving water quality. The EPT index is equal to the total number of taxa represented within these three orders within a given sample.

The relative abundance of EPT and chironomid taxa (EPT/C Index) provides an indication of the balance of the benthic invertebrate community, as generally EPT taxa are considered to be more sensitive than chironomids to environmental stress (Plafkin *et al.*, 1989). A community considered to be in good biotic condition typically has an even distribution among these four groups, whereas communities with disproportionately high numbers of chironomids may indicate environmental stress. The EPT/C Index is calculated by dividing the sum of the total number of individuals from the taxonomic orders Ephemeroptera, Plecoptera, and Trichoptera by the total number of individuals from the taxonomic family Chironomidae.

The nature of the semi-quantitative sampling required a slightly different approach such that not all of the above mentioned benthic macroinvertebrate metrics were suitable and therefore not calculated. For these semi-quantitative samples the following community parameters were determined:

- total invertebrates per sample;
- invertebrate richness;
- Simpson's Diversity (D)
- Simpson's Evenness (E)
- Hilsenhoff Index
- ETP index;
- ETP to Chironomid Ratio (EPT/C);
- relative density of major invertebrate taxonomic groups (proportion of individuals present within each group relative to the total).

2.2.2 Sediment Collections

Coincident with benthic invertebrate sampling in depositional environments, sediment samples were collected for analysis of metals, grain size and nutrients (carbon, nitrogen and phosphorus). Samples were collected using a bottom grab sampler (i.e., Ponar or Ekman) and consisted of the top 2-5 cm of sediment. Sediment samples were placed in appropriately labelled glass jars and kept cool (<10 °C) until submission for analysis. Sediment samples were submitted for analysis to ALS Laboratories, which is an Canadian Association for Laboratory Accreditation Inc. (CALA) accredited facility. Samples were analyzed with method detection limits at or below the Provincial Sediment Quality Guidelines (PSQG) (OMOE, 1993).

Sediment analyses are highlighted relative to 'lowest effect' and 'severe effect' levels listed in the PSQG. These levels are defined as follows:

- Lowest effect level (LEL): A level of contamination which has no effect on the majority of sediment dwelling organisms; and
- Severe effect level (SEL): A level of contamination considered detrimental to sediment dwelling organisms.

2.3 Fish Community Survey

Fish and fish habitat characterization was conducted within the Project area and waterbodies into which on-site watercourses drain (e.g., Pic River, Lake Superior) in 2006 (NAR, 2007), 2007 and 2008 (Golder, 2009). In 2009, 2010 and 2011 EcoMetrix's survey increased the number of survey locations in an effort to fill in both spatial and temporal gaps in the previously collected fish community data. Sufficient effort has been expended within each of the waterbodies (i.e., lakes, ponds and streams) within the Project footprint and has been completed on a seasonal basis (where appropriate) to reflect potential differences in habitat utilization relating to flow conditions, as well as seasonal differences in fish activity (e.g., spawning). In most cases, fishing effort was conducted in manner consistent with the perceived level of interaction with the mine development (i.e., greater sampling effort in areas with a greater likely interaction).

2.3.1 Fish Collections

The fish communities were surveyed using a range of gear types including: trapnets, gillnets, Nordic nets, baited minnow traps, seine nets and backpack electrofisher, as appropriate for habitat characteristics and expected fish species composition. Stream locations were fished using a Model 12-B POW 24 V Smith-Root backpack electrofisher and dip net. Ponds and small lakes were fished using a combination of baited (i.e., dog kibble) minnow traps , Nordic nets measuring 40 ft with 8 ft panels of ½", ¾", 1", 1¼" and 1½" mesh as well as small-mesh experimental gillnets measuring 75 ft with 25 ft panels of 1½", 2" and 2½" mesh. Individual nets were often set in gangs (i.e., tied together) where appropriate. In addition to the above gear types, Hare Lake and Bamoos Lake fish communities were also surveyed using trapnets with 3/8" mesh, 100 ft lead and a 4 ft house and beach seines (3/8" mesh 54 ft length). Lake Superior sites were fished with 225 ft experimental gillnets with mesh sizes including 1½", 2" 2½", 3", 4", 5" and 6" stretch mesh and a beach seine.

All collected fish, regardless of the collection method, were identified, enumerated and released at the point of capture (with the exception of tissue chemistry specimens [See Section 2.4.1]). Length and weight data were recorded for fish collected from Hare Lake, Bamoos Lake and Port Munro. Fish collection records including effort are provided in Appendix 2.

During June 2011, a more targeted fish survey was undertaken in order to confirm the absence of fish in a number of locations where fish have not previously been captured. Generally, fishing effort was consistent with methodologies described in Portt *et al*. (2006, 2008) and Bonar *et al*. (2009). This effort included setting a combination of Nordic nets, small experimental gillnets and baited minnow traps at Stations L1, L2, L3, L9, L10/11, L12, L16, L13, L13a, L21, L22, L20 (Terru Lake), L25, L27 and L29. In addition, shoreline electrofishing in wadeable areas was undertaken in all of the aforementioned waterbodies, as well as L24. Appropriate gear types and number of sets used were determined based on the size and physical characteristics of the waterbody. All the passive gear types (i.e., gillnets and minnow traps) were set for a duration ranging from 91 to 97 hours. Fish community sampling in streams was conducted as stations S20, S59, S51A, S68, S69, S70, S71, S72, S73, S74, S75, S76, S77, S78, S79 using a backpack electrofisher and dip net with effort generally consistent with standard methodologies. In some cases, it was not possible to fish the recommended length of stream due to physical constraints including steep topography, beaver ponds and/or low water levels.

Additional fishing effort was undertaken on Hare Lake in September 2011. Generally the Ontario broad-scale fish community monitoring program protocol developed by the OMNR was followed for this survey (Sandstrom *et al*., 2009). This protocol employs both large mesh and small-mesh gillnets set in straps of two gangs. Large mesh gillnets were 82 feet long with 10-ft panels of 1½", 2", 2½", 3", 3½", 4", 4½" and 5". Small-mesh gillnets were similar to Nordic nets (i.e., 40 foot length with mesh ranging from ½" to 1½"). The protocol outlines the division of effort based on net type and by depth strata. For Hare Lake, two sets in each of four and five depth strata for large mesh and small-mesh nets were required, respectively. For this survey however, twice the recommend effort was employed. In total, four large mesh overnight sets in each of the five required depth strata were used. Four Nordic net sets in each of the four required depth strata were used for a total of 36 nets sets with both gear types combined. All fish collected during the September 2011 survey were weighed and measured to allow for calculation of baseline fish biomass.

2.4 Tissue Chemistry

2.4.1 Fish Tissue Chemistry

The chemical composition of fish tissues (i.e., skinless boneless fillet, liver, whole body) was characterized for Bamoos and Hare Lakes during the 2009 field season. Metals in fish tissues are potential indicators of the degree of metal exposure. Muscle metal levels can also be used to monitor for any impairment to the usability of resources. The data from this, as well as historic surveys (i.e., OMOE data) permitted the establishment of baseline metal levels for fish liver and muscle.

For the current study, samples of muscle and liver from five sport fish species were collected for ICP-MS metal analyses from each of Bamoos and Hare Lakes. Additionally five composite whole body samples of forage fish were submitted for ICP-MS analysis of

metals. The muscle sample of the sport fish will provide a baseline value with which to compare future studies and can be used to monitor for any human health risks associated with consumption of the fish (i.e., fish usability) whereas, the liver tissue, which typically has higher metal levels than muscle, can be used to monitor for temporal and spatial changes in body burdens.

In Hare Lake, Northern Pike (*Esox lucius*) and Spottail Shiner (*Notropis hudsonius*) were collected for analysis. Lake Trout (*Salvelinus namaycush*) and Lake Chub (*Couesius plumbeus*) were sacrificed to determine tissue metal burdens for Bamoos Lake. The metals results from the fish tissues collected during the 2009 season were compared to OMOE records (limited) for fish from Bamoos Lake, Gowan Lake and Lake Superior in the vicinity of the Town of Marathon, in order to determine a baseline for the lakes sampled. The 2009 data were also compared to the current Guide to Eating Ontario Sport Fish (OMOE, 2011), to determine any potential risks associated with eating these fish.

2.4.2 Aquatic Plant Tissue Chemistry

During the 2009 survey, aquatic plant tissue samples were collected for metal analysis. At the majority of survey stations, a composite of the predominant species occurring within the waterbody was collected. Individual samples from various stations were composited to provide samples from four areas of the Project site and analyzed for metals using ICP-MS. Species used in the tissue chemistry varied by waterbody. The list of species collected for the plant tissue chemistry analyses included but were not limited to: burreed (*Sparganium* sp.), broad-leafed arrowhead (*Sagittaria latifolia*), sedges (*Carex* spp.) and pondweed (*Potamogeton* spp.). These data were collected to support contaminant fate modeling on the site as part of the environmental assessment process.

2.4.3 Lab Tissue Chemistry Analysis

The laboratory reports provided in Appendix 3 outline the methods used for the analysis of different elements from the fish and aquatic plant tissues. For the majority of elements (metals) ICP-MS procedures applied. Mercury analysis of fish tissues was completed via CVAA. Laboratory QA included the analysis of laboratory blanks, run duplicates and the analysis of standard reference materials. The results of the analyses of the QA samples are provided along with the original laboratory reports.

3.0 RESULTS

Results of the EcoMetrix aquatic baseline survey are presented on a watershed-by-watershed basis. Historic data (i.e., Nar 2007; Golder, 2009) have also been incorporated into this report, with some reworking (e.g., recalculation of biotic indices) of the data when necessary.

Supporting documentation for surface water quality, sediment quality, benthic invertebrates and fish are provided in Appendices 2, 3 and 4.

Figure 3.1 displays the watersheds as defined for the baseline studies. Figure 3.2 presents a summary of fisheries resources by community type for the Project area.

3.1 Stream 1 Watershed

The Stream 1 watershed includes Stream 1 and three small headwater basins (Stations L1, L2 and L29) (Figure 3.3). Stream 1 flows southeastwards to the Pic River. This catchment could potentially be impacted by surface water drainage from the mill site and the proposed access road. The uppermost western headwater occurs within the proposed Process Solids Management area.

Sediment quality data for the Stream 1 watershed is provided in Table 3.1. Fishing effort and species identified for the Stream 1 watershed is presented in Table 3.2. Tables 3.3 and 3.4 display the benthic macroinvertebrate data and calculated indices for Stream 1 watershed stations.

3.1.1 Station L1

Figure 3.4 displays a pictorial representation of the aquatic habitat and bathymetry for Station L1, as a discussed below.

Bathymetry and Habitat

Station L1 is a round bowl-shaped lake with a surface area of about 2.9 ha. During August 2009, the maximum depth observed was ~12 m, in the center of the lake. The lake shallows gradually in all directions from the deep center towards the shoreline. More than half of the lake is deeper that 2 m with the shallower habitats limited to a littoral band around the perimeter of the lake.

A large beaver dam was present at the lake outlet. Low dissolved oxygen (DO) levels measured in the hypolimnion (below 6 m) during August 2009 indicate that fish habitat can be restricted to the surface waters, particularly the littoral zone (nearshore area), at times. Aquatic vegetation observed in the littoral area included yellow pond lily (*Nuphar variegatum*), burreed (*Sparganium* sp.) and variable-leaved pondweed (*Potamogeton gramineus*). The lake shoreline was generally rocky (bedrock, boulder), with fine-grained

organic sediments (muck) in the deeper portions of the lake. The surrounding terrestrial vegetation included black spruce (*Picea mariana*), white spruce (*Picea glauea*), mountain maple (*Acer spicatum*), mountain ash (*Sorbus Americana*), sweet gale (*Myrica gale*), bog willow (*Salix pedicellaris*), pink lady's slipper (*Cypripedium acaule*) and currant (*Ribes* sp.).

Water Quality

The water was a clear yellow/brown colour and Secchi depth was 2.5 m. As indicated, L1 was thermally stratified during the August 2009 survey, with the epilimnion extending to a depth of 3 m. The thermocline occurred between 3 and 6 m. DO tracked temperature with adequate oxygen (i.e., 7 to 7.7 mg/L) at a water depth of 4 m or less but dropped to below 2 mg/L in the hypolimnion. The hypolimnion was therefore below the PWQO (5 mg/L) for DO. Elevated conductivity (relative to surface) at depths greater than 8 m suggested the possible influence of groundwater and also that groundwater inputs were not well mixed with the overlying water. In addition, pH was low (<5) at depths greater than 1 m which was below the PQWO (6.5 to 9.0).

During March 2009, DO levels beneath 0.46 m of ice were approximately 1 mg/L throughout the water column (True Grit, 2009). pH and conductivity were 8.08 and 17 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

NAR (2007) collected sediment from L1 in 2006. Results from that sample indicated several exceedances of the PSQG (Table 3.1). TKN and TOC exceeded the SEL whereas, total phosphorous, As, Cd, Cu, Fe, Pb, Ni and Zn exceeded the LEL. TKN and TOC were 166,816 µg/g and 20% compared the PSQG SEL of 4,800 µg/g and 10%. As (12 µg/g), Cd (4.4 µg/g), Cu (48 µg/g), Fe (21,000 µg/g, Pb (87 µg/g), Ni (20 µg/g) and Zn (122 µg/g) exceeded their respective LEL of 6, 0.6,16, 20,000, 31, 16 and 120 µg/g. All other parameters met the established PSQG.

Benthic Community

NAR (2007) collected invertebrates from L1 in 2006 using a similar method employed during the EcoMetrix surveys for other locations (i.e., 10 minute D-net kick and sweep of available habitat). The 2006 collections yielded 18 taxa and a mean Hilsenhoff value of 6.00 (Table 3.4). According to Hilsenhoff (1987) this average score indicated the benthic community in L1 was of fair quality. Identified taxa ranged from very sensitive (i.e., Odonata - *Ladona julia*) to very tolerant (i.e., Chironominae – *Endochironomus* sp.). Resident benthos included: worms (Oligochaeta), mites (Acari), amphipods (Amphipoda), beetles (Coleoptera), flies (Diptera) including many midges (Chironomidae), mayflies (Emphemeroptera), caddisflies (Trichoptera) and clams (Bivalvia - Sphaeriidae) (Table 3.3)).

Fish Community

During August 2009, three different gear types (baited minnow traps, small-mesh experimental gillnets, and Nordic nets) were set overnight (i.e., 17 hours) in L1. Minnow traps were set primarily over muck at depths ranging from 0.9 to 1.8 m whereas a gang set of a Nordic and small-mesh experimental was set perpendicular from shore out to a depth of 4 m. This effort resulted in the capture of no fish. Additionally, the use of fall walleye index nets (FWIN) and minnow traps by NAR (2007) in September 2006 also resulted in no fish being captured in L1 (Table 3.2). In June 2011, four baited minnow traps, two Nordic and two small-mesh experimental nets were set in L1 for approximately 92 hours each. Gear covered depths from 0.6 to 1.8 m and substrates ranged from muck, rock, detritus and woody debris. Some gear was set in in open water whereas others were set on drop-offs and in aquatic macrophyte beds. In addition to the passive gear, shoreline electrofishing was undertaken over approximately 250 m of shoreline expending 593 seconds of effort. During the shoreline electrofishing water clarity and visibility was good allowing for effective capture of organisms within the wadeable shoreline areas. Numerous invertebrates and Eastern Newts (*Notophthalmus viridescens*) were observed; however, no fish were captured.

3.1.2 Stream 1 (Station S54)

Fish Habitat

The outlet stream from Station L2 (Station S54) is a 1st order stream, which had a mean width of 0.3 m and a mean water depth of 0.05 m during June 2010 (Figure 3.3). Within the surveyed reach, the gradient is low and flow velocity was negligible (0.02 m/s). Stream morphology consisted of 80% flats, 10% riffles and 10% pools within a meandering channel. The stream canopy was open to partly open and instream cover was afforded by logs and trees (10%). The substrate consisted of primarily muck, sand and detritus, with minor cobble and gravel. No visible sediment or algae overlying the substrate was observed. The water was clear and colourless and the temperature was 12.5°C. DO was slightly below saturation (85%), conductivity was 17 µS/cm and pH was 6.72. The adjacent terrain was meadow and forested lowland and observed terrestrial vegetation included white spruce, black spruce, speckled alder, bog willow and balsam poplar. Although no barriers were observed within the surveyed reach, severe topography downstream of L2 prevents upstream fish movement.

Fish Community

During June 2010, a 50 m reach of the outlet stream from L2 (Station S54) was surveyed by electrofishing. No fish were captured during 96 seconds of effort (Table 3.2). Upstream of the sampled reach the topography becomes very steep and very little water was flowing. Lack of water and steep relief limited the length of the reach surveyed.

3.1.3 Station L2

Figure 3.5 provides a pictorial representation of the aquatic habitat and bathymetry for Station L2, as discussed below.

Bathymetry and Habitat

Station L2 is a long relatively narrow lake and was approximately 340 m long and 50 m wide during August 2009. The maximum observed depth of 3.5 m was measured in the southern end near the western shore. A beaver dam was present at the lake outlet, which substantially increased lake surface area and maintained water levels much higher than they would be otherwise. In June 2011, it appeared the water depth had decreased approximately 0.5 m since 2009 due to the deterioration of the beaver dam. Deeper water, more than 2 m deep in 2009, was limited to a fairly narrow north-south oriented trough in the middle of the lake. The remainder of the lake was <2 m deep, with the majority <1 m and inhabited by aquatic macrophytes. The surface area of L2 was about 1.3 ha in 2009.

Similar to Station L1, the shore was rocky with fractured bedrock and sheer cliffs present. Offshore bottom sediments were comprised of organic mud and muck. Both emergent and submergent aquatic vegetation was present in L2 and included hardstem bulrush (*Scirpus acuntus*), floating-leaved pondweed (*Potamogeton natans*), three-way sedge (*Dulichium arundinaceum*), wild celery (*Vallisneria americana*), manna grass (*Glyceria* sp.), flat-stemmed pondweed (*Potamogeton zosteriformis*), floating arrowhead (*Sagittaria ceneata*) and yellow pond lily. The adjacent terrestrial vegetation consisted primarily of black spruce, white spruce, mountain maple, speckled alder (*Alnus incana*), mountain ash, balsam fir (*Abies balsamea*), Canada yew (*Taxus canadensis*), white birch (*Betula papyrifera*) and eastern white cedar (*Thuja occidentalis*).

Water Quality

During August 2009, the water colour was clear yellow/brown and Secchi depth was 1.7 m. There was no evidence of thermal stratification; however DO and pH were slightly reduced at depths greater than 2 and 1 m, respectively. A minor increase in conductivity (compared to surface) at depths >1 m suggested the influence of groundwater. pH was below PWQO objective at depths 1 m and greater, whereas DO was only below PWQO at the bottom of the water column.

During March 2009, DO levels beneath 0.52 m of ice were <1 mg/L, pH was 7.06 and conductivity was 45 µS/cm (True Grit, 2009).

Sediment Quality

Four parameters, TKN, TOC, Cd and Pb, exceeded the LEL or SEL in the 2009 sediment sample (Table 3.1). TKN was 14,100 µg/g exceeding the SEL criteria of 4,800 µg/g. TOC exceeded the SEL at nearly 16%. Cd and Pb were 0.9 and 33 µg/g, both exceeding the

PSQG LEL for these parameters. During the 2009 survey all other key parameters were below criteria.

NAR (2007) collected a sediment sample from L2 during their 2006 study. The results had exceedances for the same parameters as in 2009. Additionally, Cu and Ni exceeded PSQG. TKN, TOC and Cu exceeded the SEL in 2006 (Table 3.1). Cd, Pb, and Ni were 1.6 µg/g, 43 µg/g and 31 µg/g, respectively, compared to their LEL values of 0.6 µg/g, 31 µg/g, and 16 µg/g. All other parameters were below PSQG.

Benthic Community

NAR (2007) collected benthic invertebrates from L2 in 2006 resulting in the identification of 22 taxa and a mean Hilsenhoff value of 5.90 (Table 3.4). This value indicated fair water quality. Similar to L1, the established tolerance of the collected individuals ranged widely. Collected benthos included mites, water scuds, beetles, mayflies, damselflies, dragonflies, caddisflies, biting midges, midges and clams (Table 3.3).

Fish Community

Three gear types (baited minnow traps, small-mesh experimental gillnet, and Nordic net) were set overnight (i.e., 23 - 25 hours) in Lake 2 in August 2009. Gear were set at depths ranging from 0.6 to 2.4 m in habitats including aquatic macrophyte beds, logs piles and open water. As in L1, no fish were captured in L2 (Table 3.2). In September 2006, NAR (2007) set minnow traps and a FWIN, which also resulted in no catch. In June 2011 four baited minnow traps, two small-mesh experimental gillnets and two Nordic nets were set over rocky, muck and detritus substrates. Depths of sets ranged from 0.75 to 1 m for baited minnow traps and 0.6 to 1.8 m for gillnets. Gear were set in all available habitats (i.e., open water, macrophyte beds, on rocky shoals and log piles). Passive gear set for approximately 93 hours in 2011 caught no fish. Shoreline electrofishing of approximately 280 m using 618 seconds resulted in no fish being captured despite good water clarity during the survey. June 2011 efforts, both passive and active, resulted in the capture of invertebrates (i.e., giant diving beetles, caddisfly larvae, leeches) Eastern newts and tadpoles.

3.1.4 Stream 1 (Station S55)

Fish Habitat

The outlet stream from waterbody L1 (Station S55) is a 1st order stream which had a mean width of 0.3 m and a mean water depth of 0.05 m during June 2010 (Figure 3.3). Within the surveyed reach, the gradient is low and flow velocity was negligible (0.02 m/s). Stream morphology consisted of 95% flats and 5% pools and the channel was meandering. The stream canopy was open and instream cover was afforded by undercut banks (10%) and logs and trees (5%). The substrate consisted of muck, sand and detritus. No visible sediment or algae overlying the substrate was observed. The water was clear and colourless and the temperature was 11.5°C. DO was slightly below saturation (82%),

conductivity was 68 µS/cm and pH was 6.82. The adjacent terrain was meadow and forested lowland and the observed terrestrial vegetation included white spruce, black spruce, speckled alder, bog willow and raspberry (*Rubus* sp.). Although no barriers were observed within the surveyed reach, severe topography immediately downstream of Lake 1 prevents upstream fish movement. The area immediately upstream of S55 was surveyed in June 2011. This reach is more densely wooded than the channel below. Substrates consist of cobble and gravel with some sandy sections. The lower portion of this reach is meandering whereas further upstream there were some braided sections. The upper portion of this reach has numerous log jams that form small cascades. Upper reach vegetation observed in June 2011 was primarily alder with some ostrich fern (*Matteuccia struthiopterus*), horsetail (*Equisetum fluviatile*), sedge and grass also evident.

Fish Community

The outlet stream from L1 (Station S55) was electrofished for 117 seconds during June 2010. No fish were collected from a 100 m reach of the stream. In June 2011, S55 was resampled extending the station further upstream to the start of the high gradient. This total station was approximately 200 m long and was sampled with 322 seconds of effort. No fish were collected (Table 3.2). At the upper end of the station, a defined channel ceases to exist and water seems to flow down the steep topography beneath boulders and the active soil layer through the forest.

3.1.5 Stream 1 (Station S58)

Fish Habitat

The uppermost headwater reach of Stream 1 (Station S58) is a 1st order stream, which had a mean width of 2 m and a mean water depth of 0.15 m during June 2010 (Figure 3.3). The gradient in this area is low and flow velocity was negligible (0.02 m/s). Stream morphology consisted of pools (50%) and flats (50%) and the channel was ponded and meandering. Stream canopy was open and instream cover was afforded by logs and trees (10%). The substrate consisted of primarily silt, muck and detritus with minor cobble, gravel and sand. Sediment and algae overlying the substrate were heavy and moderate, respectively. The water was a clear yellow/brown colour and the temperature was 21°C. DO was at saturation, conductivity was 26 µS/cm and pH was 6.42. The adjacent terrain was meadow and the observed upland vegetation included white spruce, mountain maple and balsam poplar (*Populus balsamifera*). Barriers due to beaver dams were present within the reach.

Fish Community

A 120 m section of the uppermost reach of Stream 1 (Station S58) was electrofished during June 2010. 249 seconds of effort yielded no fish (Table 3.2). Low flows, channel morphology and the presence of beaver ponds restricted the length of stream surveyed. All habitats present were fished and extending the station would not have led to any additional habitats being encountered.

3.1.6 Stream 1 (Station 79)

Fish Habitat

Station S79 is situated downstream of S58 and upstream of S1 on Stream 1 (Figure 3.3). This reach was assessed during June 2011 to determine the upstream extent of fish presence. At this location the watercourse had a mean width of 0.7 m and a mean water depth of 0.25 m. Within the 250 m surveyed reach, the gradient was moderate to low and flow velocity was about 0.1 m/s. The channel was meandering with a small braided section. Stream morphology consisted primarily of pools (50%) and riffles (30%) with flats and runs each comprising 10% of the stream length. The stream canopy was mainly dense with some small sections of partly open and open mainly along cut lines. Instream cover was afforded by undercuts, aquatic macrophytes, logs and trees, log jams, boulders and deep pools. The substrate was varied with the downstream section comprised of muck and silt whereas the upper portion of the reach was primarily sand, gravel, boulder and cobble. Sediment overlying the substrate was slight and algae overlay was moderate. The water was a clear yellow/brown. Observed aquatic macrophytes included sedges, algae and mosses. The adjacent terrain was mostly forested upland with some beaver meadow areas. Terrestrial vegetation included white spruce, black spruce, speckled alder and grasses. Barriers were observed throughout the reach in the form of old beaver dams and log jams.

Fish Community

Assessment of the S79 fish community was completed using a combination of visual and backpack electrofishing. Within the downstream 120 m of the surveyed reach, dace (*Chrosomus* spp.) and Brook Stickleback (*Culaea inconstans*) were observed, with the majority of the dace confined to the downstream 100 m (Table 3.2). Electrofishing commenced from the last visual sighting of fish and extended upstream for approximately 120 m using 214 seconds of effort. Approximately 10 m upstream of the last fish observation a large log jam was present and very little flow was observed within the creek. No fish were captured upstream of this point. A number of additional potential barriers to upstream fish passage were encountered.

3.1.7 Stream 1 (Station S1)

Fish Habitat

The upper reach of Stream 1 (Station S1), below the confluence of L1 and L2 outlet streams, just downstream of the access road had a mean width of 1.25 m and a mean depth of 0.15 m during the May 2009 survey (Figure 3.3). This reach is high gradient with a series of cascading pools and the average water velocity was approximately 0.35 m/s. Upstream of the station is an old beaver pond that had been recently drained and downstream of the station is a newly developed beaver pond. The surveyed section of stream consisted of 60% pools, 30% cascades and 10% flats. The stream canopy at the

station was dense. Instream cover was comprised of boulders, logs and trees, log jams and deep pools and the substrate consisted of 50% bedrock, 30% cobble, 10% boulder, 10% gravel with some organic silt present. The substrate had some algae and moss cover. Potential natural low flow barriers created by logjams and cascades were present throughout the reach. The water colour was stained yellow/brown and the water temperature was 10.5°C. The surrounding upland forest consisted of balsam fir, speckled alder, dogwood (*Cornouiller spp.*), white birch, balsam poplar and white spruce.

Sediment Quality

The sediment sample collected in 2007 by Golder (2009) had six parameters that exceeded their respective LEL. TP, Cu, Fe, Ni, Zn and TOC were 903 µg/g, 38 µg/g, 30,300 µg/g, 35 µg/g, 178 µg/g and 1.2 %. All other key parameters met PSQG (Table 3.1).

Benthic Community

No benthic survey was completed at S1 during the 2009 field season. However, during the May electrofishing survey caddisfly larvae, leeches and mayfly nymphs were common within the reach and were observed regularly during backpack electrofishing.

Golder conducted a benthic survey at Station S1 during their 2007 aquatic studies (Golder, 2009). Three replicate samples were collected using a Surber sampler. In total 25 unique taxa were identified for S1 with a replicate mean of 11 and a range of five to 19 (Table 3.4). The density of invertebrates at S1 ranged from 97 to 3,902 invertebrates/m^2. Mean Simpson's Diversity and Evenness at S1 were 0.76 and 0.54, indicating a relatively diverse community dominated by a moderate number of taxa. The most dominant group of macroinvertebrates was chironomid midges comprising a mean of 49% of the mean relative invertebrate community. Sphaeriids, annelids and EPT taxa comprised a mean of 11%, 7% and 15% of community, respectively. A total of 6 EPT taxa were collected at S1. The Hilsenhoff Index was 5.6 indicating a fair quality watercourse (Table 3.4). Also present in the samples were dragonflies, amphipods and mites (Table 3.3).

Fish Community

In May 2009 an electrofishing survey of a 75 m reach of upper Stream 1 (Station S1), below the confluence of the L1 and L2 outlet streams, resulted in the capture of a single adult Northern Redbelly Dace (*Chrosomus eos*) and a single Finescale Dace (*Chrosomus neogaeus*). A total of 587 seconds of fishing effort was expended. In August and September 2007, Golder captured Lake Chub and Brook Stickleback using minnow traps and backpack electrofishing (Table 3.2).

3.1.8 Stream 1 (Station S56)

Fish Habitat

The reach of Stream 1 at Station S56, below the confluence of the headwater area and lake outlet streams is a 2nd order stream, which had a mean width of 5 m and a mean water depth of 0.4 m during June 2010 (Figure 3.3). Within the surveyed reach, the gradient is primarily low and flow velocity was negligible (0.02 m/s). The channel was ponded due to beaver activity and stream morphology consisted of 95% pools and 5% riffles. The stream canopy was open to partly open and instream cover was afforded by logs and trees. The substrate consisted of silt and clay. Sediment overlying the substrate was heavy but no algae were observed. The water was clear and yellow/brown and the temperature was 19°C. DO was above saturation (120%), conductivity was 82 µS/cm and pH was 8.29. The adjacent terrain was beaver pond and forested lowland and the observed terrestrial vegetation included white spruce, black spruce and mountain maple. Multiple beaver dams were observed within the reach which could pose barriers to fish movements.

Fish Community

This reach of Stream 1 (Station S56) was electrofished during June 2010. All habitat types where fished. Four Northern Redbelly Dace and two Finescale Dace were captured within a 30 m reach during 197 seconds of effort (Table 3.2).

3.1.9 Stream 1 (Station S57)

Fish Habitat

The mid-reach of Stream 1 (as represented by Station S57), above the confluence of the Station L29 outlet stream, had a mean width of 1.5 m and a mean water depth of 0.1 m during June 2010 (Figure 3.3). Within the surveyed reach, the gradient was moderate and flow velocity was about 0.1 m/s. The channel was 75% straight reach and 25% meandering and stream morphology consisted of an equal proportion of pools, riffles, runs and flats. The stream canopy was open to partly open and instream cover was afforded by logs and trees. The substrate consisted of clay, sand, cobble, gravel and boulder. Sediment overlying the substrate was moderate and algae overlay was slight. The water was clear and yellow/brown and the temperature was 19°C. DO was slightly below saturation (87%), conductivity was 161 µS/cm and pH was 7.74. The adjacent terrain was forested lowland and the observed terrestrial vegetation included white spruce, black spruce, speckled alder, elderberry (*Sambucus* sp.) and raspberry. Beaver dams were observed within the reach, which would pose barriers to fish movements.

Fish Community

Electrofishing was undertaken within the mid-reach of Stream 1 (Station S57), during June 2010. All habitats within the reach were fished. 363 seconds of effort within a 60 m reach

yielded no fish. Upstream of this location Northern Redbelly Dace, Brook Stickleback, Finescale Dace and Lake Chub have been collected whereas downstream, Brook Trout (*Salvelinus fontinalis*) and Finescale Dace have been captured (Table 3.2).

3.1.10 Station L29

Figure 3.6 provides a pictorial representation of the aquatic habitat and bathymetry for L 29, as discussed below.

Bathymetry and Habitat

Station L29 is a small lake that is approximately 300 m long and 100 m wide at the widest point. In June 2011, the maximum depth observed was approximately 1.8 m. The deepest portion of the lake occurs in the middle of the lake across from the outlet. The majority of the lake is shallow (i.e., ≤ 1 m). The northern end of the lake features shallow water with dead trees throughout the nearshore area. The south end of the lake has a large bog inhabited by scrub-shrub wetland vegetation including sphagnum moss, bog willow, sweet gale and northern blue flag (*Iris versicolor*). A large portion of lake has a rocky shoreline. Substrates consisted primarily of organic mud and muck in the deeper offshore areas. The lake water level was maintained by an old beaver dam at the outlet. Beyond the outlet there are a series of additional inactive beaver dams. The area of L29 during June 2011 was approximately 1.3 ha including the bog at the south end of the waterbody. Scattered small patches of yellow pond lily and sedges were observed. The adjacent terrestrial vegetation consisted primarily of black spruce, white spruce and white birch with some tamarack (*Larix laricina*), buckbean (*Menyanthes trifoliate*) and ferns also present.

Water Quality

No thermal stratification was noted in June 2011. Temperature, conductivity, pH and DO levels were adequate to support fish throughout the water column. Temperature ranged from 15.3°C at the bottom to 16.0°C at the surface whereas specific conductance was approximately 17 µS/cm throughout the water column. pH was circumneutral (i.e., 6.9 to 7.7) and DO ranged from 81% near the bottom to 96% at the surface. The water colour was clear yellow/brown and Secchi depth was bottom (1.8 m).

Sediment Quality

Three parameters, TP, Cd and Cu, exceeded the LEL in the June 2011 sediment sample. TP was 715 µg/g exceeding the criteria of 600 µg/g. TOC and TKN were 15.3% and 8,810 µg/g, respectively exceeding their SEL criteria of 10% and 4,800 µg/g. Cd and Cu were 0.7 and 16 µg/g, both exceeding the PSQG LEL for these metals. During the 2011 survey all other key parameters were below criteria (Table 3.1).

Benthic Community

During ten minutes of kick-sweep sampling approximately 6,670 organisms were collected by EcoMetrix in June 2011 (Table 3.4). These organisms represented 40 different taxa. Four of these taxa were EPT taxa which are typically sensitive to environmental disturbance. EPT taxa comprised approximately 1% of the total number of organisms. The most abundant taxonomic group was chironomid midges (74%), followed by sphaeriid clams (12%). Also present in the benthic sample were annelids, mites, springtails, amphipods, beetles, dragonflies, damselflies, bugs and biting-midges (Table 3.3). The Hilsenhoff Biotic Index value for the L29 benthic community was 6.6 indicating poor water quality. Simpson Diversity (D) and Evenness (E) were 0.84 and 0.15 indicating a diverse community dominated by a limited number of taxa.

Fish Community

The fish community of L29 was assessed for the first time in June 2011 since it lies outside of the projected physical footprint and influence of the mine development. Four baited minnow traps, two small-mesh experimental gillnets and two Nordic nets were each set for approximately 93 hours. Depths ranged from 0.5 to 1.2 m for minnow traps and 1.2 to 1.8 m for the gillnets. The majority of the substrate where the nets were set was muck with some gravel and boulders present at some set locations. Habitats fished included open water, woody debris piles and adjacent to an old beaver lodge entrance. Shoreline electrofishing was also conducted along 475 m of shoreline using 363 seconds of effort. No fish were captured in during active or passive fishing (Table 3.2). Aquatic life observed included thousands of tadpoles, caddisfly larvae, leeches, beetles and water striders.

3.1.11 Stream 1 (Station S27)

Fish Habitat

This mid-reach location on Stream 1 (Station S27) is a moderate gradient reach located within upland forest with vegetation consisting primarily of white spruce, dogwood, speckled alder and eastern white cedar (Figure 3.3). The stream canopy was a combination of dense and partly open. In May 2009, the mean width was 2.5 m and mean water depth was 0.25 m. Water velocity was approximately 0.1 m/s. The reach stream morphology consisted of series of pools separated by small cascades and riffles with some flat and run habitat also present. Substantial instream cover was present within the reach, afforded by boulders, logs and trees, log jams, deep pools and undercut banks. The substrate consisted of equal proportions of bedrock and sand, with smaller amounts of cobble, gravel, silt and clay. The substrate was overlain with moderate amounts of sand and algae cover was also moderate. No barriers to fish migration were observed within the vicinity of the station. The water was clear yellow/brown in colour with a temperature of 10.5°C in May 2009.

Benthic Community

In May 2009, mayfly nymphs, caddisfly larvae and leeches were observed during the electrofishing survey. No benthic macroinvertebrate sampling has been completed at this location, to date.

Fish Community

During May 2009, an electrofishing survey of a 150 m section of the mid-reach of Stream 1 (Station S27) resulted in the capture of six juvenile and five adult Brook Trout and three adult Finescale Dace, during 1,267 seconds of effort (Table 3.2). This stream reach supports a resident coldwater community comprised of Brook Trout.

3.1.12 Stream 1 (Station S2)

Fish Habitat

Station S2 is located in the lower reach of Stream 1, upstream of its confluence with the Pic River (Figure 3.3). This reach has a moderate gradient and during the May 2009 survey had a mean width of 3 m, a mean depth of 0.2 m and a mean velocity of 0.2 m/s. The surrounding vegetation was primarily comprised of eastern white cedar, white spruce, willow, speckled alder, dogwood and white birch. Canopy cover varied from dense to partly open and instream cover was afforded by deep pools, log jams, logs and trees and undercut banks. The reach morphology was primarily riffles and pools with some flats and runs. The substrates were highly embedded and overlain with sediment and comprised of relatively equal amounts of cobble, gravel and sand with some silt also present. The water was clear yellow/brown with a temperature of 13°C.

At the lower end of the reach where Stream 1 discharges to the Pic River a perched culvert occurred at the existing access road crossing. This culvert appears to be a barrier to fish migration from the river into the tributary at most times of the year, with potential exception during high freshet flows.

Sediment Quality

Golder (2009) collected a sediment sample at S2 in 2007, resulting in a single parameter exceeding the LEL. TOC was 1.1 % exceeding the 1% LEL. All other key parameters met the PSQG (Table 3.1).

Benthic Community

Golder conducted a benthic survey at Station S2 during their 2007 survey. Three replicate samples were collected using a Surber sampler. In total, 10 unique taxa were identified with a replicate mean of five taxa. The density of invertebrates ranged from 32 to 172 invertebrates/m^2 with a mean of 93 invertebrates/m^2. Simpson's Diversity ranged from 0.51

to 0.78 with a moderate mean of 0.65 (Table 3.4). Mean Evenness was 0.74 with a wide range of 0.34 to 1.0. EPT, sphaeriids and annelids were equally dominant based on relative abundance and comprised a mean of 29%, 27% and 21%, of the community, respectively (Table 3.4). A total of five EPT taxa were collected at S2 and the Hilsenhoff Biotic Index classified the water quality in the good category. Other taxa accounting for over 1% of the mean relative abundance were ceratopogonid biting midges (11%), chironomid midges (2%) and tipulids (crane flies [10%]) (Table 3.3).

Fish Community

Within the lower reaches near the confluence with the Pic River, the coldwater fish community is more diverse than in the mid- or upper reaches. Backpack electrofishing within a 150 m reach (1,363 seconds), resulted in the collection of juvenile Rainbow Trout (*Oncorhynchus mykiss*), Brook Trout and Chinook Salmon (*Oncorhynchus tshawytscha*), Slimy Sculpin (*Cottus cognatus*), and Finescale Dace, during May 2009 (Table 3.2). Brook Trout and Slimy Sculpin were only captured below the perched culvert located near the bottom of the sampling reach. The lower reach of Stream 1 affords potential coldwater spawning and nursery habitat for both migratory (i.e., Rainbow Trout, Chinook Salmon) and resident (i.e., Brook Trout) salmonids, although as indicated, migration barriers exist under all but the highest flow conditions in the Pic River due to the perched culvert (see above).

3.1.13 Stream 1 Watershed Summary

There were a variety of benthic organisms identified representing a wide range of taxa including worms, leeches, amphipods, mayflies, stoneflies, caddisflies, beetles, midges, clams and snails (Table 3.3). The different habitats (lakes and ponds versus streams) resulted in expected differences in the community composition. Stations L1, L2 and S1 were classified as having fair water quality according to the Hilsenhoff Biotic Index; S2 was classified as having good water quality; and L29 was classified as having fairly poor water quality. The quantitative samples conducted at S1 and S2 by Golder resulted in wide ranging densities (i.e., 32 to 3,902 invertebrate/m^2). The Simpson's Diversity and Evenness numbers were moderate to high at both S1 and S2 with the S1 community being more diverse than the downstream community. EPT taxa were collected at the upstream and downstream stations and were generally more prevalent than more tolerant organisms like chironomids.

Sediment samples collected by NAR (2007) in both L1 and L2 and in L2 and L29 by EcoMetrix resulted in a number of parameters exceeding the PSQG. TKN, TOC and Cu all exceeded the SEL in at least one of the samples whereas TP, As, Fe, Cd, Pb, Ni and Zn all exceeded the LEL in L1, L2 or L29 (Table 3.1). S1 sediment exceeded the LEL for TP, TOC, Cu, Fe, Ni and Zn whereas only TOC was above the LEL in the Golder sample from Station S2.

Multi-season passive and active fishing effort in the headwater lakes (i.e., L1, L2 and L29) within the Stream 1 watershed resulted in the capture of no fish. There are several possible reasons for no fish present within these lakes. There is likely limited overwintering habitat in these lakes and in L2 and L29 in particular. In addition, oxygen depletion in the hypolimnion of L1 suggests that suitable fish habitat may be limited to the littoral zone of the epilimnion during much of the summer months. All three lakes are situated at the top of fairly steep gradients, which impedes fish colonization from downstream source populations. Overall, it is probable that a lack overwintering habitat, combined with downstream barriers (to upstream fish movement) in the form of natural topography likely account for the absence of fish in these lakes. .

No fish were collected within the most upstream reaches of Stream 1 (Stations S54, S55, and S58). Fish were captured at S1 and the extent of upstream fish inhabitation was documented in June 2011 (i.e., S79). At Station S79 and within the remaining upper 2nd order reaches small baitfish species were present. Progressing downstream within the watershed, viable habitat for resident coldwater salmonids (i.e., Brook Trout) occurred in the mid-reaches, while a more diverse coldwater community including both resident and migratory salmonids present within the lower reach. It is possible that natural barriers (e.g., low or intermittent flow, dams) to migration occur, which partition the fish communities within this watercourse, among the middle and upper, and lower and middle reaches. At the outlet of Stream 1 to the Pic River, there is a perched culvert that impedes the upstream movement of fish during non-freshet flows.

3.2 Stream 2 (Canoe Lake) Watershed

The Stream 2 catchment flows generally eastward to the Pic River and discharges at a point approximately 2 km north (upstream) of the mouth of Stream 1. A number of lakes and ponds are situated within the catchment, including Stations L3, L5 (Canoe Lake), L6, L7, L8, L14, L15 and Terru Lake [L20] (Figure 3.7). This catchment will be impacted by proposed mine rock stockpiles, the proposed mill site and the satellite pits.

Sediment quality data for the Stream 2 watershed is provided in Table 3.5 Fishing effort and species identified for the Stream 2 watershed is presented in Table 3.6. Tables 3.7 and 3.8 provide the benthic macroinvertebrate data and calculated indices, respectively for Stream 2 watershed stations.

3.2.1 Station L3

Figure 3.8 provides a pictorial representation of aquatic habitat features and bathymetry for Station L3, as discussed below.

Bathymetry and Habitat

L3 is situated south of Canoe Lake (L5), to which it flows. Detailed bathymetry was completed in October 2009. Figure 3.8 shows in detail the depth contours of the lake. The

southern end of the waterbody had a generally symmetrical basin with a maximum depth of around 4.4 m. The northern basin was relatively shallow throughout generally <1.2 m in depth. The surface area was about 2 ha with a volume of 26,120 m^3. If not for a beaver dam at the outlet, the wetted area would be much reduced.

The substrate was primarily muck with some exposed bedrock. L3 supported a variety of aquatic vegetation including both the emergent and submergent varieties. Observed species included floating-leaved burreed (*Sparganium fluctuans*), yellow pond lily, hardstem bulrush, common mare's tail (*Hippuris vulgaris*), northern water milfoil (*Myriophyllum sibiricum)* and manna grass. The shoreline consisted of rocky outcrops, as well as some areas of scrubby wetland inhabited by sweet gale and bog willow. The dominant terrestrial vegetation was black spruce, white spruce, balsam fir, balsam poplar and mountain ash.

Water Quality

The water was a clear yellow/brown colour and Secchi depth was 1.7 m. In August 2009 both water temperature and DO decreased marginally from top to bottom, whereas pH was low throughout the water column (4.1 to 4.7) and below the PWQO. The DO was just above the value set out for the protection of warmwater fish communities (i.e., 5 mg/L) based on the water temperature at the time of sampling (i.e., 17.3°C at the surface and 14.4°C at the bottom). In June 2011, DO was above PWQO in the top 1.5 m whereas pH was below the PWQO (range 5.1 to 5.3) at greater depths. Conductivity was consistent between 14 and 16 µS/cm in the top 3 m, increasing to 31 µS/cm at the bottom suggesting possible groundwater inputs.

In March 2008, Golder (2009) measured ice thickness of 0.61 m with approximately 1 m of standing water below the ice. DO measured below the ice was 1.17 mg/L. During March 2009, DO levels beneath 0.5 m of ice were between 1.2 and 1.5 mg/L (True Grit, 2009). pH and conductivity were 7.54 and 52 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

NAR (2007) collected a sediment sample from the main basin of the lake in 2006. Results yielded seven parameters that exceeded either the LEL or SEL value set by the PSQG. TOC and TKN were 22% and 13,591 µg/g, which both exceeded the SEL. TP, Cd, Cu, Pb and Ni exceeded the LEL levels of 600 µg/g, 0.6 µg/g, 16µg/g, 31 µg/g and 16 µg/g, respectively (Table 3.5). All other key parameters were below PSQG guidelines.

Benthic Community

NAR (2007) collected benthic macroinvertebrates from Station L3 in 2006 resulting in the identification of 15 taxa. The mean Hilsenhoff Index value was 6.57 indicating that the water quality was in the fairly poor category (Table 3.8). Tolerance values ranged widely with very tolerant representatives from the family Chironomidae, as well as sensitive taxa of Odonata identified. The majority of the taxa were neither very tolerant nor very sensitive

and had moderate tolerance values including oligochaetes, amphipods, bugs, caddisflies, biting midges and phantom midges (Table 3.7), .

Fish Community

During August 2009, three different gear types (baited minnow traps, small-mesh experimental gillnet, and Nordic nets) were set overnight (i.e., 23 hours) resulting in the capture of no fish (Table 3.6). Gear was set at depths of 0.3 m to 1.5 m. In June 2011, four baited minnow traps, two Nordic and two small-mesh experimental gillnets were set for approximately 95 hours in all available habitats including aquatic macrophyte beds, muck bottom, bedrock and log piles. The depth of sets ranged from 0.6 to 3.1 m. In addition to the passive gear effort, shoreline electrofishing was conducted from the south end of the lake proceeding up the west shoreline. Approximately 250 m was fished using 314 seconds of effort. The combination of active and passive effort resulted in no fish being captured in 2011. Additionally, the use of a fall walleye index net (FWIN), experimental gillnet and minnow traps set by NAR (2007) in September 2006 also resulted in no fish being captured in L3.

3.2.2 Stream 2 (Station S59)

Fish Habitat

The upper reach of Stream 2 (Station S59) between L3 and Canoe Lake (L5) was surveyed during June 2010 and 2011 (Figure 3.7). This 1st order stream had a mean width of 1 m and a mean water depth of 0.1 m. The gradient is moderate and flow velocity was about 0.1 m/s. Stream morphology consisted of pools and riffles, and the channel was ponded and meandering. The stream canopy was partly open to open at the upstream end of the reach whereas the lower end of the reach had dense canopy cover. Instream cover was afforded by logs and trees, boulders and aquatic macrophytes. The substrate consisted of muck and detritus with some boulders. Sediment and algae overlying the substrate were heavy and moderate, respectively. The water was a clear yellow/brown colour and the temperature was 20°C in 2010. DO was slightly below saturation (88%), conductivity was 13 µS/cm and pH was 5.95. Aquatic vegetation observed included common mare's tail and sedge. The adjacent terrain was forested lowland and meadow and the observed terrestrial vegetation included white spruce, black spruce, white birch, speckled alder and balsam poplar. Barriers to fish migration observed within the reach included beaver dams and a cascade.

Benthic Community

Almost 10,000 organisms were collected in June 2011 during a qualitative survey of the benthic community. A total of 30 taxa were identified (Table 3.8). The EPT index was consisted of a single taxon, comprising <1% of the community. Chironomids contributed 44% of the community indicating possible poor habitat or water quality. Fairly poor water quality was also indicated by the 6.66 Hilsenhoff Index value. Other major taxonomic

groups identified in the sample included worms, mites, bugs, biting midges, blackflies and clams (Table 3.7).

Fish Community

In June 2010, a 100 m length of the upper reach of Stream 2 (Station S59) between L3 and L5 was electrofished. No fish were collected during 303 seconds of effort (Table 3.6). In June 2011, approximately 120 m of the stream was sampled using 154 seconds of electrofishing effort. This effort began at a 1 m high waterfall and proceeded upstream to a series of beaver ponds. All available habitats were sampled within this 120 m reach. Upstream of the station, the creek was ponded and the majority was unfishable. Fishing was conducted downstream of the waterfall to the inlet to L5. This 50 m stretch was fished with 94 seconds of effort. No fish were captured during this effort despite many Lake Chub being captured in L5 during the August 2009 fishing effort.

3.2.3 Station L7

Station L7 aquatic habitat characteristics and bathymetry are shown on Figure 3.9 and discussed below.

Bathymetry and Habitat

Station L7 is a headwater lake situated at the western end of the Stream 2 watershed and has no tributary inlets. A beaver dam occurred at the lake outlet which effectively increased the surface area of the lake beyond its natural state based on topography. The maximum depth of L7 was approximately 7.8 m and the surface area was about 2 ha. Two small bays located on the east side of the lake were shallow with depths < 1 m. The lake narrows and deepens towards the outlet at the beaver dam. Adjacent to the beaver dam water depth was between 2 and 4 m.

The L7 nearshore area was comprised of a variety of habitats including submerged logs and trees, beaver dams, submerged and emergent aquatic macrophyte beds and rocky boulder strewn areas. The shallow wetland areas occurred mainly on the eastern shore of the lake and aquatic vegetation observed included floating-leaved burreed, variable-leaved pondweed, three-way sedge, beaked sedge (*Carex utriculata*), floating arrowhead, yellow pond lily, northern water milfoil and common mare's tail. Lake substrates included bedrock, boulder, muck, detritus and cobble. Offshore substrates were primarily muck. The surrounding terrestrial vegetation was similar to most areas in the Stream 2 watershed consisting of black spruce, white spruce, white birch, balsam fir, sweet gale and balsam poplar.

Water Quality

The water was clear and colourless, and Secchi depth was 4 m. Thermal stratification was evident in the lake during August 2009. Water temperatures were 15°C or greater in the

epilimnion (i.e., <2 m depth), and decreasing to between 7 and 8.4°C in the hypolimnion below the thermocline (i.e., 3 to 4 m). DO also decreased with depth, and suitable oxygen levels were only measured in the top 2 m of water. Below this depth DO generally decreased to less than 1 mg/L. Conductivity increased slightly below the thermocline indicating the possibility of groundwater inputs to the lake. pH was generally around 6 throughout the water column and met the PWQO.

In March 2008 ice thickness was 0.46 m. DO was >4.0 mg/L at the ice-water interface but was <1 mg/L below. During March 2009, DO levels beneath 0.49 m of ice were approximately 0.5 mg/L throughout the water column (True Grit, 2009). pH and conductivity were 7.74 and 160 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

NAR collected a sediment sample in 2006 that yielded nine parameters that were over guideline values; three exceeded the SEL and six exceeded the LEL. TP, TKN and TOC were 2,100 µg/g, 22,000 µg/g and 28% all exceeding the SEL outlined in the PSQG. As (15 µg/g), Cd (4.2 µg/g), Cu (40 µg/g), Fe (24,000 µg/g), Pb (132 µg/g), and Zn (186 µg/g) all exceeded their LEL values (Table 3.5). All other key parameters were below guidelines.

Benthic Community

NAR (2007) conducted a semi-quantitative benthic invertebrate survey in 2006 (i.e., 10 minute kick and sweep of all available habitats). This 2006 sample contained 23 unique taxa and an average Hilsenhoff score of 5.86, indicating fair water quality (Table 3.8). The community included sensitive species of trichopterans and odonates as well as tolerant species of chironomids and oligochaetes. Clams and amphipods were also present (Table 3.7).

Fish Community

In August 2009, three baited minnow traps, a small-mesh experimental gillnet and a Nordic net were deployed overnight (i.e., 18 hours) in L7. This fishing effort resulted in the capture of 150 Lake Chub, 149 of which were captured in the single Nordic net (Table 3.6). In September 2006 NAR (2007) used a FWIN, an experimental gillnet and minnow traps. NAR's effort resulted in the capture of no fish. In September 2008, Golder (2009) set four minnow traps for 45 hours each and captured three Lake Chub (originally identified as Pearl Dace). This combined effort suggests that only Lake Chub inhabit L7.

3.2.4 Station L6

Station L6 aquatic habitat characteristics and bathymetry are shown in Figure 3.10, and discussed below.

Bathymetry and Habitat

L6 is a beaver pond that receives flow from L7 situated to the north and flows into Canoe Lake (L5) to the south. A beaver dam was present at the outlet during August 2009. The majority of the area of L6 is now a beaver meadow. Overall, the waterbody is shallow with the only water deeper than 1.0 m situated in the extreme southern end, where it reached a maximum depth of 1.5 m. The surface area of the L6 was about 0.4 ha. In March 2008, L6 was frozen to the bottom during the Golder (2009) winter lake survey.

The shoreline of L6 consisted of fractured bedrock and wetland along the east shore. The west shore is primarily scrub-shrub wetland inhabited by sweet gale and bog willow. The dominant species of aquatic plants observed included floating-leaved burreed, variable-leaved pondweed, northern blue flag, *Sphagnum* moss and freshwater sponge. The surrounding upland terrestrial vegetation was predominantly black spruce, white spruce, white birch, balsam fir and balsam poplar.

Water Quality

In August 2009, the water was clear and colourless, with visibility to the bottom. L6 was not stratified with pH, conductivity, DO and temperature constant top to bottom. pH was 5.9 and DO was around 8.7 mg/L throughout the water column. Temperature and conductivity were 16°C and 12 µS/cm, respectively.

During March 2009, most of the pond was frozen to the bottom (True Grit, 2009). Ice thickness was 0.45 m.

Sediment Quality

NAR (2007) collected a sediment sample from L6 in 2006. This sample yielded four parameters that exceeded either the LEL or SEL value set by the PSQG (Table 3.5). TKN and TOC were 21,151 µg/g and 33%, respectively and exceeded their respective SEL of 4,800 µg/g and 10%. TP (1,900 µg/g) and Cd (1.4 µg/g) both exceeded their respective LEL guidelines of 600 and 0.6 µg/g. All other key parameters were below guidelines.

Benthic Community

NAR (2007) collected a sample in 2006 that contained 32 unique taxa and an average Hilsenhoff Biotic Index score of 5.61 (Table 3.8). This score indicated the water quality was of fair quality despite the relatively diverse benthic macroinvertebrate community. A number of sensitive odonates were identified as well as an extremely sensitive mayfly family and two moderately sensitive taxa of caddisflies. However, a number of very tolerant taxa of chironomids were also present in the sample. Overall there were representative taxa of worms, leeches, mayfliesnymphs, caddisflies, amphipods, beetles, dragonflies, damselflies, chironomids and bugs (Table 3.7).

Fish Community

During 2009, baited minnow traps were set overnight (i.e., 19 hours) resulting in the capture of 31 Lake Chub (Table 3.6). The use of minnow traps by NAR (2007) in September 2006 and Golder (2009) in August 2007 also resulted in only Lake Chub (previously reported as Pearl Dace) being captured. This data suggests that Lake Chub are the only inhabitants of the L6 pond.

3.2.5 Canoe Lake (Station L5)

Figure 3.11 displays a pictorial representation of Station L5 aquatic habitat features and bathymetry, as discussed below.

Bathymetry and Habitat

L5, known locally as Canoe Lake, receives flows from L6 and L7 to the north and L3 to the south and discharges east to Stream 2. During the 2009 and 2010 surveys, flow was observed discharging from Canoe Lake into Stream 5, which feeds into L4. Station L4 is part of the Stream 5 (Hare Lake) watershed; however, high water levels as a result of beaver activity have resulted in two lake outlets, each discharging to a different watershed. Beaver dams were observed at the outlet to Stream 5, as well as the inlet from L6. The lake surface area was approximately 4 ha and the maximum depth was 22.8 m.

A detailed bathymetric survey was completed on Canoe Lake in October 2009. The lake has a central deep basin with the inlets from L3 and L6 generally being shallow (i.e., < 2 m). The outlet arm to Stream 2 is also shallow except for a slightly deeper section adjacent to the north shore. The volume of Canoe Lake at the time of survey was approximately 194,043 m^3.

Lake substrates included bedrock, boulder, cobble and muck. Canoe Lake exhibited a variety of nearshore habitats including fractured bedrock/boulder, sheer bedrock faces, scrub-shrub wetland and aquatic vegetation beds. Dominant aquatic macrophyte species observed included floating-leaved burreed, variable-leaved pondweed, three-way sedge, hardstem bulrush, northern blue flag and northern water milfoil. In offshore areas the substrate was primarily muck with coarse organic matter. The dominant terrestrial vegetation included black spruce, white spruce, white birch, balsam fir, mountain ash, sweet gale and bog willow.

Water Quality

The water was clear and colourless, Secchi depth was 7 m and thermal stratification of the lake was evident, during August 2009. The water temperature decreased from approximately 17°C at the surface, to 5 to 8°C at 4 to 6 m depth and below depths of 10 m the temperature was generally around 4°C. DO followed this decrease in temperature and the profile indicates that only the top approximately 7 m of water would be inhabitable by

fish (i.e., DO >4 mg/L). Below 7 m, DO decreased dramatically and the bottom half of the lake was anoxic. Conductivity increased significantly below the thermocline, likely indicating groundwater inputs and the lack of mixing of bottom and surface waters.

During March 2009, DO levels beneath 0.6 m of ice ranged from 1.1 to 1.2 mg/L throughout the water column (True Grit, 2009). pH and conductivity were 7.61 and 4 µS/cm, respectively, 0.3 m below the ice.

Sediment Quality

NAR (2007) collected a sediment sample from Canoe Lake in 2006 resulting in seven parameters exceeding either the LEL or SEL value set by the PSQGs. Cd (3.5 µg/g), Cu (25 µg/g), Pb (48 µg/g) and Zn (122 µg/g) exceeded the LEL of 0.6 µg/g, 16 µg/g, 31 µg/g and 120 µg/g, respectively. TP (2,200 µg/g), TKN (16,945 µg/g) and TOC (19%) all exceeded the SEL of 2,000 µg/g, 4,800 µg/g and 10%, respectively. All other key parameters were below guidelines (Table 3.5).

Benthic Community

NAR (2007) collected benthic invertebrates from L5 in 2006. 18 taxa were identified with a mean Hilsenhoff value of 5.53, placing the water quality within the lower end of the fair quality category (i.e., 5.51 - 6.50) (Table 3.8). Four sensitive Odonata taxa were identified, although tolerant species of chironomids were also present. Included in the 18 distinct taxa there were representative worms, beetles, amphipods, midges, caddisflies, clams and odonates (i.e., dragonflies and damselflies) (Table 3.7).

Fish Community

During August 2009, baited minnow traps, a small-mesh experimental gillnet and a Nordic net were set overnight (i.e., 18.5 hours) resulting in the capture of 88 Lake Chub (Table 3.6). Fish were only captured in the Nordic net. Additionally, the use of a FWIN, experimental gillnets, a Nordic net and minnow traps by NAR (2007) in September 2006 and Golder (2009) in August 2007 also resulted in only Lake Chub (originally reported as Pearl Dace) captured. This combined effort suggests that Canoe Lake may only be inhabited by Lake Chub.

3.2.6 Station L14

Station L14 aquatic habitat characteristics and bathymetry are shown on Figure 3.12 and discussed below.

Bathymetry and Habitat

L14 is a beaver pond created by a series of dams at its outflow. It receives flow from Canoe Lake (L5) and discharges towards Station L15. The surface area was about 0.4 ha

and the maximum depth was approximately 2.2 m, adjacent to the beaver dam. The majority of the waterbody was <1 m deep during August 2009. In June 2011, visual inspection of L14 indicated a slight increase in area due to increased water levels.

Substrates were primarily muck with some boulders and minor amounts of clay and gravel. L14 had a large amount of submerged and partially submerged woody debris throughout. Aquatic vegetation was also present along much of the shoreline and the dominant species included common waterweed (*Elodea canadensis*), common mare's tail, northern milfoil, freshwater sponge, sedges, manna grass and submerged water starwort (*Callitriche hermaphroditica*). Unlike the majority of the lakes and ponds in the Stream 2 watershed, the shoreline of this waterbody consisted of an organic fibrous peat mat with less rocky substrate compared to most other lentic stations. Beyond the peaty shoreline the terrestrial vegetation consisted mainly of black spruce, white spruce and white birch.

Water Quality

In August 2009, the water was a clear yellow/brown colour and Secchi depth was bottom. No stratification was evident and water quality was suitable for fish throughout the water column. DO was below the PWQO of 5.5 mg/L in the very deepest part of the waterbody but the remainder appeared well oxygenated.

DO and ice thickness in March 2008 were 0.51 m and 3.0 mg/L, respectively (Golder, 2009). Conductivity was constant at about 40 µS/cm top to bottom. pH was between 6 and 6.6 and water temperature was between 14 and 15.0°C. During March 2009, the DO concentration beneath 0.48 m of ice was 0.5 mg/L (True Grit, 2009). pH and conductivity were 6.9 and 183 µS/cm, respectively.

Sediment Quality

NAR (2007) collected a sediment sample from L14 in 2006 resulting in six parameters exceeding the PSQG LEL values. TP (1,000 µg/g), TKN (3,744 µg/g), TOC (7.3%), Cu (78 µg/g), Fe (37,400 µg/g) and Ni (45 µg/g) exceeded their respective LEL of 600 µg/g, 550 µg/g, 1%, 16 µg/g, 20,000 µg/g, and 16 µg/g. All other key parameters were below guidelines (Table 3.5).

Benthic Community

NAR's (2007) 2006 sample contained 12 unique taxa and had a mean Hilsenhoff tolerance value of 5.64, indicating fair water quality (Table 3.8). Nine taxa were moderately sensitive (i.e., 4 - 8) and a single (chironomid) taxa was very tolerant with a value of 10. Other taxa identified were: worms, amphipods, beetles, corixids, aquatic moths and caddisflies (Table 3.7).

Fish Community

In August 2009, baited minnow traps, a small-mesh experimental gillnet and a Nordic net were set overnight (i.e., 17 hours) in L14. This fishing effort resulted in the capture of 110 Brook Stickleback and a single Lake Chub (Table 3.6). NAR (2007) fished using a dipnet in September 2006 and also captured Brook Stickleback. Golder (2009) observed stickleback in winter through the ice during their winter water quality survey of L14. These combined fishing efforts suggest that L14 supports Brook Stickleback and low numbers of Lake Chub, with the later possibly a migrant downstream from Canoe Lake.

3.2.7 Stream 2 (Station S74)

Fish Habitat

Station S74 is a 1st order of L20 (Terru Lake) with a mean width, depth and velocity of 0.1 m, 0.05 m and 0.02 m/s, respectively (Figure 3.7). The water was clear yellow/brown and the meandering channel was mostly dry. Riffles and pools occurring near the outlet to L20 comprised the limited habitat within the moderate to high gradient stream. The stream canopy was mainly open with about 30% partly open. The substrate was consisted of cobble (10%), gravel (5%), muck (65%) and detritus (20%). Instream cover was afforded by aquatic macrophytes. Riparian vegetation was primarily grasses and white spruce. Sedges were the only aquatic vegetation observed.

Fish Community

A 30 m reach of the northwest tributary of L20 (S74) was surveyed with 40 seconds of backpack electrofishing effort. All available wetted habitats within the reach were targeted. Low water flow minimized the length of fishable stream. No fish were captured (Table 3.6) but a wood frog (*Rana sylvatica*), was encountered in the stream.

3.2.8 Stream 2 (Station S75)

Fish Habitat

Station S75 is also a 1st order tributary of L20 (Terru Lake) with a mean width, depth and velocity of 0.2 m, 0.08 m and 0.05 m/s, respectively (Figure 3.7). Some pools approximately 0.7 m deep were observed and the water was clear yellow/brown colour. Stream morphology was mostly riffles (50%) and pools (30%) and stream gradient was moderate to high. The meandering channel was surrounded by grassland and bog. The stream canopy was mainly dense (50%) with about 20% partly open and 30% open. The substrate was comprised of boulder (10%), cobble (10%), gravel (10%), muck (50%) and detritus (20%). Instream cover comprised more than 25% of the reach area, afforded by logs and tress, log jams, deep pools and aquatic macrophytes. Riparian vegetation consisted of grasses, speckled alder and white spruce. Sedges were the only aquatic vegetation observed.

Fish Community

A 100 m reach of the southwest tributary of L20 (S75) was surveyed with 106 seconds of backpack electrofishing effort. All available wetted habitats within the reach were targeted. No fish were captured (Table 3.6).

3.2.9 Terru Lake (Station L20)

Station L20 (Terru Lake) aquatic habitat characteristics and bathymetry are shown on Figure 3.13 and discussed below.

Bathymetry and Habitat

Terru Lake (L20) is a small, perched headwater lake that outlets towards L8 in the east. A beaver dam at the outlet had increased the surface area of the waterbody. The lake is long and narrow with a maximum depth of about 6.5 m and a surface area of approximately 0.6 ha. The deepest part of the lake occurs adjacent to the southern shore.

Lake substrates were primarily muck with some exposed bedrock. The western end of L20 consisted of scrub-shrub wetland with areas of emergent and submergent aquatic vegetation along much of the shoreline. The dominant aquatic species observed included floating-leaved burreed, variable-leaved pondweed, floating arrowhead, sedge and yellow pond lily. The upland relief along the north and south shore was quite steep and the terrestrial vegetation was predominantly white spruce, white birch and speckled alder. Aside from the aquatic vegetation, a beaver lodge and dam also provided inwater cover.

Water Quality

The water in Terru Lake, was clear yellow/brown and Secchi depth was 2.5 m. During both August 2009 and June 2011 some stratification of the water column was observed, with water temperature and DO levels decreasing with depth. The hypolimnion of the lake had oxygen levels that were below the PWQO. In 2009 the thermocline was at approximately 5 m whereas in 2011 the thermocline was located between 2 m and 3 m depth. pH in August 2009 and June 2011 was fairly consistent throughout the water column. In 2009 it was low, averaging around 5.3 which is below PWQO, however in 2011 it averaged 6.3 or adequate according to the PQWO. Conductivity increased slightly from top to bottom, indicating possible groundwater inputs.

In March 2008, DO at the ice-water interface was 3.6 mg/L but decreased to less than 1.0 mg/L below, beneath 0.47 m of ice cover (Golder, 2009). During March 2009, DO concentrations ranged from 0.3 to 0.6 mg/L beneath 0.5 m of ice (True Grit, 2009). pH and conductivity were 7.28 and 46 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

A sample collected in June 2011 had five key parameters exceeding either the LEL or SEL. TKN, TP and TOC were 2,910 µg/g, 15,600 µg/g and 13%, respectively all exceeding their SEL values (Table 3.5). Cu and Fe exceeded the LEL values of 16 and 20,000 µg/g with concentrations of 30 and 26,500 µg/g, respectively. All other key parameters met the provincial guidelines.

Benthic Community

Qualitative benthic community data was collected June 2011. More than 3,000 organisms where collected from Terru Lake habitats representing 50 taxa (Table 3.8). Of these taxa, the majority (49%) were chironomids which are indicators of poor water quality. The EPT index was six taxa, comprising 7% of the benthic community. The Hilsenhoff Biotic Index, 7.06 for L20, also indicates below expected water quality. The community was comprised of various worms, leeches, mites, amphipods, beetles, aquatic moths, odonates, bugs snails and clams (Table 3.7).

Fish Community

In August 2009, four baited minnow traps and a Nordic net were set for 23 hours in Terru Lake resulting in no fish being captured (Table 3.6). Gear was set at 0.25 to 3 m depth in habitats including shallow scrub-shrub wetland shoreline, submergent aquatic macrophyte beds and deep water over all available substrate types. In June 2011, four baited minnow traps, two Nordic nets and one small-mesh experimental gillnet were set for approximately 92 hours at depths of 0.46 to 5.8 m and caught no fish. These sets also included all available habitats in L20 including rocky shoreline, log piles, muck bottom, open water and adjacent to a beaver lodge. In addition, backpack electrofishing expending 387 seconds of effort over 330 m of shoreline also resulted in no fish captures. In August 2007, Golder (2009) set three minnow traps for 17 hours that also resulted in no fish being captured. The data from these fishing efforts indicate that Terru Lake is fishless and the high gradient of the outlet stream prevents upstream fish movement from L8.

3.2.10 Stream 2 (Station S76)

Fish Habitat

The outlet of L20 (Terru Lake) (S76) is a 1st order stream with a mean width, depth and velocity of 0.2 m, 0.1 m and 0.1 m/s, respectively (Figure 3.7). The water was clear yellow/brown at the time of the survey. Stream morphology was mostly riffles (70%) and pools (20%). The stream gradient was moderate to high and the channel was meandering and braided.in some areas. The stream canopy was mostly dense with some partly open and the substrate was comprised of bedrock (5%), boulder (20%), cobble (20%), gravel (15%), muck (20%) and detritus (10%). Instream cover was afforded by boulders, logs and tress, log jams, deep pools and aquatic macrophytes. Riparian vegetation was lush with

ferns dominating the understory of the upland forest. Sedges were the only aquatic vegetation observed. Benthic macroinvertebrates observed during fishing activities included amphipods, stonefly and mayfly nymphs.

Fish Community

A 200 m reach of the outlet stream from L20 (S79) was surveyed with 481 seconds of backpack electrofishing effort during June 2011. All available habitats within the reach were fished; however, no fish were captured (Table 3.6). Approximately 100 m downstream of L20 there was a steep gradient barrier observed, which likely prevents fish colonization from downstream populations. Three wood frogs were the only vertebrates encountered in the stream.

3.2.11 Stream 2 (Station S77)

Fish Habitat

The outlet stream from L20 (Terru Lake) flowing to L8 (S77) was also surveyed just upstream of L8 in June 2011 (Figure 3.7). This watercourse had clear yellow/brown water with a mean channel width of 0.3 m an average water depth of 0.05 m, and a velocity of approximately 0.1 m/s. This stable, densely canopied, meandering reach was comprised of equal parts pools and riffles (40%) with some runs and flats. The gradient of this stream was moderate with some high gradient portions. The substrate was comprised of mainly coarse materials (i.e., boulder, cobble, gravel) with a small proportion of sand, muck and detritus. Instream cover was provided by boulders, logs and trees, log jams, deep pools and aquatic macrophytes. Aquatic vegetation observed included sedges, marsh marigold (*Caltha palustris*), moss and algae. Natural barriers within the reach include an old beaver dam as well as a gradient barrier at the upstream end of the station. The forested upland surrounding the reach was inhabited by maple, birch and spruce with ostrich ferns in the understory.

Fish Community

Stickleback were observed at the outlet of the stream in L8, however none were captured above the old beaver dam at the downstream end of the station (Table 3.6). Approximately 50 m of stream were fished using 118 seconds of effort above this beaver dam to the high gradient barrier (cascade).

3.2.12 Station L8

Station L8 aquatic habitat characteristics and bathymetry are shown on Figure 3.14, and discussed below.

Bathymetry and Habitat

L8 is a long, narrow, shallow lake with a maximum depth of approximately 2.3 m and a surface area of about 2.2 ha. A beaver dam was present at the lake outlet that maintained water levels. Removal of the dam would likely result in a series of three small ponds with narrow connecting channels. The deepest water occurred in the northern basin adjacent to the western steep rocky shoreline, as well as in the southern basin near the lake outlet. In both of these areas a maximum depth of 2.3 m was observed. The remainder of the lake is <2 m deep, with much of the area considerably shallower (i.e., <1 m). The mean depth of the lake was approximately 0.9 m.

Lake substrates were primarily muck with some exposed bedrock and minor amounts of boulder, cobble and gravel. A large proportion of the lake was comprised of scrub-shrub wetland (i.e., floating islands and shoreline) and submergent and emergent macrophytes. Aquatic vegetation observed included floating arrowhead, common cattail (*Typha latifolia*), beaked sedge, hardstem bulrush, northern blue flag, northern water milfoil, wild celery, water smartweed (*Polygonum amphibium*), marsh cinquefoil (*Potentilla palustris*), variable-leaved pondweed and floating-leaved burreed. In addition to the habitat provided by aquatic vegetation, there were also areas of boulders, beaver lodges and dams (both active and inactive) as well as shallow open water habitat. The terrestrial vegetation surrounding the lake consisted of mainly bog willow, sweet gale, black spruce, white spruce and white birch.

Water Quality

The water was a clear yellow/brown colour and there was visibility to the bottom. No stratification was evident and water quality was suitable for fish throughout the water column. Water temperature and DO were between 15 to 19°C and 8 to 9 mg/L, respectively. Conductivity was ranged from 36 to 40 µS/cm. All parameters measured during the ice free season met PWQO.

Ice thickness measured in March 2008 was 0.59 m with 0.5 m of standing water below the ice. The DO below the ice was 1.75 mg/L. During March 2009, most of the pond was frozen to the bottom (True Grit, 2009). Ice thickness was 0.38 m.

Sediment Quality

NAR (2007) collected a sediment sample from L8 in 2006. Three parameters exceeded the SEL and five additional parameters exceeded the LEL. TP, TKN and TOC all exceeded the SEL values of 2,000 µg/g, 4,800 µg/g and 10%, with values of 2,400 µg/g, 14,709 µg/g and 19%, respectively. The parameters that exceeded the LEL were Cd, Cu, Fe, Ni and Zn with values of 1.6 µg/g, 100 µg/g, 25,300 µg/g, 31 µg/g and 185 µg/g, respectively (Table 3.5). All other key parameters met Provincial guidelines.

Benthic Community

NAR (2007) collected a single invertebrate sample in 2006 that contained 18 unique taxa (Table 3.8). The mean Hilsenhoff score for the sample was 6.17 indicating the water quality was in the fair category. The benthic community included relatively sensitive taxa of caddisflies and dragonflies. Tolerant taxa included members of the midge family Chironomidae. The majority of invertebrate taxa collected had moderate tolerances (i.e., 4 - 8). In addition to the previously mentioned taxa the community also contained leeches, amphipods, mayflies, corixids and sphaeriid clams (Table 3.7).

Fish Community

In August 2009, three gear types (baited minnow traps, small experimental gillnet, Nordic net) were set overnight (i.e., 19 hours) in L8. This effort yielded 20 Brook Stickleback; captured in baited minnow traps and the Nordic net (Table 3.6). No fish were captured in the small experimental gillnet. In September 2006, NAR (2007) deployed six minnow traps and captured two Brook Stickleback. This combined effort suggests that the only fish species inhabiting L8 is Brook Stickleback.

3.2.13 Stream 2 (Station S78)

Fish Habitat

Station S78 is situated on the 1st order stream that flows from west to east into L15 (Figure 3.7). The source of this tributary is two small beaver ponds at the top of a steep gradient approximately 200 m and 400 m west of L15. In the vicinity of L15, the stream consisted of two branches extending from the bush line through the L15 meadow. These channels join the tributary flowing from L14. The mean width, depth and velocity of the channels were 0.2 m, 0.05 m and 0.01 m/s, respectively. Morphology was comprised of mostly riffles (60%); with pools (20%), runs (15%) and flats (5%) accounting for the remainder. The reach is stable and flows through the open canopied beaver meadow associated with L15. Substrate composition varied slightly between the two branches, however both included boulder, cobble, gravel, sand, detritus and silt. Instream cover was afforded by log jams and aquatic macrophytes. The water was a clear yellow/brown colour. Upstream of the beaver meadow, flow diminished significantly and the gradient was extreme.

Fish Community

The 30 m reach of both branches of the tributary were visually inspected during June 2011 and no fish were observed (Table 3.6). Low water levels combined with very little in-stream cover precluded the need for electrofishing and a high gradient and lack of a distinct channel above the meadow limited the length of this station.

3.2.14 Station L15

Station L15 aquatic habitat characteristics and bathymetry are shown on Figure 3.15 and discussed below.

Bathymetry and Habitat

L15 is situated at the confluence of the outflows from L8, L14, and a small headwater tributary (Figure 3.7). At one time, a beaver pond was present at this location; however the dam had been breached and subsequently the pond has reverted to a beaver meadow with a meandering channel. Maximum water depth was 1.7 m and the surface area was approximately 1.1 ha during August 2009. There were very distinct channels associated with the main tributaries flowing from L8 and L14. These channels were approximately 0.75 m deep, whereas the other tributary flowing from the west was smaller with a maximum depth of approximately 0.20 m. The portion of L15 directly upstream of the beaver dam and lodge was the deepest, with water depths decreasing towards the inflow channels. L15 substrates were primarily clay, silt and muck with some exposed bedrock and boulder. In June 2011, succession had continued to revert L15 to stream habitat. The ponded portion of had decreased substantially to approximately 10 m in length and 7 m in width, with a maximum water depth of 0.75 m.

The nearshore of the wetted portion of L15 was inhabited by water smartweed, marsh cinquefoil, common waterweed, submerged water starwort, sedge, manna grass, hardstem bulrush and northern water milfoil. Terrestrial vegetation adjacent to the riparian wetland included black spruce, white spruce, speckled alder, bog willow and sweet gale.

Water Quality

In August 2009, the water colour was clear yellow/brown and Secchi depth was bottom. No stratification was evident. Temperature decreased slightly from around almost 15°C at the surface to about 12°C at the bottom. Conductivity was about 39 µS/cm and DO was also similar throughout the water column (i.e., ~ 8 mg/L).

In March 2008, ice thickness was 0.46 m with 0.23 m of standing water beneath (Golder, 2009). During March 2009, L15 was frozen to the bottom (True Grit, 2009). Ice thickness was 0.4 m.

Sediment Quality

NAR's 2006 sediment sample resulted in TP (4,500 µg/g), TKN (6,854 µg/g) and Cu (151 µg/g) exceeding the SEL values of 2,000 µg/g, 4,800 µg/g and 110 µg/g, respectively. Additionally, TOC (8.9%), Fe (25,400 µg/g) and Ni (41 µg/g) exceeded the LEL values of 1%, 20,000 µg/g and 16 µg/g (Table 3.5).

Benthic Community

The 2006 NAR (2007) benthic invertebrate sample was comprised of 13 unique taxa (Table 3.8). The mean Hilsenhoff value was 6.50 indicating the community is at the top end of the fair water quality range. The sample included two species of caddisflies that were relatively sensitive and three taxa of chironomid midges that are considered extremely tolerant (i.e., a tolerance value of 10 out of 10). Other groups comprising the invertebrate community included a single taxon each of snail, aquatic moth, chaoborid (phantom midge) and four taxa of corixids (Table 3.7).

Fish Community

In August 2009, four baited minnow traps were set for 17 hours and captured four Brook Stickleback (Table 3.6). In September 2006, NAR (2007) set five minnow traps for two hours and captured nine Brook Stickleback. In June 2011, despite a large reduction in the area and depth of L15, stickleback were observed in small numbers. The data suggests that Brook Stickleback are the primary inhabitants of this portion of the Stream 2 watershed

3.2.15 Stream 2 (Station S3)

Fish Habitat

The upper reach of Stream 2 below Station L15, downstream of the access road (Station S3) had a mean width of 2.5 m and a mean water depth of 0.25 m, during May 2009 (Figure 3.7). This reach has a mostly moderate gradient with a small proportion that is high gradient. The mean velocity of the surveyed reach was 0.25 m/s. At the downstream end of the station there is a natural barrier in the form of a waterfall. The stream morphology consisted of 40% pools, 40% riffles, 15% flats and 5% runs. The stream canopy was a combination of dense, partly open and open. Instream cover was afforded by undercut banks, boulders, logs and trees, log jams and deep pools. The substrate was comprised of mainly of cobble and gravel, with some sand, organic silt, and clay also present. A limited amount bedrock outcropping was also noted. Sediment and algae overlying the substrate were slight and moderate, respectively, and the water was slightly stained yellow/brown in colour with a temperature of 11°C. The surrounding upland habitat consisted of balsam poplar, speckled alder, dogwood, white birch, and white spruce.

Sediment Quality

A sediment sample collected by Golder (2009) in 2007 resulted in TOC, Cu and Ni exceeding the LEL and TP and Fe, exceeding the SEL. TOC, CU, Ni, TP and Fe were 1.1%, 44 µg/g, 40 µg/g, 3,440 µg/g and 57,700 µg/g, respectively (Table 3.5). Other key parameters all met PSQG.

Benthic Community

During the May 2009 fish survey, a number of benthic invertebrates were noted to be very common at Station S3. The invertebrates observed included leeches, caddisfly larvae and mayfly nymphs.

Golder conducted a benthic survey at Station S3 during their 2007 aquatic studies. Three replicate samples were collected using a Surber sampler fitted with a 500 µm net. In total 29 unique taxa were identified with a mean of 15 taxa per sample. The density ranged from 259 to 753 invertebrates/m^2 with a mean value of 459 invertebrates/m^2. The Simpson's Diversity was high and the Evenness moderate with mean values of 0.85 and 0.48, respectively (Table 3.8).

The invertebrate community was dominated by EPT taxa. EPT taxa accounted for a mean of 63% in terms of relative abundance with 14 EPT taxa identified. Chironomids were the next most abundant group ranging from 12% to 30% with a mean relative abundance of 18%. Snails comprised a substantial proportion of the community at S3 with a mean of 9%. Other taxa comprising over 1% of the community based on mean relative abundance were leeches, mites, springtails and ceratopogonids and simuliid midges (Table 3.7). The mean Hilsenhoff Biotic index score was 4.48 indicating very good water quality and the EPT/Chironomidae ratio was 4.11 also indicating sensitive taxa dominated the community.

Fish Community

In May 2009, EcoMetrix electrofished a 125 m reach of of Stream 2 at Station S3 with 1,452 seconds of effort and captured 14 adult Brook Stickleback (Table 3.6). An additional survey at Station S3 in October 2009 captured eight adult Brook Stickleback during 220 seconds of effort. In September 2007, Golder captured 12 Brook Stickleback, also collected by electrofisher. The results of three separate surveys indicate Brook Stickleback is the only inhabitant of this this portion of Stream 2. At the downstream end of the station there is a waterfall/cascade which would impede the upstream migration of fish from downstream reaches. There is also some relatively steep topography below this area (between Stations S3 and S69) which effectively limits the upstream distribution of fish species which occur in downstream areas of the watershed, including the Pic River.

3.2.16 Stream 2 (Station 69)

Fish Habitat

Station S69 is a situated on the Stream 2 watershed downstream of S3 and upstream of S53 in the vicinity of the new proposed road crossing. The location is just upstream of a beaver pond, which was approximately 50 m long and 25 m wide with two beaver dams at the downstream end, one of which was over 2.5 m in height. Within the 40 m survey reach (upstream of the beaver pond) the mean width was 0.5 m, the mean depth was 0.15 m and velocity was 0.25 m/s during June 2011. Bank stability ranged from highly unstable (60%),

to moderately unstable (20%) to stable (20%). The majority of the reach consisted of pool and riffle habitat (i.e., 60% and 20%, respectively) with a moderate gradient. Stream canopy was dense to partly open and substrates ranged from fines such as silt and clay to coarse constituents such as bedrock, boulder and cobble. Instream cover was afforded by boulders, logs and trees, log jams and deep pools. Surrounding terrain was a combination of forested lowland and upland. Terrestrial vegetation encountered included, birch, speckled alder, white spruce, eastern white cedar and maple. Aquatic vegetation observed were limited to moss and algae. Algae and sediment overlaying the substrates was slight and the water was slightly stained yellow/brown. Barriers to fish passage in the form of beaver dams were observed within this reach and upstream gradient barriers, in the form of waterfalls, occur between stations S3 and S69.

Benthic Community

EcoMetrix collected a qualitative benthic community sample in June 2011. The sample contained over 3,500 organisms from 41 taxa (Table 3.8). The EPT index was 16 taxa indicating good water quality. The Hilsenhoff Biotic Index was low, 4.24, indicating very good water quality at this station. Chironomids also comprised a large proportion of the benthic invertebrate community (36%). Other taxa identified in the sample included annelid worms, mites, seed shrimps, springtails, snails, blackflies and Dixidae flies (Table 3.7).

Fish Community

Fish have been collected upstream at Station S3 and downstream at S53. The upstream community was comprised of only Brook Stickleback, whereas the downstream community included Brook Trout, Rainbow Trout and Slimy Sculpin. During the June 2011 survey, Brook Trout were visually observed at S69 (Table 3.6). The majority of Brook Trout seen were fry but a single adult was also observed. Brook Trout fry were observed in the stream up to a point approximately 50 m downstream of the S3 waterfall, below a very rapid narrow chute of boulders and bedrock.

3.2.17 Stream 2 (Station S53)

Fish Habitat

The mid-reach of Stream 2 (Station S53), had a mean width of 1 m and a mean water depth of 0.2 m during June 2010 (Figure 3.7). Within the surveyed reach, the gradient was moderate and flow velocity was about 0.2 m/s. The channel was 90% straight reach and 10% ponded and stream morphology consisted of pools (50%), riffles (25%) and flats (25%). The stream canopy was partly open and instream cover was afforded by logs and trees, undercut banks, boulders and log jams. The substrate was comprised of clay, bedrock, cobble and boulder. Sediment overlying the substrate was moderate and algae overlay was slight. The water was a clear yellow/brown colour with a temperature of 12°C. The adjacent terrain was forested lowland and the observed terrestrial vegetation included

white spruce, black spruce, speckled alder and mountain maple. Other than log jams, no barriers to fish passage were observed within this reach.

Fish Community

Electrofishing was undertaken during June 2010 in the mid-reach of Stream 2 (Station S53). Within a 60 m reach, two Brook Trout, one Rainbow Trout and five Slimy Sculpin were collected during 404 seconds of effort (Table 3.6). All available habitats were fished.

3.2.18 Stream 2 (Station S66)

Fish Habitat

Station S66 is located approximately 650 m upstream of S4 on Stream 2 at the proposed electricity transmission line corridor crossing (Figure 3.7). A 150 m reach of stream was surveyed in June 2011. Mean depth, width and velocity were 0.2 m, 2 m and 0.4 m/s, respectively. The substrate within this stable reach was comprised of mostly cobble (80%) with some silt (15%) and detritus (5%). Pool (30%) and riffle (55%) morphology comprised the majority of the reach with run (5%) and flat (10%) also present. Instream cover within the moderate gradient, meandering channel was afforded by boulders, undercut banks, logs and trees, log jams and deep pools. Riparian vegetation was mainly speckled alder and adjacent terrain was forested upland. No aquatic vegetation was noted but there was slight algae overlying the substrate. A beaver dam near the lower end of the station would likely impede upstream fish passage. Abundant mayfly nymphs and leeches were observed.

Fish Community

During the June 2011 electrofishing survey, six Brook Trout and six Slimy Sculpin were captured with 540 seconds of effort over a 150 m reach of stream. All available types of habitat were fished.

3.2.19 Stream 2 (Station S4)

Fish Habitat

Station S4 is situated in the lower reach of Stream 2, upstream from its confluence with the Pic River (Figure 3.7). This reach has a moderate gradient. During the May 2009 and August 2009 surveys this reach had a mean width of 2.5 m and 1.5 m, respectively. The mean depth was 0.4 m and the velocity was 0.2 m/s during the May 2009 survey. Riparian vegetation consisted of speckled alder, dogwood, white spruce, balsam fir and white birch. The majority of the stream canopy was partly open but ranged from open to dense. Instream cover was afforded by undercut banks, boulders, logs and trees, log jams and deep pools. The substrate consisted of primarily sand, silt, and cobble (35%, 30% and 20%, respectively). Boulders, gravel, clay and detritus were also present at Station S4.

The reach morphology was primarily pools (50%) and riffles (30%) with some flat and run habitat also present. Numerous log jams were observed throughout the reach, potentially impeding fish passage. There was heavy sediment overlaying the substrate and a slight amount of algae. The heavy sediment load was observed during the June 2011 field program as well. Limited aquatic vegetation was observed at Station S4 including sedge and horsetail. The water colour within the reach was turbid yellow/brown at the time of sampling in May 2009. The water temperatures in May 2009 and August 2009 were 9.5°C and 12°C, respectively.

Sediment Quality

In 2007, Golder (2009) collected a sediment sample at S4 near the mouth of the Pic River. TOC and Ni were 2.3 % and 18 µg/g, respectively both exceeding the LEL (Table 3.5). All other key parameters were below PSQG.

Benthic Community

Golder (2009) conducted a benthic survey at Station S4 during their 2007 aquatic studies. Three replicate samples were collected using a Surber sampler fitted with a 500 µm mesh net. In total, eight unique taxa were identified for S4 with a mean number of taxa per sample of three (Table 3.8). The density ranged from 22 to 65 invertebrates/m^2 with a mean value of 47 invertebrates/m^2. The Simpson's Diversity was moderate with a mean value of 0.65. The mean Simpson's Evenness was 0.93 indicating a very balanced community. There was one taxon each of tipulid, sphaeriid, chironomid, mayfly and caddisfly whereas there were three taxa of stoneflies (Table 3.7). EPT taxa did comprise 82% of the limited community collected based on relative abundance. The Hilsenhoff Index was 3.38 categorizing the water quality at this station as excellent.

Fish Community

Station S4, situated at the downstream end of the Stream 2 watershed was surveyed twice during the 2009 field season resulting in a total of 10 species collected. In May 2009 a 110 m reach was surveyed by electrofishing (1,557 seconds of effort) resulting in the capture of eight species (Table 3.6). The catch consisted of Rainbow Trout parr (2), Chinook Salmon parr (2), White Sucker (*Catostomus commersonii*) juveniles (2), Lake Chub juveniles (2), Slimy Sculpin juveniles (22) and adults (4), and Finescale Dace (1), Longnose Dace (*Rhinichthys cataractae*) (2) and Brook Stickleback (1) adults (Table 3.6). During August 2009, a shorter section of Station S4 was surveyed (50 m) expending 1,093 seconds of effort, which also resulted in the capture of eight species. The fall survey collected young of the year (YOY) Rainbow Trout, Slimy Sculpin and Trout-perch (*Percopsis omiscomaycus*). Additionally, juvenile and adult Slimy Sculpin, Lake Chub and Trout-perch were captured. The catch also included adult Brook Trout, Longnose Dace and Brook Stickleback, and a single juvenile White Sucker. In September 2007 electrofishing by Golder (2009) resulted in the capture of five Mottled Sculpin (*Cottus bairdii*). It is probable that the Mottled Sculpin

reported were in fact Slimy Sculpin. Fairly high numbers of Slimy Sculpin were collected from this watercourse during 2009. Furthermore, Slimy Sculpin was the only sculpin species observed in any of the Pic River Tributaries surveyed during 2009.

The lower reach of this tributary affords potential coldwater spawning and nursery habitat for both migratory and resident salmonids as well as a variety of other non-sport fish species.

3.2.20 Stream 2 Watershed Summary

Similar to the Stream 1 watershed there were a variety of benthic invertebrates identified in the samples from a wide range of taxa including worms, leeches, amphipods, mayflies, stoneflies, caddisflies, beetles, midges, clams and snails (Table 3.7). The different habitats (lakes and ponds versus stream stations) resulted in expected differences in the community composition. Stations L5 (Canoe Lake), L6, L7, L8, L14 and L15 were classified as having fair water quality according to the Hilsenhoff Biotic Index, whereas Station L3 and L20 (Terru Lake) were classified as having fairly poor water quality.

The quantitative benthic macroinvertebrate samples collected at S3 and S4 by Golder had wide ranging densities with the upstream station having higher densities (i.e., 258 to 753 invertebrates/m^2), Simpson's Diversity (i.e., mean 0.85) and taxa richness (i.e., mean 15) compared to the downstream station. Sensitive species such as EPT were prevalent at the both the upstream and downstream stations but were generally absent in the mid-reach between S3 and S4.

Sediment samples collected by NAR (2007) from the majority of the waterbodies within the Stream 2 watershed found a number of parameters exceeding the PSQG. TKN, TOC and TP exceeded the SEL in four of seven, six of seven and five of seven of the sampled lentic stations, respectively (Table 3.5). Copper exceeded the SEL in L15 and exceeded the LEL in all other sampled lakes except for L6. Arsenic exceeded the LEL in L7 but no other waterbody. Cd, Fe, Pb, Ni and Zn all exceeded the LEL in three or more waterbodies throughout the watershed. Sediment samples from the stream stations (i.e., S3 and S4) had less parameters exceed the PSQG. TOC and Ni exceeded the LEL at both stations, whereas Cu exceeded the LEL at S3 only. TP and Fe exceeded the SEL. All other parameters were below the PSQG.

Two of the three headwater basins (i.e., Stations L3 and Terru Lake) within the Stream 2 watershed were fishless, whereas L7 contained a large number of Lake Chub (Table 3.6). The pH in L3 and Terru Lake were relatively low (in the 4 to 5.5 range) in 2009, and may in part explain the absence of fish. Additional pH measures taken in 2011 confirmed the low pH in L3 but Terru Lake had an acceptable pH at that time. These lakes are relatively deep and may provide overwintering habitat, though reduced oxygen at depth and below winter ice was measured at both, which may indicate at least the possibility of winter-kill due to

oxygen deprivation. Beaver activity, topography and low flows in connecting channels also likely impede upstream migration of fish into these waterbodies.

In the middle portion of the watershed (i.e., Canoe Lake and Stations L6, L8, L14 and L15) only one or two species were captured at each waterbody. Canoe Lake and L6 appear to only support Lake Chub, whereas Stations L8 and L15 contained only Brook Stickleback (Table 3.6). Both species were collected in L14; however only a single Lake Chub was captured suggesting that chub are likely only downstream migrants.

All stream stations from L15 proceeding downstream all supported fish. Station S3, the most upstream location only contained Brook Stickleback (Table 3.6). At the downstream end of this station (S3) there was a significant natural barrier to upstream migration in the form of a waterfall. This barrier, as well as other topographic barriers which occur downstream, likely contribute to the lack of species diversity encountered in the upstream reaches of the watershed compared to the downstream reaches. The middle reaches of Stream 2 (Station S53 and S69) support a resident coldwater fishery that includes Brook Trout (S53 and S69) and Slimy Sculpin (S53) (Table 3.6). The presence of Rainbow Trout at S53 indicates that this area has connectivity with the lower reaches and the Pic River. Within the lowest reaches, upstream of the confluence with the Pic River (S4), Stream 2 supports a diverse fishery. Three surveys (September 2007, May 2009, and August 2009) have occurred at this location and ten species of fish have been collected including Rainbow Trout, Chinook Salmon, Brook Trout, Lake Chub, Finescale Dace, Longnose Dace, White Sucker, Trout-perch, Brook Stickleback and Slimy Sculpin. This tributary affords potential coldwater spawning and nursery habitats for resident species (i.e., Brook trout, Slimy Sculpin) as well as migratory species (i.e., Rainbow Trout, Chinook Salmon).

3.3 Stream 3 (Two Duck Lake) Watershed

The Stream 3 catchment flows eastwards to the Pic River, and its confluence is approximately 150 m upstream of the mouth of Stream 2. A number of lakes and ponds are located within the catchment including waterbodies L9, L9a, L10, L11, L12, L13, L13a and L16 (Figure 3.16). This catchment will be impacted by proposed mine rock stockpile and the primary mine pit.

Sediment quality data for the Stream 3 watershed is provided in Table 3.9. Fishing effort and species identified for the Stream 3 watershed is presented in Table 3.10. Tables 3.11 and 3.12 display the benthic macroinvertebrate data and calculated indices for Stream 3 watershed stations.

3.3.1 Station L9 (and L9a)

Station L9 aquatic habitat characteristics and bathymetry are shown on Figure 3.17 and discussed below.

Bathymetry and Habitat

L9 is a beaver pond that typically outlets to L10 and L11 (Two Duck Lake) in the east. A qualitative bathymetric survey was completed for L9 based on field observations in August 2009. The deepest part of the pond was directly adjacent to an old beaver lodge. The maximum depth encountered was 2.3 m. The remainder of the pond was very shallow, with much of the area west of the beaver lodge less than 0.5 m deep. The surface area of L9 was about 0.4 ha in 2009. In July 2011 the water level in L9 had dropped about 0.9 m due to a breach in the beaver dam at the outlet. The surface area of L9 was greatly reduced and vegetation was recolonizing the previously flooded areas (Figure 3.17).

Aquatic vegetation in L9 was diverse and included marsh cinquefoil, yellow pond lily, floating-leaved burreed, hardstem bulrush, freshwater sponge and northern water milfoil. The terrestrial vegetation surrounding the lake was comprised of black spruce, white spruce, white birch, balsam fir, mountain ash, sweet gale and currant.

As mentioned, L9 typically outlets towards the east to Two Duck Lake, however there was also an outlet observed in 2009 that flowed to the south toward L16 during high water conditions.

Station L9a is a small pond on the outlet stream from L9 situated adjacent to the east side of the existing access road. In August 2009, the round pond had a diameter of approximately 10 m and a maximum depth of about 0.4 m.

Water Quality

The water was a clear yellow/brown colour and visibility was to the bottom. No thermal stratification was observed during the August 2009 or July 2011 surveys; however there was a slight increase in conductivity with depth. DO ranged from around 8.0 to 8.5 mg/L and temperature was between 15 and 17°C in 2009. In 2011, DO ranged from 7.7 to 9.5 mg/L and temperature was between 15 and 20°C. DO was above the PWQO criteria both years. pH in L9 ranged from approximately 6.3 to 6.5 in 2011 which meets the PWQO.

During March 2009, the DO concentration beneath 0.48 m of ice was approximately 1 mg/L at a depth of 0.9 m (True Grit, 2009). pH and conductivity were 7.11 and 78 µS/cm, respectively.

Sediment Quality

The 2009 sediment sample from L9 had three parameters that were above the LEL, including TKN, TOC and Cu (Table 3.9). TKN and TOC were 3520 µg/g and 8.6%, respectively, exceeding the PSQG of 550 µg/g and 1%. Cu in the sediment was 67 µg/g, which exceeded the LEL of 16 µg/g.

The NAR (2007) sediment collected and analyzed in 2006 resulted in three parameters exceeding the SEL criteria (i.e., TKN, TOC and Cu) and three parameters exceeding the LEL criteria (i.e., TP, Cd, and Ni). TKN (17,419 µg/g), TOC (26%) and Cu (167 µg/g) exceeded the SEL values of 4,800 µg/g, 10% and 110 µg/g, respectively, whereas TP (710 µg/g), Cd (1.2 µg/g) and Ni (19 µg/g) exceeded the LEL values of 600 µg/g, 0.6 µg/g and 16 µg/g. All other parameters in both the 2006 and 2009 samples were below the established PSQG criteria (Table 3.9).

Benthic Community

A semi-quantitative benthic sample was collected from L9 in August 2009. A total of 2,359 invertebrates from 46 different taxa were collected (Table 3.12). Three families of invertebrates comprised over 73% of the benthic invertebrate community. The dominant families were Hyalellidae (14.3%), Chironomidae (47%) and Sphaeriidae (12%). Taxa of caddisfly and mayfly were also identified in the sample along with annelid worms (Table 3.11).

Simpson's Diversity was high (0.91) for but Evenness was low (0.24), resulting from a high abundance of a small number of taxa. The Hilsenhoff value was 6.50 indicating fair water quality and the EPT/Chironomid ratio was small (i.e., 0.13), indicating a community dominated by the more tolerant Chironomidae midge family rather than the generally sensitive EPT taxa (Table 3.12).

Fish Community

In August 2009, three baited minnow traps, a small-mesh experimental gillnet and a Nordic net were set for 23 hours in L9; no fish were caught (Table 3.10). The gear was set in 0.6 to 2.4 m of water encompassing all the available habitat types including woody debris, bedrock, muck, emergent vegetation and aquatic macrophyte beds. In June 2011, EcoMetrix set four baited minnow traps and two Nordic nets for 94 hours each. No fish were caught; however, giant diving beetles, giant water bugs, leeches and Eastern Newts were captured in the baited minnow traps. The gear was set at depths ranging from 0.3 to 1.2 m in all habitat types including woody debris, muck, bedrock and submergent macrophtye beds. In addition to the passive fishing methods 363 seconds of electrofishing effort was exerted along the entire wadeable shoreline (Figure 3.17). No fish were captured. This data supports the conclusion that no fish inhabit L9.

In 2009, three minnow traps and a Nordic net were set overnight in L9a. No fish were collected (Table 3.10.

3.3.2 Two Duck Lake (Stations L10 and L11)

Stations L10 and L11 aquatic habitat characteristics and bathymetry are shown on Figure 3.18 and discussed below.

Bathymetry and Habitat

Two Duck Lake is essentially one lake with two separate basins that are joined by a narrow channel. A beaver dam at the outlet of L11 maintains the water levels in these basins. Removal of this dam would likely result in the formation of two separate lakes with a short connecting channel. This dam also restricts the movement of fish upstream. There is a perched culvert at the existing access road crossing on the inlet to the lake (from L9a) which would also be an upstream fish barrier except during very high water levels.

The northwest basin is the shallower, but larger of the two lakes. The western portion of this basin was between 1.5 and 2.5 m deep, whereas the eastern portion was shallower with shrub-scrub wetland and aquatic macrophyte beds. The channel connecting the northwest and the southeast basins was approximately 1 m deep during August 2009. The southeast (lower) basin is smaller, narrower and deeper than the upper basin. The maximum depth of the lower basin was 3.1 m. There were shallow shoreline areas with water depths <1m but generally this basin was deep throughout. The combined surface area of Two Duck Lake (L10 and L11) was approximately 1.7 ha.

Lake substrates consisted of mainly muck with minor amounts of exposed bedrock. Aquatic vegetation observed within the two lakes included of floating-leaved burreed, yellow pond lily, hardstem bulrush, manna grass, three-way sedge, common cattail and *Sphagnum* moss. The terrestrial vegetation was primarily black spruce and white spruce with some balsam fir, white birch, tamarack and currant. A large area of bog willow and sweet gale occurred in the upper basin (L10) of Two Duck Lake.

Water Quality

During August 2009, the water was a clear yellow/brown colour and the bottom was visible from the surface of the water column in the L11 basin.. No stratification was evident and DO (7 mg/L) met the PWQO throughout the water column. Water temperature ranged from 17.1 to 18.4°C. In July 2011 profiles were measured in both basins and the results were similar. DO declined below the PWQO near the bottom in each. The pH was 6.0 to 6.4 in L10 and 6.2 to 6.5 in L11. L10 had a temperature range of 15.8 to 18.2°C and L11 was 15.4 to 19.5°C. Conductivity within much of the water column was very similar to values recorded in 2009 (~30 µS/cm); however an increase near the bottom was observed in both basins (~50 µS/cm). This result is suggestive of groundwater inputs and low mixing.

During March 2009, DO levels in the L10 basin ranged from 0.9 to 1.0 mg/L below the ice (True Grit, 2009). pH and conductivity were 7.7 and 64 µS/cm, respectively. In the L11 basin, DO concentrations ranged from 0.6 to 0.8 mg/L. pH and conductivity were 7.05 and 58 µS/cm, respectively, 0.4 m below the ice. Ice thickness in both basins was about 0.5 m.

Sediment Quality

NAR (2007) collected a sediment sample from L10 and L11 in 2006 which resulted in six and seven parameters exceeding the LEL or SEL in L10 and L11, respectively. TKN, TOC and Cu exceeded the SEL values of 4,800 µg/g, 10% and 110 µg/g. Parameters that exceeded the LEL in both lakes (basins) were TP and Cd. In L10 nickel exceeded the LEL of 16 µg/g, whereas in L11 nickel exceeded the SEL of 75 µg/g (Table 3.9). Lead was above the LEL in L11 but was below guidelines in the L10 sample. All other key parameters were below PSQG.

Benthic Community

NAR (2007) collected benthic invertebrate samples in L10 and L11 during their 2006 aquatic surveys. The benthic communities were comprised of 21 and 20 taxa, respectively. The Hilsenhoff Biotic Index scores were 6.24 and 6.11 for L10 and L11, respectively categorizing the water quality as fair. Both lakes contained a number of fairly tolerant dipteran and amphipod taxa. However, both lakes also contained sensitive species including dragonflies and caddisflies. Overall most species were moderate in their sensitivity to enrichment. Other invertebrates present included worms, water mites, beetles, snails and clams (Table 3.11).

Fish Community

In August 2009, three baited minnow traps, two small-mesh experimental gillnets and a Nordic net were set for 18 hours in Two Duck Lake. The gear was set in both basins and in all available habitat types. Set depths ranged from 0.5 to 3.2 m. No fish were captured (Table 3.10). During July 2011, four baited minnow traps, two small-mesh experimental gillnets and two Nordic nets were set in L10 and four baited minnow traps, a small-mesh experimental gillnet and a Nordic net were set in L11. Set depths ranged from 0.3 to 2.4 m and gear were set in all available habitats including muck, fractured rock, emergent vegetation, and submergent macrophyte beds. No fish were collected in either. In July 2011 all shoreline habitats in L10 and L11 were also electrofished. At L10 about 235 m of shoreline was fished with 409 seconds of effort and at L11 approximately 225 m of shoreline was fished with 420 seconds of effort. No fish were collected from either basin (Table 3.10). Eastern Newts, tadpoles and invertebrates were observed during electrofishing efforts.

Additionally, NAR (2007) and Golder (2009) surveyed Two Duck Lake in September 2006 and August 2007, respectively using a fall walleye index net (FWIN), an experimental gill net, minnow traps and a Nordic net, with neither survey capturing any fish.

3.3.3 Stream 3 (Station S19)

Fish Habitat

An upper reach of Stream 3 was surveyed by Golder (2009) during September 2007. Station S19 is situated directly downstream of Station L11 (Figure 3.16). This section of stream consisted of two beaver ponds separated by a small narrow channel. Channel width was generally <1 m and water depth was <0.25 m. The substrate was comprised of mainly bedrock in the stream portion and organic detritus in the ponds. The canopy was dense in the stream section and more open in the areas of the beaver ponds.

Sediment Quality

Golder (2009) collected a sediment sample from S19 in 2007 resulting in six parameters exceeding either the LEL or SEL. TP, As and Cd we 1,190 µg/g, 5.8 µg/g and 1.2 µg/g all exceeding their LEL. TOC, Cu and Ni were 11%, 325 µg/g and 87 µg/g exceeding the SEL (Table 3.9). All other key parameters were below the PSQG.

Benthic Community

Benthic sampling conducted in 2007 (Golder, 2009) resulted in the capture and identification of 28 unique taxa and sample mean of 16 taxa (Table 3.12). The density ranged from 883 to 4,802 invertebrates/m^2 with a mean of 2,458 invertebrates/m^2. The community was comprised of worms, dragonflies, snails, clams, water mites, dipterans, as well as representatives of all three sensitive orders (Ephemeroptera, Plecoptera and Trichoptera) (Table 3.11). Simpson's Diversity ranged from 0.48 to 0.75 with a moderate mean value of 0.63. Evenness was quite low ranging from 0.10 to 0.26 with a mean of 0.18. In two of the three samples the density of sensitive EPT taxa was higher than the generally more tolerant chironomid taxa and EPT comprised a mean of 23% of the benthic community. Sphaeriid clams had a mean relative abundance of 38% whereas annelid worms comprised a mean of 2% of the benthic macroinvertebrate community. Ancylid snails were the only other taxa to comprise more than 1% of the mean benthic community (Table 3.11).

Fish Community

A fish survey of the upper reach of Stream 3 (Station S19), downstream of Two Duck Lake (L10 and L11) in September 2007 using a backpack electrofisher resulted in the capture of no fish (Table 3.10).

3.3.4 Station L12

Station L12 aquatic habitat characteristics and bathymetry are shown on Figure 3.19 and discussed below.

Bathymetry and Habitat

L12 is a shallow headwater lake with lake levels maintained by a beaver dam at the outlet. The outlet is situated on the northeast arm of the lake where water depth was close to the maximum observed (1.8 m). The water was shallower along the northern shore of the lake as well as along the southern shoreline, where aquatic macrophyte beds occurred. A deeper basin also occurred within the southwest arm, with a maximum depth of about 1.5 m. The surface area of L12 was approximately 1.5 ha.

L12 substrates consisted of mainly muck and bedrock with some detritus. The lake shoreline was primarily rocky with areas of scrub-shrub wetland. Several aquatic macrophyte beds and an old beaver lodge were present. The aquatic macrophyte community consisted of floating-leaved burreed, variable-leaved pondweed, yellow pond lily and water smartweed. Surrounding the lake, the terrain is relatively flat and inhabited primarily by black spruce and white spruce.

Water Quality

During August 2009, the water was a clear yellow/brown colour and the lake bottom was visible from the surface. No thermal or DO stratification was evident. Temperature was around 17°C and DO was about 9 mg/L. In June 2011, water temperature ranged from 17°C at the surface to 15°C at a depth of 1.5 m. DO was between 8 and 9 mg/L, pH was approximately 6.2, and conductivity was 25 µS/cm throughout the water column.

During March 2009, the DO, pH and conductivity were 0.7 mg/L, 7.76 and 44 µS/cm, respectively, 0.4 m below the ice (True Grit, 2009). Ice thickness was 0.48 m.

Sediment Quality

In 2006 NAR (2007) collected a sediment sample which had three parameters exceed the LEL and three additional parameters exceed the SEL. TKN (14,000 µg/g), TOC (22%) and copper (518 µg/g) exceeded the SEL of 4,800 µg/g, 10% and 110 µg/g, respectively. TP (680 µg/g), Cd (0.9 µg/g) and Ni (70 µg/g) exceeded their respective LEL of 600, 0.60 and 16 µg/g (Table 3.9). All other parameters met the PSQG.

Benthic Community

In 2006, NAR (2007) collected an invertebrate sample from Station L12 resulting in the identification of 17 taxa (Table 3.12). The calculated mean Hilsenhoff Biotic Index score was 5.64 or fair. The benthic community contained three relatively sensitive taxa of dragonflies and a single sensitive caddisfly taxon; however the remainder of the taxa were either moderately tolerant or very tolerant according to their assigned sensitivity values. Although 17 taxa were collected, one-third were chironomid midges generally an indication of poor water quality. Also present were two taxa of amphipods, two dipteran fly taxa other

than chironomids, one taxon of tolerant damselfly, a taxon of relatively tolerant caddisfly and one taxon of sphaeriid clam (Table 3.11).

Fish Community

In June 2011 EcoMetrix set four baited minnow traps, two small-mesh experimental gillnets and two Nordic nets for approximately four days (i.e. ~95 hours) (Table 3.10). This gear was set to ensure all available habitats were surveyed and ranged in depths of 0.6 to 1.8 m. No fish were captured although tadpoles, leeches and other macroinvertebrates were observed in abundance. In August 2009, three baited minnow traps and a small-mesh experiment gillnet were set overnight (i.e., ~25 hours) resulting in the capture of no fish (Table 3.10). This gear was set in depths 0.75 to approximately 2 m in the best habitat available. In September 2006 NAR (2007) set six minnow traps and a FWIN and also captured no fish.

Shoreline electrofishing was undertaken in June 2011. EcoMetrix expended 552 seconds of effort over more than 300 m of shoreline habitat. Visibility was good and all available shoreline habitats were fished. This effort yielded no fish; only tadpoles and leeches.

3.3.5 Stations L13 and L13a

Stations L13 and L13a aquatic habitat characteristics and bathymetry are shown on Figure 3.20, and discussed below.

Bathymetry and Habitat

L13 and L13a are small, shallow beaver ponds which are maintained by dams at their outlets. Maximum observed water depths were 1.5 and 1 m, for L13 and L13a, respectively. The surface area of L13 and L13a is 0.18 and 0.38 ha, respectively. Both ponds had very little open water and L13a is almost entirely surrounded by scrub-shrub wetland.

Small areas of rocky shoreline were present in both ponds with L13 exhibiting more open water than L13a. L13a supported dense aquatic macrophytes with small areas of open water. In both ponds, substrates consisted of mainly muck and detritus with some boulder and cobble. Observed aquatic vegetation included yellow pond lily, sedge, manna grass, common mare's tail, variable-leaved pondweed and floating arrowhead. The surrounding terrestrial vegetation was diverse and comprised of black spruce, white spruce, white birch, tamarack, speckled alder, raspberry, sweet gale, bog rosemary (*Andromeda polifolia*, round-leaved sundew (*Drosera rotundifolia*), pitcher plant (*Sarracenia purpurea*), *Sphagnum* moss, bog willow and grasses.

Water Quality

Water quality was measured in both L13 and L13a. Both were very shallow (i.e., ≤ 1.5 m) and therefore the water quality was similar throughout. The water colour in both was clear yellow/brown and the bottom was visible from the surface. In L13 there was a slight increase in conductivity near the bottom (i.e., 78 µS/cm) compared to 58 µS/cm on the surface. The conductivity of L13a was 46 µS/cm. The temperatures in L13 and L13a were around 18 and 16°C, respectively. pH in both ponds were above criteria averaging 5.7 in L13 and 6.1 in L13a. The DO in both ponds was > 6.8 mg/L for all measurements and met PWQO.

During March 2009, L13 was frozen to the bottom (True Grit, 2009). Ice thickness was 0.47 m.

Sediment Quality

A sediment sample was collected from both ponds in August 2009. Four parameters exceeded either the LEL or SEL criteria in L13 and L13a including TP, TOC, Cu and Ni (Table 3.9). In L13, Cu and TOC results were 140 µg/g and 12% which exceed the SEL values of 110 µg/g and 10%, respectively. TP and Ni in L13 were 952 µg/g and 40 µg/g, which are below the SEL criteria but above the LEL criteria of 600 and 16 µg/g, respectively.

Copper was the single parameter in L13a which exceeded the SEL criteria. Cu in L13a was 185 µg/g compared to the criteria of 110 µg/g. TOC, TP and Ni all exceeded the LEL with reported values of 4.8%, 871 µg/g and 63 µg/g compared to the criteria of 1%, 600 µg/g and 16 µg/g. All other key parameters met the PSQG.

Benthic Community

Semi-quantitative samples were collected from both L13 and L13a during August 2009. A total of 5,445 individuals from 28 taxa were collected from L13, whereas, 2,352 individuals were collected representing 47 taxa in L13a (Table 3.12). The dominant taxa in L13a were Ostracoda, Hyallelidae, Corixidae, Chironomidae and Sphaeriidae comprising approximately 76% of the invertebrate community (Table 3.11). The dominant families in L13 were Hyallelidae, Chironomidae and Sphaeriidae comprising over 87% of the invertebrate community. Both pond samples contained annelid worms and caddisfly larvae, whereas only station L13a contained mayfly representatives. Both had high Simpson's Diversity value but low Evenness. The EPT/Chironomid ratio was low for both ponds and the Hilsenhoff values were 6.15 and 6.22 in L13a and L13, respectively indicating to fair water quality.

Fish Community

In June 2011, EcoMetrix set four baited minnow traps and one Nordic net in both L13 and L13a for about four days (~95 hours). The gear was set in all available habitats and ranged in depth (0.3 to 1.2 m). This effort captured no fish in either waterbody; however, numerous eastern newts, tadpoles and macroinvertebrates were observed. In August 2009, three baited minnow traps were set overnight in both waterbodies resulting in no fish being collected (Table 3.10). Theses minnow traps were set in 0.5 m of water over muck bottom.

In addition to the passive fishing, EcoMetrix conducted shoreline electrofishing in June 2011. No fish were caught in either L13 or L13a with 367 seconds of effort over more than 75 m and 420 seconds over about 125 m, respectively although all available habitats where surveyed. The electrofishing effort consisted of fishing 100% of the shoreline in L13 and over 75% of the total pond perimeter in L13a. Wood frogs, American toads (*Bufo americanus)*, leopard frogs (*Rana pipiens*), tadpoles and numerous macroinvertebrates were observed in both ponds during the electrofishing effort.

3.3.6 Station L16

Station L16 aquatic habitat characteristics and bathymetry are shown on Figure 3.21, and discussed below.

Bathymetry and Habitat

Station L16 is a shallow triangular-shaped beaver pond densely inhabited by aquatic macrophytes and scrub-shrub wetland. An old beaver dam was present at the outlet and the maximum depth was 2.2 m in August 2009. The surface area of L16 was approximately 0.6 ha.

The deeper portion of the pond exhibited cobble/boulder substrates with floating aquatic macrophytes. The majority of the remaining bottom was comprised of muck. Aquatic vegetation observed included water smartweed, northern water milfoil, common cattail, yellow pond lily, hardstem bulrush, common burreed (*Sparganium eurycarpum)*, sedge and northern marsh violet and floating-leaved burreed. The surrounding terrestrial vegetation was comprised of black spruce, white spruce, speckled alder, white birch, bog willow and sweet gale.

Water Quality

The water was clear and colourless, and the bottom was visible from the water's surface during August 2009. No stratification was evident, with temperature ranging between 14 to 17°C. DO was above PWQO criteria, averaging 7.8 mg/L and conductivity was about 43 µS/cm. In June 2011, the water temperature was 13 to 20°C, DO ranged between 8.5 and 9.7 mg/L, pH was about 6.7 and conductivity was 48 µS/cm.

During March 2009, L16 was frozen to the bottom (True Grit, 2009). Ice thickness was 0.3 m.

Sediment Quality

Six parameters exceeded either the LEL or SEL criteria in the August 2009 sediment sample. TP, TKN, TOC and Cu exceeded the SEL and Fe and Ni exceeded the LEL. TP, TKN, Cu and TOC were 28,100 µg/g, 9,100 µg/g and 475 µg/g and 13%, respectively. Fe and Ni were 33,400 µg/g and 26 µg/g exceeding their respective LELs of 20,000 µg/g and 16 µg/g (Table 3.9).

The NAR (2007) sample from 2006 resulted in the same parameters above the LEL and SEL values as the 2009 sample with one exception. Cd in the 2006 sample was 1.1 µg/g which exceeds the LEL of 0.6 µg/g. In the 2009, cadmium was below the method detection limit (i.e., 0.5 µg/g) (Table 3.9).

Benthic Community

A semi-quantitative invertebrate collection was conducted in L16 in August 2009. This resulted in the identification of 2,842 individuals representing 38 different taxa (Table 3.12). The dominant taxa were Hyallelidae, Chironomidae, Chaoboridae and Sphaeriidae comprising approximately 72% of the invertebrate community (Table 3.11). Also identified were ostracods, corixids, annelid worms, dragonflies, damselflies, mayflies and caddisflies. Simpson's Diversity and Evenness were similar to other waterbodies in the watershed with diversity being high but evenness being low. The Hilsenhoff value was 5.81 indicating fair water quality.

A similar sampling method was employed by NAR (2007) in September 2006 resulting in the collection of 23 unique taxa. Analysis of the tolerance values of these taxa yielded a mean Hilsenhoff score of 5.78 also classifying the water quality as fair. The species within the invertebrate community in both 2006 and 2009 were generally the same (Table 3.11).

Fish Community

In June 2011 EcoMetrix set four baited minnow traps, two Nordic nets and one small-mesh experimental gillnet for four days (93 hours). This gear was carefully placed to survey all habitat types present including logs, detritus, macrophytes and boulder piles and set at depths ranging from 0.4 to 1.2 m. This fishing effort caught eastern newts, tadpoles and macroinvertebrates but no fish. In August 2009, six baited minnow traps and a Nordic net were set overnight (i.e., 17 hours) resulting in the capture of no fish (Table 3.10). Gear were set in a range of habitats at water depths of 0.2 to 0.7 m.

EcoMetrix also conducted shoreline electrofishing in 2011. More than 200 m of shoreline was fished with 355 seconds of effort. All shoreline habitats were electrofished but no fish were captured.

3.3.7 Stream 3 (Station S18)

Fish Habitat

Station S18 is located in the upper reach of Stream 3 where the access road crosses the stream (Figure 3.16). This reach has a moderate gradient and during May 2009 had a mean width, mean depth and mean water velocity of 1.5 m, 0.15 m and 0.25 m/s, respectively. The surrounding vegetation consisted of speckled alder, dogwood, white spruce and white birch. Aquatic vegetation was present including water cress and horsetail. The canopy cover was 60% partly open, 30% dense and 10% open. Instream cover comprised about 30% of the total stream area and was included logs and trees, log jams and deep pools. A variety of substrates were present within the reach including boulder, cobble, organic silt, sand and clay. Reach morphology consisted primarily of riffles (65%) with some flats (15%) and pools (15%) and a small proportion of runs (5%). Bedrock cascades within the reach create natural barriers to upstream fish passage. No algae were observed at this location and sediment overlay of the substrate was slight. The water was clear yellow/brown colour with a temperature of 13°C during May 2009.

Benthic Community

During the May 2009 fish survey, caddisfly larvae and mayfly nymphs were observed in abundance. In June 2011, a semi-quantitative sample was collected. The sample contained 1,563 organisms from 42 taxa (Table 3.12). There were 11 EPT taxa, comprising 29% of the community, indicating good water quality. The Simuliidae family accounted for 40% of the sample which is also an indicator of good water quality. The Hilsenhoff value (5.18) indicated good water quality as well.

Fish Community

Station S18 in the upstream reaches of Stream 3, near the access road, was surveyed twice during the 2009 field season, both resulting in no fish being captured (Table 3.10). In May 2009 a 120 m reach was electrofished expending 634 seconds of effort and in October 2009 a smaller length of stream (~ 75 m) was surveyed expending 100 seconds of effort. Low of flows and steep topography limited the length of the stream fished at this station. Between the two surveys, all available habitats were fished and extending the station would not have led to any additional habitats being encountered.

3.3.8 Stream 3 (Station S52)

Fish Habitat

The middle reach of Stream 3 (Station S52) was surveyed downstream of the confluence of the two main tributaries, which drain L9, L10, L11, L12, L13, L13a and L16, in June 2010 (Figure 3.16). This 2nd order stream had a mean width of 1.5 m and a mean water depth of 0.1 m. The gradient is moderate and flow velocity was about 0.25 m/s. Stream morphology

consisted of riffles (60%), pools (20%), flats (15%) and runs (5%) and the channel flowed in a fairly straight reach. The stream canopy was partly open and instream cover was afforded by logs and trees and log jams. The substrate consisted of cobble, gravel, boulder and clay. Sediment overlying the substrate was moderate but no algae were observed. The water was a clear and colourless and the temperature was 10°C. The adjacent terrain was forested lowland and the observed terrestrial vegetation included white spruce, black spruce, white birch, speckled alder, eastern white cedar, raspberry and balsam poplar. No barriers to fish passage were observed within the surveyed reach. Downstream of this station there were numerous log and beaver dams with sediment built up behind them. These barriers may obstruct upstream fish passage from the lower reaches.

Fish Community

The middle reach of Stream 3 (Station S52) was electrofished in June 2010 and June 2011, downstream of the two main tributaries. No fish were collected along a 100 m reach, representing all habitats present, during 373 seconds of effort in 2010 (Table 3.10). In 2011 a 250 m section of the middle reach was fished with 704 seconds of effort, All types of habitat present were fished and again no fish were captured.

3.3.9 Stream 3 (Station S6)

Fish Habitat

Station S6 is located in the lower reach of Stream 3, upstream of its confluence with the Pic River (Figure 3.16). This reach has a moderate gradient and during May 2009 and August 2009 had mean widths of 3 and 1.3 m, respectively. The mean depth was 0.20 m and the velocity was 0.2 m/s during the May 2009 survey. The surrounding vegetation was primarily speckled alder, dogwood, white spruce, balsam fir and white birch. The canopy cover was partly open with some open areas and a small section of dense canopy. The stream morphology was mainly riffles (60%) and flats (25%) with small portions of pool and run also present. In-stream cover was provided by undercut banks, boulders, logs and trees, log jams and deep pools, comprising about 25% of the total station area. The substrate consisted of cobble with small amounts of gravel, sand, boulder and silt. A log jam was observed creating a natural impediment to fish migration during May 2009. There was moderate sediment overlaying the substrate and algae growth was slight. Aquatic vegetation observed was limited to sedges. The water was a turbid yellow/brown colour at the time of sampling in May 2009, whereas during August, the water was a clear yellow/brown colour. The water temperature during May 2009 and August 2009 were 15.5°C and 12.5°C, respectively.

Sediment Quality

A Golder (2009) sediment sample from 2007 had only one parameter exceed the LEL. Ni was 19 µg/g exceeding the PSQG LEL of 16 µg/g (Table 3.9). All other key parameters were met the PSQG.

Benthic Community

Golder (2009) conducted a benthic survey at Station S6 during their 2007 studies. Three replicate samples were collected using a Surber sampler. In total 15 unique taxa were identified with a mean of 7 taxa per sample (Table 3.12). The density ranged from 43 to 140 invertebrates/m^2 with a mean value of 83 invertebrates/m^2. Only 23 individual invertebrates were collected in all three replicates combined and therefore indices calculated from these data are not to be considered entirely meaningful. Of the individuals collected, EPT taxa were most prevalent comprising 32% of the mean community based on relative abundance. Other groups collected and their mean relative abundance were as follows empid midges (22%), snails (3%), ceratopogonid midges (8%), mites (11%), leeches (6%) and annelid worms (16%) (Table 3.11).

Fish Community

Station S6 is located in the downstream reach of Stream 3 approximately 120 m upstream of the confluence with the Pic River. Three electrofishing surveys (September 2007, May 2009, and August 2009) have resulted in the capture of five species of fish (Table 3.10). In May 2009, a 180 m reach was surveyed expending 1,369 seconds of effort and resulted in the capture of two juvenile and three adult Slimy Sculpin. In August 2009, a 120 m reach was surveyed expending 1,059 seconds of effort and the catch consisted of one adult Longnose Dace, 19 young of the year (YOY) and four adult Slimy Sculpin, nine YOY and two juvenile Rainbow Trout and one adult Johnny Darter (*Etheostoma nigrum*). During the September 2007 survey, Golder (2009) collected single specimens of Brook Trout, Rainbow Trout and Mottled Sculpin at Station S6. It is probable that the Mottled Sculpin reported was in fact Slimy Sculpin. Slimy Sculpin was the only sculpin species observed in any of the Pic River Tributaries surveyed during 2009. The downstream portion of this tributary affords potential coldwater spawning and nursery habitat for both migratory and resident salmonids and other small (baitfish) species.

3.3.10 Stream 3 Watershed Summary

The Stream 3 watershed benthic invertebrate community was comprised of a variety of taxa from a wide range groups including worms, chironomids, leeches, amphipods, mayflies, stoneflies, caddisflies, beetles, midges, clams and snails (Table 3.11). The different habitats (lentic stations versus stream stations) resulted in expected differences in the community composition. The collected samples classified all stations as having fair water quality according to the Hilsenhoff Biotic Index with the exception of S18 which had good water quality. Quantitative samples collected at Stations S19 and S6 by Golder (2009) had wide ranging densities with the upper reach (S19) having higher densities compared to the downstream reach (S6). Mean taxa richness was more than twice as high in the S19 samples compared to the downstream S6 samples. The downstream station had a higher Simpson's Diversity and higher Evenness compared to the upper reach station, however this is likely a result of the low number of individuals collected downstream. Simpson's

Diversity and Evenness were high and low respectively in L9, L13, L13a and L16 in 2009 (Table 3.12). EPT species were found in the upstream, mid-reach and downstream Stream 3 stations.

Sediment samples were collected in 2006 by NAR (2007) at L9, L10, L11, L12 and L16. Sediment samples were collected by Golder (2009) in 2007 at S19 and S6. During 2009 sediment samples were collected at L9, L13, L13a and L16. Samples from both 2006 and 2009 resulted in a number of parameters exceeding the PSQG. TKN, TOC and Cu exceeded the SEL in the majority of the waterbodies within the watershed, whereas TP, Ni and Cd generally exceeded the LEL. There were also occurrences of As, Fe and Pb exceeding the LEL criteria.

Despite relatively intensive fish surveys, including increased efforts in 2009, 2010 and 2011, all streams, lakes and ponds surveyed within upper and mid-reaches of the Stream 3 watershed have yielded no fish. The potential for re-population of this area from downstream reaches is unlikely due to topographic barriers afforded by the steep relief as the watershed drains to the east towards the Pic River

Within the lower reaches, upstream of the confluence with the Pic River, Stream 3 (Station S6) supports a fairly diverse fishery. Three surveys (September 2007, May 2009, and August 2009) have occurred at this location and five species of fish have been collected including Rainbow Trout, Brook Trout, Longnose Dace, Slimy Sculpin and Johnny Darter (Table 3.10). This lower reach of the tributary affords coldwater spawning and nursery habitat for a community of migratory and resident salmonids as well as other small (baitfish) species.

3.4 Stream 4 (Claw Lake) Watershed

The Stream 4 catchment flows northeast and discharges into the Pic River approximately 4 km upstream of the mouth of Stream 3. The catchment includes waterbodies L18, L19, L21 and L22 (Figure 3.22). This catchment is outside, but adjacent to, the footprint of the proposed mine.

Table 3.13 presents the sediment quality data for the Stream 4 watershed and Table 3.14 displays a summary of the effort and fish species identified. Benthic community data presented on a percent composition is provided in Table 3.15. A summary of the calculated benthic community indices for all stations sampled within Stream 4 watershed are presented in Table 3.16.

3.4.1 Stream 4 (Station S72)

Fish Habitat

Station S72 is the satellite pond and connecting channel situated north of L21 (Figure 3.22). Stream morphology consisted of mostly riffles (65%) with pools (30%) and runs (5%). The

stream portion of this station had stable banks with a low to moderate gradient. The stream channel was meandering with some braided and ponded sections with mainly dense canopy cover. Instream cover was afforded by logs and trees, log jams, deep pools and macrophytes. S72 substrates were primarily cobble, muck and detritus with some sand and gravel. The surrounding terrain was forested upland inhabited by spruce with bog and meadow adjacent to the ponded areas. Sedge was the only aquatic vegetation observed. No sediment and slight algae overlaid the substrates and barriers were present in the form of beaver dams. The water was a clear yellow/brown colour.

Benthic Community

The benthic community was not assessed at S72 but amphipods, leeches and mayfly nymphs were observed during the fishing effort.

Fish Community

A 100 m length of the satellite pond shoreline and the connecting stream was fished using 146 seconds of electrofishing effort (Table 3.14). No fish were captured during this effort but tadpoles and wood frogs were observed. This effort encompassed all available habitats at this location.

3.4.2 Station L21

Golder (2009) conducted a survey of Station L21 during their 2007 field season. EcoMetrix surveyed L21 in June 2011. Station L21 aquatic habitat characteristics and bathymetry are shown on Figure 3.23, and discussed below.

Bathymetry and Habitat\

L21 is a shallow beaver pond with a maximum depth of around 1.2 m. The surface area was 1.03 ha, 20% of which was marsh. The substrate was primarily bedrock overlain by organic silt and detritus. Habitat consisted of shallow open water, emergent and submergent aquatic vegetation beds, and scrub-shrub wetland. Aquatic macrophytes observed included floating-leaved burreed, manna grass and coontail. Terrestrial vegetation included black spruce, white spruce and white birch. A large area of bog willow and sweet gale was present at the north end of the pond.

Water Quality

The water colour was a clear yellow/brown colour. The pH ranged from 4.4 to 6.1 and DO was 5.7 mg/L during the 2007 survey. Al and Fe exceeded PWQO for the 2007 water sample.

During March 2009, the DO concentration beneath 0.5 m of ice was <0.5 mg/L (True Grit, 2009). pH and conductivity were 6 and 127 µS/cm, respectively.

Sediment Quality

In the 2007 Golder (2009) sediment sample, TOC exceeded the SEL of 10% with a value of 39% whereas Cd exceeded the LEL of 0.6 µg/g with a value of 1.09 µg/g. Phosphorous also exceeded the LEL with a value of 974 µg/g (Table 3.13).

Benthic Community

Golder (2009) collected three replicates from three sites within L21 resulting in the identification of 37 unique taxa (Table 3.16)). For calculation purposes the three replicates from each site were pooled, resulting in 3 samples rather than nine. The replicate mean taxa richness for L21 was 24. The mean density was 35,262 invertebrates/m^2 per sample and ranged from 6,414 to 87,943 invertebrates/m^2. Site 3 had a higher taxa richness and mean density compared to sites 1 and 2. The Simpson's Diversity averaged 0.85 and the Evenness had a mean of 0.29. The Hilsenhoff Biotic Index was 7.50 indicating fairly poor water quality.

The invertebrate community was dominated by chironomids (74%). Annelid worms also comprised a substantial proportion (11%) of the mean benthic community (Table 3.16). In addition to the aforementioned taxa, dragonflies, damselflies, dytiscid beetles, mites, corixids, caddisflies, phantom midges, biting-midges, tabanid and tipulid midges and roundworms were also present (Table 3.15).

Fish Community

In August 2007, Golder (2009) set three minnow traps for 19 hours which resulted in the capture of no fish (Table 3.14). In June 2011, EcoMetrix set four baited minnow traps, two Nordic nets and one small-mesh experimental gillnet. This gear was set for four days, (i.e., 97.5 hrs), in locations representing all habitats. Set depths ranged from 0.5 to 1.2 m. This fishing effort also caught no fish but did catch numerous macroinvertebrates.

In addition to the passive fishing efforts, EcoMetrix conducted 306 seconds of shoreline electrofishing. A total of 360 m of shoreline was fished including all habitats, but no fish were caught.

3.4.3 Stream 4 (Station S73)

Fish Habitat

Station S73 is situated within the headwaters of Stream 4 (Figure 3.22). The station comprised the stream connecting L21 to its south satellite pond and the satellite pond itself. The stream portion was <0.25 m wide, whereas the ponded area was approximately 3 m at its widest point. Both the stream and ponded area exhibited stable banks. The stream was primarily riffle habitat which comprised approximately 10% of the area surveyed; the remainder was ponded. The stream above and below the ponded area was of moderate

gradient and meandering. The substrate reflected the overall reach gradient (low) and was mostly muck (65%) and detritus (20%) with some bedrock, boulder and cobble. The water was a clear yellow/brown and there was a moderate amount of algae overlaying the substrate, especially in the ponded area. The canopy tended to be dense but there were a few areas where it was partly open (20%). The riparian vegetation was largely comprised of white spruce and sedges were the dominant aquatic vegetation. Instream cover was sparse, limited to a few logs and trees, and deep pools. The beaver dams present in this reach would likely pose a barrier to fish passage.

Benthic Community

The benthic community was not assessed at S73 but leeches, dragonfly nymphs and mayfly nymphs were observed during the fishing effort.

Fish Community

An 80 m section of the L21 south satellite pond and connecting channel were electrofished with 140 seconds in effort in June 2011 (Table 3.14). All habitats within the reach were fished. A wood frog and leeches but no fish were encountered during this exercise.

3.4.4 Stream 4 (Station S71)

Fish Habitat

The reach of Stream 4 connecting L21 and L22 was investigated during June 2011 (Station S71) (Figure 3.22). The channel was meandering (45%) and ponded (40%) with some braided (15%) sections. The water colour was a clear yellow-brown and average flow velocity was about 0.15 m/s. The channel was on average 0.75 m wide and 0.1 m deep. Within the reach, there were a number of beaver ponds that were up to 60 m wide and more than 1.5 m deep. Stream morphology consisted of pools (40%) and riffles (50%) with minor amounts (5%) of runs and flats. The substrate was mostly muck (30%) and detritus (20%) with bedrock, boulders, cobble, gravel and sand. The muck and detritus were prevalent in the ponded habitat. The stream banks were stable and well vegetated, and adjacent terrain was primarily forested lowland with some meadows associated with the beaver ponds. The dominant terrestrial species was white spruce and the dominant aquatic species observed was moss. Canopy cover was mainly dense with 30% partly open and 10% open. Instream cover was abundant including undercut banks, boulders, logs and trees, log jams, deep pools and aquatic macrophytes. Numerous beaver dams within the reach would pose barriers to fish passage.

Benthic Community

The benthic community was not assessed at S71 but amphipods, leeches, dragonfly nymphs and mayfly nymphs were observed during the fishing effort.

Fish Community

In June 2011, approximately 550 m of stream and pond perimeter was fished between Stations L21 and L22. Within this reach of Stream 4 (Station S71) all habitats present were fished. A total of 410 seconds of electrofishing effort were expended but no fish were captured (Table 3.14). Larger aquatic organisms observed during the survey included wood frogs, tadpoles and leeches.

3.4.5 Station L22

Golder (2009) conducted a survey of Station L22 during their 2007 field studies. In June 2011, EcoMetrix conducted additional fisheries work on L22. Station L22 aquatic habitat characteristics and bathymetry are shown on Figure 3.24, and discussed below.

Bathymetry and Habitat

Station L22 is a round, bowl-shaped lake, situated approximately 700 m downstream of L21 and is relatively deep, compared to other lakes in the area of similar size. The surface area of the lake was approximately 1.73 ha and the maximum depth was about 9.1 m during August 2007. The lake receives flow from the south and outlets to the east. The majority of the lake was deeper than 2 m with shallow water restricted to the nearshore areas.

The lake substrate was comprised of bedrock, muck and detritus. The shoreline was mostly fractured rock and bedrock with a small area of emergent vegetation and scrub-shrub wetland near the inlet. Riparian vegetation included black spruce, white spruce and white birch. Aquatic vegetation was sparse and included floating-leaved burreed, common mare's tail, manna grass and sedges.

Water Quality

The water colour was stained yellow/brown. During August 2007, the pH throughout the water column was 6.0 to 6.7, while DO levels ranged from 8.7 mg/L at the surface to 3.6 mg/L at depth. Deeper DO measurements were below the PWQO.

During March 2009, DO concentrations beneath 0.49 m of ice ranged from 0.4 to 0.6 mg/L, throughout the water column (True Grit, 2009). pH and conductivity were 7.45 and 34 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

Five parameters exceeded the PSQG in the L22 sample collected by Golder (2009) in 2007. TP and TOC exceeded the SEL of 2,000 µg/g and 10%, respectively, whereas, Cd, Cu and Ni exceeded the LEL of 0.6, 16 and 16, respectively (Table 3.13). All other key parameters were below PSQG. .

Benthic Community

Golder (2009) collected three replicate samples from three sites in L22, representing the most dominant habitats present. It total 52 taxa were identified with a mean of 35 per site. The range in density was 24,414 to 27,200 invertebrate/m^2, with a mean of 25,424 invertebrates/m^2. The Simpson's Diversity was relatively high with a mean of 0.90 and range of 0.85 to 0.92. Evenness was low with a mean of 0.29. The Hilsenhoff Biotic Index was 6.07 indicating fair water quality and the EPT/Chironomid ratio was 0.33 indicating a larger proportion of more tolerant chironomid taxa compared to the more sensitive EPT taxa (Table 3.16).

Chironomids dominated the benthic community from a relative abundance perspective (~ 45%). Sphaeriid clams (20%) and EPT taxa (15%) also comprised a large proportion of the benthic community. Other taxa comprising over 1% of the mean community were roundworms (2%), annelids (3%) and amphipods (~ 9%). Dipterans from three families other than chironomids also accounted for ~ 4% of the benthic community. Also present in at least a single sample were damselflies, dragonflies, haliplid beetles, snails, seed shrimps and mites (Table 3.15).

Fish Community

In September 2007, Golder (2009) set three minnow traps, a Nordic net and an experimental gillnet for between 19 and 23 hours. No fish were captured (Table 3.14). In June 2011, EcoMetrix set three baited minnow traps, two Nordic nets and a small-mesh experimental gillnet for four days (i.e., 97 hrs) at locations in L22 which represented all habitats present. Set depths ranged from 0.3 to 4.2 m. No fish were caught although tadpoles and macroinvertebrates were relatively abundant.

In addition to the passive fishing efforts, EcoMetrix conducted 286 seconds of shoreline electrofishing. A total of 285 m of shoreline was fished and included all accessible habitats present in L22. No fish were captured by electrofishing.

3.4.6 Stream 4 (Station S70)

Fish Habitat

The upstream portion of Stream 4 was surveyed downstream of the outlet from L22 at Station S70 (Figure 3.22). At this location the watercourse consisted of a confined channel flowing through upland forest and small meadows. The dominant terrestrial vegetation wais white spruce. This station reach was 200 m long, with an average channel width of 0.4 m and a mean depth of 0.15 m. Some pools within the reach averaged 10 m wide and 0.3 m deep. Stream morphology was composed of pools (55%), riffles (30%), runs (10%) and flats (5%). The majority of instream cover was afforded by log jams with boulders, pools, and logs and trees providing some. The substrate was mainly bedrock, boulder and cobble,

and there was slight algae overlying the streambed materials._The water was a clear yellow/brown colour.

Benthic Community

The benthic community was not sampled but caddisfly larvae, mayfly nymphs, amphipods and leeches were observed in the stream.

Fish Community

A 200 m section of the upper reaches of Stream 4 (Station S70) was surveyed by EcoMetrix in June 2011 using 259 seconds of backpack electrofishing effort. No fish were captured (Table 3.14) although a leopard frog, a few wood frogs, some tadpoles and a couple leaches were observed.

3.4.7 Stream 4 (Station S51)

Fish Habitat

The upstream portion of Stream 4 was surveyed between Stations L18 and L22 during September 2007 by Golder (2009) (Figure 3.22). At this location (S51) the watercourse consisted of a confined channel flowing through a meadow. There was an abandoned beaver dam and an active beaver dam within the reach and instream cover was afforded by undercut banks, boulders and pools. The stream morphology was comprised of relatively equal parts of riffle, pools, runs and flats and the majority of the station had partly open canopy. Substrates within the reach consisted of silt, sand, boulder, cobble and gravel.

Water Quality

In September 2007, the pH was 5.8, which met PWQO.

Sediment Quality

A sediment sample was collected by Golder (2009) in September 2007. Six key parameters exceeded PSQG criteria. Phosphorus and Fe both exceeded the SEL of 2,000 and 40,000 µg/g, respectively. TOC, Cu, Ni and Zn exceeded the LEL of 1% and 16, 16 and 120 µg/g, respectively (Table 3.13).

Benthic Community

In 2007, Golder (2009) collected three replicate Surber samples at Station S51, resulting in 32 unique taxa being identified with a per sample range of 14 to 19 yielding a mean of 17. The density ranged from 301 to 1,033 invertebrates/m^2 with a mean of 710 invertebrates/m^2. Simpson's Diversity was high for all three replicates ranging from 0.82 to 0.89 and a mean of 0.85. Evenness was moderate with a mean of 0.43. A total of 9 EPT

taxa were identified at the station and the Hilsenhoff Biotic index was 4.43 indicating very good water quality (Table 3.16).

The benthic community was dominated by chironomids and EPT taxa in fairly equal proportions. Mean sphaeriid clam relative abundance was 8% with a range of 4 to 13%. Oligochaete and leech density ranged from 0 to 4% with a mean relative abundance of 3%. Biting-midges ranged from 4 to 11% with a mean of 7%. Mites, amphipods, roundworms, tipulids and dragonflies were also identified in small proportions in at least one replicate (Table 3.15).

In June 2011, EcoMetrix collected an additional qualitative benthic sample slightly downstream of this station (S51A). This sample contained about 5,300 organisms from 31 taxa. Similar to 2007, the community was dominated by chironomids; however EPT taxa were reduced relative to 2007. Chironomids and EPT taxa represented 72% and 7% of the benthic community, respectively. The slight difference in location between S51 and S51A may be the reason for the minor differences in community composition.

Fish Community

A 150 m section of the upper reaches of Stream 4 (Station S51) was surveyed by Golder in September 2007. No fish were captured by electrofishing (Table 3.14). In June 2011, EcoMetrix surveyed a reach slightly downstream of S51 at Station S51A. This exercise included electrofishing above and below a waterfall believed to be a barrier to upstream fish passage. Below the cascade, Finscale Dace and Brook Stickleback were captured during 333 seconds of effort. Above the barrier, 45 m of stream was fished with 107 seconds of effort. No fish were captured; however, dace were observed in the pools directly below the waterfall. The combined efforts in the upper reaches of Stream 4 during 2007 and 2011 suggest that the encountered waterfall may be a barrier to upstream fish passage beyond that point.

3.4.8 Station L18

Station L18 aquatic habitat characteristics and bathymetry are shown on Figure 3.25 and discussed below.

Bathymetry and Habitat

Station L18 is a long and narrow waterbody with a marshy area associated with the inlet embayment at the south end. L18 receives flow from L22 upstream and discharges to Claw Lake (L19). A small inlet stream also occurred along the western shoreline. An existing electrical transmission line easement traverses the middle of the pond and an active beaver dam was present at the outlet which maintained the water level. The maximum depth of L18 was about 3.2 m and the surface area was approximately 2.6 ha during August 2009.

The substrate consisted of primarily fine organic material (muck) with areas of bedrock, boulder and cobble. The majority of the nearshore was inhabited by aquatic vegetation comprised of both submergent and emergent types, as well as patches of scrub-shrub wetland (i.e., sweet gale). The dominant aquatic plant species observed in L18 included sedge, water smartweed, hardstem bulrush, floating-leaved burreed, manna grass and yellow pond lily. The surrounding landscape was steep and densely forested along the western shore and more gradually sloped and open along the eastern shore. Riparian tree species observed include black spruce, white spruce, white birch, speckled alder and balsam fir.

Water Quality

The water colour was stained yellow/brown, the Secchi depth was 1.75 m and the lake was stratified during August 2009. Water temperature and DO were near 17°C and 7.8 mg/L, respectively in the surface waters, but began to decrease below 1 m depth, with temperature stabilizing at 2 m and DO continuing to decline to less than 4 mg/L near the bottom (3 m). The pH ranged from 6.6 to 6.9 and DO was 7.5 to 8.8 mg/L during the summer 2007 field assessment by Golder (2009). In June 2011, L18 was beginning to stratify. DO and temperature decreased at depths below 1.5 m. DO was above the PWQG until the deepest reading (3.4 mg/L at 2.6 m depth). pH was 5.9 to 6.5 and conductivity was around 26 µS/cm throughout most of the water column, increasing slightly near the bottom.

During March 2009, DO levels beneath 0.54 m of ice were <1 mg/L in the uppermost (south) basin (True Grit, 2009). pH and conductivity were 6.85 and 41 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

Golder (2009) collected sediment samples using a petite Ponar during the 2007 survey of L18. Five key parameters in the sample exceeded either the LEL or the SEL criteria. TOC was 7.8% exceeding the LEL of 1% and Cd was 0.7 µg/g exceeding the LEL of 0.6 µg/g. Ni also exceeded the LEL of 16 µg/g with a result of 32 µg/g. Cu and TP exceeded the SEL with values of 191 and 3,740 µg/g compared to the criteria of 110 and 2,000 µg/g, respectively (Table 3.13). All of the other key parameters met PSQG.

Benthic Community

Golder (2009) collected three replicate samples at three sites within L18 in September 2007. The sites were selected to represent the dominant habitats within the lake. The mean density after pooling the three replicates per site was 39,571 invertebrates/m^2 (Table 3.16). Taxa richness ranged from 35 to 42 with a mean of 39 and a total of 63 taxa identified. Simpson's Diversity had a mean of 0.91 and Evenness a mean of 0.30. The Hilsenhoff biotic index value puts the water quality of L18 in the fairly poor category.

Generally, dipterans were the dominant taxa followed by EPT taxa, worms and leeches and representatives from the phylum Mollusca. Dragonflies, damselflies, amphipods, water mites and corixid bugs were also present in the samples (Table 3.15).

Fish Community

In August 2009, three types of gear (baited minnow traps, small-mesh experimental gillnet, Nordic net) were set overnight in Lake 18 resulting in the capture of six fish species (Table 3.14). Adult Blacknose Shiner (*Notropis heterolepis*), Finescale Dace, Northern Redbelly Dace and Fathead Minnow (*Pimephales promelas*), as well as juvenile and adult Longnose Sucker (*Catostomus catostomus*) and Brook Stickleback were captured in the minnow traps and/or the Nordic net. No fish were collected in the experimental gillnet. During September 2007, Golder set three minnow traps for 18 hours and captured 439 Finescale Dace.

3.4.9 Claw Lake (Station L19)

Golder (2009) conducted a survey of Station L19, known locally as Claw Lake, during their 2007 field season (Figure 3.26). The following is a summary of the 2007 data, as well as a water quality profile from June 2011.

Bathymetry and Habitat

L19 receives flow from L18 through a marsh in the southern end of the lake and exits through a culvert under the access road crossing at the northeast end of the lake. This culvert effectively forms the lake outlet and a shallow beaver pond occurs downstream of the road. Beaver activity has been observed blocking flow through this culvert, increasing upstream water levels. The surface area and maximum depth of the lake were 9.53 ha and 9 m, respectively, during the 2007 survey. The majority of the lake was >3 m deep with shallow marsh habitat generally confined to the northeast shoreline, and the area in the northeast corner near the culvert. Aquatic macrophyte beds were largely comprised of floating-leaved burreed and lake substrates consisted mainly of organic silt (muck), bedrock and detritus. To the north of the lake, relief is very steep whereas south of the lake the slope is more gradual. Riparian vegetation included black spruce, white spruce and white birch.

Water Quality

The water colour was stained yellow/brown. During September 2007, the lake was stratified. Water temperature, DO and pH were 19.4 and 6.0°C, 9.3 and 1.7, mg/L, and 6.9 and 6.8, at surface and 1 m above bottom, respectively. Conductivity was 38 µS/cm at the surface and 94 µS/cm near bottom, suggesting groundwater inputs. In June 2011, EcoMetrix undertook an additional water quality profile. Water temperature, DO and pH were 18.7 and 5.9 °C, 9.3 and 1.6 mg/L, and 6.6 and 6.3, at surface and 1 m above bottom, respectively. Conductivity was 38 µS/cm near the surface and 79 µS/cm near bottom.

During March 2009, DO levels beneath 0.56 m of ice ranged from 0.4 to 0.9 mg/L throughout the water column (True Grit, 2009). pH and conductivity were 7.63 and 8 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

In 2007, Golder (2009) collected a sediment sample in Claw Lake. Six key parameters in the sample exceeded the PSQG. TOC (24%) and Cu (234 µg/g) both exceeded their respective SEL of 10% and 110 µg/g. Cd, Ni, TP and Fe had values of 1.3, 31, 1,970 and 35,200 µg/g, respectively, exceeding their LEL of 0.6, 16, 2,000 and 20,000 µg/g (Table 3.13).

Benthic Community

Golder (2009) collected three replicate samples at three sites within Claw Lake in September 2007. The sites were selected to represent the dominant habitats within the lake. The mean density was 7,338 invertebrates/m^2 (Table 3.16). Taxa richness ranged from 23 to 35 with a mean of 30 and a total of 54 unique taxa identified. Simpson's Diversity had a mean of 0.87 with a range of 0.85 to 0.90, and Evenness ranged from 0.22 to 0.31 with a mean of 0.27. A total of eight EPT taxa were identified with a mean of four per sample. The mean EPT/Chironomid ratio was 0.94 indicating a balance between these two taxonomic groups. Despite a fairly diverse community and balance among a number of taxonomic groups, the Hilsenhoff Biotic Index classified the water quality in Claw Lake as fairly poor.

Generally, chironomids and EPT taxa were the dominant groups of invertebrates comprising a combined total of 69% of the mean benthic community. Annelid worms comprised 9% of the community and sphaeriid clams 6% (Table 3.15). Also identified in the samples were mites, aquatic moths, snails, biting- and tipulid midges, dragonflies, damselflies, amphipods, beetles and roundworms.

Fish Community

In August 2007, Golder (2009) set three minnow traps, one Nordic net and one experimental gillnet for between 24 and 28 hours each. This effort resulted in the capture of 14 Lake Chub, 3 Blacknose Shiner, 113 Northern Redbelly Dace, 157 Finescale Dace, 85 Fathead Minnow, 37 Longnose Sucker and 1 Brook Stickleback (Table 3.14). Claw Lake provides coolwater habitat for a diverse community of large and small-bodied fish species.

3.4.10 Stream 4 (Station S8)

Fish Habitat

Station S8 is located in the mid-reach of Stream 4, downstream from the marsh at the outlet of Claw Lake (L19) (Figure 3.22). This reach had a high gradient and the stream channel had a mean width of 1.5 m, a mean depth of 0.30 m and a mean velocity of 0.45 m/s. The morphology of the stream was 40% pools, 20% cascades, 20% riffles and 10% of both runs and flats. The majority of the stream channel was braided and the canopy was generally party open with some dense portions. Boulders, deep pools, and logs and trees provided instream cover at this location. The substrate was predominantly bedrock (40%), with boulder (20%), cobble (25%), gravel (5%), organic silt (5%) and detritus (5%) also present. The surrounding upland forest included white birch, balsam fir, speckled alder and dogwood. There were slight sediment and heavy algae overlaying the substrates. Aquatic vegetation observed at Station 8 was primarily mosses. A beaver dam at the outlet from the Claw Lake marsh and bedrock cascades throughout the reach are natural impediments to upstream fish passage.

Water Quality

In September 2007, the pH at S8 was 6.2. The water was clear and colourless during May 2009 and the water temperature was 19°C.

Sediment Quality

Golder (2009) collected a sediment sample in 2007 which resulted in five key parameters exceeding the LEL. TOC, As, Cu, Fe and Ni had values of 2.7%, and 6.5, 28, 27,100 and 47 µg/g, respectively (Table 3.13). All other key parameters met the PSQG.

Benthic Community

In 2007, Golder (2009) collected three replicate Surber samples distributed throughout Station S8, resulting in 27 unique taxa identified with a mean of 15 taxa per replicate (Table 3.16). The density ranged from 1,485 to 1,862 invertebrates/m^2 with a mean of 1,665 invertebrates/m^2. Simpson's Diversity was relatively low for all three replicates ranging from 0.32 to 0.45 with a mean of 0.39. Evenness was also low with a mean of 0.11. The benthic community was dominated by sphaeriid clams comprising a mean of 78% of the community. EPT and chironomids also accounted for a substantial proportion of the community with mean values of 11% and 5%, respectively. These three groups comprised nearly 95% of the invertebrate community. The other 5% of the community was comprised of dragonflies, elmid beetles, dipterans other than chironomids, snails, oligochaete worms, leeches and roundworms (Table 3.15).

Fish Community

In August 2009, a 70 m section of Stream 4 downstream of the outflow from the Claw Lake Marsh was surveyed at Station S8. 981 seconds of electrofishing effort resulted in the capture of six species including Lake Chub (1), Blacknose Shiner(1), Northern Redbelly Dace (18), Finescale Dace (17), Fathead Minnow (1) and Brook Stickleback (9) (Table 3.14). The majority of the catch were adults. In September of 2007, Golder (2009) electrofished this reach and captured 73 Finescale Dace and four Brook Stickleback. This portion of the Stream 4 watershed provides coolwater habitat for small (baitfish) species.

3.4.11 Stream 4 (Station S43)

Fish Habitat

Station S43 is situated in the lower reach of Stream 4, approximately 140 m upstream of the confluence with the Pic River (Figure 3.22). This reach had a moderate gradient and during the May 2009 and August 2009 surveys, had mean widths of 2.0 and 1.5 m, respectively. During the May survey, the mean depth and velocity were 0.2 m and 0.1 m/s, respectively. The surrounding upland vegetation was comprised of speckled alder, dogwood, white spruce, white birch and eastern white cedar. The majority of the canopy cover was dense with some partly open areas. Instream cover was abundant and afforded by a variety of structures including undercut banks, boulders, logs and trees, log jams and deep pools. The substrates were comprised of primarily fine materials including silt (25%) and sand (50%). Cobble (5%), gravel (10%) and detritus (10%) accounted for the remainder of the substrates with minor amounts of bedrock and boulders. Reach morphology was comprised of pools (60%), flats (25%), riffles (10%) and runs (5%). No barriers to fish migration were observed within the lowest reach of Stream 4. No algae were observed and sediment overlay of the substrates was heavy. Aquatic vegetation was present in the form of sedges.

Water Quality

The water was slightly stained yellow/brown with a temperature of 9°C in May and 14°C in August, 2009. During October 2009, the water temperature was 3.4°C, DO was 12.33 mg/L, pH was 8.05 and conductivity was 9 µS/cm.

Sediment Quality

A sediment sample was collected at S43 during October 2009. Four parameters (TP, Cu, Fe and Ni) were equal to or greater than the LEL. Analysis resulted in measurements of 651 µg/g,. 16 µg/g, 22,200 µg/g and 26 µg/g for these four parameters, respectively (Table 3.13). All other key parameters were below PSQG.

Benthic Community

A semi-quantitative benthic invertebrate sample was collected from the lower reaches of Stream 4 (S43) near its confluence with the Pic River, in October 2009. Results from the taxonomic identification of the benthic sample yielded 152 organism representing 11 different taxa (Table 3.16). Baetid mayflies, chironomid midges, tipulid midges and limnephilid caddisflies were the principal components of the sample. These four families accounted for over 74% of the invertebrate community. Other taxa present included nemerteans, two families of annelid worms, lepidostomatid caddisflies and tabanid midges (Table 3.15). There were a total of four EPT taxa identified comprising approximately 42% of the invertebrate community. Simpson's Diversity was 0.86 and Simpson's Evenness was 0.67. The Hilsenhoff score was 5.2 classifying the water quality as good.

Fish Community

In May 2009, a 100 m section of the downstream reach of Stream 4 (Station S43) was surveyed by electrofisher. 1,097 seconds of effort resulted in the capture of seven species (Table 3.14). The catch included juvenile Brook Trout, juvenile Rainbow Trout, juvenile Chinook Salmon, juvenile and adult Slimy Sculpin, juvenile Finescale Dace, juvenile White Sucker, and juvenile and adult Brook Stickleback. In August 2009, a 130 m section of the same downstream reach of Stream 4 (Station S43) was surveyed. During 964 seconds of effort, five species including juvenile and adult Trout-perch, YOY Rainbow Trout, adult Brook Stickleback, adult Johnny Darter and adult Slimy Sculpin, were collected. The downstream reach of Stream 4 potentially affords both spawning and nursery habitat for migratory and resident salmonid species, as well as other small (baitfish) species.

3.4.12 Stream 4 Watershed Summary

The Stream 4 watershed benthic invertebrate samples indicated a relatively diverse benthic community was present with representatives from a wide range groups including worms, leeches, amphipods, mayflies, stoneflies, caddisflies, beetles, midges, clams and snails. The different habitats (lentic versus stream stations) resulted in expected differences in the community composition. The density of invertebrates varied among replicates and between waterbodies. Stream stations sampled by Golder (2009) exhibited similar taxa richness, with the upstream station having higher Simpson's Diversity and Evenness. Taxa richness in the lower reach was lower than in the middle and upper reaches. EPT taxa comprised a similar proportion of the community at the downstream and upstream stations (i.e., 42% and 31%) which was higher than in the mid-reach station (i.e., 11%) According to the Hilsenhoff Biotic Index, Stations L18, L19 (Claw Lake) and L21 had fairly poor water quality whereas L22 had fair water quality. The upper reach, mid-reach and lower reach stations (i.e., S51, S8 and S43) were classified as having very good, fair and good water quality, respectively according to the Hilsenhoff Biotic Index.

Sediment samples were collected in 2007 by Golder (2009) in L18, Claw Lake (L19), L21 and L22 and at S8 and S51. During the 2009 field season a sediment sample was collected at S43 by EcoMetrix. Many sediment samples from both 2007 and 2009 resulted in a number of parameters exceeding the PSQG. TOC exceeded the SEL in all lakes except L18, whereas Cu exceeded the SEL in L18 and Claw Lake and the LEL in L22. Cd and Ni exceeded the LEL in L18, Claw Lake and L22. At all three stream stations Ni exceeded and Cu was equal to or exceeded the LEL. In the upstream and downstream stations, TP exceeded the SEL and LEL, respectively, whereas TOC exceeded the LEL in the upper and mid-reach stations. Zn, As and Fe also had exceedances in the Stream 4 watershed.

No fish were captured upstream of a waterfall located at Station S51a (i.e., Stations S51, L21, L22 and all connecting tributaries). This could possibly be a result of low pH in some of the areas of the upper watershed (i.e., pH of 4.4 in L21). However, water quality was suitable in L22 at the time of the survey suggesting that a lack of overwintering habitat, combined with downstream barriers in the form of beaver dams and/or natural topography such as the waterfall at the downstream end of S51A likely account for the absence of fish. Stations L18 and L19 and the mid-reach of Stream 4 (S8) supported a variety of fish species including Blacknose Shiner, Finescale Dace, Fathead Minnow, Longnose Sucker, Brook Stickleback, Lake Chub, and Northern Redbelly Dace. The extremely steep cascades within the mid-reaches of Stream 4 may impede upstream migration of fish from the lower reaches.

Within the lower reaches, upstream of the confluence with the Pic River, Stream 4 (S43) supports a diverse fishery. Two surveys (May 2009, August 2009) have resulted in the capture of nine species including Rainbow Trout, Brook Trout, Chinook Salmon, Finescale Dace, White Sucker, Trout-Perch, Brook Stickleback, Slimy Sculpin and Johnny Darter. This lower reach of the tributary affords potential coldwater spawning and nursery habitat for both migratory and resident salmonids as well as other small (baitfish) species.

3.5 Stream 5 (Hare Creek) Watershed

The Stream 5 watershed drains a relatively large area including both Hare and Bamoos Lakes. Stream 5 flows westward, draining the northwestern portion of the Project area, discharging into the eastern end of Hare Lake. Bamoos Lake outlets from its western end into Bamoos Creek, which flows into the eastern end of Hare Lake. The outlet at the southwestern end of Hare Lake forms Hare Creek, which flows westward towards Lake Superior. Hare Creek discharges to Lake Superior at Port Munroe. The Stream 5 subwatershed includes Stations L4, L17, L23, L25 and L27, as well as Hare and Bamoos Lakes and all connecting waterways (Figure 3.27). This catchment (Hare Lake) will receive treated mine effluent. The remainder of the watershed will not be directly impacted by the proposed mine.

Sediment quality is presented in Table 3.17. Table 3.18 provides a summary of the fishing effort and species identified for the Stream 5 watershed. Table 3.19 displays the benthic community data on a percent composition basis and a summary of the calculated benthic community indices for the Stream 5 watershed are presented in Table 3.20.

3.5.1 Station L25

Station L25 aquatic habitat characteristics and bathymetry are shown on Figure 3.28 and discussed below.

Bathymetry and Habitat

Station L25 is a series of beaver ponds and beaver meadows occurring within the headwaters of the Stream 5 watershed. Maximum depth of the pond was approximately 2 m, although most of the pond was no more than 1 m deep during June 2010. The surface area was about 0.5 ha. In Jun 2011, the beaver dam on the uppermost pond showed signs of recent beaver activity and the flooded area of the pond had increased approximately 25% compared to 2010.

The substrate consisted of primarily muck with areas of bedrock and boulder towards the middle of the basin. Abundant woody debris occurred throughout the ponds. The shoreline was a combination of fractured bedrock and boulders, with emergent aquatic macrophyte beds. Aquatic vegetation observed included sedge, manna grass, hardstem bulrush and floating-leaved burreed. Scrub-shrub wetland species included sweet gale and bog willow and the surrounding upland forest was inhabited primarily by black spruce and white spruce, with some white birch and speckled alder.

Water Quality

The water colour was clear yellow/brown during the June 2010 survey. The water temperature averaged 18.5°C and DO was approximately 60% saturation. Water temperature and DO were slightly higher near the surface than the bottom. The pH (5.2) and conductivity (13 µS/cm) were both relatively low.

In March 2008 ice thickness was measured at 0.61 m and extended to the bottom (Golder, 2009). During March 2009, the pond was also frozen to the bottom (True Grit, 2009). Ice thickness was 0.45 m.

Sediment Quality

A sediment sample was collected from L25 during June 2011. TOC and TKN exceeded the PSQG SELs of 10% and 4800 µg/g. Cd had a value of 1.4 µg/g and exceeded the LEL of 0.6 and TP also exceeded the LEL value of 600 µg/g (Table 3.17). All other key parameters were below the PSQG.

Benthic Community

In June 2011, EcoMetrix collected a qualitative benthic invertebrate sample from L25. The sample contained over 7,200 organisms, representing 23 taxa (Table 3.20). The majority of the community were chironomids, representing 54% of the organisms. Nemata (i.e., roundworms) were the next most abundant group representing 35% of the community. There were few EPT taxa (2%), and only Emphemeroptera and Trichoptera species were represented. The community was dominated by tolerant taxa such as chironomids (11 taxa). The Hilsenhoff Biotic Index value for L25 was 7.68 which classified the water quality as poor. Also identified in the sample were clams, mites, springtails, beetles, damselflies, dragonflies, biting-midges and phantom midges (Table 3.19).

Fish Community

Intensive sampling effort was expended during June 2010 and June 2011. In 2010, three baited minnow traps, two Nordic nets and one small-mesh experimental gillnet were set in key habitat locations. They were set at depths ranging from 0.3 to 1.5 m. Nets and traps were set for 97 hours but no fish were collected (Table 3.18). In 2011, four baited minnow traps, two Nordic nets and two small experimental gillnets were set for 92 hours. Gear were set in all available habitats including near bog, over muck, adjacent rock piles and amongst logs, at depths of 0.25 to 1.5 m. No fish were captured.

EcoMetrix conducted shoreline electrofishing in June 2011 within all representative habitats. A total of 250 m of shoreline was fished with 510 seconds of effort. No fish were caught during the electrofishing effort, although tadpoles were observed.

3.5.2 Stream 5 (Station S60)

Fish Habitat

Station S60 is situated on the northeastern headwater tributary downstream of L25 (Figure 3.27). At this location, the 1st order watercourse had a mean width of 1 m and a mean water depth of 0.3 m during June 2010. Within the 100 m surveyed reach, the gradient was low and flow velocity was about 0.01 m/s. The channel was meandering and stream morphology consisted of pools (50%) and flats (50%). The stream canopy was mainly open and instream cover was afforded by aquatic macrophytes and logs and trees. The substrate was comprised of muck, detritus, silt and boulder. Sediment overlying the substrate was slight and algae overlay was heavy. The water was a clear yellow/brown colour and the temperature was 20°C. Observed aquatic macrophytes included floating-leaved burreed, manna grass, submerged water starwort and sedges. The adjacent terrain was forested lowland and the observed terrestrial vegetation included white spruce, black spruce and speckled alder.

Benthic Community

A benthic sample was collected at S60 during June 2011 using the semi-quantitative method. A total of 3,592 organisms were collected during the 10 minute kick and sweep of all available habitats (Table 3.20). A total of 31 taxa were identified with chironomids being the dominant taxon (86%). Other taxa comprising over 1% of the community included roundworms, mites, springtails, bugs, biting-midges and clams (Table 3.19). The Simpson's Diversity was 0.88 and the Evenness was 0.27 indicative of a fairly diverse community dominated by a limited number of taxa, in this case chironomids. The Hilsenhoff Index for S61 was 7.87 indicating poor water quality. Only three EPT taxa were collected comprising 1% of the community supporting the poor water quality rating.

Fish Community

Electrofishing was undertaken at Station S60 during June 2010. No fish were collected from a 100 m reach during 278 seconds of effort (Table 3.18). Although the gradient was low at S60, situated immediately downstream of the outlet from L25, high gradients occur below the station, which may pose a barrier to upstream fish passage.

3.5.3 Stream 5 (Station S61)

Fish Habitat

Station S61 is situated on the northeastern headwater tributary, upstream of L17 (Figure 3.27). At this location the 1st order watercourse had a mean width of 2 m and a mean water depth of 0.15 m during June 2010. Within the 75 m surveyed reach, the gradient was low to moderate and flow velocity was about 0.1 m/s. The channel was straight and meandering and stream morphology consisted of pools (60%), riffles (20%), runs (10%) and flats (10%). The stream canopy was mainly dense to partly open and instream cover was afforded by boulders, logs and trees. The substrate was comprised of muck, sand, gravel, cobble and boulder. Sediment and algae overlying the substrate were slight and the water was a clear yellow/brown colour. The adjacent terrain was forested lowland and the observed terrestrial vegetation included white spruce, black spruce, mountain maple and speckled alder. Numerous beaver dams were observed below this reach.

Benthic Community

EcoMetrix collected a benthic sample at S61 during June 2011. Nearly 1,100 organisms were collected representing 25 taxa (Table 3.20). The dominant taxa were chironomids (51%) and psychodids (28%). The Simpson's Diversity and Evenness were 0.87 and 0.30 and the the Hilsenhoff Index was 6.58. The Simpson's values indicate a fairly diverse community dominated by a limited number of taxa and the Hilsenhoff value classified the water quality as fairly poor. EPT, roundworms, mites, biting-midges and clams represented 2%, 2%, 6%, 4% and 5%, respectively. Other taxa identified in the sample included dragonflies, beetles and springtails (Table 3.19).

Fish Community

Electrofishing was undertaken on the northeastern headwater tributary upstream of L17 (Station S61) during June 2010. No fish were collected from a 75 m reach during 222 seconds of effort in all available habitats (Table 3.18). Many beaver dams were present between the station (S61) and the next downstream station (L17) limiting potential fish movement into the area. Brook Stickleback have been collected from the ponds at Station L17.

3.5.4 Station L4

Station L4 aquatic habitat characteristics and bathymetry are shown on Figure 3.29 and discussed below.

Bathymetry and Habitat

Station L4 is located at the headwaters of Hare Creek and drains the northwest portion of the mine site. This waterbody also occasionally receives water from Canoe Lake (L5 - Stream 2 watershed) depending on the state of the beaver dams and water levels in Canoe Lake. L4 is a small, narrow lake with deeper channel in the middle of the basin, gradually shallowing towards the shoreline. In August 2009, the maximum depth of 1.8 m occurred adjacent to the outlet. During June 2010, maximum observed depth was 2.4 m and the surface area was about 0.5 ha.

The substrate of L4 consisted of primarily muck and detritus with patches of bedrock and boulder. The shoreline was a combination of fractured bedrock and boulders, scrub-shrub wetland and emergent aquatic macrophyte beds. Aquatic vegetation included of three-way sedge, hardstem bulrush, northern water milfoil, wild celery, variable-leaved pondweed, yellow pond lily and freshwater sponge. Scrub-shrub wetland species included sweet gale, bog willow and *Sphagnum* moss, and the surrounding upland forest was primarily black spruce and white spruce, with some white birch, balsam poplar, speckled alder and balsam fir.

Water Quality

In August 2009, the water colour was clear yellow/brown and the lake bottom was visible from the surface. DO levels decreased to below the PWQO at depths greater than 1 m. pH was also low near the bottom (4.8) relative to the surface (5.8). Conductivity was near 13 µS/cm throughout the water column and water temperature decreased slightly from top to bottom (17 to 15°C). During June 2010, the water temperature differential was approximately 1 degree between surface and bottom. DO was above PWQO throughout the water column and pH (5.9) and conductivity (14 µS/cm) were stable.

During the winter of 2008, the DO and pH were 3.5 mg/L and 5.0, below the ice (Golder, 2009).

Sediment Quality

A sediment sample was collected from L4 during the June 2011 survey. TOC exceeded the PSQG SEL of 10% with a value of 13%. Cd and Pb had values of 1.1 and 31.3 µg/g exceeding the LELs of 0.6 and 31 µg/g, respectively (Table 3.17). TP also exceeded the LEL value of 600 µg/g and TKN exceeded the SEL value of 4800 µg/g.

.Benthic Community

In 2006, NAR (2007) collected an invertebrate sample from L4. The sample was comprised of 15 taxa which yielded a Hilsenhoff Biotic Index score of 6.07 (Table 3.20). This score classified the L4 water quality in the fair category. The benthic community contained three sensitive dragonfly taxa, a single sensitive caddisfly taxon and a relatively sensitive mayfly taxon. The remainder of the taxa were either moderately tolerant or very tolerant (i.e., four chironomid taxa) according to their assigned sensitivity values. Also present were a single taxon of amphipod, chaoborid fly and tolerant caddisfly, and two taxa of moderately tolerant chironomids (Table 3.19).

Fish Community

Intensive sampling effort was expended during June 2010 using five baited minnow traps, two Nordic nets and a small-mesh experimental gillnet set in 0.3 to 1.5 m of water. Gear were set for 98 hours and the combined catch was 268 Lake Chub and two Brook Stickleback (Table 3.18). The majority of fish were captured in the Nordic net. During August 2009, three baited minnow traps were set overnight (i.e., 19 hours) resulting in the capture of a single Lake Chub (Table 3.18). In 2006, NAR (2007) set six minnow traps and used a dipnet to capture four Lake Chub. Two minnow traps, set for 17 hours by Golder (2009) in August 2007 yielded no fish.

3.5.5 Stream 5 (Station S20)

Fish Habitat

The southeastern Stream 5 headwater tributary was surveyed downstream of L4 at Station S20 during June 2010 (Figure 3.27). At this location the 1st order watercourse had a mean width of 1.5 m and a mean water depth of 0.15 m. Within the 75 m surveyed reach, the gradient was moderate and flow velocity was about 0.1 m/s. The channel was 50% straight and 50% ponded and stream morphology consisted of pools (50%), runs (25%) and flats (25%). The stream canopy was partly open and instream cover was afforded by logs and trees and boulders. The substrate was comprised of cobble, boulder, bedrock and gravel. Sediment overlying the substrate was slight and algae overlay was moderate. The water was a clear yellow/brown colour. Observed aquatic macrophytes included northern blue flag, freshwater sponge and sedges. The adjacent terrain was forested lowland and the observed terrestrial vegetation included white spruce, black spruce, speckled alder and balsam fir. Numerous beaver dams were observed along this reach.

In June 2011, this station was revisited and extended further downstream. Within the new area, the stream gradient was high with numerous cascades along a straight densely canopied channel.

Benthic Community

The benthic community at S20 was sampled by EcoMetrix during June 2011. There were more than 3,700 organisms and 28 taxa in the sample. 33% of the organisms were moth flies (i.e., Family Psychodidae), 28% were chironomids 17% were sphaeriid clams and 13% were EPT taxa. The Hilsenhoff value of 5.51 classifies the water quality as fair (Table 3.20). The Simpson's Diversity and Evenness were 0.82 and 020, respectively. Other than the aforementioned taxa, the sample also included nematodes, annelids, mites, dytiscid beetles, dragonflies, biting-midges and dance flies (i.e., Family Empididae) (Table 3.19).

Fish Community

Electrofishing was undertaken within the southeastern Stream 5 headwater tributary at Station S20 during June 2010. No fish were collected from a 75 m reach during 154 seconds of effort (Table 3.18). In June 2011, 453 seconds of effort was expended over 150 m of stream also resulting in the capture of no fish. Steep relief in the area likely impedes upstream fish passage; however fish do occur upstream at L4.

3.5.6 Station L27

Station L27 aquatic habitat characteristics and bathymetry are shown on Figure 3.30 and discussed below.

Bathymetry and Habitat

L27 is a small, shallow waterbody with a surface area of 0.8 ha and a maximum depth of approximately 1.7 m. During August 2009, approximately 80% of the basin was less than 1.0 m deep. Water outlets from L27 to the southeast past a pair of beaver dams. These dams at the outlet maintain the water levels without which, much of the pond would be dry.

The substrate consisted of primarily muck with limited areas of bedrock outcrops and boulders. The shoreline was mainly bedrock and fractured rock with a boggy area inhabited by *Sphagnum* moss, near the outlet. Fallen logs and aquatic macrophyte beds occurred in the nearshore. Aquatic macrophyte species observed included variable-leaved pondweed, sedge and northern water milfoil. The surrounding upland forest consisted of black spruce, white spruce, white birch, speckled alder and balsam fir.

Water Quality

During August 2009, water temperature at the surface and at 1.3 m depth were 18.5°C and 15.8°C, respectively. pH was below PWQO ranging from 4.0 to 4.6. Conductivity was 14

µS/cm at the surface and 28 µS/cm at depth. DO was above the PWQO with a range of 5.6 to 7.6 mg/L. Secchi depth was bottom (1.7 m). During June 2010, water temperature varied by <1°C top to bottom. DO ranged from 8 and 9.5 mg/L, pH was between 6.9 and 7.7, and conductivity was near 14 µS/cm throughout the water column.

During March 2009, DO concentrations beneath 0.49 m of ice ranged from 0.7 to 0.9 mg/L (True Grit, 2009). pH and conductivity were 8.06 and 25 µS/cm, respectively, 0.4 m below the ice.

Sediment Quality

A sediment sample was collected from L27 in June 2011. TOC exceeded the PSQG SEL of 10% with a value of 25%. Cd had a value of 1.1 µg/g exceeding the LEL of 0.6 (Table 3.17). TP also exceeded the LEL value of 600 µg/g and TKN exceeded the SEL value of 4800 µg/g. All other key parameters met PSQG.

Benthic Community

The benthic community was sampled by EcoMetrix in June 2011. There were nearly 3,800 organisms and 24 taxa in the sample (Table 3.20). 82% of the organisms were chironomids and 3% were annelids. Chironomids and annelids are generally tolerant groups indicating that the benthic community was tolerant. The Hilsenhoff value of 7.10 also classifies the water quality as fairly poor. The Simpson's Diversity and Evenness were 0.81 and 022 indicating a fairly diverse benthic community dominated by a limited number of taxa. Other than the aforementioned taxa the sample also included nematodes, aquatic mites, damselflies, dragonflies, bugs, biting and phantom-midges, and clams (Table 3.19).

Fish Community

Intensive sampling effort was expended during August 2009, June 2010 and June 2011. In 2011, four baited minnow traps, two Nordic nets and two small experimental gillnets were set in all available habitats in L27. Gear was set for 92 hours at depths of 0.5 to 1.5 m and yielded no fish (Table 3.18). Tadpoles and dragonfly nymphs were captured in the minnow traps. During 2010, EcoMetrix set three baited minnow traps, a Nordic net and a small-mesh experimental gillnet. Nets and traps were set for 97 hours in 0.8 to 1.2 m of water. No fish were collected. During August 2009 four baited minnow traps and a Nordic net were set overnight in 0.6 to 1.1 m of water (i.e., 23 hours) in L27 also resulting in the capture of no fish.

In addition EcoMetrix conducted shoreline electrofishing in all accessible shore habitats during June 2011. 376 seconds of effort was expended over approximately 250 m of shoreline but no fish were captured.

3.5.7 Stream 5 (Station S62)

Fish Habitat

Station S62 is situated on a northern headwater tributary downstream of station L27 (Figure 3.27). At this location the 1st order watercourse had a mean width of 1.5 m and a mean water depth of 0.15 m during June 2010. Within the 55 m surveyed reach, the gradient was low to moderate and flow velocity was about 0.1 m/s. The channel was meandering and stream morphology consisted of pools (65%), riffles (10%), runs (5%) and flats (20%). The stream canopy was mainly open to partly open and instream cover was afforded by boulders, logs and trees. The substrate was comprised of boulder, cobble, gravel, silt and muck. Sediment and algae overlying the substrate were moderate and the water was a clear yellow/brown colour with a temperature of 20°C. Observed aquatic macrophytes included floating-leaved burreed, manna grass and sedges. The adjacent terrain was forested lowland and the observed terrestrial vegetation included white spruce, black spruce, mountain maple, white birch and speckled alder. Three beaver dams were observed within this reach.

Benthic Community

The benthic community at S62 was sampled by EcoMetrix in June 2011. Over 4,800 organisms were collected from 21 different taxa (Table 3.20). Three of these taxa were EPT but this group represented <1% of the total community. Chironomids and moth flies comprised 97% of the benthic community. Round worms, annelids, beetles, damselflies, dragonflies, bugs, biting-midges and clams comprised the remainder of the community with each representing <1% (Table 3.19). The Simpson's Diversity and Evenness values of 0.56 and 0.11 indicate a moderately diverse community dominated by few taxa. Water quality was classified as fair according to a Hilsenhoff Index of 6.46.

Fish Community

Station S62, situated downstream of L27, was electrofished during June 2010. No fish were captured during 198 seconds of effort within a 55 m reach (Table 3.18).

3.5.8 Station L17

Station L17 aquatic habitat characteristics and bathymetry are shown on Figure 3.31 and discussed below.

Bathymetry and Habitat

L17 consists of a series of three beaver ponds largely maintained by dams. Generally all three ponds are shallow, with a maximum water depth of approximately 1.0 m in the two smaller ponds. The middle (largest) pond had a maximum depth of approximately 2.0 m and a surface area about 1.5 ha.

The substrate of the ponds consisted of muck, bedrock, boulder and large amounts of woody detritus. All three ponds contained a large amount of submergent and emergent aquatic vegetation and the shoreline was primarily scrub-shrub wetland (sweet gale and bog willow). Observed aquatic macrophyte species included sedge, floating-leaved burreed, northern blue flag, variable-leaved pondweed, yellow pond lily, *Sphagnum* moss and manna grass. The surrounding terrestrial vegetation was mainly black spruce and white spruce with some white birch and speckled alder.

Water Quality

The water was a clear yellow/brown colour and the bottom was visible from the surface during August 2009. The pH of the ponds indicated acidic conditions with values near 4. Conductivity was 14 µS/cm, water temperature was about 19°C and DO levels were sufficient for fish throughout the water column. In June 2010, water temperature was 19.2°C, DO was 8.17 mg/L, pH was 7.44 and conductivity was 15 µS/cm.

In March 2008, winter oxygen profiling and ice thickness measurements were undertaken by Golder (2009). Within the middle pond, the ice thickness was 0.61 m with approximately 0.4 m of water below the ice. DO was 6.33 mg/L and the pH was 4.3. The downstream (western) pond had a DO level of 1.5 mg/L. The upstream (eastern) pond had winter DO of 8.95 mg/L. During March 2009, the middle pond was frozen to the bottom (True Grit, 2009). Ice thickness was 0.55 m.

Sediment Quality

A sediment sample was collected from the middle pond of L17 during 2007 (Golder, 2009). TOC exceeded the PSQG SEL of 10% with a value of 13%. Cd and Zn had values of 1.6 and 126 µg/g exceeding the LEL of 0.6 and 120 µg/g, respectively (Table 3.17). TP also exceeded the LEL value of 600 µg/g.

Benthic Community

Golder (2009) collected three replicate samples from three sites within L17 in 2007. Similar to other lake and pond stations surveyed in the Stream 4 watershed, the three replicates at each site were pooled resulting in a total of three samples per station. A total of 41 unique taxa were identified with the mean per sample of 20 (Table 3.20). The mean density was 4,000 invertebrates/m^2. Simpson's Diversity ranged from 0.83 to 0.92 and had a mean of 0.88. Evenness overall was moderate with a mean of 0.51 but ranged widely from 0.39 to 0.64. A total of three EPT taxa were collected in L17 and the EPT/Chironomid ratio was 0.12. The Hilsenhoff Biotic Index was 7.68 indicating poor water quality. The calculated Hilsenhoff value was 7.68 classifying the water quality as poor.

Chironomids were the dominant group in L17 comprising 54% of the mean benthic community. Annelids were the next most abundant group comprising 13% of the benthic community. EPT, sphaeriid clams, mites, ceratopogonids and roundworms comprised 6%,

8%, 3%, 5% and 8% respectively. Additional taxa identified included ostracods, dragonflies, tabanid and chaoborid midges, snails and pyralid moths (Table 3.19).

Fish Community

Intensive fishing effort was expended on L17 during June 2010 utilizing three baited minnow traps, two Nordic nets and a small-mesh experimental gillnet. Nets and traps were set for 96 hours and the combined catch was 6 Brook Stickleback and 1 Lake Chub. The majority of fish were captured in the minnow traps. During August 2009, four minnow traps and a small-mesh experimental gillnet were set for 23 and 24 hours, respectively resulting in the capture of 3 Brook Stickleback (Table 3.18). In 2007, Golder set three minnow traps and a Nordic net for 20 hours each and captured a single Lake Chub.

3.5.9 Stream 5 (Station S22)

Fish Habitat

The mid-reach of Stream 5 was surveyed downstream of L17 at Station S22 (Figure 3.27). At this location the 2nd order tributary had a mean width of 2 m and a mean water depth of 0.25 m during June 2010. Within the 75 m surveyed reach, the gradient was moderate and flow velocity was about 0.2 m/s. The channel was both straight and meandering in areas and stream morphology consisted of pools (50%) and riffles (50%). The stream canopy was dense to partly open and instream cover was afforded by boulders and deep pools. The substrate was comprised of bedrock and boulder and sediment and algae overlying the substrate were moderate. The water was a clear yellow/brown colour with a temperature of 16.3°C. DO was at 86% saturation, pH was 6.78 and conductivity was 18 µS/cm. No aquatic macrophytes were observed, however moss was present on some of the substrate. The adjacent terrain was forested upland and the observed terrestrial vegetation included speckled alder, white birch, mountain maple, balsam poplar and white spruce, black spruce, mountain maple, white birch and speckled alder. Three beaver dams were observed within this reach.

Fish Community

The mid-reach of Stream 5 was electrofished downstream of L17 at Station S22 during June 2010. At this location, 11 Brook Stickleback were collected during 460 seconds of effort within a 75 m reach (Table 3.18).

3.5.10 Station L23

Station L23 aquatic habitat characteristics and bathymetry are shown on Figure 3.32 and discussed below.

Bathymetry and Habitat

Station L23 is a deep lake with a maximum depth of 10 m and a surface area about 10.5 ha. A large proportion of the lake is <2 m with a deeper central basin. The outlet channel to Stream 5 is a high gradient reach, cascading down a steep rock face.

The substrate consisted of muck, bedrock, boulder and detritus with minor amounts of cobble, gravel and sand in the nearshore area. Areas of the eastern shoreline consisted of scrub-shrub wetland (bog willow and sweet gale), whereas the remainder was primarily bedrock, fractured rock and boulder, with woody debris (logs). The boggy western embayment contained *Sphagnum* moss, dwarf cranberry (*Viburnum trilobum*) and round-leaved sundew. The relief around the lake was variable, ranging from nearly flat to relatively steep with some sheer rock faces. A beaver lodge was present along the western shore of the northern embayment and a hydro transmission right-of-way traverses the south end of the lake. The aquatic vegetation community was comprised of northern water milfoil, variable-leaved pondweed and floating arrowhead. The terrestrial upland and lowland forest vegetation surrounding the lake was comprised of black spruce, white spruce, speckled alder and white birch.

Water Quality

The water was a dark stained yellow/brown colour and Secchi depth was 1.5 m. Thermal stratification was apparent in August 2009 with the thermocline observed between 4 and 6 m. Above 4 m, water temperatures ranged from around 20°C at the surface to 14°C at 4 m depth. Below 6 m the temperature was between 6.5 and 7.5°C. Below the thermocline DO levels rapidly decreased from 5 mg/L to near zero at 9 m depth. Throughout the water column pH values were slightly acidic ranging from 5.1 at the surface to 4.7 at the bottom.

During March 2009, DO concentrations beneath 0.55 m of ice ranged from 1.8 to 1.4 mg/L, decreasing with depth (True Grit, 2009). pH and conductivity were 7.05 and 86 µS/cm, respectively, 0.35 m below the ice.

Sediment Quality

To date no samples have been collected for the characterization of sediment chemistry in L23.

Benthic Community

To date no benthic sampling has been conducted on L23 because it is outside the foot print of the project and is not expected to be influenced by mine development or operations.

Fish Community

During August 2009, four baited minnow traps, a small-mesh experimental gillnet and a Nordic net were set in L23 for between 21 and 22 hours resulting in the capture of no fish (Table 3.18). As mentioned L23 is outside the project footprint and is not expected to be influenced by mine development or operations. No further fishing effort has been expended since August 2009.

3.5.11 Stream 5 (Station S9)

Fish Habitat

Station S9 is situated within the mid-reaches of Stream 5, approximately 1 km downstream of L17 and was surveyed by Golder (2009) in 2007 (Figure 3.27). The surveyed reach included a series of beaver dams. The substrates consisted primarily of course materials (bedrock, boulder and cobble) with abundant woody debris within the ponded areas. Abundant instream cover was afforded by logs and trees, log jams, boulders, undercut banks and deep pools. Stream morphology consisted of mainly pool habitat with sections of riffle and run between the ponds. The water was acidic with a pH of 4.5.

Benthic Community

Golder (2009) collected three replicate benthic invertebrate samples at this location in 2007 using a Surber sampler fitted with a 500 µm mesh net. The total number of taxa was 28 with a replicate mean of 16 and ranged of 12 to 22 taxa (Table 3.20). The mean density was 2,605 invertebrates/m^2. Simpson's Diversity at this station ranged from 0.63 to 0.70 with a mean of 0.67. Mean Evenness was 0.20 ranging from 0.14 to 0.24. The Hilsenhoff Biotic Index was 5.18 indicating good water quality. A total of nine EPT taxa were identified with a replicate mean of 7. The EPT/Chironomid ratio was over 27 indicating EPT dominance.

Sphaeriid clams and EPT taxa comprised over 92% if the community with chironomids and annelids also constituting a substantial portion of the mean community (i.e., >1%). A single representative roundworm taxa, single leech taxa, two taxa of dragonflies and four dipteran families other than Chironomidae, comprised the remainder of the collected community (Table 3.19).

Fish Community

The mid-reach of Stream 5 (Station S9) was electrofished in September 2007 by Golder (2009) resulting in the capture of 53 Brook Stickleback (Table 3.18).

3.5.12 Stream 5 (Station S10)

Fish Habitat

Station S10 is situated in the lower reaches of Stream 5, upstream its outlet to Hare Lake (Figure 3.27). This section of the stream was surveyed by Golder (2009) in 2007. This area was influenced by beaver activity similar to the stream reach represented by Station S9. The upstream portion of the station was braided and the downstream reach was ponded due to a large beaver dam. The substrates were primarily coarse within the stream section (i.e., excluding the pond), consisting primarily of boulders and bedrock. Stream morphology was comprised of pools habitat within the lower half of the station and mainly riffles and runs in the upper half of the station. Instream cover was provided by deep pools, boulders and woody debris in the form of beaver dams and submerged logs and trees. The pH (5.6) was slightly higher than upstream at S9.

Benthic Community

A total of 21 unique taxa were identified in the three replicate samples collected by Golder (2009) in 2007 (Table 3.20). The mean number of taxa per replicate was 9 with a range of 6 to 12. Invertebrate density was low with a mean of 165 invertebrates/m^2, ranging from 97 to 226 invertebrates/m^2. Simpson's Diversity at this station ranged from 0.71 to 0.89 with a mean of 0.80. Mean Evenness was 0.66 ranging from 0.43 to 0.79. The calculated Hilsenhoff Biotic Index was 4.21 indicating very good water quality.

Similar to S9, EPT were the dominant taxonomic group comprising 50% of the mean invertebrate community with nine taxa collected. Ceratopogonid midges were the second most relatively abundant taxa (18%) followed by chironomids (7%) and sphaeriids (6%). Annelid worms, simulids and tipulids each comprised 4% of the benthic community, whereas leeches comprised 3% and dytiscid beetles and mites each comprised 2% (Table 3.19).

Fish Community

Station S10 within the lower reaches of Stream 5 was surveyed by Golder (2009) in September 2007 using four minnow traps set overnight (i.e., 20 hours) and electrofishing. These efforts captured two Brook Trout and 22 Brook Stickleback (Table 3.18).

3.5.13 Bamoos Lake

Bamoos Lake aquatic habitat characteristics and bathymetry are shown on Figure 3.33 and discussed below.

Bathymetry and Habitat

A detailed bathymetric survey was completed for Bamoos Lake in August 2009. Bamoos Lake is the largest lake within the study area. Public access is difficult and mainly occurs during the winter. No cabins are on the lake and fishing pressure would be considered low. The maximum depth of Bamoos Lake was approximately 80 m and the surface area was about 174 ha. Bamoos Lake is a deep, coldwater lake with limited littoral zone habitat, usually associated with tributary inflows.

Generally the lake comprises two primary basins separated by a narrows about 250 m wide. The eastern basin is the deeper of the two, with a maximum depth of around 80 m. The western basin is also deep; however the western end of the basin had a larger proportion of relatively shallow water (i.e., <25 m). There are a number of small islands with rocky shoreline throughout the lake with the largest ones occurring in the middle of the western basin. A number of small tributaries flow into Bamoos Lake, largely primarily along the north shore. Water discharges from the lake at the western end into Bamoos Creek, which subsequently flows into Hare Lake and eventually to Lake Superior, via Hare Creek.

Substrates consisted of mainly organic silt (muck) and bedrock. Lesser amounts of various other bottom types were also observed including boulder, cobble, gravel, sand and detritus, though the coarser fractions were generally limited to nearshore areas. Much of the shoreline consists of bedrock and boulder and large areas along the perimeter comprise relatively steep bluffs. A few small shallow areas, primarily associated with tributary inflows, are inhabited by aquatic vegetation (i.e., floating-leaved burreed) and a sand beach shoreline occurs at the western end of the lake. Many active and inactive beaver lodges occur along the shoreline. Rocky shoals are plentiful throughout the lake providing suitable spawning habitat for Lake Trout and many of the small tributaries flowing into the lake, as well as the outlet (Bamoos Creek), afford potential spawning habitats for Brook Trout and suckers. The adjacent upland forest was comprised of predominantly white spruce, white birch, balsam poplar and speckled alder.

Water Quality

The water was a clear yellow/brown colour and Secchi depth was 4.9 m. In August 2009, the lake was thermally stratified with the epilimnion and hypolimnion having temperatures of around 15.7 and 6.3°C, respectively with the transition occurring between 9 and 13 m. DO levels and pH were above PWQO throughout the water column.

Sediment Quality

Sediment quality was measured in both littoral and profundal habitats (5 replicates each), with samples collected during August 2009, at the same locations as the benthic invertebrate collections. The mean littoral sample value of four parameters exceeded either the LEL or SEL including TP, TKN, TOC and Cu (Table 3.17). TP (3,074 µg/g) exceeded the SEL (2,000 µg/g). TKN (4,482 µg/g), TOC (6.4%) and Cu (18 µg/g) exceeded the LEL

of 4,800 µg/g, 1% and 16 µg/g, respectively. In addition to these four parameters, three other metals had values that exceeded the LEL for at least one sample including, Cd (three samples), Fe (one sample) and Zn (three samples). Cd levels in the five samples ranged from below detection (i.e., <0.5 µg/g) to 0.99 µg/g. Fe and Zinc were also variable with ranges of 6,870 to 21,500 µg/g and 46 to 174 µg/g, respectively.

The mean value of the five profundal samples exceeded the PSQG LEL or SEL criteria for 10 parameters. TP (2,260 µg/g), TKN (11,492 µg/g) and TOC (12%) all exceeded the SEL criteria. As (10 µg/g), Cd (2.4 µg/g), Cu (100 µg/g), Fe (36,940 µg/g), Pb (46 µg/g), Ni (26 µg/g) and Zn (231 µg/g) all exceeded the LEL (Table 3.17). Cu in two individual samples exceeded the SEL, whereas Fe also had a single sample exceed the SEL.

Benthic Community

A quantitative benthic invertebrate survey was conducted on Bamoos Lake in August 2009. This survey consisted of five littoral and five profundal samples, throughout the lake where suitable habitat existed. Each sample was comprised of three subsample grabs collected using a petite Ponar.

The littoral samples had a mean density (i.e., organisms/m^2) of 1,646 with a mean of eight taxa per sample (Table 3.20). The range in densities was 800 to 2,629 and the total number of taxa collected was 17. The mean Simpson's Evenness (E) and Diversity (D), which are measures of the community composition using taxa proportionality and richness, were 0.73 and 0.80, respectively with ranges of 0.55 to 1.0 and 0.69 to 0.86, respectively. The mean Simpson's Diversity was very high compared to the mean maximum attainable value of 0.86 and indicates a fairly diverse and well distributed community. The Hilsenhoff score classified Bamoos water quality as fair.

Sphaeriid clams and chironomids comprised over 76% of the littoral benthic invertebrate community. Also present in the littoral community were roundworms (0.5%), annelid worms (5%), mites (7%), elimid beetles (0.5%), ephemerid mayflies (4%), sialid alderflies (3%) and certopogonid biting midges (4%) (Table 3.19). Chironomid midges comprised an average of 51% of the community whereas, EPT taxa only comprised on average 4%.

The profundal samples ranged in density from 414 to 800 organisms/m^2 with a mean of 543 (Table 3.20). There were a total of 11 taxa identified with a mean of six taxa per sample. The mean E and D values were 0.52 and 0.67. The range in the E values was 0.31 to 0.66 and the range of D values was 0.59 to 0.76. The mean maximum attainable D value based on the collected community was 0.83. The Hilsenhoff score categorized Bamoos Lake as having fairly poor water quality.

The dominant taxa in the profundal samples were the same as in the littoral samples with Chironomidae and Sphaeriidae on average accounting for over 93% of the benthic invertebrate community. There were no Ephemeroptera, Plecoptera or Trichoptera, generally considered sensitive taxa, identified from any of the profundal samples. The

remaining community included roundworms, annelid worms, amphipods and mysids with mean contributions of 1.3%, 1.4%, 2% and 2%, respectively (Table 3.19).

Fish Community

During August 2009, seven baited minnow traps, a seine net, a trapnet, two Nordic nets and various small-mesh and full experimental gillnets were used to assess the fish community in Bamoos Lake. Nets and traps were set overnight (i.e., 21 to 23 hours) and resulted in the capture of twelve species including Lake Trout, Brook Trout, Cisco (*Coregonus artedi*), Slimy Sculpin, Longnose Sucker, White Sucker, Trout-perch, Brook Stickleback, Ninespine Stickleback (*Pungitius pungitius*), Lake Chub, Finescale Dace and Fathead Minnow (Table 3.18). Two forms of Cisco are present within the lake: a “dwarf” form in which fish are sexually mature at a relatively small size (e.g., ~ 10 cm total length) and a “normal” form in which fish do not become sexually mature until reaching a typical larger size (e.g., ~ 30 cm total length). Additional species not collected but reported include Lake Whitefish (*Coregonus clupeaformis*), and Burbot (*Lota lota*) (Virginia Thompson, OMNR, pers. comm., 2009). Bamoos Lake supports a diverse coldwater fish community and is managed as a Lake Trout fishery (OMNR, 2006).

Fish Tissue Chemistry

A small number of fish were sacrificed to establish baseline levels of metals in fish from Bamoos Lake. Boneless, skinless fillets and liver samples were collected from five Lake Trout in 2009. Five composite samples of whole body Lake Chub were also collected and analyzed for metals.

A summary of mean metal levels in Lake Trout liver and muscle tissue is displayed in Table 3.21a, along with the Lake Chub composite data. Mean levels of mercury in muscle tissue for a variety of fish from Bamoos Lake, Gowan Lake and Lake Superior is provided in Table 3.21b for comparison. Mean mercury concentrations in both Lake Trout muscle tissue and the Lake Chub composite samples were below 0.61 µg/g, the value at which consumption restrictions for the general population begin (Food Directorate of Health Canada; see OMOE, 2011). One Lake Trout sample was slightly above this guideline (i.e., 0.68 µg/g) but none exceeded the total consumption restriction advisory level of 1.84 µg/g. All five Lake Trout muscle tissue samples exceeded 0.26 µg/g, the value at which consumption restrictions begin for children under 15 and women of child-bearing age. In fact, two of five Lake Trout tissue samples exceeded the total restriction value of 0.52 µg/g for this portion of the population. This indicates that children and women of child-bearing age should not eat Lake Trout from Bamoos Lake.

3.5.14 Bamoos Creek (Station S41)

Fish Habitat

Station S41 is situated on Bamoos Creek, downstream of Bamoos Lake (Figure 3.27). This reach has a moderate gradient and during the October 2009 survey had a mean width, depth and velocity of 3.5 m, 0.25 m and 0.15 m/s, respectively. Downstream of this area there are several bedrock cascades and a relatively large beaver pond. Together these features may impede the upstream movement of fish.

The majority of the stream canopy was dense, with some partly open areas. The surrounding vegetation was primarily speckled alder and white spruce. Instream cover was abundant, afforded by undercut banks, boulders, logs and trees, log jams and deep pools. The majority of the substrate was comprised of cobble (80%) with gravel (10%), boulder (5%) and sand (5%) also present. The reach morphology consisted of riffles (50%), pools (35%) and runs (15%). Sediment and algae overlying the substrate were slight and moderate, respectively. Aquatic vegetation was limited to mosses and algae. The water was clear and colourless.

Sediment Quality

Five key parameters from a sediment sample collected in October 2009 were above PSQG LEL for the S41 sample. The parameters over the LEL included TP, TKN, TOC, Cu and Fe with values of 1,020 µg/g, 1,400 µg/g, 1.2%, 17 µg/g and 31,800 µg/g, respectively, exceeding the LEL values of 600 µg/g, 550 µg/g, 1%, 16 µg/g and 20,000 µg/g (Table 3.17). All other key parameters met PSQG.

Benthic Community

The semi-quantitative invertebrate sample collected in October 2009 yielded 17,568 organisms from 50 different taxa (Table 3.20). Chironomidae was the dominant single family (28%); however the generally sensitive orders of Ephemeroptera (32%), Plecoptera (22%), and Trichoptera (13%) (i.e., EPT) constituted 67% of the stream benthic community. In total, 25 different EPT taxa were identified. The remainder of the invertebrate community was comprised of triclad flatworms, annelid worms, mites, elmid beetles, dragonflies, ceratopogonid biting midges and crane flies (Table 3.19). With the exception of the annelid worms none of these taxa accounted for more than 1% of the community in terms of relative abundance. The Simpson's Diversity and Evenness values were 0.94 and 0.32, respectively, and the Hilsenhoff Biotic index was 4.45 indicating very good water quality.

Fish Community

During October 2009, a 130 m reach of Bamoos Creek between Bamoos Lake and Hare Lake (Station S41) was electrofished. 623 seconds of effort resulted in the capture of 6 Brook Trout and 12 Slimy Sculpin (Table 3.18). This portion of Bamoos Creek provides

potential nursery and spawning habitat for coldwater fish including resident salmonids (i.e., Brook Trout).

3.5.15 Hare Lake

Hare Lake aquatic habitat characteristics and bathymetry are shown on Figure 3.34 and discussed below.

Bathymetry and Habitat

Hare Lake is situated along the western property boundary and could be considered a medium-sized lake. Public access is provided through a dirt road off Hwy 17 and there are two private cabins on the lake.

The maximum depth of Hare Lake was approximately 29 m and surface area was about 57 ha. Hare Lake receives inflows from Bamoos Creek and Stream 5, at the eastern end of the lake, as well as an unnamed creek originating from a group of lakes approximately two kilometres to the north, discharging mid lake. Hare Lake discharges to Hare Creek at the western end, which outlets to Lake Superior approximately 3 km downstream. The deepest waters occurred in the central basin and aquatic vegetation and sandy shoreline habitat were more plentiful in Hare Lake than in Bamoos Lake.

Substrates were primarily organic silt (muck) with lesser amounts of boulder, bedrock, cobble, gravel, sand and detritus. Aquatic beds that potentially provide spawning, nursery and adult habitat for coolwater species including Northern Pike and Yellow Perch (*Perca flavescens*) can be found in bays throughout the lake, and in particular within the eastern basin near the Stream 5 and Bamoos Creek inlets. Observed aquatic macrophytes included wild rice (*Zizania palustris*), floating-leaved burreed, yellow pond lily, variable-leaved pondweed, bladderwort (*Ulticulaire* sp.) and water horsetail (*Equisetum fluviatile*). The terrain surrounding the lake is quite steep along the northwestern and southeastern shores. The adjacent upland forest community was comprised of white spruce, black spruce, white birch, balsam poplar, sweet gale and speckled alder.

Water Quality

The water was a stained yellow/brown colour and Secchi depth was 2.5 m. In August 2009 the lake was stratified. The thermocline existed between approximately 6 and 11 m depth. Above the thermocline the water temperature was between 16 and 18°C and below the temperature was between 6 and 7°C. pH ranged from 7.1 down to 6.5 from the top of the water column to the bottom. The entire water column was well oxygenated with all depths having over 8 mg/L. A profile undertaken during September 2011 indicated the thermocline was between 7 and 9 m. Similar to the 2009 profile, all water quality measures met PWQO. Three chlorophyll a samples were collected in Hare Lake in September 2011 with values ranging from 1.4 to 1.8 µg/L indicating that Hare Lake is oligotrophic (Wetzel, 2001).

Sediment Quality

Sediment samples for chemical characterization were collected from profundal and littoral habitats (five replicates each) during August 2009. For littoral zone samples, the mean of five parameters exceeded the LEL and one parameter's mean exceeded the SEL. TP (786 µg/g), TOC (6.2%), Cd (1.4 µg/g), Cu (21 µg/g) and Zn (208 µg/g) all exceeded the LEL criteria of 600 µg/g, 1%, 0.6 µg/g, 16 µg/g and 120 µg/g, respectively. TKN (5,622 µg/g) exceeded the SEL of 4,800 µg/g (Table 3.17). In addition there were two samples at which Fe and Ni also exceeded the LEL criteria.

The profundal sediment samples had a larger number of mean values that exceeded PSQG criteria. TP, As, Cd, Cu, Pb, Ni and Zn all exceeded the LEL criteria with mean values of 1,256 µg/g, 14 µg/g, 3.5 µg/g, 32 µg/g, 65 µg/g, 17 µg/g and 338 µg/g, respectively. TKN (10,686 µg/g), TOC (12%), and Fe (47,500 µg/g) all exceeded the SEL criteria of 4,800 µg/g, 10% and 40,000 µg/g, respectively (Table 3.17).

Benthic Community

A quantitative benthic invertebrate survey, similar to that undertaken in Bamoos Lake, was conducted on Hare Lake in August 2009. This survey consisted of five littoral and five profundal samples collected throughout the lake where suitable habitat existed. Each sample consisted of three subsamples (grabs) collected using a petite Ponar.

The mean invertebrate density of the littoral and profundal stations were 5,516 and 1,140 organisms/m^2, respectively, with a range of 1,043 to 9,960 and 314 to 1,715 organisms/m^2, respectively (Table 3.20). A total of 37 taxa were identified from the littoral zone samples with a mean per sample of 14 taxa and a range of 11 to 22. The profundal samples contained 12 discrete taxa with a mean of six and a range of four to eight. Simpson's Diversity values for the littoral and profundal samples had means of 0.84 and 0.68 with ranges of 0.76 to 0.90 and 0.55 to 0.76, respectively. The mean value of the littoral zone was relatively high with a mean maximum diversity value of 0.93. The profundal maximum attainable D value was 0.82 indicating the mean value was moderate. The mean Simpsons' Evenness values for the littoral and profundal zones were 0.52 and 0.57, respectively. The range of Evenness values for the littoral and profundal samples was 0.32 to 0.77 and 0.46 to 0.68, respectively. Both mean values were moderate as the Evenness scale ranges from 0 to 1 with 1 indicating a balanced community and 0 being indicative of a community dominated by large numbers of a relatively few taxa.

The benthic invertebrate communities in both littoral and profundal habitats were dominated by chironomids and sphaeriids (Table 3.19). These two families comprised over 65% and 86% in the littoral and profundal zones, respectively. Three other taxa present in the profundal samples comprised more that 1% of the community (i.e., nemertean roundworms, mites, and ostracods). One family of amphipods and Tipulidae (crane flies) accounted for the remainder of the community. The littoral zone was more diverse than the profundal

zone with additional taxa accounting for 1% of more of the community including, annelid worms, amphipods, mayflies, caddisflies and snails. Taxa present but not highly abundant (i.e., <1% relative abundance) included dragonflies, caddisflies, biting midges, midges and clams (Table 3.19).

Fish Community

Hare Lake was considered a coldwater lake which supported Lake Trout and Cisco in the 1960s and 70s. Several hundred thousand Walleye eyed-eggs were stocked during the 1950s (ODLF, 1960). In 1991 it was recommended that Splake (Brook Trout x Lake Trout hybrid) be stocked and if successful, re-stock Lake Trout (OMNR, 1991). Currently, Hare Lake supports a predominantly coolwater fish community with Northern Pike and Yellow Perch the most abundant sport fish species. Elements of a coldwater fishery remain (i.e., Burbot, Cisco, Lake Trout); however these species are not nearly as abundant as the coolwater species.

During August 2009, five gear types (baited minnow traps, trapnet, small-mesh experimental gillnet, full experimental gillnet, seine net) were used to assess the Hare Lake fish community. Passive gear (i.e., gillnets, trapnets, minnow traps) were set overnight for between 18 and 20 hours. A 400 m^2 section of sand beach at the western end of the lake near the access was also fished using a seine net. The combination of these efforts resulted in the capture of six species including two “dwarf” form Cisco, 19 Northern Pike, 100 Spottail Shiner, one Burbot, 303 Yellow Perch and 60 Logperch (Table 3.18).

The combined effort during the broad-scale lake monitoring netting program conducted in September 2011 resulted in the capture of nine species. These species included Northern Pike, Yellow Perch, “dwarf” form Cisco, Spottail Shiner and Logperch; all previously captured during fishing efforts in 2009. Additionally, Trout-Perch, Longnose Sucker, Spoonhead Sculpin (*Cottus ricei*) and Lake Trout were also captured. Northern Pike and Yellow Perch remained the most common sport fish with catches of 68 and 513, respectively. Catch total for Trout-Perch, Longnose Sucker, Spoonhead Sculpin, Spottail Shiner, Cisco, Logperch and Lake Trout were 3, 5, 1, 156, 29, 21 and 1, respectively. Burbot was the only fish species captured in 2009 but not in 2011. Catches varied greatly between the two different net sizes, with only pike, perch, sucker and trout being captured in large mesh nets. All species except Lake Trout were captured in the Nordic nets. Total catches in large and small-mesh nets were 97 and 700.

The data from the 2011 survey yielded a catch-per-unit-effort (CPUE) of 0.24 for large mesh and 1.07 for Nordic nets and a CPUE of 0.75 when all gear was combined. CPUE from Nordic nets was split into two replicates (i.e., 32 total samples) whereas large mesh nets were processed as a single sample. CPUE decreased with increased depth ranging from 0.57 to 0.02 for large mesh and 1.66 to 0.22 for small-mesh sets. When the two gear types were combined, CPUE decreased from 1.29 in the shallowest depth strata (i.e., 1 to 3 m) to 0.17 in the fourth depth strata (i.e., 12 to 20 m).

To establish a baseline, the biomass (i.e., g/net) was calculated for the 32 Nordic net sets from the 2011 survey. Biomass ranged from 0 to 2,590 g per net with a mean of 685 g and a median of 283 g. The mean value was between the 5 and 25% percentiles of provincial benchmarks, classifying Hare Lake biomass as low (Morgan and Snucins, 2005). To gauge the species diversity in Hare Lake, the Shannon H Evenness and Berger-Parker Dominance indices were calculated based solely on the 2011 Nordic netting data. The Berger-Parker index was 1.51 falling between the 25% and median values indicating below average diversity. The Shannon H index was 1.02 also indicating below average diversity.

In total, 10 species have been captured in Hare Lake during the 2009 and 2011 surveys. The catches only varied slightly among the two surveys in terms of species composition and abundance. Two species, Walleye and Fathead Minnow have previously been reported (ODLF, 1960; OMNR 1975, 1991) but have not been captured recently. Walleye were stocked in the 1950s but likely no longer inhabit the lake.

Fish Tissue Chemistry

A small number of fish were sacrificed to establish baseline levels of metals in fish from Hare Lake. Boneless, skinless fillets and liver samples were collected from five Northern Pike in 2009. Five composite samples of whole body Spottail Shiner were collected and analyzed for metals.

A summary of mean metal concentrations for Northern Pike liver and muscle tissues as well as, whole body Spottail Shiners is presented in Table 3.21a. Mean levels of mercury in muscle tissue for a variety of fish from Bamoos Lake, Gowan Lake and Lake Superior is provided in Table 3.21b for comparison. Mean mercury concentrations in both Northern Pike muscle and liver tissue were above the value (0.61 µg/g) at which consumption restrictions for the general population begin (Food Directorate of Health Canada; see OMOE, 2011). Two of the five Northern Pike muscle samples exceeded the total consumption restriction value of 1.84 µg/g. These data indicate that young children (i.e., < 15 years old) and women of child-bearing age should avoid eating Northern Pike from Hare Lake, as all samples exceeded the 0.52 µg/g total restriction concentration advisory.

3.5.16 Hare Creek (Station S11)

Fish Habitat

Station S11 is situated on Hare Creek downstream of Hare Lake, approximately 75 m below the Highway No. 17 crossing (Figure 3.22). This reach has a moderate gradient and during the May 2009 survey had a mean width, depth and velocity of 9 m, 0.5 m and 0.40 m/s, respectively.

The riparian vegetation was comprised of speckled alder, eastern white cedar, white spruce and tamarack. The canopy cover was mostly partly open, with some open sections. The stream morphology was predominantly run (55%), with equal portions comprised of riffles

and pools (20%) and a small proportion of flats (5%). Instream cover was abundant, afforded by a variety of sources including boulders, logs and trees, deep pools, undercut banks and log jams. Substrates at S11 consisted of cobble (35%), gravel (30%), bedrock (15%), boulder (10%), sand (5%) and silt (5%). No barriers to fish migration were observed within the surveyed reach, although upstream of the highway there is a large waterfall which would likely impede upstream migration of Lake Superior fish past this point. Marsh marigold was the only aquatic vegetation observed at this station. In May 2009, the water was clear yellow/brown with a temperature of 11°C.

Sediment Quality

Sediment samples collected during the 2007 Golder (2009) survey had no key parameters exceeding the PSQG (Table 3.17).

Benthic Community

In 2007, Golder (2009) collected three replicate Surber samples immediately upstream of the Highway No. 17 crossing resulting in a total of 39 unique taxa identified (Table 3.20). The mean number of taxa per sample was 22 taxa. Invertebrate density ranged from 570 to 1,195 invertebrates/m^2 with a mean of 954 invertebrates/m^2. Simpson's Diversity at this station was high with a mean of 0.89 whereas mean Evenness was moderate with a range of 0.32 to 0.47 and a mean of 0.42. The Hilsenhoff Biotic Index was 4.30 classifying the water quality at the station as very good. EPT accounted for the highest proportion of the mean invertebrate community (65%). A total of 16 EPT taxa were identified in the three replicate samples with a replicate mean of 12 taxa. Sphaeriids were the next most relatively abundant group in the community (18%). Chironomids and annelids accounted for 8% and 3% of the mean invertebrate community, respectively. Also present at S11 were dragonflies, amphipods, tipulid and ceratopogonid midges and hydrobiid and planorbid snails (Table 3.19).

Benthic collections were undertaken by EcoMetrix in the vicinity during S11 in September 2011. Collections consisted of five replicate samples with each sample consisting of three subsamples using a Surber sampler. Replicate sample locations were distributed from below the Hwy. 17 crossing to the outlet of Hare Lake. Two replicates were collected downstream of the highway crossing, whereas three replicates were collected between the waterfall above the highway and the Hare Lake outlet. There was a total of 60 taxa identified with a replicate mean of 33 (Table 3.20). The mean density of the five replicates was 3,553 individuals/m^2 with a range of 2,112 to 5,281. Mean Simpson's Diversity and Evenness were 0.76 and 0.18 with ranges of 0.44 to 0.88 and 0.06 to 0.29, respectively. Diversity was fairly high, whereas Evenness was low. The Hilsenhoff Biotic Index was 3.99 classifying the water quality as very good. EPT were the dominant group of invertebrates (51%) whereas sphaeriids were the second most abundant taxa (27%). A total of 26 EPT taxa were identified with a mean of 16 taxa per replicate. Chironomids, simulids and dragonflies contributed 15%, 1% and 3% of the relative community, respectively (Table

3.19). Overall, the benthic community was very similar among the two sampling periods (2007 and 2011).

Fish Community

In May 2009, a 75 m reach of Hare Creek downstream of the Highway No. 17 crossing (Station S11) was surveyed. 1,551 seconds of electrofishing effort resulted in the capture of five species (Table 3.18). The catch was comprised of seven juvenile and two adult Brook Trout, two Chinook Salmon smolts, two YOY and eight juvenile Rainbow Trout, one juvenile and one adult Slimy Sculpin and two adult Brook Stickleback. In 2007, Golder (2009) set four minnow traps resulting in the capture of Rainbow Trout, Brook Trout and Brook Stickleback. This portion of Hare Creek affords coldwater spawning and nursery habitat for both migratory and resident salmonids, as well as other resident fish species.

3.5.17 Hare Creek (Station S30)

Fish Habitat

Station S30 is situated on Hare Creek approximately 400 m upstream from the outlet to Lake Superior at Port Munro. This reach has a moderate gradient and during the May 2009 survey had a mean with of 10.5 m. The mean depth and velocity were 0.6 m and 0.3 m/s. The riparian vegetation was comprised of speckled alder, dogwood, white spruce and tamarack. The canopy cover was mostly open, with some partly open sections. The stream morphology was predominantly runs (60%) with similar proportions of pools, riffles and flats comprising the remainder. Logs and trees, log jams and deep pools provided the majority of instream cover, with a minor contribution from boulders and undercut banks. The substrate was predominantly gravel (60%), with cobble (15%) and sand (15%), and lesser amounts of boulder and silt. No fish migration barriers were observed within the surveyed reach. Sediment overlying the substrate was slight and the water was slightly stained yellow/brown with a temperature of 9°C.

Fish Community

During May 2009, a 200 m reach of Hare Creek approximately 400 m upstream from the mouth at Lake Superior (Station S30) was surveyed, expending 1,814 seconds of electrofishing effort. A diverse coldwater fish community was encountered including YOY and juvenile Rainbow Trout, juvenile Chinook Salmon, juvenile Brook Trout, juvenile and adult Longnose Dace, adult Rainbow Smelt (*Osmerus mordax*), adult Longnose Sucker, juvenile and adult Mottled Sculpin (*Cottus bairdii*) and an adult Ninespine Stickleback (Table 3.18). Hare Creek affords spawning and nursery habitats for many lake species, as well as resident species.

3.5.18 Stream 5 (Hare Creek) Watershed Summary

In 2009, quantitative benthic samples were collected from five littoral and five profundal zone sites in Bamoos Lake and Hare Lake and a semi-quantitative sample was collected from S41 on Bamoos Creek. Five replicate quantitative samples were collected at S11 in September 2011. Also in 2011, semi-quantitative samples were collected at lentic stations L25, L27 and stream stations S20, S60, S61 and S62. Previously, samples were collected by NAR (2007) at L4 in 2006 and by Golder (2009) in 2007 at Stations S9, S10, S11 and L17. To date no benthic sampling has been conducted near the mouth of Hare Creek (S30). The NAR sample from L4 and the 2009 littoral zone samples from Bamoos Lake and Hare Lake classified the water quality as fair. The Hilsenhoff value classified L17 water quality as poor and L25, L27, and Bamoos and Hare Lake profundal areas as fairly poor. The water quality of the outlets of a number of the headwater ponds were classified as poor to fair, whereas further downstream, the Hilsenhoff values classified the water quality as good to very good.

A wide variety of invertebrates were collected at the stream stations in 2007, 2009 and 2011. S9, S10, S11 and S41 were dominated by EPT taxa whereas the headwaters stations S60, S61 and S62 were dominated by chironomids. S20 had a fairly even split in dominance between chironomids and EPT taxa. Mollusks (predominantly sphaeriid clams) oligochaetes and leeches also comprised substantial proportions of most stream station benthic communities. In both Bamoos and Hare Lakes, the littoral zone benthic samples were more diverse and generally had higher densities than the profundal stations. In both lakes, dipterans and sphaeriids dominated the benthic communities in both littoral and profundal zones with a number of other groups comprising smaller proportions of the community. Simpson's Diversity was moderate to high at all stations within the watershed and Evenness was generally moderate.

Sediment samples were collected coincident with the benthic sampling in Bamoos and Hare Lakes and Bamoos Creek (S41) in 2009 and additionally at L4, L25 and L27 in 2011. Sediments were previously collected in L17 and at S9, S10 and S11 by Golder in 2007. Many samples resulted in a number of parameters exceeding the PSQG. TOC and TP exceeded the LEL at all sampled stations except S11. TKN and Cu exceeded the LEL or SEL in both Hare and Bamoos Lakes, as well as Bamoos Creek, TKN exceeded the SEL in L4, L25 and L27 but met the PSQG for Cu. Other parameters that exceeded the LEL in at least one station in the Stream 5 watershed were Cd, Zn, Mn, Fe, As, Pb and Ni.

The small headwater basins within the Hare Lake watershed support no fish or sustain a very limited community. Station L4 and L17 contained Lake Chub and Brook Stickleback. Stations L23, L25 and L27 were fishless, as were their downstream tributaries (Stations S60, S61 and S62). These headwater basins and tributaries are probably fishless due to a lack of overwintering habitat, combined with barriers in the form of beaver dams and steep gradients, which impede re-colonization from downstream. Within the mid-reach of Stream 5, only Brook Stickleback have been collected (i.e., S22 and S9). Within the lower reach

(S10), just upstream of Hare Lake, a resident coldwater fishery existed including Brook Trout and Brook Stickleback. Bamoos Creek between Bamoos Lake and Hare Lake (S41) also supported a resident coldwater fish community including Slimy Sculpin and Brook Trout.

Bamoos Lake supports a diverse coldwater community. Twelve species were captured during the 2009 survey including Lake Trout, Brook Trout, Cisco, Slimy Sculpin, Longnose Sucker, White Sucker, Trout-perch, Brook Stickleback, Ninespine Stickleback, Lake Chub, Finescale Dace and Fathead Minnow with two additional species, Lake Whitefish and Burbot reported, according to OMNR records.

Hare Lake provides coldwater habitat; however the extensive 2009 and 2011 fish surveys indicated that the majority of the community is comprised primarily of coolwater species, with only low numbers of coldwater fish. The species captured in 2009 included Northern Pike, Cisco, Burbot, Yellow Perch, Spottail Shiner and Logperch. In 2011, a single Lake Trout and low numbers of Trout-Perch, Spoonhead Sculpin and Longnose Sucker were captured in Hare Lake increasing the total species captured to ten. Historic records also report Fathead Minnow inhabiting and Walleye stocking in the lake. Extensive fishing efforts in 2009 and 2011 did not result in the capture of either of these two species.

Hare Creek downstream of Hare Lake was surveyed at two locations, below the Highway No. 17 crossing (S11) and upstream of the outlet to Lake Superior (S30). Both surveys indicated that the lower portions of Hare Creek support a relatively diverse coldwater fish community including both migratory and resident salmonid species. The fish community in lower Hare Creek includes: Rainbow Trout, Chinook Salmon, Brook Trout, Brook Stickleback, Slimy Sculpin, Rainbow Smelt, Longnose Dace, Longnose Sucker, Ninespine Stickleback and Mottled Sculpin. The lower reaches of Hare Creek affords spawning and nursery habitat for both migratory and resident coldwater fishes.

3.6 Stream 6 Watershed

Within the Stream 6 watershed, water flows westward, draining the southwestern portion of the Project area. Stream 6 discharges to Lake Superior at Sturdee Cove. Lentic Stations L24 and L26 and Stream Stations S12, S14, S15, S31, S42, S63 and S64 are within the Stream 6 watershed (Figure 3.35). The headwaters of the watershed will be impacted by the proposed process solids management facility.

The Stream 6 watershed sediment quality is presented in Table 3.22. Table 3.23 provides a summary of the fishing effort and species identified for the Stream 6 watershed. The benthic community percent composition data and calculated indices are presented in Tables 3.24 and 3.25, respectively.

3.6.1 Station L26

Station L26 aquatic habitat characteristics and bathymetry are shown on Figure 3.36 and discussed below.

Bathymetry and Habitat

Station L26 is a small headwater pond with substantial aquatic macrophyte beds and a limited amount of open water. The maximum water depth was about 5 m and the surface area was approximately 1.9 ha. Historically, beaver activity has increased the surface area and depth of this waterbody substantially.

The lake substrate was predominantly muck with detritus and bedrock. Approximately 25% of L26 surface area was open water with the remainder predominately scrub-shrub wetland (sweet gale and bog willow) and submergent and emergent macrophytes. Observed aquatic vegetation included variable-leaved pondweed, sedge, woolgrass (*Scirpus cyperinus*), *Spaghnum* moss and yellow pond lily. Bog vegetation observed included pitcher plant, bog laurel (*Kalmia polifolia)*, bog rosemary and round-leaved sundew. Terrestrial vegetation surrounding the lake is comprised of black spruce, white spruce, speckled alder, tamarack and balsam fir.

Water Quality

The water was a dark stained yellow/brown colour and Secchi depth was only 1 m. In June 2010, water temperature and DO began to decrease at a depth of 2.5 m, with DO below the PWQO at depths >3.5 m. The lake was moderately acidic throughout, with a pH of about 5. During August 2009, water temperature and DO were reduced at depths below 1 m, and dissolved DO was below the PWQO at depths >2 m. The pH was highly acidic (3.5 or less) at that time.

In March 2008, ice thickness was measured at 0.53 m with approximately 0.5 m of standing water below. DO beneath the ice was measured at 1.32 mg/L (Golder, 2009). During March 2009, ice thickness was 0.65 m and the pond was frozen to the bottom (True Grit, 2009).

Sediment Quality

In June 2011, a sediment sample was collected to characterize the chemistry. TP and Cd exceeded their respective LEL values with concentrations of 876 and 1.72 µg/g, respectively. TKN and TOC concentrations were 19,700 µg/g and 24%, respectively and both exceeded their SEL values. No other key parameters exceeded either the LEL or SEL in L26 sediments (Table 3.22).

Benthic Community

Results from the taxonomic identification of the benthic sample yielded 5,408 animals from 18 different taxa (Table 3.25). Chironomid midges were the dominant family comprising over 86% of the total invertebrate community. There were also representatives from Sphaeriidae, Ceratopogonidae, Corixidae, Libellulidae and Coenargrionidae families. Only a single genus of caddisfly was identified in the sample and no annelid worms were present. Large numbers of water striders and dragonfly nymphs were observed during electrofishing efforts in June 2011.

Fish Community

In August 2009, three baited minnow traps, a small experimental gillnet and a Nordic net, were set for over 16 hours in L26. These gear types were set at depths ranging from 0.5 m to 1.5 m in all available habitats including open water, scrub-shrub wetland edge and aquatic macrophyte beds. This effort resulted in the capture of no fish (Table 3.23). In June 2010, more intensive sampling effort was expended using three baited minnow traps and a gang net consisting of a Nordic net tied to a small experimental gillnet. Nets and traps were set for 97 hours and no fish were collected. Baited minnow traps were set at depths ranging from 0.3 m to 0.8 m whereas the gang net was set in a depth range of 0.6 to 2.0 m. Gear types were set in all available habitats including nearshore vegetation dominated areas and open water. Substrates at the net set locations included muck, wood debris and rocks.

Electrofishing was also undertaken in June 2011, along approximately 275 m of shoreline using 361 seconds of effort. Habitats sampled included rocky areas, macrophyte beds, shrub-shrub wetland edge, mucky bottom, log piles and shallow open water habitat. No fish were captured during electrofishing (Table 3.23).

3.6.2 Stream 6 (Station S63)

Fish Habitat

Station S63 is situated on the northern tributary, downstream of L26 (Figure 3.35). AT this location, the watercourse was ponded due to beaver dams downstream. The mean channel width was 5 m and average depth was 1 m. The gradient was low and stream morphology consisted of 100% pools. The substrates were largely comprised of sand and instream cover was afforded by deep pools, logs and trees, and aquatic macrophytes. The channel supported dense aquatic vegetation including sedges, water horsetail and manna grass. The canopy was open and the riparian forest was comprised of black spruce, speckled alder and white spruce.

Water Quality

The upstream portion of Stream 6 (north tributary) was surveyed during June 2010 (Station S63). The water colour was stained yellow/brown and the temperature was 22°C. DO was low ranging from 20 to 30% saturation. pH was 6.55 and conductivity was 54 µS/cm.

Benthic Community

Benthic samples were collected in 2007 from the northern headwater tributary of Stream 6 near the outflow from L26 by Golder (2009). A total of 38 taxa were identified with a mean of 21 taxa per sample (Table 3.25). The mean density ranged from 560 to 1,184 invertebrates/m^2 with a mean of 940 invertebrates/m^2. Simpson's Diversity was high with a mean of 0.89 whereas Evenness was moderate with a mean of 0.42. The Hilsenhoff Biotic Index categorized the water quality as excellent. EPT taxa dominated the community comprising 50% or more in each sample. A total of 13 EPT taxa were identified with a replicate mean of nine taxa. Sphaeriids were also relatively abundant comprising between 14 and 25% of the benthic community (relative abundance). Chironomids and annelids accounted for mean relative abundances of about 8% and 3%, respectively. Also identified were dragonflies, bugs, amphipods, aquatic moths, leeches, biting midges, tipulid midges and snails (Table 3.24).

Fish Community

Electrofishing was undertaken at Station S63 during June 2010. A total of 15 Brook Stickleback were collected from a 50 m reach during 556 seconds of effort (Table 3.23).

3.6.3 Stream 6 (Station S64)

Fish Habitat

Station S64 is situated in the headwaters of the eastern tributary of Stream 6, upstream of the confluence with the northern tributary which drains L26 (Figure 3.35). During June 2010, the flow in this 1st order stream was very low. The meandering channel averaged 0.75 m wide and mean depth was 0.1 m. The gradient was moderate and stream morphology consisted of pools (50%), flats (35%) and riffles (15%). The substrates consisted of sand and gravel with a minor amount of coarser materials. Instream cover was afforded by logs and trees, and undercut banks. The canopy was dense and the riparian vegetation was comprised of primarily speckled alder. A beaver dam was present downstream of the station.

Water Quality

Water at S64 was a clear yellow/brown colour and the temperature was 13°C. DO was 75% saturation and the pH and conductivity were 7.5 and 31 µS/cm, respectively.

Fish Community

Electrofishing was undertaken at Station S64 during June 2010. No fish were collected from a 30 m reach during 140 seconds of effort (Table 3.23). All available habitats were fished within this reach; however due to the small size of the watercourse, many areas were not fishable.

3.6.4 Stream 6 (Station S15)

Fish Habitat

Station S15 is situated below the confluence of the northern and eastern tributaries of Stream 6 (Figure 3.35). During August and October 2009, the reach was a beaver ponded wetland with a meandering channel. In June 2010 water levels were considerably lower than previous seasons, due to beaver dam breaches downstream. The mean channel width and depth were 1.7 m and 0.3 m, respectively. The gradient was low and stream morphology consisted of pools (70%) and flats (30%).

The substrate was comprised of sand and organic silt (muck) with some bedrock and boulders. This reach supported abundant aquatic vegetation including beaked sedge, water horsetail, variable-leaved pondweed and common mare's tail. Large amounts of woody debris, deep pools, undercut banks and aquatic macrophyte beds afforded instream cover. In August 2009, the ponded section of S15 included areas of dense canopy cover as well as open areas. In June 2011, the amount of shade afforded to this reach was reduced due to the reversion to stream habitat. The surrounding forest was comprised of black spruce, white spruce, speckled alder, tamarack and bog willow. Although the beaver dam nearest to S15 has been breached, numerous other dams occur upstream and downstream of the station.

Water Quality

In August 2009, the water temperature, DO and pH were 15.5°C, 87% saturation and 6.5 at the surface and 14.5°C, 72% and 6.0 m at a depth of 1m, respectively. Conductivity was 27 µS/cm throughout the water column. During June 2010, the water was a clear yellow/brown colour and the temperature was 16°C. DO was at 81% saturation and the pH and conductivity were 7.58 and 57 µS/cm, respectively.

Sediment Quality

Results from the analysis of a sediment sample collected in October 2009 yielded two parameters above the LEL criteria. TKN and TOC were 1,710 µg/g and 1.3%, respectively exceeding the criteria of 550 µg/g and 1%. All other key parameters were below the LEL outlined in the PSQG (Table 3.22).

Benthic Community

Semi-quantitative benthic invertebrate samples collected in October 2009 resulted in the collection of 981 individuals from 24 taxa (Table 3.25). The benthic community was dominated by annelids and ostracods which accounted for 36% and 31% of the collection, respectively. Other well represented taxa were the chironomids (15%) and sphaeriid clams (11%). There were a total of four taxa of EPT identified equaling 3% of the invertebrate community. Acarina (mites) and mayflies from the family Leptophlebiidae each accounted for nearly 2% of the community. Nemertean worms, Corduliidae dragonflies, corixids, Ceratopogonidae biting midges, and midges from the Empididae family were also present (Table 3.24). The Simpson's Diversity and Evenness were 0.76 and 0.17, respectively, and the Hilsenhoff Biotic Index of 6.35 classified the water quality as fair.

Fish Community

Electrofishing was undertaken at Station S15 during June 2010. A total of 44 Brook Stickleback were collected from a 50 m reach during 416 seconds of effort. During August 2009 a total of 10 baited minnow traps and two Nordic nets set for approximately 43 hours resulted in the capture of eight Brook Stickleback (Table 3.23).

3.6.5 Station L24

Station L24 aquatic habitat characteristics and bathymetry are shown on Figure 3.37 and discussed below.

Bathymetry and Habitat

L24 was a former beaver pond that has drained and is now primarily a beaver meadow with a meandering channel and small shallow pond. During June 2010, the remnant stream channel was 1 to 2 m in width and mean water depth was 0.3 m. Substrates were comprised of fine organic material (muck) with bedrock and some detritus. The channel supported dense aquatic vegetation including sedge, common mare's tail and *Sphagnum* moss, and instream cover was afforded by log jams, aquatic macrophytes, boulders and pools. During June 2011, the volume of water at L24 had increased compared to 2010; however, the majority of the station remained a beaver meadow. The pond near the beaver dam at the outlet was approximately 15 m wide and 50 m long with a maximum depth of approximately 1.8 m. The canopy was open and the surrounding forest was comprised of black spruce, white spruce, speckled alder and white birch.

Water Quality

In June 2010, the water colour was stained yellow/brown and the temperature was 18°C. In June 2011, water temperature ranged from 13.3 °C at the surface to 6.7 °C near the bottom. L24 had sufficient oxygen levels in the top 0.5 m (i.e., 8.96 to 7.20 mg/L) but

decreased to less than 1 mg/L at depths of ≥1 m. Conductivity was low throughout the water column, ranging from 14 to 25 µS/cm and the pH was acidic, ranging from 4.4 to 5.4.

During the winter of 2008, the pond was frozen to the bottom (Golder, 2009). This was also the case in March 2009 (True Grit, 2009).

Sediment Quality

A sediment sample was collected in June 2011. TP, TKN and TOC exceeded either LEL or SEL. TKN and TOC had concentrations of 7,250 µg/g and 11% both exceeding their respectively SEL values of 4,800 µg/g and 10 % respectively. TP concentration in the 2011 sample was 838 µg/g exceeding the LEL of 600 µg/g for TP. All other key parameters were below applicable guidelines (Table 3.22).

Benthic Community

The benthic community in L24 was assessed using the semi-quantitative method in June 2011. Over 1,900 organisms representing 28 taxa were collected (Table 3.25). The Simpson's Diversity and Evenness were 0.90 and 0.36 indicating a diverse community dominated by a limited number of taxa. The calculated Hilsenhoff Index of 6.04 indicated fair water quality. Chironomids were the dominant taxa comprising 36% of the benthic community. Biting midges, roundworms, corixid bugs, and dytiscid beetles comprised 16%, 9%, 8% and 12%, of the benthic community respectively. Other taxa comprising a substantial proportion of the community (i.e., > 1%) included mayflies, damselflies, dragonflies, mites, annelids, notonectid bugs and long-legged flies (Family Dolichopodidae) (Table 3.24).

Fish Community

Electrofishing was undertaken at L24 during June 2010 and June 2011 and no fish were collected (Table 3.23). In June 2010, 87 seconds of effort were used to survey approximately 50 m of stream. In 2011, 320 seconds of effort over 90 m of shoreline were expended to survey the increased ponded area. Habitats fished included open water, vegetated nearshore areas, rocky areas and piles of submerged logs.

3.6.6 Stream 6 (Station S12)

Fish Habitat

S12 is situated in the mid-reaches of Stream 6, upstream of Highway No. 17 and below S15, downstream of the majority of beaver activity (Figure 3.35). During October 2009, the mean stream width was approximately 1 m and mean water depth was 0.15 m. Instream cover was afforded by boulders, deep pools, log jams, and logs and trees. The substrate was mainly comprised of boulders and coarse sand. Canopy cover was partly open and observed aquatic vegetation was limited to sedges. Reconnaissance of the S12 station in

June 2011 indicated little change in habitat since 2009 despite the upstream changes at S15..

Water Quality

A spot measure of water quality was conducted at Station S12 in October 2009. The water temperature was 2.55°C, the pH was 8.0, DO was 13.54 mg/L and conductivity 38 µS/cm. All measured parameters met the PWQO.

Sediment Quality

Four parameters analyzed in the sediment sample collected in October 2009 were above the LEL criteria. TP, TKN TOC and Fe were 1,020 µg/g, 840 µg/g, 1.7% and 23,300 µg/g, respectively exceeding the LEL of 600 µg/g, 550 µg/g, 1% and 20,000 µg/g for these four parameters. All other key parameters were below PSQG (Table 3.22).

Benthic Community

A semi quantitative invertebrate sample was collected in October 2009. A total of 1,025 organisms were identified from 47 different taxa (Table 3.25). There were a total of 14 EPT taxa comprising 48% of the community with the majority consisting of mayflies (35%). EPT taxa and chironomids (34%) comprised 82% of the community. Also relatively abundant were annelids (3%), mites (4%), Ceratopogonidae (2%), Empididae (3%) and Sphaeriidae (4%). Other taxa present in low numbers included Dixidae, Tipulidae, Cordulegastridae, Collembola, Ostracoda and Nemata (Table 3.24). D and E were 0.93 and 0.30, respectively indicating a diverse community dominated by relatively few taxa. The Hilsenhoff score indicated good water quality at S12.

Fish Community

To date no fish community assessment has been conducted at Station S12 on Stream 6. Fish have been captured upstream at S15 and also downstream at S14. Brook Stickleback were observed at the downstream end of this reach in June 2011 (Table 3.23).

3.6.7 Stream 6 (Station S14)

Fish Habitat

Station S14 is situated within the mid-reach of Stream 6, downstream of the Highway No. 17 crossing (Figure 3.35). The culvert on the downstream side of the highway crossing is perched well above the normal water level in the creek and likely provides a year-round barrier to upstream fish passage.

In May 2009, the mean water depth was 0.25 m, the mean stream width was 3.0 m and mean water velocity was about 0.25 m/s. The canopy within this reach was mostly dense

with some partially open sections. Substrates were predominantly bedrock, boulder and cobble, with lesser amounts of gravel, silt and sand. Sediment overlying the substrate was slight. Aquatic vegetation was limited to moss and algae which covered a high proportion of the substrate.

Stream morphology consisted of pool-riffle sequence with a mostly moderate gradient although some high gradient sections exist. Some of the cascades could be considered large enough to act as impediments to upstream fish migration. Pools (45%) and riffles (30%) accounted for the majority of the stream morphology, with flats (20%) and runs (5%) comprising the remainder. Instream cover was abundant with undercut banks, boulders, deep pools, logs and trees and log jams contributing.

Water Quality

During May 2009, the water was darkly stained yellow/brown with a temperature of 13°C.

Benthic Community

Macroinvertebrates including mayfly nymphs, caddisfly larvae, dragonfly nymphs and leeches, were commonly observed during the May 2009 survey; however no benthic samples have been collected at this location.

Fish Community

A 120 m section of the mid-reach of Stream 6 at Station S14 was surveyed during May 2009 by electrofishing. 1,143 seconds of effort resulted in the capture of one juvenile and 27 adult Brook Stickleback (Table 3.23).

3.6.8 Stream 6 (Station S42)

Fish Habitat

Station S42 is situated within the lower reach of Stream 6 between the power transmission lines, south of Highway No. 17 (Figure 3.35). In October 2009, the mean width of the stream was 3 m and the mean depth was 1.5 m. Substrates were primarily fine with 60% silt, 30% sand and 10% detritus. The canopy was mostly open and instream cover was relatively abundant, created by undercut banks, aquatic macrophytes, log jams, logs and trees, and deep pools. The stream gradient was generally low, and morphology consisted of primarily pools with areas of flat and run, and a few cascades created by log jams. The riparian vegetation was mainly white spruce and speckled alder.

Water Quality

Spot measurements of conventional water quality were taken at the five benthic sampling sites during the October 2009 survey. The mean temperature at the five stations was

0.84°C with a range of 0.72 to 1.1°C. Conductivity ranged from 67 to 133 µS/cm with a mean value of 113 µS/cm. Mean pH was 7.8 a range of 7.6 to 7.9. DO was high at all stations with a mean of 12.4 mg/L. All parameters met PWQO.

Sediment Quality

Five sediment samples were collected coincident with benthic samples during October 2009. The mean (of 5 samples) TKN was the only parameter to exceed the LEL criteria. The established LEL is 550 µg/g and the mean sediment concentration was 1,246 µg/g. All other key parameters were below the PSQG (Table 3.22).

Benthic Community

A quantitative benthic invertebrate survey was completed in October 2009 and consisted of the collection of five replicate samples from Stream 6 near the hydro transmission line crossing (S42). Each of the five benthic samples consisted of thee subsample grabs collected in depositional habitats using a standard Ekman dredge.

The mean density (no. of organism/m^2) was 8,886 with a range of 2,858 to 21,149 (Table 3.25). There were a total of 50 taxa identified with a mean of 17 taxa per sample and a range of 8 to 28. EPT comprised eight of the 50 taxa. Simpson's Diversity ranged from 0.55 to 0.82 with a mean of 0.72. This value was moderate compared to the mean maximum attainable value of 0.93 but somewhat expected due to sampling of depositional habitats which are typically less diverse than erosional habitats. The Simpson's Evenness values ranged from 0.16 to 0.36 with a mean of 0.26. These values were low indicating few species dominating the community. The mean Hilsenhoff Index was 6.18 indicating fair water quality.

The benthic community at S42 was dominated by annelids (14%), chironomids (32%) and sphaeriids (42%) which combined for nearly 88% of the mean community abundance. Other taxa comprising more than 1% of the community were tipulid and tabanid midges with approximately 3% and 1%, respectively, ceratopogonid biting midges (~2%), Plecoptera (stoneflies, two families, ~ 2%) and three families of Trichoptera (caddisflies, 3%). Also present in mean relative abundances <1% were nemertean worms, Acarina, Ostracoda, baetid mayflies, pyralid moths, Aeshnidae and Cordulegastridae dragonflies, Empididae midges and physid snails (Table 3.24).

Fish Community

To date, no fisheries assessment has been conducted on this reach of Stream 6. Upstream of this locale Brook Stickleback have been captured and downstream a large bedrock cascade exists that prevents the upstream migration of Lake Superior fish.

3.6.9 Stream 6 (Station S31)

Fish Habitat

Station S31 is situated in the lower reach of Stream 6 upstream of the outlet to Lake Superior at Sturdee Cove (Figure 3.35). At this location, the gradient is primarily low and the channel meanders greatly. There is a large bedrock cascade/ falls at the upstream end of this stream reach, below the rail-line crossing that prevents lake fish from moving upstream.

During May 2009, the mean width was 4.5 m, the mean depth was 0.4 m and the mean velocity was 0.1 m/s. Stream morphology at the station was primarily pool (50%), with runs (20%), flats (20%) and riffles (10%) comprising the remainder. Canopy cover was mainly party open with some sections of dense canopy. A large proportion of the total station area afforded instream cover for fish including logs and trees, log jams and deep pools. The substrate was comprised almost entirely of sand with fractions of silt and detritus also observed. The only aquatic vegetation observed were sedges along the shoreline. The surrounding upland forest was comprised of white spruce, dogwood, balsam fir, speckled alder and tamarack.

Water Quality

In May 2009, the water was stained yellow/brown colour with a temperature of 12°C.

Fish Community

A 160 m reach of Stream 6 (Station S31), approximately 300 m upstream of its outlet to Lake Superior, was surveyed in May 2009 with 1,126 seconds of electrofishing effort. A total of four species were captured including juvenile Rainbow Trout, juvenile Chinook Salmon, juvenile and adult Longnose Dace and juvenile and adult Mottled Sculpin (Table 3.23). The OMNR (2001a) surveyed the lower reaches of Stream 6, in the vicinity of Station S31, during August 2001 and reported catches of a single Brook Trout and a single Rainbow Trout as well as 13 Threespine Stickleback (*Gasterosteus aculeatus*).

Though Stream 6 provides coldwater habitats for both migratory and resident species upstream of its outlet to Lake Superior, habitat (spawning and nursery) is limited owing to the low gradient and sandy substrate conditions. A 20 m-high natural bedrock cascade occurs approximately 500 m upstream of Station 31, a short distance below the rail line crossing. This barrier limits the extent of upstream fish migrations from Lake Superior. Above the falls, coldwater habitat potential exists, although Brook Stickleback seems to be the only inhabitant. A limited amount of potential spawning and/or nursery habitat is provided in the immediate vicinity of the falls. Fish can access this area during high spring flows, otherwise access to the area is limited by low flows and natural barriers.

3.6.10 Stream 6 Watershed Summary

EcoMetrix collected benthic samples at stations S12, S15 and S42 within Stream 6 to compliment the sample collected in the headwaters at S63 in 2007. Station L26, which is situated at the headwaters of Stream 6 was sampled during the 2009 study and L24 was sampled in June 2011. Chironomids were the dominant taxa in both L24 and L26. At S12 and S63, EPT taxa were most common. Annelids and ostracods dominated the S15 benthic community. At S42, near the power transmission lines, chironomids and clams were the principal components of the benthic invertebrate community. Generally, chironomids, annelids and mollusks were more prevalent in slower sections of Stream 6 and in L26 and L24 compared to the areas where there were coarser substrates. Generally the Simpson's Diversity and Evenness values indicated diverse communities that were dominated by a limited number of taxa. The water quality was categorized as excellent at the headwater stream stations to fair downstream according to the Hilsenhoff Biotic Index.

A limited number of parameters exceeded the LEL in sediment samples. In upper portion of the creek (S15) TKN and TOC both exceeded the LEL value. Further downstream (S12), TP, TKN, TOC and Fe exceeded the LEL. At S42, only TKN exceeded the LEL. In L24 and L26 TP, TKN and TOC exceeded the LEL, SEL and LEL values, respectively. In addition, Cd also exceeded the SEL value in L26. No sediment samples have been collected at S31 or S14 to date.

Multiple fisheries surveys of L26 during 2009, 2010 and 2011 have resulted in no fish being collected. Backpack electrofishing at L24 in 2010 and 2011 indicates that it does not support fish. Only Brook Stickleback have been collected at Stream 6 Stations upstream of the cascade/falls which occurs in the lower reaches. Possible explanations for such a limited fish community in the upstream reaches and headwater lakes include acidity (low pH), a lack of overwintering habitat, low flows and barriers (including beaver dams and cascades). At Station S14 there were a number of cascades that would be impediments to upstream fish passage. The cascade/waterfall which occurs in the lower reach upstream of S31 prevents migrating Lake Superior species from getting past that point under essentially any flow conditions.

Within the lowest reaches, upstream of the outlet to Lake Superior, a limited number of salmonids were captured in 2009. In total four species were collected including Rainbow Trout, Chinook Salmon, Longnose Dace and Mottled Sculpin. This reach of Stream 6 provides a limited amount of nursery and spawning habitat for migratory coldwater species from Lake Superior as well as some other small-bodied species. The quality of this lower reach for nursery and spawning habitat is reduced compared to other tributaries in the area due to the primarily sandy substrates compared to more productive habitats which are typically comprised of courser substrates (i.e., gravel, cobble).

3.7 Stream 7 (Shack Creek) Watershed

The Shack Creek watershed drains a relatively small portion of the Project area along the southwest edge. This watershed includes the Rag Lakes and Shack Lake and discharges to Lake Superior at Peninsula Harbour (Figure 3.38). This catchment is outside the footprint of the proposed mine.

Table 3.26 displays a summary of the fishing effort and species identified for the Stream 7 watershed.

3.7.1 Rag Lakes

The Rag Lakes were not assessed as part of the baseline characterization study as they are situated outside of the planned mine development area and are not likely to be impacted by mine activities. From the late 1940s through to the 1960s multiple stocking events and fisheries surveys occurred with all three Rag Lakes (i.e., Upper Rag Lake, Middle Rag Lake, and Lower Rag Lake) (Table 3.26). Records indicate that the only fish species stocked and/or reported by the OMNR was Brook Trout (ODLF, 1951a, 1951b, 1951c).

3.7.2 Shack Lake

Due to the fact that Shack Lake is outside of the planned mine development area and unlikely to be impacted by mine activities, an assessment of the fish habitat potential was not undertaken.

Shack Lake is situated south of Highway No. 17 and is a man-made lake formed by damming of Shack Creek. Brook Trout have been frequently stocked between 1954 and 1980 (Table 3.26). The most recent OMNR (1990) survey data records the presence of Brook Trout, Northern Pearl Dace (*Margariscus nachtriebi*), White Sucker and Yellow Perch. In 1990, rehabilitation of the lake was proposed; however further stocking with Brook Trout was not recommended; it was suggested to maintain Shack Lake as a perch lake.

3.7.3 Shack Creek (Station S23)

Fish Habitat

Station S23 is located in the lower reaches of Shack Creek upstream of its outlet to Lake Superior (Peninsula Harbour). In May 2009, the mean width, depth and velocity were 4.75 m, 0.25 m and 0.5 m/s, respectively. The water was slightly stained yellow/brown with a temperature of 14°C. The majority of the reach morphology was riffle (55%) with pools (20%), runs (15%) and flats (10%). The stream gradient was generally moderate with a small portion of high gradient. The canopy varied from very dense near the top of the surveyed reach to open in the bottom portion of the station. Instream cover was afforded

by undercut banks, boulders, logs and trees, log jams and deep pools. Substrates were generally coarse with the majority comprised of cobble and gravel, with boulders and patches of sand. Algae overlying the substrate were slight and sedges were the only aquatic vegetation observed. Terrestrial vegetation was comprised of dogwood, speckled alder, white spruce and white birch.

Fish Community

In May 2009, the lower reach of Shack Creek was electrofished upstream from the mouth at Peninsula Harbour for a distance of 200 m. A total of 967 seconds of effort were expended to capture a total of seven species (Table 3.26). The catch included: two YOY and 20 juvenile Rainbow Trout, one YOY, six juvenile and six adult Brook Trout, one juvenile Chinook Salmon, one juvenile White Sucker, one juvenile and 38 adult Longnose Dace, three juvenile and three adult Slimy Sculpin. In addition, more than 100 adult Longnose Suckers, were observed in pools below the first log jam. These suckers had migrated from Lake Superior into Shack Creek to spawn. Additional species reported by OMNR (2001b) and BEAK (2001) include Coho Salmon (*Oncorhynchus kisutch*), Lake Chub and Mottled Sculpin. Pink Salmon (*Oncorhynchus gorbuscha*) are also reported to utilize Shack Creek for spawning. A natural barrier consisting of a high gradient bedrock cascade occurs approximately 500 m above the lake in the vicinity of the CPR rail line. Above this barrier, only Brook Trout have been reported (BEAK, 2001). Shack Creek affords spawning and nursery habitats for migratory lake species within its lowest reaches.

3.7.4 Stream 7 (Shack Creek) Watershed Summary

The Shack Creek Watershed is mostly outside of the planned mine development area and is unlikely to be impacted by mine activities. The headwater Rag Lakes and man-made Shack Lake, have historically been coldwater Brook Trout lakes. No recent surveys of the Rag Lakes have been completed so the current state of the fishery in these lakes is unknown. Shack Lake although historically a coldwater lake has appeared to have transitioned to a coolwater lake dominated by Yellow Perch. OMNR management has decided that moving forward Shack Lake should continue as a perch lake.

Within its lower reaches, Shack Creek provides spawning and nursery habitat for migratory and resident salmonids, other migratory Lake Superior fish and some resident small-bodied species.

3.8 Pic River and Small Tributaries

During 2007, Golder (2009) completed fish community and aquatic habitat surveys on approximately 18 km of the Pic River, from 1 km upstream of the Project Area downstream to the Highway No. 17 crossing (Figures 3.39 to 3.47). Detailed substrate maps were also created as part of a M.Sc. research project on habitat use by Lake Sturgeon in the Pic River (Ecclestone, 2012) (Figures 3.48 to 3.51).

There are a small number of small tributaries of the Pic River within the vicinity of the Project that occur outside the aforementioned watersheds (Figure 3.39). For the purpose of this report these have been grouped together. All but two consist solely of a small 1st order stream, typically less than 1 km in length, originating at higher elevation and flowing east towards the Pic River. The Malpa Lake watershed and the unnamed creek east of Bamoos Lake are similar in size to these other tributaries except they have a small headwater lake as their source. The other tributaries rely on runoff as a primary source of flow and most have been determined to be intermittent in nature. A few of these small Pic River tributaries will be directly impacted by the proposed mine rock stockpile. No direct impacts to the Pic River are proposed.

Sediment quality data for the Pic River and Small Tributaries is presented in Table 3.27. Table 3.28 provides a summary of the fishing effort and species identified for the Pic River and small Pic River tributaries. Benthic community data for the Pic River and small Pic River tributaries on a percent composition is provided in Table 3.29. A summary of the calculated benthic community indices is presented in Table 3.30.

3.8.1 Pic River

Fish Habitat

The Pic River is situated east of the Project Area and meanders through a clay, silt and fine sand till plain. The river is a medium sized river with a drainage area of 4,270 km^2. The water is a turbid year-round. In general, the channel morphology consisted of relatively flat runs. There were several shallow riffle areas located near the southeastern Project Area boundary but these are unlikely to be used as spawning areas. During high flows the riffles are submerged and not discernible from the surface. The Pic River is one of 12 Lake Superior tributaries that support Lake Sturgeon (*Acipenser fulvescens*) spawning. A radio telemetry and spawning assessment study was undertaken from 2007 to 2010 to monitor movement patterns and to identify critical habitat in the Pic River (Ecclestone, 2012). Three migration patterns were observed, two of which related to foraging and one relating to spawning. Spawning fish entered the river earlier and rapidly ascended the river to one of two uppermost barriers (Manitou and Kagiano Falls), whereas foraging individuals either remained at the mouth of the river or migrated 20 km to 30 km upriver to deep pools throughout the lower rapids. A key foraging area was identified approximately 2 km downstream of the Stream 1 confluence. Pools exist at many of the sharp bends in the Pic River and these are likely important refuge areas for many fish species including Lake Sturgeon.

Water Quality

The water of the Pic River is extremely turbid due to suspended clay and silt. Extensive erosion of steep banks happens along much of the shore with some large slides occurring

in the 2010. Exceedances of PWQO at the Pic River stations sampled by Golder included Al, Co, Fe, V and Zr (see Golder 2009, Appendix B).

Sediment Quality

TOC was the only key parameter that exceeded PSQG LEL for sediment collected by Golder (2009) at all three Pic River sampling areas (i.e., upstream of the Project site, near the Project site, downstream of the Project site) during 2007 (Table 3.27).

Benthic Community

Golder (2009) collected nine benthic invertebrate samples from the Pic River, three in each of three areas (upstream of the Project site [upstream], adjacent to the Project site [adjacent] and downstream of the Project site [downstream]). See Figures 3.40 (upstream), Figure 3.45 (adjacent) and Figure 3.47 (downstream) for benthic sampling locations.

At the upstream, adjacent and downstream sites, chironomids, annelids and ceratopogonids were the most dominant taxa, respectively (Table 3.29). In the upstream area ceratopogonids also constituted a large proportion of the community whereas in the downstream area EPT taxa, corixids, chironomids and tipulids comprised the majority of the remaining community. Adjacent to the Project site, aside from annelid worms, chironomids, snails, EPT taxa and dipterans comprised the remainder of the benthic community.

Mean total density was nearly 6,000 invertebrates/m^2 upstream, whereas adjacent and downstream, mean densities were 304 and 464 invertebrate/m^2, respectively (Table 3.30). Mean richness values were highest at the upstream stations (16 taxa) and quite similar adjacent (5 taxa) and downstream (6 taxa).

Evenness was relatively high at the adjacent (0.83) and downstream (0.72) stations, but was low at the upstream stations (0.25), reflecting the greater dominance of individual genera at this station. This is also a result of low numbers of individuals being collected adjacent and downstream of the project and the Evenness of one adjacent area replicate was actually 1.0 as three individuals in three different taxa were collected. The calculated Hilsenhoff value categorized the water quality from good to fairly poor depending on the station.

Fish Community

In June 2007, Golder (2009) set 11 experimental gillnets, 8 hoop nets and 10 Nordic nets in the Pic River resulting in the capture of eight species (Table 3.28). The fish community within the Pic River is diverse and Golder collections included: two juvenile Lake Sturgeon, four Walleye (*Sander vitreus*), nine Longnose Sucker, five Silver Redhorse (*Moxostoma anisurum*), one Muskellunge (*Esox masquinongy*), two Trout-perch, 19 Spottail Shiner and one Northern Redbelly Dace. Although no salmonids were captured in 2007, the OMNR reports both Rainbow Trout and Coho Salmon as resident in the Pic River. Rainbow Trout,

Chinook Salmon and Brook Trout were captured in tributaries to the Pic River during May 2009 indicating that these species use the river at least for migratory purposes on a seasonal basis and utilize coldwater tributaries for nursery habitat and potentially spawning. Additional species reported from OMNR records include Rainbow Smelt, Northern Pike, White Sucker and Shorthead Redhorse (*Moxostoma macrolepidotum*) (Noranda, 1984). No fish were captured in the Pic River during a second netting period undertaken in October 2007 by Golder. This may have been a result of high flows that limited the deployment of stationary fishing gear and also likely reduced gear effectiveness.

It is believed that Lake Sturgeon spawn at the base of Manitou Falls on the Kagiano River, which flows into the Pic River approximately 40 km upstream of the Project Area (OMNR, 2002). Lake Sturgeon have also been captured on the Black and Little Black Rivers, which enter the Pic River approximately 2 km from its mouth on Lake Superior. A detailed study of Lake Sturgeon habitat utilization and movement in Pic River was undertaken from 2007 to 2010 as part of a master's thesis (Ecclestone, 2012). In that study, a total of 159 Lake Sturgeon were captured and 47 were fitted with radio tags. Results show that Lake Sturgeon move extensively up and down the Pic River during spawning migration and utilize the lower river for foraging, but generally would not be considered resident in the river.

Great Lakes – Upper St. Lawrence populations of Lake Sturgeon are designated as Threatened by both the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Committee on the Status of Species at Risk in Ontario (COSSARO) (COSEWIC, 2011; OMNR, 2011). As such, they received protection from the federal Species at Risk Act (SARA) and the Ontario Endangered Species Act (ESA). The Northern Brook Lamprey (*Icthyomyzon fossor*), which are reported to occur within lower sections of the Pic River, well downstream of the Project site, are designated by COSEWIC and COSSARO as Special Concern.

3.8.2 Malpa Lake

Malpa aquatic habitat characteristics and bathymetry are shown on Figure 3.52 and discussed below.

Bathymetry and Habitat

Malpa Lake is a small headwater lake situated at the top of a ridge just west of the Pic River. A beaver dam was present on the lake outlet and an active lodge was observed along the eastern shore. The maximum depth of the lake was 3.1 m and the surface area was about 3.4 ha. The substrate was predominantly muck and detritus with bedrock and boulders.

Much of Malpa Lake is open water habitat and the shoreline includes fractured bedrock and boulders with abundant woody debris, and emergent aquatic vegetation beds. The northern part of the lake was a combination of scrub-shrub wetland and aquatic macrophyte

beds. Scrub-shrub wetland species included sweet gale, *Sphagnum* moss, bog willow, bogbean (*Menyanthes trifoliata*) and round-leaved sundew. Species of aquatic macrophytes observed include floating arrowhead, three-way sedge, hardstem bulrush, northern blue flag, common mare's tail, beaked sedge, freshwater sponge and manna grass. The terrestrial riparian vegetation included black spruce, white spruce, white birch and eastern white cedar

Water Quality

The water was clear and colourless and the bottom was visible from the water's surface. In August 2009, water temperature was uniform throughout the water column but DO declined at depths >1 m, and was well below the PWQO at depths >2 m. The pH varied slightly from 6.73 at the surface to 6.04 at the bottom. Conductivity was elevated at depths >2 m (46 µS/cm), relative to surface waters (13 µS/cm), suggesting possible groundwater input.

Sediment Quality

In 2006, NAR (2007) collected a sediment sample that resulted in eight parameters exceeding either the LEL of SEL criteria. TKN and TOC were 18,816 µg/g and 22%, respectively, exceeding the SEL. TP, Cd, Cu, Pb, Ni and Zn had values of 1,100, 1.5, 53, 39, 36 and 168 µg/g, respectively, all exceeding the LEL(Table 3.27).

Benthic Community

The 2006 NAR (2007) benthic invertebrate sample was comprised of 10 unique taxa (Table 3.30). The mean Hilsenhoff value of 6.00 indicated fair water quality. There were two species of dragonflies that are considered sensitive; however, six of the 10 taxa were chironomids which are considered relatively tolerant (i.e., value > 6). The other groups comprising the invertebrate community included: a single taxon of snail and a single taxon of caddisfly (Table 3.29).

Fish Community

In August 2009, four baited minnow traps and one Nordic net were set overnight (i.e., 23.5 hours) resulting in the capture of no fish (Table 3.28). In September 2006, NAR (2007) set a FWIN net and minnow traps which also resulted in no fish being collected. The outlet of Malpa Lake is very steep. This topographic barrier combined with limited flow in the outlet stream likely prevents fish from colonizing the lake.

3.8.3 Malpa Creek (Station S49)

Fish Habitat

Malpa Creek was surveyed downstream of the existing access road, near the Pic River confluence (Station S49), during May 2009 (Figure 3.39). At this location, the tributary had

mean width of 0.75 m, a mean depth of, 0.10 m and average velocity of 0.05 m/s. The water was a clear yellow/brown colour and the temperature was 9.5°C. The gradient was moderate to high and the majority of the stream morphology was comprised of flats (80%) with some pools (10%) riffles (10%). The stream canopy was dense throughout the surveyed reach. Instream cover was afforded by logs and trees, logs jams, deep pools and undercut banks. Substrates were generally equal proportions of cobble, gravel, sand, silt and clay with a minor amount of detritus. Marsh marigold was the only aquatic vegetation observed. The terrestrial vegetation was comprised of balsam fir, balsam poplar, white spruce, dogwood, speckled alder and white spruce. Sediment overlying the substrate was heavy and no algae were observed.

Fish Community

A 50 m section of Malpa Creek downstream of the access road (Station S49) was surveyed in May 2009. Electrofishing produced no fish during 161 seconds of effort (Table 3.28). All available habitats were fished, but low water levels limited availability.

3.8.4 Pic River Tributaries (Stations S68, S32, S44, S67, S45, and S24)

Station S68

Fish Habitat

Station S68 is situated in the upper reach of a Pic River tributary, downstream of a small headwater pond, east of Bamoos Lake (Figure 3.39). During May 2011, the water was a clear yellow/brown colour. At this location, mean width, depth and velocity were 0.6 m, 0.1 m and 0.2 m/s, respectively. The banks were stable and the gradient was moderate (75%) to high (25%). The morphology of the stream included riffles (40%), runs (20%), pools (20%) and flats (10%). The stream canopy ranged from dense to partly open. Instream cover was provided primarily by boulders and log and trees; however deep pools and undercut banks also contributed. The substrate composition included bedrock, boulder, cobble, gravel, muck and detritus. Moss and ferns were observed along the stream banks and the majority of the substrate was slightly covered by algae. The riparian vegetation included speckled alder, white birch, white spruce, maple and sumac.

Benthic Community

The benthic invertebrate community was not sampled at this location; however, leeches, stonefly and mayfly nymphs, water striders, amphipods, water beetles, caddisfly larvae and mites were observed during electrofishing.

Fish Community

In June 2011, a 200 m section of the upper reach of this Pic River tributary (S63) was electrofished, expending 572 seconds of effort. This effort yielded no fish but frogs and

tadpoles were observed. All available habitats were fished. Steep topography downstream likely prevents upstream fish passage into this reach.

Station S32

Fish Habitat

Station S32 is located in the lower reach of the Pic River Tributary that originates at a small headwater pond, east of Bamoos Lake (Figure 3.39). The entire stream length is approximately 2 km. During May 2009, the water was a turbid blue/green colour with a temperature of 10°C. At this location, mean width, depth and velocity were 1.0 m, 0.15 m and 0.35 m/s, respectively. The banks were highly unstable and the gradient was high to moderate. The morphology of the stream included riffles (70%), runs (15%), pools (10%) and flats (%). Canopy cover ranged from dense to open with the majority partly open. Instream cover was provided primarily by log jams; however contributions were made by deep pools, boulders and logs and trees. The substrates included cobble, clay, gravel, silt, sand and boulder. Sedges were observed along the stream banks and the majority of the substrate was covered by sediments. Log jams throughout the station may pose impediments to fish migration during low flow regimes. The riparian vegetation included balsam poplar, white spruce, white birch and speckled alder.

Water Quality

During May 2009, the water was a turbid blue/green colour with a temperature of 10°C. In October 2009, water temperature was 3°C, dissolved oxygen was 13.47 mg/L (100% saturation), pH was 8.25 and conductivity was 14 µS/cm.

Sediment Quality

Analysis of the sediment sample collected in October 2009 resulted in five parameters above the LEL criteria. TP, TKN, Cu, Fe and Ni had concentrations of 775, 640, 35 27,600 and 36 µg/g, respectively. All other relevant parameters met PSQG (Table 3.27).

Benthic Community

The October 2009 benthic invertebrate sample from S32 contained 24 individuals representing eight taxa (Table 3.30). Four of the taxa were EPT (one family from each order) and represented 58% of the community. The remainder of the community was comprised of chironomid (8%), empidid (83%) and tipulid (17%) midges and dipteran larvae (8%) (Table 3.29). The EPT/Chironomid ratio was 7.0. Simpson's Diversity and Evenness and were 0.85 and 0.82, respectively indicating a fairly balanced community. The Hilsenhoff Biotic Index value of 4.71 classified the water quality as good despite the low number of invertebrates.

Fish Community

In May 2009, a 175 m reach of the Pic River Tributary that originates at a small headwater lake east of Bamoos Lake (Station S32) was electrofished, expending 959 seconds of effort. This effort resulted in the collection of three Rainbow Trout fry (Table 3.28). The lower reaches of this Pic River tributary affords limited spawning and nursery habitats for migratory salmonids (i.e., Rainbow Trout).

Station S44

Fish Habitat

Station S44 is situated in the lower reaches of a Pic River Tributary that occurs just upstream of the hydro transmission right-of-way corridor (Figure 3.39). At this location, the mean width was 1.0 m, the mean depth was 0.15 m and the mean velocity 0.3 m/s. This is a high gradient stream and the majority of the substrates were coarse (i.e., 30% boulder, 50% cobble, 5% bedrock), with only small pockets of fines (i.e., 10% silt and 5% sand). Stream morphology was comprised of riffles (50%), flats (30%) and pools (20%). Instream cover was afforded by boulders, logs and trees, log jams, deep pools and undercut banks. Some portions of the stream were braided and the canopy cover was primarily dense with some partly open sections. Sediment and algae overlying the substrates were heavy and slight, respectively. The surrounding upland forest was inhabited by white birch, balsam fir, speckled alder and dogwood. Numerous log jams observed throughout the surveyed reach pose potential barriers to fish passage.

Water Quality

In May 2009, the water was slightly turbid and the temperature was 6°C. In October 2009, water temperature was 3°C, dissolved oxygen was 12.48 mg/L (93% saturation), pH was 8.43 and conductivity was 21.6 µS/cm.

Sediment Quality

A sediment sample was collected during October 2009. TKN and TOC exceeded the LEL criteria of 550 µg/g and 1%, respectively. TKN was 1,120 µg/g and TOC was 1.1% in the sample. All other relevant parameters met PSQG (Table 3.27).

Benthic Community

The benthic sample collected in October 2009 yielded 104 individuals from 11 different taxa (Table 3.30). Approximately 62% of the community consisted of four EPT taxa including one family of mayfly, two families of stoneflies and one family of caddisfly. Annelids comprised 4% of the community and dryopid beetles 8%. Three families of midges; Chironomidae (19%), Ephydridae (4%) and Tipulidae (4%), comprised the remaining taxa identified in the sample (Table 3.29). The EPT to Chironomid ratio was 3.2 and Diversity

and Evenness were 0.87 and 0.70, respectively. The Hilsenhoff value of 5.09 classified the water quality as good.

Fish Community

In May 2009 a 65 m section within the lower reaches of the Pic River Tributary that occurs just upstream of the hydro transmission right-of-way corridor (Station S44) was electrofished with 497 seconds of effort. No fish were collected (Table 3.28). All available habitats were fished. Flow in this stream was much reduced during October 2009 with upstream fish passage improbable due to low water levels, log jams and sedimentation. This tributary may provide seasonal fish habitat in its lower reaches; however, low flows likely preclude fish utilization during much of the year.

Station S67

Fish Habitat

Station S67 is situated in the mid reach of a small Pic River tributary, approximately 250 m upstream of S45 (Figure 3.39). In June 2011 the water was clear and colourless but flows were extremely low. The mean width was 0.1 m, the mean depth was 0.01 m and the velocity negligible. The stream gradient was moderate and the majority of the substrate was composed of fines (i.e., 20% silt, 30% clay). Stream morphology was comprised of riffles (50%) and pools (50%). Instream cover occurred in the form of logs and trees, and log jams. The channel meandered and the stream canopy was dense. Sediment overlying the substrates was heavy. No algae were observed in the stream. The surrounding upland forest was inhabited by speckled alder, white birch and balsam fir.

Fish Community

A 100 m section of stream was visually inspected for fish. No fish were observed (Table 3.28). Water levels were too low for electrofishing during June 2011; however low flow likely precludes fish utilization of the upper reaches of this tributary year round.

Station S45

Fish Habitat

Station S45 is situated in the lower reaches of a tributary which outlets to the Pic River approximately 500 m south of the hydro transmission right-of-way corridor (Figure 3.39). At this location the gradient ranged from low to high and bank stability varied from stable to unstable. The mean width, depth and velocity were 1.0 m, 0.10 m and 0.2 m/s, respectively. Stream morphology was comprised of flats (50%), riffles (30%), pools (10%) and runs (10%). The channel was meandering and braided with dense canopy cover throughout. Instream cover was provided mainly by logs and trees, log jams, undercut banks, boulders and deep pools. The substrate was comprised of boulder, cobble, gravel,

sand and silt with some detritus. Aquatic vegetation was observed in the form sedges and mosses and the surrounding vegetation included white spruce, speckled alder and white birch.

Water Quality

In May 2009 the clear yellow/brown water had a temperature of 8.0°C. In October 2009, water temperature was 3.4°C, dissolved oxygen was 9.27 mg/L (70% saturation), pH was 8.07 and conductivity was 8.4 µS/cm.

Sediment Quality

All key parameters in the sediment sample collected in October 2009 met PSQG (Table 3.27).

Benthic Community

The semi-quantitative benthic sample collected in October 2009 yielded 56 individuals from seven different taxa (Table 3.30). Chironomids comprised 71% of the collected community (Table 3.29). Tipulid midges, annelid worms, ostracods, and Dipteran larvae comprised the rest of the community with 7% each. There were no EPT taxa present and therefore the EPT to Chironomid ratio was 0. Simpson's Diversity and Evenness were 0.77 and 0.66 or moderate, respectively. The Hilsenhoff value was 6.33 placing the water quality in the fair category.

Fish Community

The lower reach of the Pic River Tributary (Station S45), situated approximately 500 m south of hydro transmission right-of-way corridor was surveyed in May 2009. A 50 m reach, beginning 20 m upstream of the confluence with the Pic River was electrofished. A total of 315 seconds of effort resulted in the capture of no fish (Table 3.28). All available habitats were fished. Similar to S44, flow at this station was much reduced during October 2009 with upstream fish passage improbable due to low water levels, log jams and sedimentation. This tributary may provide seasonal fish habitat in its lower reaches; however, low flows likely preclude fish utilization during much of the year.

Station S24

Fish Habitat

The Pic River Tributary (Station S24) situated east of Malpa Lake was surveyed upstream and downstream of the existing access road during May 2009 (Figure 3.39). Downstream of the road the gradient was moderate to high. The mean width was 0.25 m, mean depth was 0.05 m, and average velocity was 0.15 m/s. The stream morphology was mostly riffles and flats with some pools. The channel was braided and substrates consisted of cobble

(45%), silt (25%), sand (20%), gravel (5%) and clay (5%). Instream cover was provided by undercut banks, logs and trees, log jams and deep pools. Upstream of the road the gradient was low. The mean width was 0.40 m, mean depth was 0.05 m, and average velocity was 0.1 m/s. Stream morphology consisted of 90% flats and 10% pools. The substrate was comprised of sand (80%) and silt (20%). Instream cover was afforded by logs and trees, log jams, deep pools and undercut banks. Both the upstream and downstream portions of the station had dense canopy cover. No aquatic macrophytes were observed nor were there any algae on the substrates. A large proportion of the substrates were overlain with fine sediment. Riparian vegetation consisted of speckled alder, white spruce, white birch and dogwood. A culvert beneath the access road was not observed, and therefore flow is believed to pass via seepage through the road bed. Downstream of the road the water was turbid whereas upstream it was clear and colourless.

Water Quality

The water temperature was 8°C upstream of the access road and 9.5°C downstream during May 2009. In October 2009, water temperature was 3.5°C, dissolved oxygen was 7.07 mg/L (54% saturation), pH was 8.07 and conductivity was 22 µS/cm, downstream of the access road.

Sediment Quality

A sediment sample was collected during October 2009. TKN was equal to the LEL criteria of 550 µg/g. All other key parameters measured in the sediment met PSQG (Table 3.27).

Benthic Community

A semi-quantitative benthic invertebrate sample was collected in October 2009 resulting in the identification of 344 individuals from 12 discrete taxa (Table 3.30). The community was dominated by annelid worms (26%) and chironomid (40%) and tipulid (16%). Ephemeroptera (mayfly) were absent from the sample but Plecoptera (stonefly, 12%) and Trichoptera (caddisfly, 5%) were both represented by a single taxon each (Table 3.29). In total, EPT taxa equaled 16% of the relative abundance of the community. Collembola (springtails) were also identified (2%). The EPT to Chironomid ratio was 0.4 indicating a chironomid dominated community. The Hilsenhoff Biotic Index classified the water quality as fairly poor.

Fish Community

The Pic River tributary (Station S24) situated east of Malpa Lake was electrofished upstream and downstream of the access road during May 2009. A total length of 100 m of stream was fished expending 223 seconds of effort. No fish were collected (Table 3.28). The lack of a culvert beneath the access road prevents upstream fish passage, and low flow limits the potential for fish utilization.

3.8.5 Intermittent Pic River Tributaries (Stations S25, S46, S47, S48 and S50)

Fish Habitat

These five small tributaries are all 1st order streams which originate approximately 0.5 km from their outlets to the Pic River and only flow during part of the year, typically during the spring freshet and after significant rainfall events. All of these have been determined to be intermittent in nature with severely limited fisheries potential.

Water Quality

During May 2009, the water was clear and 9°C at S25 and S46. At S47 and S48, the water was turbid, and 8.5°C and 7.5°C, respectively. In October 2009, water temperature was 3°C, dissolved oxygen was 10.33 mg/L (77% saturation), pH was 7.61 and conductivity was 41.8 µS/cm, at S46.

Sediment Quality

Sediment was collected from S46 during October 2009. Only TKN and TOC exceeded the PSQG with results of 1,930 µg/g and 1.1% compared to the LEL of 550 µg/g and 1%, respectively. No other key parameters in the sample exceeded established guidelines (Table 3.27).

Benthic Community

A semi-quantitative benthic sample was collected at Station S46 in October 2009. There were 1,032 individuals in the sample representing 18 taxa (Table 3.30). EPT taxa comprised 58% of the community with three families of Plecoptera (stonefly) the most abundant of the EPT orders (57%) (Table 3.29). Chironomids comprised 34% of the invertebrate community. The EPT to Chironomid ratio was 1.7. Other taxa present in the sample were midges in the Dixidae and Tipulidae families, other dipterans and mites. The Simpson's Diversity was 0.74 and the Evenness was 0.21. Water quality was good according to the Hilsenhoff Biotic Index.

Benthic samples were not collected at the other intermittent Pic River tributaries due to insufficient flow during the October 2009 survey.

Fish Community

As discussed above, these small tributaries are intermittent in nature with limited fisheries potential.

3.8.6 Pic River and Small Tributaries Summary

There are a number of small tributaries of the Pic River within the vicinity of the Project Area. Many are 1st order streams with total stream lengths of 1 km or less. Most rely on precipitation runoff as a primary source of flow and have been determined to be intermittent in nature. Five of these watercourses only flow during part of the year, typically during the spring freshet and after significant rainfall events, and have severely limited fisheries habitat potential. Surveys of these creeks were based on the flow conditions encountered during the survey periods and have been discussed accordingly.

A benthic sample was collected in Malpa Lake in 2006 by NAR (2007) that classified the benthic community as fair despite the lake having the lowest number of taxa of any of the lakes sampled within the Project Area. Benthic samples were collected in 2009 at S24, S32, S44, S45 and S46. The water quality in these tributaries ranged from fairly poor to good based on the Hilsenhoff value. EPT taxa dominated the communities in S32, S44 and S46, whereas chironomids were dominant in S24 and S45. These community differences likely result from the variability of substrates encountered at these stations, some of which were predominantly fine sediments and others that were mainly coarse materials. A number of other invertebrate groups were collected including annelid worms, tipulid midges, dixid flys, mites, ostracods and springtails.

A 2006 sediment sample from Malpa Lake resulted in eight parameters (i.e., TKN, TOC, TP, Cd, Cu, Pb, Ni, Zn) exceeding the LEL or SEL. In 2009, sediment samples were collected at S24, S32, S44, S45 and S46. At S32, sediment exceeded the LEL for TP, TKN, Cu, Fe and Ni. TKN was equal to or exceeded the LEL at S24, S44 and S46. TOC also exceeded the LEL at S44. All other parameters at these stations met the PSQG and no parameters exceeded Provincial guidelines at S45 (Table 3.27).

Of all of the Pic River Tributaries which appeared to have some fisheries potential, fish were only collected in one. The presence of Rainbow Trout fry at Station S32 indicates that this tributary affords potential (albeit limited) coldwater spawning and nursery habitat. Overall the value of these small streams from a fish habitat perspective is considered minimal as flows are dependent on the amount of precipitation and salmonid spawning habitat is relative scarce due to the paucity of coarse substrates in most of the tributaries.

Golder (2009) collected benthic samples in three areas of the Pic River in 2007. The Simpson's Diversity was moderate for all three areas. Evenness was moderately high in the adjacent and downstream areas but low in the upstream area. Density ranged widely between areas. Invertebrate density in the upstream area was an order of magnitude higher than in the other two areas. Dominant taxa were chironomids upstream, annelids adjacent to and biting-midges downstream. EPT taxa were identified in all three areas but the number of taxa was low throughout all areas. The Hilsenhof Index values classified the water as fairly poor in upstream and adjacent areas and good in the downstream area.

TOC was the only key parameter that exceeded the PSQG, exceeding the LEL of 1% in all three areas sampled on the Pic River.

The fish community of the Pic River is diverse, with a variety of coolwater and coldwater fish species reported including Lake Sturgeon, Walleye, Longnose Sucker, Silver Redhorse, Muskellunge, Trout-perch, Spottail Shiner, Northern Redbelly Dace, Rainbow Trout, Coho Salmon, Chinook Salmon, Brook Trout, Rainbow Smelt, Northern Pike, White Sucker and Shorthead Redhorse.

3.9 Lake Superior

Lake Superior is the regional watershed that encompasses all waterbodies on and near the Project and will ultimately receive any runoff or water produced or redirected by the mine operation. Lake Superior is the northernmost and largest by area and volume of the five Laurentian Great Lakes. Lake Superior has an average depth of 147 m and a maximum depth of 406 m with a surface area of 82,100 km^2 and a total watershed area of 127,700 km^2. For the purpose of this report section, Lake Superior relates to embayments at the mouth of three watersheds that drain the proposed mine site. These three areas include Port Munro at the mouth of Hare Creek (Stream 5), Sturdee Cove at the mouth of Stream 6 and Peninsula Harbour at the outlet of Shack Creek (Stream 7).

Table 3.31 presents the sediment quality data for samples collected in Lake Superior embayments and Table 3.32 displays a summary of the fishing effort and species identified. Benthic community data presented on a percent composition is provided in Table 3.33. A summary of the calculated benthic community indices for all stations sampled within Lake Superior embayments are presented in Table 3.34.

3.9.1 Port Munro (mouth of Hare Creek)

Port Munro (PM) aquatic habitat characteristics and bathymetry are shown on Figure 3.53 and discussed below.

Bathymetry and Habitat

Hare Creek outlets into PM from an easterly direction. The northern shore of the bay is sandy, the western shore is rocky and the eastern shore is a mix of rocky shoreline with large accumulations of logs. There is a small island in the northwestern corner of the bay that is surrounded by rocky shoreline with shallow macrophyte beds to the north and west. The bay gradually deepens proceeding south from the mouth of the creek moving offshore into Lake Superior.

Within the embayment, maximum depth was approximately 18 m. Habitat is primarily deep open water as the lake bed is generally steeply sloped from shore with exception of a shallow sand bar shelf off the creek mouth and in the northwest corner of the bay, behind a small island. A sand beach is present along the northern shore of the embayment, while

the remaining shoreline is rocky. Substrates consisted of primarily organic silt (muck) with nearshore sand, bedrock and cobble. Minor amounts of bedrock, boulder and gravel were also observed. The area was once used for log booming by the local pulp and paper mill and much of the shoreline contains washed up logs. Sunken and deadhead logs also occur throughout. Some submergent aquatic vegetation was observed in the northwest corner of the embayment, including muskgrass *(Chara* spp.) and pondweed (*Potamogeton* spp.). Adjacent upland forest vegetation was comprised of white spruce, speckled alder, balsam poplar and white birch.

Water Quality

During August 2009, the water was a turbid blue/green colour and Secchi depth was 3.2 m. Water chemistry was generally constant throughout the water column. The water temperature declined slightly from 15.2°C at the surface to 9.7°C at a depth of 17.5 m. DO was at saturation, conductivity was around 90 µS/cm and pH ranged from 7.4 to 7.9.

Sediment Quality

Sediment quality was assessed at five sites in PM during August 2009. The mean TKN, Cu and TOC exceeded the LEL with values of 631, 2,534, 21 µg/g and 2%, respectively (Table 3.31). There were instances when the mean value for the five replicates was below the LEL but individual site results did yield values over the LEL including: Cd, Fe and Ni (see Appendix 3).

Benthic Community

A quantitative benthic macroinvertebrate survey was conducted in PM in August 2009. Benthic invertebrate samples were collected from five replicate sites, with each sample consisting of three subsample grabs collected using a petite Ponar. The mean density was 3,941 organisms/m^2 (Table 3.34). The mean number of taxa per sample was 23 with 46 total taxa identified. The dominant taxa in the PM samples were chironomid midges (46%), ostracods (18%), sphaeriid clams (14%) and annelid worms (10%), comprising over 87% of the mean invertebrate community. The remainder of the invertebrate community was comprised of snails, amphipods, mites, roundworms and caddisflies (Table 3.33).

Simpson's Diversity (D) and Evenness (E) were calculated with mean values of 0.89 and 0.43, respectively. The D value indicated a very diverse invertebrate community. The E value was moderate and likely a result of the high proportion of chironomids. The calculated Hilsenhoff Index value was 6.72 categorizing the water quality as fairly poor (Table 3.34).

Fish Community

Fishing was undertaken at Port Munro using gillnets and a beach seine during May 2009. Two experimental gillnets (1 to 5" mesh) were set overnight (18 hours) and approximately

2,600 m^2 of beach was seined. Collected species included 7 Round Whitefish (*Prosopium cylindraceum*), 1 Lake Chub, 1 Longnose Sucker, 14 White Sucker and 1 Mottled Sculpin (Table 3.32).

3.9.2 Sturdee Cove (mouth of Stream 6)

Sturdee Cove (SC) aquatic habitat characteristics and bathymetry are shown on Figure 3.54 and discussed below.

Bathymetry and Habitat

Stream 6 outlets to SC at the southeast corner of the embayment. The bay is uniform is its bathymetry with no major underwater structures or islands. Water is deeper in the middle of the bay than near the north and south shorelines and the water gets deeper moving east to west. Within the embayment, maximum depth was approximately 18 m. Habitat is primarily open deep water. A sand beach is present along the eastern shore of the embayment, while the northern and southern shorelines are rocky. The lake bed is gradually sloped off the beach, but steeply sloped elsewhere. Substrates consisted of primarily organic silt (muck) in deeper waters and silty sand at moderate depth. Nearshore substrates included sand, bedrock, cobble and boulder. Much of the beach shoreline is covered with washed-up logs.

Some submergent aquatic vegetation (i.e., pondweed) was present off the creek mouth and adjacent upland forest vegetation was comprised of white spruce, black spruce, speckled alder, balsam poplar and white birch.

Water Quality

During October 2009, water chemistry was generally constant throughout the water column. The water temperature was 6.3°C, DO saturation was 92%, conductivity was 62 µS/cm and pH ranged from 7.8 to 8.2.

Sediment Quality

Sediment samples were collected concurrently with the benthic collections at five sites in Sturdee Cove during October 2009. No relevant parameters had a mean value that exceeded any of the PSQG (Table 3.31). There were however, instances of individual samples exceeding the PSQG for Fe (one sample), TKN (four samples) and Ni (two samples) (see Appendix 3).

Benthic Community

A quantitative benthic macroinvertebrate survey was conducted in Sturdee Cove in October 2009. The survey consisted of the same design and level of effort of that conducted at Port Munro. The mean density was 7,174 organisms/m^2 (Table 3.34). The mean number of

taxa per sample was 25, with a total number of 42 taxa identified. The dominant taxa in the SC samples were the same as in the PM samples, with annelid worms (11%), ostracods (18%), chironomid midges (49%) and sphaeriid clams (13%) comprising a total of over 88% of the invertebrate community (Table 3.33). Additional taxa including snails, caddisflies, amphipods, isopods and mites were also identified in the samples.

The mean D value from the five samples was 0.87 which indicates a very diverse community. The Evenness mean value was 0.31 which indicates that despite the high diversity a limited number of taxa dominated the invertebrate community. The Hilsenhoff Index categorized the water quality as fair.

Fish Community

Fishing was not undertaken within Sturdee Cove; however, similar species as those reported for PM and PH would be expected.

3.9.3 Peninsula Harbour

Fish Habitat

Shack Creek outlets to a nearshore embayment of Lake Superior known as Peninsula Harbour (PH). PH includes two embayments, Carden Cove situated to the west and Jellicoe Cove located in the east. Habitat assessment was undertaken by BEAK (2001) during August 2000.

Generally Carden Cove is shallow protected environment. Maximum water depth was 7 m. The substrate is primarily sand overlying glacial clay, with a few bedrock outcrops. Accumulation of detritus also occurred at the northwest edge of the cove. Aquatic macrophytes were sparse, limited to a few small patches of pondweed near the middle of the bay. The north shore is a sand beach while the west and east shorelines are exposed bedrock and/or boulder. The adjacent terrain was forested by mainly coniferous species.

Jellicoe Cove is somewhat less protected than Carden Cove due to prevailing winds. Water depth was much greater with a maximum observed depth of 28 m. Generally, the substrate was silty sand in the nearshore, transitioning to mud offshore in deeper waters. Areas of bare glacial clay also occur. Accumulation of detritus was observed along the southeast end of the cove and a patch of cobble was present off the south shore. Aquatic macrophytes were fairly common and observed varieties included pondweed, common waterweed and muskgrass. A large portion of the southeast shore is beach with coarse sand and gravel substrates. Many logs occurred along the beach shore. A pulp and paper mill, currently not in operation, is situated on the southwest edge of the cove. Portions of the shore adjacent to the mill have been armoured with large boulder/rubble material and a wharf occupies some of the western shore. Bedrock shoreline occurs along the head of the cove. Log piles and rock cribs associated with antecedent log booming activities are

present and a public boat launch and docks are situated at the northeast corner of the bay. The adjacent terrain was sparsely vegetated due to mill activities.

Fish Community

Carden Cove and Jellicoe Cove were surveyed by BEAK (2001) during August 2000 using a variety of gear including experimental gillnets, seine nets and electrofishing. Species collected from Carden Cove include Alewife (*Alosa psuedoharengus*), Rainbow Trout, Cisco, Lake Whitefish, Round Whitefish, Lake Chub, Longnose Dace, Longnose Sucker, White Sucker, Burbot and Mottled Sculpin (Table 3.32). Species of fish collected from Jellicoe Cove include Alewife, Pink Salmon, Coho Salmon, Rainbow Trout, Lake Trout, Cisco, Round Whitefish, Northern Pike, Lake Chub, Longnose Dace, Longnose Sucker, Burbot, Threespine Stickleback, Mottled Sculpin, Slimy Sculpin and Yellow Perch.

3.9.4 Lake Superior Summary

In 2009, quantitative benthic invertebrate surveys were conducted in both Port Munro (mouth of Hare Creek) and Sturdee Cove (mouth of Stream 6). The dominant invertebrate groups in both cases were chironomids, ostracods, sphaeriids and tubificid worms comprising 87 and 88% of the mean benthic communities in Port Munro and Sturdee Cove, respectively. Additional taxa included mites, amphipods, trichopterans, emphemeropterans, snails and isopods. Simpson's Diversity values indicated that the benthic communities were diverse at both locations. Evenness was moderate resulting from the small number of taxa dominating the communities.

Sediment samples collected coincident with the benthic surveys indicated that no parameters of concern exceeded the SEL and only a limited number exceeded the LEL at Port Munro. Mean values for TKN, TP, TOC and Cu exceeded the LEL and at least one sample replicate exceeded the LEL for Cd, Fe and Ni.

No mean parameter values exceeded the LEL for the Sturdee Cove sediment, although some samples did have replicate exceedances.

The nearshore embayments of Lake Superior provide habitat for a variety of fishes, including both coldwater and coolwater species. These embayments offer nursery habitats for many species including whitefish, salmon, trout and suckers. Spawning habitat for species such as whitefish is also likely present. In addition, many Lake Superior species migrate through the embayments to spawning tributaries which outlet to the lake including Hare Creek and Shack Creek.

4.0 METALS IN AQUATIC VEGETATION

Composite samples comprised of the dominant aquatic vegetation were collected from a number of lentic (lake) stations during August 2009, to determine baseline metal levels in their tissues. These data were collected primarily to support contaminant fate modeling that will be completed as part of the assessment phase of the Marathon PGM-Cu Project development.

Species used in the tissue chemistry varied by waterbody and sampling area. The list of species collected for the plant tissue chemistry analyses included but were not limited to: burreed (*Sparganium* spp.), broad-leafed arrowhead (*Sagittaria latifolia*), sedges (*Carex* spp.) and pondweed (*Potamogeton* spp.).

A total of four composite aquatic vegetation samples were collected during the 2009 aquatic studies. The stations combined to form the composites are as follows.

- HL is a composite of aquatic plants from Hare Lake
- BL is a composite of aquatic plants from Bamoos Lake
- C2 is a composite of aquatic plants collected from Stations L1, L2, L3, L4, L5, L6, L7, L8, L14, L15 and L26
- C3 is a composite of aquatic plants collected from Stations L9, L10, L11, L12, L13, L13a, L16 and L18

Key metals in the four composite aquatic vegetation samples are summarized in Table 4.1.

5.0 REFERENCES

Beak International Incorporated (BEAK). 2001. Fisheries resources and habitat assessment. Report prepared for the Town of Marathon.

Bonar, S.A., W.A. Hubert and D.W. Willis (eds). 2009. Standard methods for sampling North American freshwater fishes. American Fisheries Society, Bethesda, Maryland. 335 p.

COSEWIC. 2011. Canadian species at risk. Committee on the Status of Endangered Wildlife in Canada. Gatineau, Quebec. October 2011. ii + 95 pp.

Environment Canada. 2002. Metal mining guidance document for aquaitic environmental effects monitoring. June 2002.

Ecclestone, A. 2012. Movement patterns, habitat utilization and spawning habitat of Lake Sturgeon (*Acipenser fulvenscens*) in the Pic River, a northwestern Lake Superior tributary in Ontario, Canada. M.Sc. Thesis, Trent University. Peterborough, ON. January, 2012. 174 p.

Golden Software Inc. 2002. Surfer 8. Version 8.05 05/11/04. Golden Software Incorporated, Golden, Colorado.

Golder Associates Ltd. (Golder) 2009. Final report on Marathon Platinum Group Metals – Copper (PGM-Cu) Mining Project. Baseline assessment of the aquatic and terrestrial environments. Report prepared for Marathon PGM Corporation. January 2009. 07-1118-0012.

Government of Canada. 2002. Metal mining effluent regulations. Canada Gazette part II Vol. 136, No. 13, p. 1412-1462.

Hilsenhoff, W.L. 1987. An improved biotic index of organic stream pollution. Great Lakes Entomol. 20:31-39.

Jones, C., K.M., Somers, B. Craig and T.B. Reynoldson. 2007. Ontario benthos biomonitoring network: Protocol manual. January 2007. 109 pp.

Krebs, C.J. 1994. Ecology: The experimental analysis of distribution and abundance, 4th edition. Harper Collins, New York. p. 705-706.

Mandaville, S.M. 2002. Benthic macroinvertebrates in freshwaters - Taxa tolerance values, metrics, and protocols. Soil & Water Conservation Society of Metro Halifax. 128 p.

Morgan, G.E. and E. Snucins. 2005. Manual of instructions – NORDIC index netting. Ontario Ministry of Natural Resources. Peterborough, Ontario. 47 p.

N.A.R. Environmental Consultants Inc. (NAR). 2007. Environmental baseline assessment. Marathon PGM-Cu Project. Report prepared for Marathon PGM Corporation. March 2007.

Noranda Inc. (Noranda). 1984. Fish collection records for Pic-Black River confluence area Pic River, Ontario, September-October 1983.

Ontario Department of Lands and Forests (ODLF). 1951a. Lake survey (Lower Rag Lake) summary sheet – June 30, 1951.

ODLF. 1951b. Lake survey (Middle Rag Lake) summary sheet – June 30, 1951.

ODLF. 1951c. Lake survey (Upper Rag Lake) summary sheet – July 1, 1951.

ODLF. 1960. Lake card (Hare Lake) – July 2, 1960.

Ontario Ministry of the Environment (OMOE). 1993. Guidelines for the protection and management of aquatic sediments in Ontario. Ministry of the Environment, Toronto, Ontario.

OMOE. 1994. Water management, policies, guidelines: Provincial water quality objectives of the Ministry of the Environment and Energy. July 1994, reprinted February 1999. Ministry of the Environment, Toronto, Ontario.

OMOE. 2011. Guide to eating Ontario sport fish 2011-2012. Twenty-sixth edition, revised. Queens printer for Ontario.

Ontario Ministry of Natural Resources (OMNR). 1975. Lake survey summary aquatic habitat inventory (Hare Lake) - August 18, 1975.

OMNR. 1990. Lake survey summary aquatic habitat inventory (Shack Lake) - August 7, 1990.

OMNR. 1991. Lake survey summary aquatic habitat inventory (Hare Lake) - August 12, 1991.

OMNR. 2001a. Aquatic habitat inventory stream survey summary (Angler Creek) - August 22, 2001.

OMNR. 2001b. Aquatic habitat inventory stream survey summary (Shack Creek) - July 19, 2001.

OMNR. 2002. Lake sturgeon assessment 2001-2002 update - Pic River. Upper Great Lakes Management Unit – Lake Superior.

OMNR. 2006. Inland Ontario lakes designated for Lake Trout management. MNR 52013. ISBN 1-4249-1482-5.

Ontario Ministry of Natural Resources (OMNR). 2011. Species at risk in Ontario (SARO) list. updated 8 June 2011.

Portt, C.B., G.A. Coker, D.L. Ming and R.G. Randall. 2006. A review of fish sampling methods commonly used in Canadian freshwater habitats. Can. Tech. Rep. Fish. Aquat. Sci. 2604. 51 p.

Portt, C.B., G.A. Coker, N.E. Mandrak and D.L. Ming. 2008. Protocol for the detection of fish species at rick in Ontario Great Lakes Area (OGLA). Can. Sci. Ad. Sec. Res Doc. 2008/026. 31 p.

Sandstrom, S., M. Rawson and N. Lester. 2009. Manual of instructions for broad-scale fish community monitoring; using large mesh gillnets and small mesh gillnets. Ontario Ministry of Natural Resources. Peterborough, Ontario. Version 2009.2 34 p. + appendices.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. Rapid Bioassessment Protocols for use in Streams and Rivers: Benthic Macroinvertebrates and Fish. U.S. Environmental Protection Agency. EPA 440/4-89/001.

Smith B. and J.B. Wilson. 1996. A consumer’s guide to evenness indices. Oikos 76:70–82.

True Grit Consulting Ltd. (True Grit). 2009. Marathon PGM Cu Project Winter 2009 Lake Sampling Program Report. Letter to Marathon PGM Corporation, 30 March, 2009. 10p.

Wetzel, R.G. 2001. Limnology – Lake and river ecosystems, 3rd edition. Academic Press, New York, New York.

TABLES

TABLE 3.1: SEDIMENT QUALITY FOR THE STREAM 1 WATERSHED

				Lentic Stations				Stream Stations	
				L1	L2	L2	L29	S1	S2
	Units	LEL	SEL	NAR	EcoMetrix	NAR	EcoMetrix	Golder	Golder
Physical Tests									
Total Phosphorus	(µg/g)	600	2000	2000	561	1400	715	903	416
Total Kjeldahl Nitrogen	(µg/g)	550	4800	166816	14100	13665	8810	-	-
Organic / Inorganic Carbon									
Total Organic Carbon	%	1	10	20	16	19	15	1.2	1.1
Total Metals									
Aluminum	(µg/g)	-	-	21300	5560	13600	6120	8590	3220
Arsenic	(µg/g)	6	33	12	3.0	4.8	2.9	2.6	2.0
Cadmium	(µg/g)	0.6	10	4.4	0.9	1.6	0.7	0.2	<0.05
Cobalt	(µg/g)		50	7.6	1.9	13	3.8	11	3.4
Copper	(µg/g)	16	110	48	9.3	130	16	38	6.3
Iron	(µg/g)	20000	40000	21000	7110	13600	11300	30300	8520
Lead	(µg/g)	31	250	87	33	43	22	6.1	2.3
Molybdenum	(µg/g)	-	-	2.4	1.4	1.2	1.0	1.1	<0.5
Nickel	(µg/g)	16	75	20	4.3	31	7.2	35	12
Selenium	(µg/g)	-	-	2.7	1.5	0.9	<1.0	<0.50	<0.50
Zinc	(µg/g)	120	820	122	81	70	75	178	16

- Sample exceeds LEL value
- Sample exceeds SEL value

TABLE 3.2: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR THE STREAM 1 WATERSHED

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Rainbow Trout	Chinook Salmon	Brook Trout	Pearl Dace[2]	Northern Redbelly Dace	Finescale Dace	Brook Stickleback	Slimy Sculpin
L1	L1	Sep-06	NAR	FWIN	1	3.2								
	L1	Sep-06	NAR	minnow trap	6	3.2								
	L1	Aug-09	EcoMetrix	baited minnow trap	3	17								
	L1	Aug-09	EcoMetrix	sm exp gillnet	1	17								
	L1	Aug-09	EcoMetrix	Nordic net	1	17								
	L1	Jun-11	EcoMetrix	baited minnow trap	4	92								
	L1	Jun-11	EcoMetrix	sm exp gillnet	2	92								
	L1	Jun-11	EcoMetrix	Nordic net	2	92								
	L1	Jun-11	EcoMetrix	electrofishing	-	593								
L2	L2	Sep-06	NAR	FWIN	1	3								
	L2	Sep-06	NAR	minnow trap	6	3								
	L2	Aug-09	EcoMetrix	baited minnow trap	3	24.5								
	L2	Aug-09	EcoMetrix	sm exp gillnet	1	23								
	L2	Aug-09	EcoMetrix	Nordic net	1	23								
	L2	Jun-11	EcoMetrix	baited minnow trap	4	93								
	L2	Jun-11	EcoMetrix	sm exp gillnet	2	93								
	L2	Jun-11	EcoMetrix	Nordic net	2	93								
	L2	Jun-11	EcoMetrix	electrofishing	-	618								
L29	L29	Jun-11	EcoMetrix	baited minnow trap	4	93								
	L29	Jun-11	EcoMetrix	sm exp gillnet	2	93								
	L29	Jun-11	EcoMetrix	Nordic net	2	93								
	L29	Jun-11	EcoMetrix	electrofishing	-	475								
Stream 1	S1	Aug-07	Golder	minnow trap	8	20							6	
	S1	Sep-07	Golder	electrofishing	-	-				9				
	S1	May-09	EcoMetrix	electrofishing	-	587					1	1		
	S2	Sep-07	Golder	minnow trap	2	5								
	S2	Sep-07	Golder	electrofishing	-	-								
	S2	May-09	EcoMetrix	electrofishing	-	1363	8	3	1			6		2
	S27	May-09	EcoMetrix	electrofishing	-	1267			11			3		
	S54	Jun-10	EcoMetrix	electrofishing	-	96								
	S55	Jun-10	EcoMetrix	electrofishing	-	117								
	S55	Jun-11	EcoMetrix	electrofishing	-	322								
	S56	Jun-10	EcoMetrix	electrofishing	-	197					4	2		
	S57	Jun-10	EcoMetrix	electrofishing	-	363								
	S58	Jun-10	EcoMetrix	electrofishing	-	249								
	S79	Jun-11	EcoMetrix	electrofishing	-	214					P	P	P	

[1] - effort for electrofishing is in seconds

[2] - misidentified Lake Chub

P - present

TABLE 3.3: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 1 WATERSHED

	Lentic Stations			Stream Stations	
	L1[1]	L2[1]	L29	S1[2]	S2[2]
ROUNDWORMS					
P. Nemata	-	-	<1%	-	-
ANNELIDS					
P. Annelida					
WORMS					
Cl. Oligochaeta					
F. Enchytraeidae	-	-	-	-	21%
F. Naididae	-	-	<1%	<1%	-
F. Lumbriculidae	-	P	<1%	-	-
LEECHES					
Cl. Hirudinea					
F. Erpobdellidae	-	P	<1%	3%	-
F. Glossiphoniidae	-	-	<1%	3%	-
ARTHROPODS					
P. Arthropoda					
MITES					
Cl. Arachnida					
O. Acarina	P	P	<1%	<1%	-
WATER SCUDS					
O. Amphipoda					
F. Crangonyctidae	P	P	<1%	-	-
F. Hyalellidae	-	-	-	4%	-
F. Talitridae	P	-	-	-	-
SPRINGTAILS					
Cl. Entognatha					
O. Collembola	-	-	<1%	-	-
INSECTS					
Cl. Insecta					
BEETLES					
O. Coleoptera					
F. Dytiscidae	-	-	<1%	-	-
F. Gyrinidae	-	P	-	-	-
F. Haliplidae	-	P	-	-	-
MAYFLIES					
O. Ephemeroptera					
F. Baetidae	-	-	<1%	-	-
F. Caenidae	-	-	<1%	-	-
F. Leptophlebiidae	P	P	-	2%	2%
O. Odonata					
DAMSELFLIES					
F. Coenagrionidae	P	P	<1%	-	-

TABLE 3.3: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 1 WATERSHED (CONT.)

	Lentic Stations			Stream Stations	
	L1[1]	L2[1]	L29	S1[2]	S2[2]
DRAGONFLIES					
F. Aeshnidae	P	-	<1%	-	-
F. Cordulegastridae	-	-	-	<1%	-
F. Corduliidae	-	P	<1%	-	-
F. Gomphidae	-	-	-	-	-
F. Libellulidae	P	-	1%	-	-
STONEFLIES					
O. Plecoptera					
F. Capniidae	-	-	-	-	16%
F. Nemouridae	-	-	-	3%	7%
BUGS					
O. Hemiptera					
F. Corixidae	P	-	-	-	-
F. Notonectidae	P	-	<1%	-	-
CADDISFLIES					
O. Trichoptera					
F. Glossosomatidae	-	-	-	-	2%
F. Hydropsychidae	-	-	-	3%	-
F. Lepidostomatidae	-	-	-	<1%	2%
F. Leptoceridae	-	P	<1%	-	-
F. Limnephilidae	-	-	<1%	3%	-
F. Polycentropodidae	P	P	-	3%	-
TRUE FLIES					
O. Diptera					
pupae	-	-	-	-	-
indeterminate	-	-	-	-	-
BITING-MIDGE					
F. Ceratopogonidae	P	P	5%	3%	11%
PHANTOM MIDGE					
F. Chaoboridae	P	-	<1%	-	-
MIDGES					
F. Chironomidae	P	P	74%	49%	2%
F. Empididae	P	P	-	-	-
F. Tipulidae	-	-	-	<1%	10%
MOLLUSCS					
P. Mollusca					
SNAILS					
Cl. Gastropoda					
F. Ancylidae	-	-	-	10%	-
CLAMS					
Cl. Bivalvia					
F. Sphaeriidae	P	P	12%	11%	28%

1 - From original NAR (2007) presence/absence benthic data.

2 - Calculated from original Golder (2009) benthic data.

P - present

Note: For sampling methods used see NAR (2007) and Golder (2009).
EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.4: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 1 WATERSHED

	Lentic Stations			Stream Stations	
	L1[1]	L2[1]	L29	S1[2]	S2[2]
TOTAL NUMBER OF ORGANISMS	-	-	6676	128	9
DENSITY (No./m^2)	-	-	-	1374	93
TOTAL NUMBER OF TAXA	18	22	40	25	10
MEAN NUMBER OF TAXA	-	-	-	11	5
SIMPSON'S DIVERSITY	-	-	0.84	0.76	0.65
SIMPSON'S EVENNESS	-	-	0.15	0.54	0.74
TOTAL EPT	2	3	4	6	5
MEAN EPT	-	-	-	2.0	2.3
HILSENHOFF INDEX	6.0	5.9	6.6	5.6	5.2
EPT/CHIRONOMIDAE	-	-	0.02	1.37	4.00
MAYFLIES	-	-	<1%	2%	2%
STONEFLIES	-	-	0%	3%	23%
CADDISFLIES	-	-	<1%	10%	4%
EPT	-	-	1%	15%	29%
CHIRONOMIDS	-	-	74%	49%	2%
ANNELIDS	-	-	<1%	7%	21%
SPHAERIID CLAMS	-	-	12%	11%	28%

1 - From original NAR (2007) presence/absence benthic data.

2 - Calculated from original Golder (2009) benthic data.

P - present

Note: For sampling methods used see NAR (2007) and Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.5: SEDIMENT QUALITY FOR THE STREAM 2 WATERSHED

				Lentic Stations								Stream Stations	
				L3	L5	L6	L7	L8	L14	L15	L20	S3	S4
	Units	LEL	SEL	NAR	NAR	NAR	NAR	NAR	NAR	NAR	EcoMetrix	Golder	Golder
Physical Tests													
Total Phosphorus	(µg/g)	600	2000	1300	2200	1900	2100	2400	1000	4500	2910	3440	506
Total Kjeldahl Nitrogen	(µg/g)	550	4800	13591	16945	21151	22000	14709	3744	6854	15600	-	-
Organic / Inorganic Carbon													
Total Organic Carbon	%	1	10	22	19	33	28	19	7.3	8.9	13	1.1	2.3
Total Metals													
Aluminum	(µg/g)	-	-	15200	19250	10000	18800	16100	10300	20700	9920	12500	6950
Arsenic	(µg/g)	6	33	5.8	5.0	1.3	15	3.2	3.0	1.8	3.9	2.4	3.4
Cadmium	(µg/g)	0.6	10	1.8	3.5	1.4	4.2	1.6	0.4	0.5	1.1	0.2	0.1
Cobalt	(µg/g)		50	4.7	4.6	2.1	5.8	14	19	20	4.2	20	6.4
Copper	(µg/g)	16	110	31	25	14	40	100	78	151	30	44	12
Iron	(µg/g)	20000	40000	11500	11650	8990	24000	25300	37400	25400	26500	57700	11800
Lead	(µg/g)	31	250	43	48	15	132	22	13	9.5	13	6.7	4.1
Molybdenum	(µg/g)	-	-	1.4	1.3	0.6	2.0	1.6	0.6	0.5	1.3	1.1	<0.50
Nickel	(µg/g)	16	75	18	15	5.5	14	31	45	41	7.8	40	18
Selenium	(µg/g)	-	-	0.6	1.6	<0.5	2.0	2.8	1.1	1.4	1.3	<0.5	0.6
Zinc	(µg/g)	120	820	66	122	26	186	185	69	83	116	94	28

- Sample exceeds LEL value

- Sample exceeds SEL value

TABLE 3.6: FISHING EFFORT AND FISH SPECIES IDENTIFIED FORTHE STREAM 2 WATERSHED

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Rainbow Trout	Chinook Salmon	Brook Trout	Lake Chub	Pearl Dace[2]	Finescale Dace	Longnose Dace	White Sucker	Trout-perch	Brook Stickleback	Mottled Sculpin	Slimy Sculpin
L3	L3	Sep-06	NAR	FWIN	1	3												
	L3	Sep-06	NAR	exp gillnet	1	3												
	L3	Sep-06	NAR	minnow trap	6	3												
	L3	Aug-09	EcoMetrix	baited minnow trap	3	23												
	L3	Aug-09	EcoMetrix	Nordic net	1	23												
	L3	Aug-09	EcoMetrix	sm exp gillnet	1	23												
	L3	Jun-11	EcoMetrix	baited minnow trap	4	95												
	L3	Jun-11	EcoMetrix	Nordic net	2	95												
	L3	Jun-11	EcoMetrix	sm exp gillnet	2	95												
	L3	Jun-11	EcoMetrix	electrofishing	-	314												
L5	L5	Sep-06	NAR	FWIN	1	6					1							
(Canoe Lake)	L5	Sep-06	NAR	exp gillnet	2	6												
	L5	Sep-06	NAR	minnow trap	6	3.5					1							
	L5	Aug-07	Golder	exp gillnet	1	41												
	L5	Aug-07	Golder	minnow trap	3	42					14							
	L5	Aug-07	Golder	Nordic net	1	41					303							
	L5	Aug-09	EcoMetrix	baited minnow trap	2	18.5												
	L5	Aug-09	EcoMetrix	sm exp gillnet	1	18.5												
	L5	Aug-09	EcoMetrix	Nordic net	1	18.5				88								
L6	L6	Sep-06	NAR	minnow trap	3	1					3							
	L6	Aug-07	Golder	minnow trap	2	44					19							
	L6	Aug-09	EcoMetrix	baited minnow trap	3	19				31								
L7	L7	Sep-06	NAR	exp gillnet	1	3.3												
	L7	Sep-06	NAR	FWIN	1	3.3												
	L7	Sep-06	NAR	minnow trap	6	3.5												
	L7	Sep-08	Golder	minnow trap	3	45					3							
	L7	Aug-09	EcoMetrix	baited minnow trap	3	18												
	L7	Aug-09	EcoMetrix	sm exp gillnet	1	18				1								
	L7	Aug-09	EcoMetrix	Nordic net	1	18				149								
L8	L8	Sep-06	NAR	minnow trap	6	2.5										2		
	L8	Aug-09	EcoMetrix	baited minnow trap	3	19.5										19		
	L8	Aug-09	EcoMetrix	sm exp gillnet	1	19												
	L8	Aug-09	EcoMetrix	Nordic net	1	19										1		
L14	L14	Sep-06	NAR	dip net	-	-										7		
	L14	Aug-09	EcoMetrix	baited minnow trap	3	17										109		
	L14	Aug-09	EcoMetrix	sm exp gillnet	1	17												
	L14	Aug-09	EcoMetrix	Nordic net	1	17				1						1		
L15	L15	Sep-06	NAR	minnow trap	5	2										9		
	L15	Aug-09	EcoMetrix	baited minnow trap	4	17										4		
	L15	Jun-11	EcoMetrix	observed	-	-										p		
L20	L20	Aug-07	Golder	minnow trap	3	17												
(Terru Lake)	L20	Aug-09	EcoMetrix	baited minnow trap	4	23												
	L20	Aug-09	EcoMetrix	Nordic net	1	23												
	L20	Jun-11	EcoMetrix	baited minnow trap	4	92												
	L20	Jun-11	EcoMetrix	Nordic net	2	91.5												
	L20	Jun-11	EcoMetrix	sm exp gillnet	1	92												
	L20	Jun-11	EcoMetrix	electrofishing	-	387												
Stream 2	S3	Sep-07	Golder	electrofishing	-	-										12		
	S3	May-09	EcoMetrix	electrofishing	-	1452										14		
	S3	Oct-09	EcoMetrix	electrofishing	-	220										8		
	S4	Sep-07	Golder	electrofishing	-	-											5	
	S4	May-09	EcoMetrix	electrofishing	-	1557	2	2		2		1	2	2		1		26
	S4	Aug-09	EcoMetrix	electrofishing	-	1093	16		2	6			5	1	3	1		17
	S53	Jun-10	EcoMetrix	electrofishing	-	404	1		2									5
	S59	Jun-10	EcoMetrix	electrofishing	-	303												
	S59	Jun-11	EcoMetrix	electrofishing	-	154												
	S66	Jun-11	EcoMetrix	electrofishing	-	540			6									6
	S69	Jun-11	EcoMetrix	visual	-	-			17									
	S74	Jun-11	EcoMetrix	electrofishing	-	40												
	S75	Jun-11	EcoMetrix	electrofishing	-	106												
	S76	Jun-11	EcoMetrix	electrofishing		481												
	S77	Jun-11	EcoMetrix	electrofishing	-	118												
	S78	Jun-11	EcoMetrix	visual	-	-												

[1] - effort for electrofishing is in seconds

[2] - misidentified Lake Chub

TABLE 3.7: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 2 WATERSHED

	Lentic Stations								Stream Stations			
	L3[1]	L5[1]	L6[1]	L7[1]	L8[1]	L14[1]	L15[1]	L20	S3[2]	S4[2]	S59	S69
ROUNDWORMS												
P. Nemata	-	-	-	-	-	-	-	2%	-	-	10%	-
ANNELIDS												
P. Annelida												
WORMS												
Cl. Oligochaeta												
F. Enchytraeidae	-	-	-	-	-	-	-	2%	-	-	<1%	<1%
F. Naididae	-	-	P	P	-	-	-	2%	-	-	2%	-
F. Tubificidae	-	-	-	-	-	-	-	4%	-	-	-	-
F. Lumbricidae	-	-	-	-	-	-	-	-	-	-	-	<1%
F. Lumbriculidae	P	P	P	P	-	P	-	-	-	-	-	<1%
LEECHES												
Cl. Hirudinea												
F. Erpobdellidae	-	-	-	P	-	-	P	<1%	1%	-	-	-
F. Glossiphoniidae	-	-	P	-	P	-	-	<1%	-	-	-	-
ARTHROPODS												
P. Arthropoda												
MITES												
Cl. Arachnida												
O. Acarina	-	-	-	-	-	-	-	<1%	1%	-	<1%	2%
SEED SHRIMPS												
Cl. Ostracoda	-	-	-	-	-	-	-	-	-	-	-	<1%
WATER SCUDS												
O. Amphipoda												
F. Crangonyctidae	P	P	P	P	P	-	-	-	-	-	-	-
F. Hyalellidae	-	-	-	-	-	-	-	11%	-	-	-	-
F. Talitridae	-	-	P	-	P	P	-	-	-	-	-	-
SPRINGTAILS												
Cl. Entognatha												
O. Collembola	-	-	-	-	-	-	-	<1%	1%	-	-	<1%
INSECTS												
Cl. Insecta												
BEETLES												
O. Coleoptera												
F. Dytiscidae	-	-	P	-	-	-	-	<1%	-	-	<1%	-
F. Elmidae	-	-	-	-	-	-	-	-	<1%	-	-	-
F. Gyrinidae	-	P	P	-	-	-	-	<1%	-	-	-	-
F. Haliplidae	-	-	-	-	-	P	-	-	-	-	-	-
MAYFLIES												
O. Ephemeroptera												
F. Baetidae	-	-	P	-	-	-	-	-	-	23%	-	5%
F. Caenidae	-	-	P	-	P	-	-	<1%	-	-	-	-
F. Ephemerellidae	-	-	-	-	-	-	-	1%	2%	-	-	5%
F. Heptageniidae	-	-	-	-	-	-	-	-	-	-	-	<1%
F. Leptophlebiidae	-	-	P	-	-	-	-	-	1%	-	-	-
AQUATIC MOTHS												
O. Lepidoptera												
F. Pyralidae	-	-	-	-	-	P	P	<1%	-	-	-	-
O. Odonata												
DAMSELFLIES												
F. Coenagrionidae	P	-	P	P	-	-	-	-	-	-	-	-
DRAGONFLIES												
F. Aeshnidae	P	-	P	P	-	-	-	-	-	-	-	-
F. Corduliidae	P	P	P	-	P	-	-	<1%	-	-	<1%	-
F. Libellulidae	-	P	P	P	-	-	-	1%	-	-	-	-
STONEFLIES												
O. Plecoptera												
F. Capniidae	-	-	-	-	-	-	-	-	4%	24%	-	-
F. Leuctridae	-	-	-	-	-	-	-	-	-	11%	-	5%
F. Nemouridae	-	-	-	-	-	-	-	-	1%	7%	-	10%
F. Perlodidae	-	-	-	-	-	-	-	-	-	-	-	6%
BUGS												
O. Hemiptera												
F. Belostomatidae	-	-	-	-	-	P	-	-	-	-	-	-
F. Corixidae	-	-	P	-	P	P	P	<1%	-	-	<1%	-
F. Notonectidae	P	-	-	P	-	-	-	-	-	-	<1%	-

TABLE 3.7: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 2 WATERSHED (CONT.)

	Lentic Stations								Stream Stations			
	L3[1]	L5[1]	L6[1]	L7[1]	L8[1]	L14[1]	L15[1]	L20	S3[2]	S4[2]	S59	S69
CADDISFLIES												
O. Trichoptera												
F. Dipseudopsidae	-	-	-	-	-	-	-	<1%	-	-	-	-
F. Hydropsychidae	-	-	-	-	-	-	-	-	51%	17%	-	1%
F. Hydroptilidae	-	-	P	P	P	-	-	-	-	-	-	-
F. Lepidostomatidae	-	-	-	-	-	-	-	-	-	-	-	<1%
F. Leptoceridae	-	-	P	-	P	-	-	4%	-	-	-	-
F. Limnephilidae	-	-	-	P	-	-	P	1%	1%	-	-	5%
F. Philopotamidae	-	-	-	-	-	-	-	-	<1%	-	-	8%
F. Phryganeidae	-	P	P	P	P	P	P	-	-	-	-	-
F. Polycentropodidae	P	P	-	P	-	-	-	-	<1%	-	<1%	-
F. Rhyacophilidae	-	-	-	-	-	-	-	-	1%	-	-	<1%
TRUE FLIES												
O. Diptera												
indeterminate	-	-	-	-	-	-	-	-	-	-	-	<1%
BITING-MIDGE												
F. Ceratopogonidae	P	-	P	-	-	-	-	8%	1%	-	1%	-
PHANTOM MIDGE												
F. Chaoboridae	P	-	P	P	-	-	P	2%	-	-	-	-
MIDGES	-											
F. Chironomidae	P	P	P	P	P	P	P	49%	18%	7%	44%	36%
F. Dixidae	-	-	-	-	-	-	-	-	-	-	-	<1%
F. Empididae	-	-	-	-	-	-	-	-	<1%	-	-	-
F. Simuliidae	-	-	-	-	-	-	-	-	1%	-	37%	12%
F. Tipulidae	-	-	-	-	-	P	-	-	-	6%	-	-
MOLLUSCS												
P. Mollusca												
SNAILS												
Cl. Gastropoda												
F. Ancylidae	-	-	-	-	-	-	-	-	9%	-	-	-
F. Lymnaeidae	-	-	-	-	-	-	-	-	-	-	-	<1%
F. Planorbidae	-	-	-	-	-	-	P	-	-	-	-	-
F. Valvatidae	-	-	-	-	-	-	-	5%	-	-	-	-
CLAMS												
Cl. Bivalvia												
F. Sphaeriidae	P	P	-	P	P	-	-	4%	<1%	6%	2%	-

1 - From original NAR (2007) presence/absence benthic data.

2 - Calculated from original Golder (2009) benthic data.

P - present

Note: For sampling methods used see NAR (2007) and Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.8: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 2 WATERSHED

	Lentic Stations								Stream Stations			
	L3[1]	L5[1]	L6[1]	L7[1]	L8[1]	L14[1]	L15[1]	L20	S3[2]	S4[2]	S59	S69
TOTAL NUMBER OF ORGANISMS	-	-	-	-	-	-	-	3059	43	4	9933	3512
DENSITY (No./m^2)	-	-	-	-	-	-	-	-	459	47	-	-
TOTAL NUMBER OF TAXA	15	18	32	23	18	12	13	50	29	8	30	41
MEAN NUMBER OF TAXA	-	-	-	-	-	-	-	-	15	3	-	-
SIMPSON'S DIVERSITY	-	-	-	-	-	-	-	0.94	0.85	0.65	0.81	0.93
SIMPSON'S EVENNESS	-	-	-	-	-	-	-	0.33	0.48	0.93	0.17	0.37
TOTAL EPT	1	2	6	4	4	1	2	6	14	5	1	13
MEAN EPT	-	-	-	-	-	-	-	-	7.7	2.3	-	-
HILSENHOFF INDEX	6.57	5.53	5.61	5.86	6.17	5.64	6.50	7.06	4.48	3.38	6.66	4.24
EPT/CHIRONOMIDAE	-	-	-	-	-	-	-	0.14	4.11	4.00	0.01	1.33
MAYFLIES	-	-	-	-	-	-	-	2%	4%	23%	0%	12%
STONEFLIES	-	-	-	-	-	-	-	0%	5%	42%	0%	21%
CADDISFLIES	-	-	-	-	-	-	-	5%	54%	17%	<1%	14%
EPT	-	-	-	-	-	-	-	7%	63%	82%	<1%	47%
CHIRONOMIDS	-	-	-	-	-	-	-	49%	18%	7%	44%	36%
ANNELIDS	-	-	-	-	-	-	-	8%	<1%	0%	3%	<1%
SPHAERIID CLAMS	-	-	-	-	-	-	-	4%	<1%	6%	2%	0%

1 - From original NAR (2007) presence/absence benthic data.

2 - Calculated from original Golder (2009) benthic data.

P - present

Note: For sampling methods used see NAR (2007) and Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.9: SEDIMENT QUALITY FOR THE STREAM 3 WATERSHED

				Lentic Stations									Stream Stations	
	Units	LEL	SEL	L9 EcoMetrix	L9 NAR	L10 NAR	L11 NAR	L12 NAR	L13 EcoMetrix	L13a EcoMetrix	L16 EcoMetrix	L16 NAR	S19 Golder	S6 Golder
Physical Tests														
Total Phosphorus	(µg/g)	600	2000	374	710	1400	1600	680	952	871	28100	7950	1190	515
Total Kjeldahl Nitrogen	(µg/g)	550	4800	3520	17419	17239	18437	14000	8200	2300	9100	23313	-	-
Organic / Inorganic Carbon														
Total Organic Carbon	%	1	10	8.6	26	21	17	22	12	4.8	13	30	11	3.1
Total Metals														
Aluminum	(µg/g)	-	-	8140	5900	7310	9730	10600	17700	23500	6260	5410	19000	7300
Arsenic	(µg/g)	6	33	1.5	1.8	1.9	3.9	2.5	3.3	1.9	1.7	2.4	5.8	3.1
Cadmium	(µg/g)	0.6	10	<0.50	1.2	1.1	1.4	0.9	<0.50	<0.50	<0.50	1.1	1.2	0.1
Cobalt	(µg/g)	50		6.3	6.6	10	29	7.6	18	17	25	16	50	6.5
Copper	(µg/g)	16	110	67	167	368	1360	518	140	185	475	529	325	15.7
Iron	(µg/g)	20000	40000	9780	7560	648	8590	4910	18600	18700	33400	33600	-	-
Lead	(µg/g)	31	250	23.5	31	21	43	20	21	6.7	17	21	23	4.1
Molybdenum	(µg/g)	-	-	<1.0	0.9	0.8	1.7	0.6	1.1	<1.0	<1.0	0.7	1.6	<0.50
Nickel	(µg/g)	16	75	14.0	19	45	125	70	40	63	26	30	87	19
Selenium	(µg/g)	-	-	<1.0	2.2	3.0	3.0	2.1	<1.0	<1.0	2.4	3.3	<0.50	0.7
Zinc	(µg/g)	120	820	55.0	67	77	113	79	85	58	82	81	112	27

- Sample exceeds LEL value
- Sample exceeds SEL value

TABLE 3.10: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR THE STREAM 3 WATERSHED

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Rainbow Trout	Brook Trout	Longnose Dace	Mottled Sculpin	Slimy Sculpin	Johnny Darter
L9	L9	Aug-09	EcoMetrix	baited minnow trap	3	23						
	L9	Aug-09	EcoMetrix	sm exp gillnet	1	23						
	L9	Aug-09	EcoMetrix	Nordic net	1	23						
	L9	Jun-11	EcoMetrix	baited minnow trap	4	94						
	L9	Jun-11	EcoMetrix	Nordic net	2	94						
	L9	Jun-11	EcoMetrix	electrofishing	-	363						
L10 (Two Duck Lake)	L10	Sep-06	NAR	exp gillnet	1	4.5						
	L10	Sep-06	NAR	minnow trap	3	3.3						
	L10	Aug-07	Golder	minnow trap	3	19						
	L10	Aug-09	EcoMetrix	baited minnow trap	2	18						
	L10	Aug-09	EcoMetrix	sm exp gillnet	1	18						
	L10	Jun-11	EcoMetrix	baited minnow trap	4	94						
	L10	Jun-11	EcoMetrix	sm exp gillnet	2	94						
	L10	Jun-11	EcoMetrix	Nordic net	2	94						
	L10	Jun-11	EcoMetrix	electrofishing	-	409						
L11 (Two Duck Lake)	L11	Sep-06	NAR	FWIN	1	5.3						
	L11	Sep-06	NAR	minnow trap	3	3.5						
	L11	Aug-07	Golder	minnow trap	3	19						
	L11	Aug-07	Golder	Nordic net	1	20						
	L11	Aug-09	EcoMetrix	baited minnow trap	1	18						
	L11	Aug-09	EcoMetrix	sm exp gillnet	1	18						
	L11	Aug-09	EcoMetrix	Nordic net	1	18						
	L11	Jun-11	EcoMetrix	baited minnow trap	4	94						
	L11	Jun-11	EcoMetrix	sm exp gillnet	2	94						
	L11	Jun-11	EcoMetrix	Nordic net	2	94						
	L11	Jun-11	EcoMetrix	electrofishing	-	420						
L12	L12	Sep-06	NAR	FWIN	1	2						
	L12	Sep-06	NAR	minnow trap	6	2						
	L12	Aug-09	EcoMetrix	baited minnow trap	3	26						
	L12	Aug-09	EcoMetrix	sm exp gillnet	1	25						
	L12	Jun-11	EcoMetrix	baited minnow trap	4	95						
	L12	Jun-11	EcoMetrix	sm exp gillnet	2	95						
	L12	Jun-11	EcoMetrix	Nordic net	2	95						
	L12	Jun-11	EcoMetrix	sm exp gillnet	2	95						
	L12	Jun-11	EcoMetrix	Nordic net	2	95						
	L12	Jun-11	EcoMetrix	electrofishing	-	552						
L13	L13	Aug-09	EcoMetrix	baited minnow trap	3	19						
	L13	Jun-11	EcoMetrix	baited minnow trap	4	95						
	L13	Jun-11	EcoMetrix	Nordic net	1	95						
	L13	Jun-11	EcoMetrix	electrofishing	-	367						
	L13a	Aug-09	EcoMetrix	baited minnow trap	3	16.5						
	L13a	Jun-11	EcoMetrix	sm exp gillnet	4	95						
	L13a	Jun-11	EcoMetrix	Nordic net	1	95						
	L13a	Jun-11	EcoMetrix	electrofishing	-	420						
L16	L16	Aug-09	EcoMetrix	baited minnow trap	6	17						
	L16	Aug-09	EcoMetrix	Nordic net	1	17						
	L16	Jun-11	EcoMetrix	baited minnow trap	4	93						
	L16	Jun-11	EcoMetrix	sm exp gillnet	1	93						
	L16	Jun-11	EcoMetrix	Nordic net	2	93						
	L16	Jun-11	EcoMetrix	electrofishing	-	355						
Stream 3	S6	Sep-07	Golder	electrofishing	-	-	1	1		1		
	S6	May-09	EcoMetrix	electrofishing	-	1369					5	
	S6	Aug-09	EcoMetrix	electrofishing	-	1059	11		1		23	1
	S18	May-09	EcoMetrix	electrofishing	-	634						
	S18	Oct-09	EcoMetrix	electrofishing	-	100						
	S19	Sep-07	Golder	electrofishing	-	-						
	S52	Jun-10	EcoMetrix	electrofishing	-	373						
	S52	Jun-11	EcoMetrix	electrofishing	-	704						

[1] - effort for electrofishing is in seconds

TABLE 3.11: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 3 WATERSHED

	Lentic Stations								Stream Stations		
	L9	L10[1]	L11[1]	L12[1]	L13	L13a	L16[1]	L16	S6[2]	S18	S19[2]
ROUNDWORMS											
P. Nemata	3%	-	-	-	-	2%	-	-	-	1%	<1%
ANNELIDS											
P. Annelida											
WORMS											
Cl. Oligochaeta											
F. Enchytraeidae	<1%	-	-	-	-	-	-	-	6%	-	<1%
F. Naididae	3%	P	P	-	-	-	P	<1%	3%	-	-
F. Tubificidae	<1%	-	-	-	1%	<1%	-	-	-	-	<1%
F. Lumbricidae	-	-	-	-	-	-	-	-	8%	-	<1%
F. Lumbriculidae	1%	P	P	-	-	<1%	P	<1%	-	-	<1%
LEECHES											
Cl. Hirudinea											
F. Erpobdellidae	1%	-	P	-	-	-	-	<1%	6%	<1%	-
F. Glossiphoniidae	<1%	-	-	-	<1%	<1%	-	-	-	-	-
F. Haemopidae	-	-	-	-	-	<1%	-	<1%	-	-	-
ARTHROPODS											
P. Arthropoda											
MITES											
Cl. Arachnida											
O. Acarina	1%	P	-	-	<1%	4%	-	1%	11%	3%	<1%
SEED SHRIMPS											
Cl. Ostracoda	<1%	-	-	-	-	9%	-	3%	-	<1%	-
WATER SCUDS											
O. Amphipoda											
F. Crangonyctidae	-	P	P	P	-	-	P	1%	-	-	-
F. Hyalellidae	14%	-	-	-	4%	8%	-	25%	-	-	-
F. Talitridae	-	P	P	P	-	-	P	-	-	-	-
SPRINGTAILS											
Cl. Entognatha											
O. Collembola	-	-	-	-	-	-	-	-	-	2%	-
INSECTS											
Cl. Insecta											
BEETLES											
O. Coleoptera											
F. Chrysomelidae	-	-	-	-	<1%	-	-	-	-	-	-
F. Dytiscidae	<1%	-	-	-	<1%	1%	P	1%	-	<1%	-
F. Gyrinidae	-	-	P	-	-	2%	-	-	-	-	-
F. Haliplidae	<1%	-	P	-	2%	1%	P	2%	-	-	-
F. Hydrophilidae	-	-	-	-	-	2%	-	1%	-	<1%	-
F. Staphylinidae	-	-	-	-	-	-	-	-	-	<1%	-
MAYFLIES											
O. Ephemeroptera											
F. Baetidae	<1%	-	-	-	-	2%	P	2%	-	9%	-
F. Caenidae	<1%	-	-	-	-	-	P	5%	-	-	-
F. Ephemerellidae	-	-	-	-	-	-	-	-	-	6%	6%
F. Leptophlebiidae	-	-	-	-	-	-	P	-	-	-	<1%
F. Siphlonuridae	-	-	-	-	-	-	-	-	-	<1%	-
O. Odonata											
DAMSELFLIES											
F. Coenagrionidae	1%	P	-	P	<1%	<1%	P	-	-	-	-
F. Lestidae	-	-	-	-	<1%	-	-	-	-	-	-
DRAGONFLIES											
F. Aeshnidae	<1%	P	P	P	<1%	-	-	<1%	-	<1%	-
F. Cordulegastridae	-	-	-	-	<1%	-	-	-	-	-	<1%
F. Corduliidae/Libellulidae	-	-	-	-	<1%	-	-	-		-	
F. Corduliidae	<1%	-	P	P	1%	-	P	<1%	-	-	<1%
F. Gomphidae	-	-	-	-	-	-	-	-	-	-	-
F. Libellulidae	<1%	-	P	P	-	-	P	2%	-	-	-

TABLE 3.11: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 3 WATERSHED (CONT.)

	Lentic Stations								Stream Stations		
	L9	L10[1]	L11[1]	L12[1]	L13	L13a	L16[1]	L16	S6[2]	S18	S19[2]
STONEFLIES											
O. Plecoptera											
F. Capniidae	-	-	-	-	-	-	-	-	3%	-	-
F. Chloroperlidae	-	-	-	-	-	-	-	-	-	-	-
F. Leuctridae	-	-	-	-	-	-	-	-	5%	5%	2%
F. Nemouridae	-	-	-	-	-	-	-	-	-	6%	-
BUGS											
O. Hemiptera											
F. Corixidae	<1%	P	P	-	-	10%	P	4%	-	-	-
F. Gerridae	2%	-	-	-	-	<1%	-	-	-	-	-
F. Notonectidae	<1%	-	-	-	-	<1%	P	<1%	-	-	-
O. Neuroptera											
F.Sisyridae	-	-	-	-	-	-	P	-	-	-	-
CADDISFLIES											
O. Trichoptera											
F. Glossosomatidae	-	-	-	-	-	-	-	-	3%	-	-
F. Hydropsychidae	-	-	-	-	-	-	-	-	17%	<1%	1%
F. Hydroptilidae	-	P	-	P	-	-	P	-	-	-	-
F. Lepidostomatidae	-	-	-	-	-	-	-	-	-	1%	5%
F. Leptoceridae	<1%	-	-	-	-	-	-	1%	-	-	-
F. Limnephilidae	1%	-	-	-	-	3%	-	-	-	<1%	-
F. Philopotamidae	-	-	-	-	-	-	-	-	-	1%	-
F. Phryganeidae	3%	P	-	-	<1%	<1%	-	-	-	-	-
F. Polycentropodidae	-	P	P	P	<1%	-	P	-	6%	<1%	6%
F. Rhyacophilidae	-	-	-	-	-	-	-	-	-	-	<1%
TRUE FLIES											
O. Diptera											
indeterminate	-	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	<1%	-	-	<1%
BITING-MIDGE											
F. Ceratopogonidae	2%	P	-	P	1%	2%	-	1%	8%	2%	<1%
PHANTOM MIDGE											
F. Chaoboridae	-	P	P	P	-	<1%	P	6%	-	-	-
MIDGES											
F. Chironomidae	47%	P	P	P	78%	47%	P	27%	-	19%	32%
F. Empididae	-	-	-	-	-	-	-	-	22%	-	-
F. Psychodidae	-	-	-	-	-	-	-	-	3%	-	-
F. Simuliidae	-	-	-	-	-	-	-	-	-	40%	-
F. Tabanidae	-	-	-	-	1%	<1%	-	-	-	-	-
F. Tipulidae	-	-	-	-	<1%	-	-	<1%	-	1%	<1%
MOLLUSCS											
P. Mollusca											
SNAILS											
Cl. Gastropoda											
F. Ancylidae	-	P	-	-	-	-	-	-	3%	-	2%
F. Physidae	-	-	-	-	-	<1%	-	-	-	-	<1%
F. Planorbidae	-	P	-	-	-	<1%	-	<1%	-	-	-
CLAMS											
Cl. Bivalvia											
F. Sphaeriidae	12%	P	-	P	5%	3%	P	14%	-	-	38%

1 - From original NAR (2007) presence/absence benthic data.

2 - Calculated from original Golder (2009) benthic data.

P - present

Note: For sampling methods used see NAR (2007) and Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats

TABLE 3.12: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 3 WATERSHEI

	Lentic Stations								Stream Stations		
	L9	L10[1]	L11[1]	L12[1]	L13	L13a	L16[1]	L16	S6[2]	S18	S19[2]
TOTAL NUMBER OF ORGANISMS	2359	-	-	-	5445	2352	-	2842	8	1563	228
DENSITY (No./m^2)	-	-	-	-	-	-	-	-	83	-	2458
TOTAL NUMBER OF TAXA	46	21	20	17	28	47	23	38	15	42	28
MEAN NUMBER OF TAXA	-	-	-	-	-	-	-	-	7	-	16
SIMPSON'S DIVERSITY	0.91	-	-	-	0.87	0.93	-	0.87	0.82	0.80	0.63
SIMPSON'S EVENNESS	0.24	-	-	-	0.27	0.32	-	0.21	0.93	0.12	0.18
TOTAL EPT	5	3	1	2	2	4	5	4	6	11	6
MEAN EPT	-	-	-	-	-	-	-	-	2.0	-	5.7
HILSENHOFF INDEX	6.50	6.24	6.11	5.64	6.22	6.15	5.78	5.81	5.65	5.18	5.51
EPT/CHIRONOMIDAE	0.13	-	-	-	0.02	0.12	-	0.27	-	1.56	1.92
MAYFLIES	1%	-	-	-	0%	2%	-	6%	0%	15%	7%
STONEFLIES	0%	-	-	-	0%	0%	-	0%	8%	11%	2%
CADDISFLIES	5%	-	-	-	1%	4%	-	1%	25%	4%	13%
EPT	6%	-	-	-	1%	6%	-	7%	32%	29%	23%
CHIRONOMIDS	47%	-	-	-	78%	47%	-	27%	0%	19%	32%
ANNELIDS	8%	-	-	-	2%	1%	-	1%	22%	<1%	2%
SPHAERIID CLAMS	12%	-	-	-	5%	3%	-	14%	0%	0%	38%

1 - From original NAR (2007) presence/absence benthic data.

2 - Calculated from original Golder (2009) benthic data.

P - present

Note: For sampling methods used see NAR (2007) and Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.13: SEDIMENT QUALITY FOR THE STREAM 4 WATERSHED

				Lentic Stations				Stream Stations		
	Units	LEL	SEL	L21 Golder	L22 Golder	L18 Golder	L19 Golder	S8 Golder	S43 EcoMetrix	S51 Golder
Physical Tests										
Total Phosphorus	(µg/g)	600	2000	974	2100	3740	1970	556	651	4340
Total Kjeldahl Nitrogen	(µg/g)	550	4800	-	-	-	-	-	470	-
Organic / Inorganic Carbon										
Total Organic Carbon	%	1	10	39	14	7.8	24	2.7	0.66	1.22
Total Metals										
Aluminum	(µg/g)	-	-	5580	13000	12600	13600	19400	14000	10400
Arsenic	(µg/g)	6	33	0.6	0.9	1.9	3.3	6.5	2.1	1.4
Cadmium	(µg/g)	0.6	10	1.1	1.1	0.7	1.3	0.2	<0.50	0.3
Cobalt	(µg/g)	50		1.2	9.6	21	29	20	14	22
Copper	(µg/g)	16	110	13	39	191	234	28	16	20
Iron	(µg/g)	20000	40000	3200	15850	15700	35200	27100	22200	199000
Lead	(µg/g)	31	250	18	15	12	20	11	7.0	5.0
Molybdenum	(µg/g)	-	-	0.7	1.6	0.8	1.4	<0.50	<1.0	8.0
Nickel	(µg/g)	16	75	3.5	17	32	31	47	26	19
Selenium	(µg/g)	-	-	<0.50	<0.50	1	2.4	<0.50	<1.0	1.5
Zinc	(µg/g)	120	820	54	114	40	62	76	48	225

- Sample exceeds LEL value
- Sample exceeds SEL value

TABLE 3.14: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR THE STREAM 4 WATERSHED

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Rainbow Trout	Chinook Salmon	Brook Trout	Lake Chub	Pearl Dace[2]	Blacknose Shiner	Northern Redbelly Dace	Finescale Dace	Fathead Minnow	Longnose Sucker	White Sucker	Trout-perch	Brook Stickleback	Slimy Sculpin	Johnny Darter
L18	L18	Aug-07	Golder	minnow trap	3	18								439							
	L18	Aug-09	EcoMetrix	baited minnow trap	4	24						3	12	25	6	1			16		
	L18	Aug-09	EcoMetrix	Nordic net	1	24						3		12		2			2		
	L18	Aug-09	EcoMetrix	sm exp gillnet	1	24															
L19	L19	Aug-07	Golder	exp gillnet	1	28										1					
(Claw Lake)	L19	Aug-07	Golder	minnow trap	3	24							113	157	82						
	L19	Aug-07	Golder	Nordic net	1	28					14	3			3	36			1		
L21	L21	Aug-07	Golder	minnow trap	3	19															
	L21	Jun-11	EcoMetrix	baited minnow trap	4	97.5															
	L21	Jun-11	EcoMetrix	Nordic net	2	97.5															
	L21	Jun-11	EcoMetrix	sm exp gillnet	1	97.5															
	L21	Jun-11	EcoMetrix	electrofishing	-	306															
L22	L22	Aug-07	Golder	exp gillnet	1	23															
	L22	Aug-07	Golder	minnow trap	3	19															
	L22	Aug-07	Golder	Nordic net	1	23															
	L22	Jun-11	EcoMetrix	baited minnow trap	3	97															
	L22	Jun-11	EcoMetrix	Nordic net	2	97															
	L22	Jun-11	EcoMetrix	sm exp gillnet	1	97															
	L22	Jun-11	EcoMetrix	electrofishing	-	286															
Stream 4	S8	Sep-07	Golder	electrofishing	-	-								73					4		
	S8	May-09	EcoMetrix	electrofishing	-	981				1		1	18	17	1				9		
	S43	May-09	EcoMetrix	electrofishing	-	1097	9	2	1					1			7		2	3	
	S43	Aug-09	EcoMetrix	electrofishing	-	964	23											2	1	1	1
	S51	Sep-07	Golder	electrofishing	-	-															
	S51A	Jun-11	EcoMetrix	electrofishing	-	440								P					P		
	S70	Jun-11	EcoMetrix	electrofishing	-	259															
	S71	Jun-11	EcoMetrix	electrofishing	-	410															
	S72	Jun-11	EcoMetrix	electrofishing	-	146															
	S73	Jun-11	EcoMetrix	electrofishing	-	140															

[1] - effort for electrofishing is in seconds

[2] - misidentified Lake Chub

P - present

TABLE 3.15: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 4 WATERSHED

	Lentic Stations				Stream Stations			
	L18[1]	L19[1]	L21[1]	L22[1]	S8[1]	S43	S51[1]	S51A
ROUNDWORMS								
P. Nemata	3%	<1%	1%	2%	<1%	5%	2%	3%
ANNELIDS								
P. Annelida								
WORMS								
Cl. Oligochaeta								
F. Enchytraeidae	2%	<1%	-	-	-	5%	<1%	<1%
F. Naididae	<1%	<1%	10%	<1%	<1%	-	-	-
F. Tubificidae	2%	6%	-	2%	-	-	1%	-
F. Lumbricidae	-	-	-	-	-	5%	-	-
F. Lumbriculidae	<1%	2%	<1%	<1%	-	-	<1%	-
LEECHES								
Cl. Hirudinea								
F. Erpobdellidae	<1%	-	-	-	<1%	-	<1%	<1%
F. Glossiphoniidae	1%	-	-	<1%	-	-	<1%	-
ARTHROPODS								
P. Arthropoda								
MITES								
Cl. Arachnida								
O. Acarina	<1%	<1%	<1%	<1%	-	-	2%	2%
SEED SHRIMPS								
Cl. Ostracoda	<1%	-	-	<1%	-	-	-	-
WATER SCUDS								
O. Amphipoda								
F. Crangonyctidae	<1%	<1%	-	<1%	-	-	-	-
F. Hyalellidae	7%	9%	-	9%	-	-	6%	-
SPRINGTAILS								
Cl. Entognatha								
O. Collembola	-	-	-	-	-	-	-	-
INSECTS								
Cl. Insecta								
BEETLES								
O. Coleoptera								
F. Dytiscidae	-	-	<1%	-	-	-	-	-
F. Elmidae	-	-	-	-	<1%	-	-	-
F. Haliplidae	-	<1%	-	<1%	-	-	-	-
MAYFLIES								
O. Ephemeroptera								
F. Arthropleidae	-	-	-	-	-	-	-	-
F. Baetidae	-	1%	-	-	-	26%	-	-
F. Caenidae	11%	28%	-	3%	-	-	-	-
F. Ephemerellidae	<1%	<1%	-	4%	3%	-	1%	<1%
F. Heptageniidae	-	-	-	-	-	-	-	-
F. Leptophlebiidae	<1%	1%	-	4%	2%	-	14%	-
F. Siphlonuridae	-	-	-	-	-	-	-	<1%
AQUATIC MOTHS								
O. Lepidoptera								
F. Pyralidae	-	<1%	-	-	-	-	-	-
O. Odonata								
DAMSELFLIES								
F. Coenagrionidae	<1%	<1%	<1%	<1%	-	-	-	-
F. Lestidae	-	-	-	-	-	-	-	-
DRAGONFLIES								
F. Aeshnidae	-	-	<1%	-	-	-	<1%	-
F. Corduliidae	<1%	<1%	1%	<1%	<1%	-	-	-
F. Gomphidae	-	<1%	-	-	-	-	-	-
F. Libellulidae	<1%	<1%	5%	-	-	-	-	-

TABLE 3.15: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 4 WATERSHED (CONT.)

	Lentic Stations				Stream Stations			
	L18[1]	L19[1]	L21[1]	L22[1]	S8[1]	S43	S51[1]	S51A
STONEFLIES								
O. Plecoptera								
F. Leuctridae	-	-	-	-	-	-	-	<1%
F. Nemouridae	-	-	-	-	-		-	<1%
BUGS								
O. Hemiptera								
F. Corixidae	<1%	-	<1%	-	-	-	-	-
F. Notonectidae	-	-	-	-	-	-	-	-
CADDISFLIES								
O. Trichoptera								
F. Dipseudopsidae	-	-	-	<1%	-	-	-	-
F. Hydropsychidae	-	-	-	-	1%	-	4%	-
F. Hydroptilidae	<1%	-	-	<1%	-	-	3%	-
F. Lepidostomatidae	-	-	-	-	2%	5%	3%	2%
F. Leptoceridae	<1%	2%	-	3%	2%	-	-	-
F. Limnephilidae	<1%	-	-	-	<1%	11%	4%	2%
F. Molannidae	-	-	-	-	-	-	<1%	-
F. Phryganeidae	<1%	1%	1%	<1%	-	-	-	-
F. Polycentropodidae	-	-	1%	<1%	<1%	-	2%	<1%
F. Rhyacophilidae	-	-	-	-	-	-	1%	-
TRUE FLIES								
O. Diptera								
indeterminate	-	-	-	-	-	-	-	<1%
pupae	-	-	-	-	-	-	-	-
BITING-MIDGE								
F. Ceratopogonidae	3%	1%	2%	3%	1%	-	7%	<1%
PHANTOM MIDGE								
F. Chaoboridae	-	-	<1%	-	-	-	-	-
MIDGES								
F. Chironomidae	63%	36%	74%	45%	5%	26%	40%	72%
F. Empididae	-	-	-	-	-	-	-	<1%
F. Psychodidae	-	-	-	-	<1%	-	-	-
F. Simuliidae	-	-	-	-	3%	-	-	13%
F. Tabanidae	-	<1%	<1%	<1%	-	5%	-	-
F. Tipulidae	-	-	<1%	<1%	-	11%	1%	<1%
MOLLUSCS								
P. Mollusca								
SNAILS								
Cl. Gastropoda								
F. Ancylidae	-	-	-	<1%	<1%	-	-	-
F. Planorbidae	<1%	3%	-	<1%	-	-	-	-
CLAMS								
Cl. Bivalvia								
F. Sphaeriidae	3%	6%	-	20%	78%	-	8%	<1%
F. Unionidae	-	<1%	-	-	-	-	-	-

1 - Calculated from original Golder (2009) benthic data.

Note: For sampling methods used see Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.16: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 4 WATERSHED

	Lentic Stations				Stream Stations			
	L18[1]	L19[1]	L21[1]	L22[1]	S8[1]	S43	S51[1]	S51A
TOTAL NUMBER OF ORGANISMS	2770	514	2468	1780	155	152	66	5300
DENSITY (No./m^2)	39571	7338	35262	25424	1665	-	710	-
TOTAL NUMBER OF TAXA	63	54	37	52	27	11	32	31
MEAN NUMBER OF TAXA	39	30	24	35	15	-	17	-
SIMPSON'S DIVERSITY	0.91	0.87	0.85	0.90	0.39	0.86	0.85	0.77
SIMPSON'S EVENNESS	0.30	0.27	0.29	0.29	0.11	0.67	0.43	0.14
TOTAL EPT	9	8	4	7	8	4	9	7
MEAN EPT	5	4	2	6	6	-	6	-
HILSENHOFF INDEX	7.06	7.05	7.50	6.07	5.58	5.20	4.43	6.14
EPT/CHIRONOMIDAE	0.28	0.94	0.03	0.33	5.01	1.60	0.85	0.10
MAYFLIES	11%	30%	0%	11%	5%	26%	15%	1%
STONEFLIES	0%	0%	0%	0%	0%	0%	0%	1%
CADDISFLIES	2%	3%	2%	4%	6%	16%	16%	5%
EPT	13%	33%	2%	15%	11%	42%	31%	7%
CHIRONOMIDS	63%	36%	74%	45%	5%	26%	40%	72%
ANNELIDS	7%	9%	11%	3%	<1%	11%	3%	<1%
SPHAERIID CLAMS	3%	6%	0%	20%	78%	0%	8%	<1%

1 - Calculated from original Golder (2009) benthic data.

Note: For sampling methods used see Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.17: SEDIMENT QUALITY FOR THE STREAM 5 WATERSHED

				Lentic Stations								Stream Stations			
	Units	LEL	SEL	L4 EcoMetrix	L17 Golder	L25 EcoMetrix	L27 EcoMetrix	Bamoos Littoral EcoMetrix	Bamoos Profundal EcoMetrix	Hare Littoral EcoMetrix	Hare Profundal EcoMetrix	S9 Golder	S10 Golder	S11 Golder	S41 EcoMetrix
Physical Tests															
Total Phosphorus	(µg/g)	600	2000	890	1060	876	793	3074	2260	786	1256	650	1230	319	1020
Total Kjeldahl Nitrogen	(µg/g)	550	4800	12900	-	19500	14500	4482	11492	5622	10686	-	-	-	1400
Organic / Inorganic Carbon															
Total Organic Carbon	%	1	10	13	13	15	25	6.4	12	6.2	12	10	1.1	0.95	1.2
Total Metals															
Aluminum	(µg/g)	-	-	9230	14700	11600	9060	9064	26840	14320	21860	7450	12100	5600	6340
Arsenic	(µg/g)	6	33	3.7	1.7	2.8	2.9	1.8	10	3.9	14	3.4	3.7	1.2	<1.0
Cadmium	(µg/g)	0.6	10	1.1	1.6	1.4	1.1	0.6	2.4	1.4	3.5	0.37	0.4	0.25	<0.50
Cobalt	(µg/g)		50	1.4	6.3	1.5	1.2	8.7	19	9.8	19	2.7	11	4.3	7.5
Copper	(µg/g)	16	110	12	16	11	11	18	100	21	32	4.4	7.7	7.2	17
Iron	(µg/g)	20000	40000	8250	11400	9360	7890	14474	36940	19940	47500	18600	66500	13300	31800
Lead	(µg/g)	31	250	31.3	15	20	20	16	46	18	65	14	8.2	4.5	4.4
Molybdenum	(µg/g)	-	-	1	1.5	1.2	1.4	<1.0	1.5	0.7	1.7	1.0	3.4	0.7	1.3
Nickel	(µg/g)	16	75	6.2	14	5.5	4.3	12	26	15	17	4.4	9.9	9.4	12
Selenium	(µg/g)	-	-	1.3	<0.50	1.4	2.1	0.6	2.7	1.0	2.5	<0.50	<0.50	0.6	<1.0
Zinc	(µg/g)	120	820	56	126	82	59	114	231	208	338	45	98	52	49

- Sample exceeds LEL value
- Sample exceeds SEL value

TABLE 3.18: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR THE STREAM 5 WATERSHED

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Rainbow Trout	Chinook Salmon	Brook Trout	Lake Trout	Cisco	Lake Whitefish	Rainbow Smelt	Northern Pike	Lake Chub	Spottail Shiner	Finescale Dace	Fathead Minnow	Longnose Dace	Longnose Sucker	White Sucker	Trout-perch	Burbot	Brook Stickleback	Ninespine Stickleback	Mottled Sculpin	Slimy Sculpin	Spoonhead Sculpin	Yellow Perch	Logperch	Walleye
L4	L4	Sep-06	NAR	minnow trap	6	2.5																									
	L4	Sep-06	NAR	dip net	-	-									4																
	L4	Aug-07	Golder	minnow trap	2	17																									
	L4	Aug-09	EcoMetrix	baited minnow trap	3	19									1																
	L4	Jun-10	EcoMetrix	baited minnow trap	5	98									9																
	L4	Jun-10	EcoMetrix	Nordic net	2	98									259									2							
	L4	Jun-10	EcoMetrix	sm exp gillnet	1	98																									
L17	L17	Aug-07	Golder	minnow trap	3	20																									
	L17	Aug-07	Golder	Nordic net	1	20									1																
	L17	Aug-09	EcoMetrix	baited minnow trap	4	23																		3							
	L17	Aug-09	EcoMetrix	sm exp gillnet	1	24																									
	L17	Jun-10	EcoMetrix	baited minnow trap	3	96																		6							
	L17	Jun-10	EcoMetrix	Nordic net	2	96									1																
	L17	Jun-10	EcoMetrix	sm exp gillnet	1	96																									
L23	L23	Aug-09	EcoMetrix	baited minnow trap	1	22																									
	L23	Aug-09	EcoMetrix	Nordic net	1	22																									
	L23	Aug-09	EcoMetrix	sm exp gillnet	1	21																									
L25	L25	Jun-10	EcoMetrix	baited minnow trap	3	97																									
	L25	Jun-10	EcoMetrix	Nordic net	2	97																									
	L25	Jun-10	EcoMetrix	sm exp gillnet	1	97																									
	L25	Jun-11	EcoMetrix	baited minnow trap	4	92																									
	L25	Jun-11	EcoMetrix	Nordic net	2	92																									
	L25	Jun-11	EcoMetrix	sm exp gillnet	2	92																									
	L25	Jun-11	EcoMetrix	electrofishing	-	510																									
L27	L27	Aug-09	EcoMetrix	baited minnow trap	4	23																									
	L27	Aug-09	EcoMetrix	Nordic net	1	23																									
	L27	Jun-10	EcoMetrix	baited minnow trap	3	97																									
	L27	Jun-10	EcoMetrix	Nordic net	1	97																									
	L27	Jun-10	EcoMetrix	sm exp gillnet	1	97																									
	L27	Jun-11	EcoMetrix	baited minnow trap	4	92																									
	L27	Jun-11	EcoMetrix	Nordic net	2	92																									
	L27	Jun-11	EcoMetrix	sm exp gillnet	2	92																									
	L27	Jun-11	EcoMetrix	electrofishing	-	376																									
Bamoos Lake	-	1982	OMNR	survey	-	-			P	P	P	P			P						P	P	P	P	P		P				
	BL	Aug-09	EcoMetrix	exp gillnet	4	23			2	21	15									34	4										
	BL	Aug-09	EcoMetrix	sm exp gillnet	3	23			4	8										70	15										
	BL	Aug-09	EcoMetrix	Nordic net	2	21			2						22					14	4	2									
	BL	Aug-09	EcoMetrix	trap net	2	23									36					4	3	26		1	2						
	BL	Aug-09	EcoMetrix	seine net	-	400									1										17		4				
	BL	Aug-09	EcoMetrix	baited minnow trap	7	22									50		5	2				1		5			1				
Hare Lake	-	Jun-51	OMNR	stocking	-	-																									S
	-	1953	OMNR	stocking	-	-																									S
	-	Jul-60	OMNR	gillnet	-	-				P	P									P									P		
	-	Aug-75	OMNR	survey	-	-				P	P			P		P				P		P							P	P	
	-	Aug-91	OMNR	survey	-	-					P			P		P		P		P		P							P	P	
	HL	Aug-09	EcoMetrix	seine net	1	400										12													3	60	
	HL	Aug-09	EcoMetrix	baited minnow trap	8	20										1															
	HL	Aug-09	EcoMetrix	trap net	2	18									2		87												293		
	HL	Aug-09	EcoMetrix	exp gillnet	6	20					2				8								1						4		
	HL	Aug-09	EcoMetrix	sm exp gillnet	3	20									9														3		
	HL	Sep-11	EcoMetrix	exp gillnet	20	20				1					43					2									51		
	HL	Sep-11	EcoMetrix	Nordic net	16	20					29				25		156			3		3						1	462	21	
Stream 5	S9	Sep-07	Golder	electrofishing	-	-																		53							
	S10	Sep-07	Golder	minnow trap	4	20																									
	S10	Sep-07	Golder	electrofishing	-	-			2															22							
	S20	Jun-10	EcoMetrix	electrofishing	-	154																									
	S20	Jun-11	EcoMetrix	electrofishing	-	453																									
	S22	Jun-10	EcoMetrix	electrofishing	-	460																		11							
	S60	Jun-10	EcoMetrix	electrofishing	-	278																									
	S61	Jun-10	EcoMetrix	electrofishing	-	222																									
	S62	Jun-10	EcoMetrix	electrofishing	-	198																									
Bamoos Creek	S41	Oct-09	EcoMetrix	electrofishing	-	623			6																		12				
Hare Creek	S11	Sep-07	Golder	minnow trap	4	-	1		5											7											
	S11	May-09	EcoMetrix	electrofishing	-	1551	10	2	9											2							2				
	S30	May-09	EcoMetrix	electrofishing	-	1814	11	1	2				1						48	1					1	37					

P - present; S -stocked

[1] - effort for electrofishing is in seconds

[2] - misidentified Lake Chub

TABLE 3.19: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 5 WATERSHED

	Lentic Stations								Stream Stations								
	L4[1]	L17[2]	L25	L27	Bamoos Lake Profundal[3]	Bamoos Lake Littoral[3]	Hare Lake Profundal[3]	Hare Lake Littoral[3]	S9[2]	S10[2]	Hare Creek S11[2]	Hare Creek S11[3]	S20	S41	S60	S61	S62
ROUNDWORMS																	
P. Nemata	-	8%	35%	7%	1%	<1%	5%	8%	<1%	-	-	<1%	2%	-	1%	2%	<1%
FLATWORMS																	
P. Platyhelminthes																	
Cl. Turbellaria																	
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Tricladida	-	-	-	-	-	-	-	-	-	-	-	-	-	<1%	-	-	-
ANNELIDS																	
P. Annelida																	
WORMS																	
Cl. Oligochaeta																	
F. Enchytraeidae	-	-	-	<1%	-	-	-	-	<1%	2%	-	<1%	-	<1%	-	-	<1%
F. Naididae	-	7%	-	<1%	-	-	-	<1%	-	-	<1%	<1%	-	-	-	-	-
F. Tubificidae	-	5%	-	<1%	1%	5%	-	3%	-	2%	-	<1%	<1%	<1%	-	-	-
F. Lumbricidae	-	-	-	-	-	-	-	-	-	-	<1%	<1%	-	2%	-	-	-
F. Lumbriculidae	-	<1%	-	-	-	-	-	<1%	<1%	-	<1%	-	-	-	<1%	-	-
F. Sparganophilidae	-	-	-	<1%	-	-	-	<1%	-	-	-	-	-	-	-	-	-
LEECHES																	
Cl. Hirudinea																	
F. Erpobdellidae	-	-	-	-	-	-	-	-	<1%	3%	<1%	-	<1%	-	-	-	-
F. Glossiphoniidae	-	-	-	-	-	-	-	-	-	-	-	-	<1%	-	-	-	-
F. Haemopidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS																	
P. Arthropoda																	
MITES																	
Cl. Arachnida																	
O. Acarina	P	3%	1%	1%	-	7%	4%	4%	-	2%	-	<1%	5%	<1%	1%	6%	-
SEED SHRIMPS																	
Cl. Ostracoda	-	<1%	-	-	-	-	3%	4%	-	-	-	-	-	-	-	-	-
WATER SCUDS																	
O. Amphipoda																	
F. Crangonyctidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hyalellidae	-	-	-	-	-	-	-	8%	-	-	<1%	-	-	-	-	-	-
F. Pontoporeiidae	-	-	-	-	2%	-	<1%	-	-	-	-	-	-	-			
AQUATIC SOW BUGS																	
O. Isopoda																	
F. Asellidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPOSSUM SHRIMPS																	
O. Mysidacea	-	-	-	-	2%	-	-	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS																	
Cl. Entognatha																	
O. Collembola	-	-	<1%	-	-	-	-	-	-	-	-	-	-	-	2%	<1%	-
INSECTS																	
Cl. Insecta																	
BEETLES																	
O. Coleoptera																	
F. Chrysomelidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dryopidae	-	-	-	-	-	-	-	-	-	-	-	<1%	-	-	-	-	-
F. Dytiscidae	-	-	<1%	-	-	-	-	-	-	2%	-	-	<1%	-	-	<1%	<1%
F. Elmidae	-	-	-	-	-	<1%	-	-	-	-	-	<1%	-	<1%	-	-	-
F. Gyrinidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Haliplidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydrophilidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES																	
O. Ephemeroptera																	
F. Arthropleidae	-	-	<1%	-	-	-	-	-	-	-	-	-	-	-	<1%	-	-
F. Baetidae	-	-	-	-	-	-	-	-	-	-	<1%	<1%	-	12%	-	-	-
F. Caenidae	-	-	-	-	-	-	-	-	-	3%	-	-	-	-	-	-	-
F. Ephemeridae	-	-	-	-	-	4%	-	2%	-	-	-	-	-	-	-	-	-
F. Ephemerellidae	-	-	-	-	-	-	-	-	3%	-	4%	12%	1%	9%	-	-	-
F. Heptageniidae	-	-	-	-	-	-	-	-	-	-	10%	3%	-	4%	-	-	-
F. Leptophlebiidae	P	-	-	-	-	-	-	-	8%	2%	8%	11%	-	7%	-	-	-
AQUATIC MOTHS																	
O. Lepidoptera																	
F. Pyralidae	-	<1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Megaloptera																	
ALDERFLIES																	
F. Sialidae	-	-	-	-	-	3%	-	-	-	-	-	-	-	-	-	-	-
O. Odonata																	
DAMSELFLIES																	
F. Coenagrionidae	-	-	-	1%	-	-	-	-	-	-	-	-	-	-	-	-	<1%
F. Lestidae	-	-	1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 3.19: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 5 WATERSHED (CONT.)

	Lentic Stations								Stream Stations								
	L4[1]	L17[2]	L25	L27	Bamoos Lake Profundal[3]	Bamoos Lake Littoral[3]	Hare Lake Profundal[3]	Hare Lake Littoral[3]	S9[2]	S10[2]	Hare Creek S11[2]	Hare Creek S11[3]	S20	S41	S60	S61	S62
DRAGONFLIES																	
F. Aeshnidae	P	<1%	-	<1%	-	-	-	-	<1%	-	-	<1%	-	-	-	<1%	<1%
F. Cordulegastridae	-	-	-	-	-	-	-	-	-	-	-	<1%	-	-	-	-	-
F. Corduliidae/Libellulidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Corduliidae	-	-	-	-	-	-	-	<1%	<1%	-	-	-	<1%	-	-	<1%	-
F. Gomphidae	-	-	-	-	-	-	-	-	-	-	<1%	3%	-	<1%	-	-	-
F. Libellulidae	P	<1%	-	-	-	-	-	-	-	-	-	-	-	-	<1%	-	<1%
STONEFLIES																	
O. Plecoptera																	
F. Capniidae	-	-	-	-	-	-	-	-	-	12%	1%	2%	-	9%	-	-	-
F. Chloroperlidae	-	-	-	-	-	-	-	-	-	-	-	<1%	-	<1%	-	-	-
F. Leuctridae	-	-	-	-	-	-	-	-	<1%	5%	-	<1%	3%	7%	-	-	-
F. Nemouridae	-	-	-	-	-	-	-	-	<1%	-	-	-	-	<1%	-	-	-
F. Perlidae		-							-	-	2%	1%		-			
F. Perlodidae	-	-	-	-	-	-	-	-	-	-	-	<1%	-	6%	-	-	-
F. Taeniopterygidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BUGS																	
O. Hemiptera												-					
F. Corixidae	-	-	<1%	-	-	-	-	-	-	-	-	-	-	-	3%	-	-
F. Gerridae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Notonectidae	-	-	-	2%	-	-	-	-	-	-	-	-	-	-	<1%	-	<1%
CADDISFLIES																	
O. Trichoptera																	
F. Glossosomatidae	-	-	-	-	-	-	-	-	-	-	<1%	<1%	-	-	-	-	-
F. Hydropsychidae	-	-	-	-	-	-	-	-	30%	15%	23%	8%	2%	9%	-	<1%	-
F. Hydroptilidae	P	<1%	-	-	-	-	-	-	-	-	-	<1%	-	-	-	-	-
F. Lepidostomatidae	-	-	-	-	-	-	-	-	-	3%	3%	2%	6%	2%	-	-	-
F. Leptoceridae	-	5%	<1%	-	-	-	-	1%	3%	-	-	4%	-	-	-	-	-
F. Limnephilidae	-	-	-	-	-	-	-	-	<1%	6%	<1%	-	<1%	<1%	-	2%	<1%
F. Molannidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Odontoceridae	-	-	-	-	-	-	-	-	-	-	<1%	<1%	-	-	-	-	-
F. Philopotamidae	-	-	-	-	-	-	-	-	-	-	-	<1%	-	-	-	-	-
F. Phryganeidae	-	<1%	-	<1%	-	-	-	-	-	-	-	-	-	-	<1%	-	<1%
F. Polycentropodidae	P	-	1%	-	-	-	-	<1%	-	4%	10%	1%	<1%	-	1%	-	<1%
F. Rhyacophilidae	-	-	-	-	-	-	-	-	-	-	2%	5%	-	2%	-	-	-
TRUE FLIES																	
O. Diptera																	
indeterminate	-	<1%	-	-	-	-	-	-	-	-	-	-	<1%	-	-	<1%	-
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BITING-MIDGE																	
F. Ceratopogonidae	-	5%	2%	2%	-	4%	-	<1%	<1%	18%	3%	<1%	<1%	<1%	2%	4%	<1%
PHANTOM MIDGE																	
F. Chaoboridae	P	1%	<1%	<1%	-	-	-	-	-	-	-	-	-	-	<1%	-	-
MIDGES																	
F. Chironomidae	P	54%	54%	82%	49%	51%	47%	39%	3%	7%	8%	15%	28%	28%	86%	51%	36%
F. Culicidae			-	-								-	-		<1%	-	-
F. Dixidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Empididae	-	-	-	-	-	-	-	-	2%	-	-	<1%	<1%	<1%	-	-	-
F. Psychodidae	-	-	-	<1%	-	-	-	-	<1%	-	-	-	33%	-	-	28%	61%
F. Simuliidae	-	-	-	-	-	-	-	-	<1%	4%	-	1%	-	-	-	-	-
F. Tabanidae	-	<1%	-	-	-	-	-	<1%	-	-	-	-	-	-	-	-	-
F. Tipulidae	-	-	-	-	-	-	<1%	-	-	4%	<1%	<1%	-	<1%	-	-	-
MOLLUSCS																	
P. Mollusca																	
SNAILS																	
Cl. Gastropoda																	
F. Ancylidae	-	<1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydrobiidae	-	-	-	-	-	-	-	1%	-	-	<1%	-	-	-	-	-	-
F. Lymnaeidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Physidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Planorbidae	-	-	-	-	-	-	-	-	-	-	<1%	<1%	-	-	-	-	-
CLAMS																	
Cl. Bivalvia																	
F. Sphaeriidae	-	8%	3%	<1%	45%	26%	39%	27%	48%	6%	18%	27%	17%	-	1%	5%	<1%
F. Unionidae	-	-	-	-	-	-	-	<1%	-	-	-	-	-	-	-	-	-

1 - From original NAR (2007) presence/absence benthic data.
2 - Calculated from original Golder (2009) benthic data.
3 - Calculated from a mean of five samples.
Note: For sampling methods used see NAR (2007) and Golder (2009).
With exception of Hare Lake, Bamoos Lake and Hare Creek, EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.
Hare Lake and Bamoos Lake samples collected using petite Ponar.
S11 samples collected with a 500µm Surber sampler.

TABLE 3.20: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 5 WATERSHED

	Lentic Stations								Stream Stations								
	L4[1]	L17[2]	L25	L27	Bamoos Lake Profundal[3]	Bamoos Lake Littoral[3]	Hare Lake Profundal[3]	Hare Lake Littoral[3]	S9[2]	S10[2]	Hare Creek S11[2]	Hare Creek S11[3]	S20	S41	S60	S61	S62
TOTAL NUMBER OF ORGANISMS	-	280	7216	3795	38	115	80	386	242	15	89	992	3708	17568	3592	1099	4857
DENSITY (No./m^2)	-	4000	-	-	543	1646	1140	5516	2605	165	954	3553	-	-	-	-	-
TOTAL NUMBER OF TAXA	15	41	23	24	11	17	12	37	28	21	39	60	28	50	31	25	21
MEAN NUMBER OF TAXA	-	20	-	-	6	8	6	14	16	9	22	33	-	-	-	-	-
SIMPSON'S DIVERSITY	-	0.88	0.81	0.81	0.67	0.80	0.68	0.84	0.67	0.80	0.89	0.76	0.82	0.94	0.88	0.87	0.56
SIMPSON'S EVENNESS	-	0.51	0.22	0.22	0.52	0.73	0.57	0.52	0.20	0.66	0.42	0.18	0.20	0.32	0.27	0.30	0.11
TOTAL EPT INDEX	-	3	3	1	0	1	0	3	9	9	16	26	6	25	3	2	3
MEAN EPT INDEX	-	1	-	-	0.0	0.6	0.0	1.0	7	4	12	16	-	-	-	-	-
HILSENHOFF INDEX	6.07	7.68	7.45	7.10	6.79	6.09	7.45	6.17	5.18	4.21	4.30	3.99	5.51	4.45	7.87	6.58	6.46
EPT/CHIRONOMIDAE	-	0.12	0.04	0.01	0.00	0.09	0.00	0.10	3.50	7.00	9.45	3.90	0.45	2.42	0.02	0.04	0.02
MAYFLIES	-	0%	<1%	0%	0%	4%	0%	2%	10%	5%	23%	26%	1%	32%	<1%	0%	0%
STONEFLIES	-	0%	0%	2%	0%	0%	0%	0%	<1%	17%	3%	4%	3%	22%	0%	0%	0%
CADDISFLIES	-	6%	2%	<1%	0%	0%	0%	2%	33%	28%	39%	21%	9%	13%	<1%	2%	<1%
EPT	-	6%	2%	<1%	0%	4%	0%	3%	44%	50%	65%	51%	13%	67%	1%	2%	<1%
CHIRONOMIDS	-	54%	54%	82%	49%	51%	47%	39%	3%	7%	8%	15%	28%	28%	86%	51%	36%
ANNELIDS	-	13%	0%	3%	1%	5%	0%	4%	2%	7%	3%	<1%	<1%	3%	<1%	0%	<1%
SPHAERIID CLAMS		8%	3%	<1%	45%	26%	39%	27%	48%	6%	18%	27%	17%	0%	1%	5%	<1%

1 - From original NAR (2007) presence/absence benthic data.

2 - Calculated from original Golder (2009) benthic data.

3 - Calculated from a mean of five samples.

Note: For sampling methods used see NAR (2007) and Golder (2009).

With exception of Hare Lake, Bamoos Lake and Hare Creek, EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

Hare Lake and Bamoos Lake samples collected using petite Ponar.

S11 samples collected with a 500µm Surber sampler.

TABLE 3.21: MEAN FISH TISSUE METAL CONCENTRATIONS

a) MEAN FISH TISSUE METAL CONCENTRATIONS FOR HARE LAKE AND BAMOOS LAKE

				Hare Lake			Bamoos Lake		
				Spottail Shiner	Northern Pike		Lake Chub	Lake Trout	
Parameter	**n**	**Units**	**MDL**	whole	muscle	liver	whole	muscle	liver
Aluminum	5	mg/kg	2	<2	<2	2	1	<2	2
Arsenic	5	mg/kg	0.01	0.07	0.24	0.07	0.05	0.11	0.13
Cadmium	5	mg/kg	0.1	<0.1	<0.1	0.3	<0.1	<0.1	0.8
Cobalt	5	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	5	mg/kg	0.1	0.8	0.2	11.8	0.8	0.3	24.8
Iron	5	mg/kg	1	16	3	168	17	3	149
Lead	5	mg/kg	0.02	0.04	<0.02	<0.02	0.01	<0.02	<0.02
Mercury	5	mg/kg	0.002	0.182	2.084	1.510	0.079	0.539	0.526
Molybdenum	5	mg/kg	0.01	0.04	0.02	0.13	0.04	0.01	0.19
Nickel	5	mg/kg	0.1	0.3	0.1	0.1	0.2	0.1	<0.1
Selenium	5	mg/kg	0.2	0.9	0.9	3.1	0.9	0.7	9.8
Zinc	5	mg/kg	0.1	54.8	3.7	41.6	61.3	3.0	33.8

Note: Means were calculated using half the MDL when the sample metal concentration was below the method detection limit.

b) HISTORICAL MEAN MERCURY LEVELS IN FISH FOR WATERBODIES NEAR THE MARATHON PGM-CU SITE

Waterbody	**Species**	**n**	**Mercury** (mg/kg)
Lake Superior	Lake Trout	390	0.41
	Northern Pike	1	0.74
	Rainbow Trout	5	0.26
	Walleye	12	0.24
	Longnose Sucker	196	0.79
	White Sucker	56	0.78
	Redhorse Sucker	7	0.91
	Lake Whitefish	154	0.48
	Round Whitefish	17	0.23
	Cisco	1	1.50
	Burbot	5	0.91
	Gizzard Shad	7	0.24
	Rainbow Smelt	12	0.28
Bamoos Lake	Lake Trout	13	0.37
Gowan Lake	Northern Pike	6	1.37

Note: Data is from MOE Sport Fish Contamination Program, 1976 to 2007.

TABLE 3.22: SEDIMENT QUALITY FOR THE STREAM 6 WATERSHED

				Lentic Stations		Stream Stations		
				L24	L26	S12	S15	S42
	Units	LEL	SEL	EcoMetrix	EcoMetrix	EcoMetrix	EcoMetrix	EcoMetrix
Physical Tests								
Total Phosphorus	(µg/g)	600	2000	838	876	646	574	408.6
Total Kjeldahl Nitrogen	(µg/g)	550	4800	7250	19700	840	1710	1246
Organic / Inorganic Carbon								
Total Organic Carbon	%	1	10	11	24	1.7	1.3	0.8
Total Metals								
Aluminum	(µg/g)	-	-	12300	7490	10900	8650	8768
Arsenic	(µg/g)	6	33	2.4	3.3	1.4	<1.0	0.9
Cadmium	(µg/g)	0.6	10	<0.50	1.7	<0.50	<0.50	<0.50
Cobalt	(µg/g)	50		2.5	1.4	8.7	7	6.8
Copper	(µg/g)	16	110	7	10	7.3	10	5.3
Iron	(µg/g)	20000	40000	8720	5610	23300	12700	13440
Lead	(µg/g)	31	250	14	27	6.1	4.4	3.6
Molybdenum	(µg/g)	-	-	<1.0	1.1	<1.0	<1.0	<1.0
Nickel	(µg/g)	16	75	8.8	6.1	13	10	11
Selenium	(µg/g)	-	-	<1.0	1.8	<1.0	<1.0	<1.0
Zinc	(µg/g)	120	820	46	116	88	55	79

- Sample exceeds LEL value
- Sample exceeds SEL value

TABLE 3.23: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR STREAM 6 WATERSHED

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Rainbow Trout	Chinook Salmon	Brook Trout	Longnose Dace	Brook Stickleback	Threespine Stickleback	Mottled Sculpin
L24	L24	Jun-10	EcoMetrix	electrofishing	-	87							
	L24	Jun-11	EcoMetrix	electrofishing	-	320							
L26	L26	Aug-09	EcoMetrix	baited minnow trap	3	16.5							
	L26	Aug-09	EcoMetrix	Nordic net	1	16.5							
	L26	Aug-09	EcoMetrix	sm exp gillnet	1	16.5							
	L26	Jun-10	EcoMetrix	baited minnow trap	3	97							
	L26	Jun-10	EcoMetrix	Nordic net	1	97							
	L26	Jun-10	EcoMetrix	sm exp gillnet	1	97							
	L26	Jun-11	EcoMetrix	electrofishing	-	361							
Stream 6	-	Aug-01	OMNR	electrofishing	-	-	1		1			13	
	S12	Jun-11	EcoMetrix	visual	-	-					p		
	S14	May-09	EcoMetrix	electrofishing	-	1143					28		
	S15	Aug-09	EcoMetrix	baited minnow trap	10	43					7		
	S15	Aug-09	EcoMetrix	Nordic net	2	43					1		
	S15	Jun-10	EcoMetrix	electrofishing	-	416					44		
	S31	May-09	EcoMetrix	electrofishing	-	1126	8	5		8			4
	S63	Jun-10	EcoMetrix	electrofishing	-	556					15		
	S64	Jun-10	EcoMetrix	electrofishing	-	140							

[1] - effort for electrofishing is in seconds

TABLE 3.24: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 6 WATERSHED

	Lentic Stations		Stream Stations			
	L24	L26	S12	S15	S42[2]	S63[1]
ROUNDWORMS						
P. Nemata	9%	-	<1%	<1%	<1%	-
FLATWORMS						
P. Platyhelminthes						
Cl. Turbellaria						
indeterminate	-	-	-	-	-	-
O. Tricladida	-	-	-	-	-	-
ANNELIDS						
P. Annelida						
WORMS						
Cl. Oligochaeta						
F. Enchytraeidae	3%	-	<1%	36%	<1%	-
F. Naididae	<1%	-	-	-	-	<1%
F. Tubificidae	-	-	<1%	-	12%	-
F. Lumbricidae	-	-	-	-	-	<1%
F. Lumbriculidae	<1%	-	-	-	<1%	<1%
F. Sparganophilidae	-	-	-	-	-	-
LEECHES						
Cl. Hirudinea						
F. Erpobdellidae	-	-	<1%	-	<1%	<1%
F. Glossiphoniidae	-	-	2%	-	-	-
F. Haemopidae	-	-	-	-	-	-
ARTHROPODS						
P. Arthropoda						
MITES						
Cl. Arachnida						
O. Acarina	2%	<1%	4%	2%	<1%	-
SEED SHRIMPS						
Cl. Ostracoda	-	-	<1%	31%	<1%	-
WATER SCUDS						
O. Amphipoda						
F. Crangonyctidae	-	-	-	-	-	-
F. Hyalellidae	-	-	-	-	-	<1%
F. Pontoporeiidae	-	-	-	-	-	-
AQUATIC SOW BUGS						
O. Isopoda						
F. Asellidae	-	-	-	-	-	-
OPOSSUM SHRIMPS						
O. Mysidacea	-	-	-	-	-	-
SPRINGTAILS						
Cl. Entognatha						
O. Collembola	-	<1%	<1%	-	-	-
INSECTS						
Cl. Insecta						
BEETLES						
O. Coleoptera						
F. Chrysomelidae	-	-	-	-	-	-
F. Dryopidae	-	-	-	-	-	-
F. Dytiscidae	12%	<1%	-	-	-	-
F. Elmidae	-	-	-	-	-	-
F. Gyrinidae	-	-	-	-	-	-
F. Haliplidae	-	-	-	-	-	-
F. Hydrophilidae	-	-	-	-	-	-
MAYFLIES						
O. Ephemeroptera						
F. Arthropleidae	5%					
F. Baetidae	-	-	6%	-	<1%	<1%
F. Caenidae	-	-	-	-	-	-
F. Ephemeridae	-	-	-	-	-	-
F. Ephemerellidae	-	-	12%	-	-	-
F. Heptageniidae	-	-	6%	-	-	4%
F. Leptophlebiidae	-	-	11%	2%	-	10%

TABLE 3.24: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 6 WATERSHED (CONT.

	Lentic Stations		Stream Stations			
	L24	L26[1]	S12[1]	S15[1]	S42[2]	S63[1]
AQUATIC MOTHS						
O. Lepidoptera						
F. Pyralidae	-	-	-	-	<1%	9%
O. Megaloptera						
ALDERFLIES						
F. Sialidae	-	-	-	-	-	-
O. Odonata						
DAMSELFLIES						
F. Coenagrionidae	2%	4%	-	-	-	-
F. Lestidae		-	-	-	-	-
DRAGONFLIES						
F. Aeshnidae	-	-	-	-	<1%	-
F. Cordulegastridae	-	-	<1%	-	<1%	2%
F. Corduliidae/Libellulidae	-	-	-	-	-	-
F. Corduliidae	-	-	-	<1%	-	-
F. Gomphidae	-	-	-	-	-	<1%
F. Libellulidae	3%	1%	-	-	-	<1%
STONEFLIES						
O. Plecoptera						
F. Capniidae	-	-	5%	-	<1%	-
F. Chloroperlidae	-	-	-	-	-	-
F. Leuctridae	-	-	<1%	-	1%	1%
F. Nemouridae	-	-	-	-	-	-
F. Perlodidae	-	-	<1%	-	-	-
F. Taeniopterygidae	-	-	<1%	-	-	-
BUGS						
O. Hemiptera						2%
F. Corixidae	8%	2%	-	<1%	-	-
F. Gerridae	-	-	-	-	-	-
F. Notonectidae	1%	<1%	-	-	-	-
CADDISFLIES						
O. Trichoptera						
F. Dipseudopsidae	-	-	-	-	-	-
F. Hydropsychidae	-	-	<1%	-	-	24%
F. Hydroptilidae	-	-	5%	-	-	-
F. Lepidostomatidae	-	-	-	-	<1%	3%
F. Leptoceridae	-	-	-	<1%	-	-
F. Limnephilidae	-	-	2%	-	2%	-
F. Molannidae	-	-	-	-	<1%	<1%
F. Philopotamidae	-	-	-	-	-	<1%
F. Phryganeidae	-	<1%	-	<1%	-	-
F. Polycentropodidae	<1%	-	<1%	-	-	-
F. Rhyacophilidae	-	-	<1%	<1%	-	10%
TRUE FLIES						
O. Diptera						
indeterminate	-	-	-	-	<1%	-
pupae	-	-	<1%	-	<1%	-
BITING-MIDGE						
F. Ceratopogonidae	16%	1%	2%	<1%	2%	3%
PHANTOM MIDGE						
F. Chaoboridae	-	<1%	-	-	-	
MIDGES						
F. Chironomidae	36%	86%	34%	15%	32%	8%
F. Dixidae	-	-	<1%	-	-	-
F. Dolichopodidae	1%					
F. Empididae	-	-	3%	<1%	<1%	-
F. Ephydridae	-	-	-	-	-	-
F. Tabanidae	-	-	-	-	1%	-
F. Tipulidae	<1%	-	<1%	-	3%	<1%

TABLE 3.24: BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 6 WATERSHED (CONT.

	Lentic Stations		Stream Stations			
	L24	L26[1]	S12[1]	S15[1]	S42[2]	S63[1]
MOLLUSCS						
P. Mollusca						
SNAILS						
Cl. Gastropoda						
F. Hydrobiidae	-	-	-	-	-	<1%
F. Lymnaeidae	-	-	-	-	-	-
F. Physidae	-	-	-	-	<1%	-
F. Planorbidae	-	-	-	-	-	<1%
F. Valvatidae	-	-	-	-	-	-
CLAMS						
Cl. Bivalvia						
F. Sphaeriidae	-	2%	4%	11%	42%	18%
F. Unionidae	-	-	-	-	-	-

1 - Calculated from original Golder (2009) benthic data.
2 - Calculated from a mean of five samples.
standardized to ten minutes of effort and covering all available habitats.
Note: For sampling methods used see Golder (2009).
With exception of S41, EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.
S42 samples collected with a standard Ekman.

TABLE 3.25: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE STREAM 6 WATERSHED

	Lentic Stations		Stream Stations			
	L24	**L26**	**S12**	**S15**	**S42[2]**	**S63[1]**
TOTAL NUMBER OF ORGANISMS	1902	5408	1025	981	622	87
DENSITY (No./m^2)	-	-	-	-	8886	940
TOTAL NUMBER OF TAXA	28	18	47	24	50	38
MEAN NUMBER OF TAXA	-	-	-	-	17	21
SIMPSON'S DIVERSITY	0.90	0.78	0.93	0.76	0.72	0.89
SIMPSON'S EVENNESS	0.36	0.26	0.30	0.17	0.26	0.42
TOTAL EPT INDEX	2	1	14	4	8	13
MEAN EPT INDEX	-	-	-	-	1.8	9
HILSENHOFF INDEX	6.04	6.71	5.47	6.35	6.18	3.10
EPT/CHIRONOMIDAE	0.16	0.01	1.44	0.18	0.17	7.56
MAYFLIES	5%	0%	35%	2%	0%	15%
STONEFLIES	0%	0%	6%	0%	2%	1%
CADDISFLIES	<1%	<1%	8%	1%	3%	38%
EPT	6%	<1%	48%	3%	4%	54%
CHIRONOMIDS	36%	86%	34%	15%	32%	8%
ANNELIDS	4%	0%	3%	36%	14%	3%
SPHAERIID CLAMS	0%	2%	4%	11%	42%	18%

1 - Calculated from original Golder (2009) benthic data.

2 - Calculated from a mean of five samples.

standardized to ten minutes of effort and covering all available habitats.

Note: For sampling methods used see Golder (2009).

With exception of S41, EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

S42 samples collected with a standard Ekman.

TABLE 3.26: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR THE STREAM 7 WATERSHED

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Coho Salmon	Rainbow Trout	Chinook Salmon	Brook Trout	Lake Chub	Pearl Dace	Longnose Dace	Longnose Sucker	White Sucker	Mottled Sculpin	Slimy Sculpin	Yellow Perch
Upper Rag Lake	-	1949	OMNR	stocking	-	-				S								
	-	May-51	OMNR	stocking	-	-				S								
	-	Jul-51	OMNR	survey	-	-												
	-	May-58	OMNR	stocking	-	-				S								
Middle Rag Lake	-	1949	OMNR	stocking	-	-				S								
	-	May-51	OMNR	stocking	-	-				S								
	-	Jun-51	OMNR	survey	-	-				P								
	-	May-61	OMNR	stocking	-	-				S								
Lower Rag Lake	-	1949	OMNR	stocking	-	-				S								
	-	May-51	OMNR	stocking	-	-				S								
	-	Jun-51	OMNR	survey	-	-				P								
	-	May-58	OMNR	stocking	-	-				S								
Shack Lake	-	1954	OMNR	stocking	-	-				S								
	-	1955	OMNR	stocking	-	-				S								
	-	1956	OMNR	stocking	-	-				S								
	-	1959	OMNR	stocking	-	-				S								
	-	1965	OMNR	stocking	-	-				S								
	-	1966	OMNR	stocking	-	-				S								
	-	1971	OMNR	stocking	-	-				S								
	-	1974	OMNR	stocking	-	-				S								
	-	1975	OMNR	stocking	-	-				S								
	-	1976	OMNR	stocking	-	-				S								
	-	1980	OMNR	stocking	-	-				S								
	-	Aug-90	OMNR	survey	-	-				P		P			P			P
Shack Creek	-	Aug-00	BEAK	electrofishing	-	555				57								
	-	Aug-00	BEAK	electrofishing	-	453				29								
	-	Aug-00	BEAK	electrofishing	-	775	36	23		1			3					
	-	Aug-00	BEAK	electrofishing	-	659	9	34		1	1		30			2	10	
	-	Jul-01	OMNR	electrofishing	-	-	41	12	2	43				3				
	S23	May-09	EcoMetrix	electrofishing	-	967		22	1	13			39	100	1		6	

P - present; S -stocked

[1] - effort for electrofishing is in seconds

TABLE 3.27: SEDIMENT QUALITY FOR THE PIC RIVER AND SMALL TRIBUTARIES

				Pic River Stations			Small Tributary Stations					Lentic Stations
				Upstream	Adjacent	Downstream	S24	S32	S44	S45	S46	Malpa
	Units	LEL	SEL	Golder	Golder	Golder	EcoMetrix	EcoMetrix	EcoMetrix	EcoMetrix	EcoMetrix	NAR
Physical Tests												
Total Phosphorus	(µg/g)	600	2000	397	431	383	376	775	383	415	445	1100
Total Kjeldahl Nitrogen	(µg/g)	550	4800	-	-	-	550	640	1120	390	1930	18816
Organic / Inorganic Carbon												
Total Organic Carbon	%	1	10	2.1	2.0	1.7	0.4	0.98	1.1	0.9	1.1	22
Total Metals												
Aluminum	(µg/g)	-	-	5180	4170	4180	5820	20900	7950	6700	9660	17700
Arsenic	(µg/g)	6	33	2.9	2.4	2.2	1.2	3.4	1.5	1.2	2	5.9
Cadmium	(µg/g)	0.6	10	0.05	0.08	<0.05	<0.50	<0.50	<0.50	<0.50	<0.50	1.5
Cobalt	(µg/g)	50		5.2	3.9	3.9	6	19	7.7	5.8	8.8	14
Copper	(µg/g)	16	110	7.5	5.7	5.2	6.3	35	14	8.3	12	53
Iron	(µg/g)	20000	40000	9750	8090	8050	11300	27600	12000	10100	14800	12400
Lead	(µg/g)	31	250	3	2.6	2.4	6.9	9.3	5	3.8	6.7	39
Molybdenum	(µg/g)	-	-	<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	1.7
Nickel	(µg/g)	16	75	13	13	12	11	36	14	11	15	36
Selenium	(µg/g)	-	-	<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	3.8
Zinc	(µg/g)	120	820	23	18	19	20	63	26	23	30	168

- Sample exceeds LEL value
- Sample exceeds SEL value

TABLE 3.28: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR THE PIC RIVER AND SMALL TRIBUTARIES

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[1]	Lake Sturgeon	Rainbow Trout	Rainbow Smelt	Northern Pike	Muskellunge	Spottail Shiner	Northern Redbelly Dace	Longnose Sucker	White Sucker	Silver Redhorse	Shorthead Redhorse	Trout-perch	Walleye
Pic River	-	Sep-83	Noranda	gillnet	11	24			2	2	2				14	2	13	2	32
	-	Jun-07	Golder	exp gillnet	11	-	2				1	1		9		5			4
	-	Jun-07	Golder	hoop net	8	-												1	
	-	Jun-07	Golder	Nordic net	10	-						18	1					1	
Tributaries	S24	May-09	EcoMetrix	electrofishing	-	223													
	S32	Aug-09	EcoMetrix	electrofishing	-	959		3											
	S44	May-09	EcoMetrix	electrofishing	-	497													
	S45	May-09	EcoMetrix	electrofishing	-	315													
	S67	Jun-11	EcoMetrix	visual	-	-													
	S68	Jun-11	EcoMetrix	electrofishing	-	572													
Malpa Lake	ML	Sep-06	NAR	FWIN	1	2.3													
	ML	Sep-06	NAR	minnow trap	6	2													
	ML	Aug-09	EcoMetrix	baited minnow trap	4	23.5													
	ML	Aug-09	EcoMetrix	Nordic net	1	23.5													
Malpa Creek	S49	May-09	EcoMetrix	electrofishing	-	161													

[1] - effort for electrofishing is in seconds

TABLE 3.29: BENTHIC MACROINVERTEBRATE DATA FOR THE PIC RIVER AND SMALL TRIBUTARIES

	Pic River			Stream Stations						Lentic Stations
	Upstream[2]	Adjacent[2]	Downstream[2]	S24	S32	S43	S44	S45	S46	Malpa Lake[1]
ROUNDWORMS										
P. Nemata	<1%	6%	-	-	-	5%	-	-	-	-
ANNELIDS										
P. Annelida										
WORMS										
Cl. Oligochaeta										
F. Enchytraeidae	12%	30%	8%	21%	-	5%	-	-	-	-
F. Naididae	<1%	-	-	-	-	-	-	-	-	-
F. Tubificidae	1%	11%	-	5%	-	-	-	7%	-	-
F. Lumbricidae	-	-	-	-	-	5%	4%	-	<1%	-
F. Lumbriculidae	-	-	-	-	-	-	-	-	-	-
F. Sparganophilidae	-	-	-	-	-	-	-	-	-	-
LEECHES										
Cl. Hirudinea										
F. Erpobdellidae	-	-	-	-	-	-	-	-	-	-
F. Glossiphoniidae	-	-	-	-	-	-	-	-	-	-
F. Haemopidae	-	-	-	-	-	-	-	-	-	-
ARTHROPODS										
P. Arthropoda										
MITES										
Cl. Arachnida										
O. Acarina	-	-	-	-	-	-	-	-	<1%	-
SEED SHRIMPS										
Cl. Ostracoda	-	-	-	-	-	-	-	7%	-	-
WATER SCUDS										
O. Amphipoda										
F. Crangonyctidae	-	-	-	-	-	-	-	-	-	-
F. Hyalellidae	-	-	-	-	-	-	-	-	-	-
F. Pontoporeiidae	-	-	-	-	-	-	-	-	-	-
AQUATIC SOW BUGS										
O. Isopoda										
F. Asellidae	-	-	-	-	-	-	-	-	-	-
OPOSSUM SHRIMPS										
O. Mysidacea	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS										
Cl. Entognatha										
O. Collembola	-	-	-	2%	-	-	-	-	-	-
INSECTS										
Cl. Insecta										
BEETLES										
O. Coleoptera										
F. Chrysomelidae	-	-	-	-	-	-	-	-	-	-
F. Dryopidae	-	-	-	-	-	-	8%	-	-	-
F. Dytiscidae	-	-	-	-	-	-	-	-	-	-
F. Elmidae	-	-	-	-	-	-	-	-	-	-
F. Gyrinidae	-	-	-	-	-	-	-	-	-	-
F. Haliplidae	-	-	-	-	-	-	-	-	-	-
F. Hydrophilidae	-	-	-	-	-	-	-	-	-	-
MAYFLIES										
O. Ephemeroptera										
F. Baetidae	-	11%	-	-	17%	26%	15%	-	-	-
F. Caenidae	-	-	-	-	-	-	-	-	-	-
F. Ephemeridae	-	-	10%	-	-	-	-	-	-	-
F. Ephemerellidae	-	3%	-	-	-	-	-	-	-	-
F. Heptageniidae	<1%	3%	-	-	-	-	-	-	-	-
F. Leptophlebiidae	-	-	3%	-	-	-	-	-	-	-

TABLE 3.29: BENTHIC MACROINVERTEBRATE DATA FOR THE PIC RIVER AND SMALL TRIBUTARIES (CONT.)

	Pic River			Stream Stations						Lentic Stations
	Upstream[2,3]	Adjacent[2,4]	Downstream[2,5]	S24	S32	S43	S44	S45	S46	Malpa Lake[1]
AQUATIC MOTHS										
O. Lepidoptera										
F. Pyralidae	-	-	-	-	-	-	-	-	-	-
O. Megaloptera										
ALDERFLIES										
F. Sialidae	-	-	-	-	-	-	-	-	-	-
O. Odonata										
DAMSELFLIES										
F. Coenagrionidae	-	-	-	-	-	-	-	-	-	-
F. Lestidae	-	-	-	-	-	-	-	-	-	-
DRAGONFLIES										
F. Aeshnidae	-	-	-	-	-	-	-	-	-	-
F. Cordulegastridae	-	-	-	-	-	-	-	-	-	-
F. Corduliidae/Libellulidae	-	-	-	-	-	-	-	-	-	-
F. Corduliidae	-	-	-	-	-	-	-	-	-	-
F. Gomphidae	-	-	-	-	-	-	-	-	-	-
F. Libellulidae	-	-	-	-	-	-	-	-	-	P
STONEFLIES										
O. Plecoptera										
F. Capniidae	<1%	-	-	-	-	-	19%	-	11%	-
F. Chloroperlidae	-	-	-	-	-	-	-	-	-	-
F. Leuctridae	-	-	-	-	-	-	-	-	2%	-
F. Nemouridae	-	-	-	12%	25%	-	8%	-	44%	-
F. Perlodidae	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae	-	-	-	-	-	-	-	-	-	-
BUGS										
O. Hemiptera										
F. Corixidae	-	-	16%	-	-	-	-	-	-	-
F. Gerridae	-	-	-	-	-	-	-	-	-	-
F. Notonectidae	-	-	-	-	-	-	-	-	-	-
CADDISFLIES										
O. Trichoptera										
F. Dipseudopsidae	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae	-	-	-	-	-	-	-	-	-	-
F. Lepidostomatidae	-	-	-	-	-	5%	-	-	-	-
F. Leptoceridae	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae	-	-	3%	5%	17%	11%	19%	-	2%	-
F. Molannidae	-	-	-	-	-	-	-	-	-	-
F. Phryganeidae	-	-	-	-	-	-	-	-	-	-
F. Polycentropodidae	-	-	-	-	-	-	-	-	-	P
F. Rhyacophilidae	-	-	-	-	-	-	-	-	-	-
TRUE FLIES										
O. Diptera										
indeterminate	2%	8%	3%	-	8%	-	-	7%	<1%	-
pupae	-	-	5%	-	-	-	-	-	-	-
BITING-MIDGE										
F. Ceratopogonidae	21%	3%	43%	-	-	-	-	-	-	-
PHANTOM MIDGE										
F. Chaoboridae	-	-	-	-	-	-	-	-	-	-
MIDGES										
F. Chironomidae	62%	14%	8%	40%	8%	26%	19%	71%	34%	P
F. Dixidae				-	-	-	-	-	2%	-
F. Empididae	<1%	-	-	-	8%	-	-	-	-	-
F. Ephydridae	-	-	-	-	-	-	4%	-	-	-
F. Tabanidae	-	-	-	-	-	5%	-	-	-	-
F. Tipulidae	-	-	3%	16%	17%	11%	4%	7%	4%	-

TABLE 3.29: BENTHIC MACROINVERTEBRATE DATA FOR THE PIC RIVER AND SMALL TRIBUTARIES (CONT.)

	Pic River			Stream Stations						Lentic Stations
	Upstream[2,3]	Adjacent[2,4]	Downstream[2,5]	S24	S32	S43	S44	S45	S46	Malpa Lake[1]
MOLLUSCS										
P. Mollusca										
SNAILS										
Cl. Gastropoda										
F. Hydrobiidae	-	-	-	-	-	-	-	-	-	-
F. Lymnaeidae	-	11%	-	-	-	-	-	-	-	-
F. Physidae	-	-	-	-	-	-	-	-	-	-
F. Planorbidae	-	-	-	-	-	-	-	-	-	-
F. Valvatidae	-	-	-	-	-	-	-	-	-	-
CLAMS										
Cl. Bivalvia										
F. Sphaeriidae	-	-	-	-	-	-	-	-	-	P
F. Unionidae	-	-	-	-	-	-	-	-	-	-

1 - From original NAR (2006) presence/absence benthic data.

2 - Mean calculated from original Golder (2009) benthic data.

Note: For sampling methods used see NAR (2007) and Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.30: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE PIC RIVER AND SMALL TRIBUTARIES

	Pic River			Stream Stations						Lentic Stations
	Upstream[2]	Adjacent[2]	Downstream[2]	S24	S32	S43	S44	S45	S46	Malpa Lake[1]
TOTAL NUMBER OF ORGANISMS	131	7	11	344	24	152	104	56	1032	-
DENSITY (No./m^2)	5696	304	464	-	-	-	-	-	-	-
TOTAL NUMBER OF TAXA	24	11	12	12	8	11	11	7	18	10
MEAN NUMBER OF TAXA	16	5	6	-	-	-	-	-	-	-
SIMPSON'S DIVERSITY	0.70	0.66	0.72	0.88	0.85	0.86	0.87	0.77	0.74	-
SIMPSON'S EVENNESS	0.25	0.83	0.72	0.68	0.82	0.67	0.70	0.61	0.21	-
TOTAL EPT INDEX	2	3	3	2	4	4	4	0	5	1
MEAN EPT INDEX	0.7	1.0	1.0	-	-	-	-	-	-	-
HILSENHOFF INDEX	7.45	6.86	5.48	7.00	4.71	5.20	5.09	6.33	4.63	6.00
EPT/CHIRONOMIDAE	0.01	1.00	1.83	0.41	7.00	1.60	3.20	0.00	1.70	-
MAYFLIES	<1%	17%	12%	0%	17%	26%	15%	0%	0%	-
STONEFLIES	<1%	0%	0%	12%	25%	0%	27%	0%	57%	-
CADDISFLIES	0%	0%	3%	5%	17%	16%	19%	0%	2%	-
EPT	<1%	17%	15%	16%	58%	42%	62%	0%	58%	-
CHIRONOMIDS	62%	14%	8%	40%	8%	26%	19%	71%	34%	-
ANNELIDS	13%	41%	8%	26%	0%	11%	4%	7%	<1%	-
SPHAERIID CLAMS	0%	0%	0%	0%	0%	0%	0%	0%	0%	-

1 - From original NAR (2006) presence/absence benthic data.

2 - Mean calculated from original Golder (2009) benthic data.

Note: For sampling methods used see NAR (2007) and Golder (2009).

EcoMetrix samples were collected with a 500 µm D-net Kick and Sweep method standardized to ten minutes of effort within all available habitats.

TABLE 3.31: SEDIMENT QUALITY FOR THE LAKE SUPERIOR EMBAYMENTS

	Units	LEL	SEL	Lake Superior Stations: Port Monro EcoMetrix	Lake Superior Stations: Sturdee Cove EcoMetrix
Physical Tests					
Total Phosphorus	(µg/g)	600	2,000	631	431
Total Kjeldahl Nitrogen	(µg/g)	550	4,800	2534	540
Organic / Inorganic Carbon					
Total Organic Carbon	%	1	10	2.1	0.6
Total Metals					
Aluminum	(µg/g)	-	-	7312	8002
Arsenic	(µg/g)	6	33	3.1	2.4
Cadmium	(µg/g)	0.6	10	0.4	<0.50
Cobalt	(µg/g)	50		7.4	8.5
Copper	(µg/g)	16	110	21	6.4
Iron	(µg/g)	20,000	40,000	17160	16300
Lead	(µg/g)	31	250	7.5	3.4
Mercury	(µg/g)	0.2	2	0.1	<0.050
Molybdenum	(µg/g)	-	-	<1.0	<1.0
Nickel	(µg/g)	16	75	14	15
Selenium	(µg/g)	-	-	<1.0	<1.0
Zinc	(µg/g)	120	820	76	71

- Sample exceeds LEL value

- Sample exceeds SEL value

TABLE 3.32: FISHING EFFORT AND FISH SPECIES IDENTIFIED FOR THE LAKE SUPERIOR EMBAYMENTS

Waterbody	Station	Date	Reported by	Method	Sets	Effort (hrs)[2]	Alewife	Pink Salmon	Coho Salmon	Rainbow Trout	Lake Trout	Cisco	Lake Whitefish	Round Whitefish	Northern Pike	Lake Chub	Longnose Dace	Longnose Sucker	White Sucker	Burbot	Threespine Stickleback	Mottled Sculpin	Slimy Sculpin	Yellow Perch
Port Monro	LS	Aug-09	EcoMetrix	seine net	2	2600								1								1		
	LS	Aug-09	EcoMetrix	exp gillnet	2	18								6		1		1	14					
Peninsula Harbour	CC	Aug-00	BEAK	exp gillnet	5	18	1			1		1	1	6				106	5					
	CC	Aug-00	BEAK	seine net	3	2750				1			4	43		6						2		
	CC	Aug-00	BEAK	electrofishing	-	1054										53	4	6		4		11		
	JC	Aug-00	BEAK	exp gillnet	5	18	2		1		5	1		18	3			7						
	JC	Aug-00	BEAK	seine net	4	4125		1						6				24			1		15	3
	JC	Aug-00	BEAK	electrofishing	-	1299			11	3						3	11			1		25	29	

[2] - effort for electrofishing is in seconds; seine net effort is in square meters.

TABLE 3.33: BENTHIC MACROINVERTEBRATE DATA FOR THE LAKE SUPERIOR EMBAYMENTS

	Lake Superior	
	Port Monro[1]	Sturdee Cove[1]
ROUNDWORMS		
P. Nemata	<1%	-
FLATWORMS		
P. Platyhelminthes		
Cl. Turbellaria		
indeterminate	-	<1%
O. Tricladida	-	-
ANNELIDS		
P. Annelida		
WORMS		
Cl. Oligochaeta		
F. Enchytraeidae	-	-
F. Naididae	<1%	-
F. Tubificidae	9%	9%
F. Lumbricidae	-	-
F. Lumbriculidae	<1%	2%
F. Sparganophilidae	-	-
LEECHES		
Cl. Hirudinea		
F. Erpobdellidae	-	-
F. Glossiphoniidae	-	<1%
F. Haemopidae	-	-
ARTHROPODS		
P. Arthropoda		
MITES		
Cl. Arachnida		
O. Acarina	2%	1%
SEED SHRIMPS		
Cl. Ostracoda	18%	18%
WATER SCUDS		
O. Amphipoda		
F. Crangonyctidae	-	-
F. Hyalellidae	-	<1%
F. Pontoporeiidae	2%	2%
AQUATIC SOW BUGS		
O. Isopoda		
F. Asellidae	3%	<1%
OPOSSUM SHRIMPS		
O. Mysidacea	<1%	-
SPRINGTAILS		
Cl. Entognatha		
O. Collembola	-	-
INSECTS		
Cl. Insecta		
BEETLES		
O. Coleoptera		
F. Chrysomelidae	-	-
F. Dryopidae	-	-
F. Dytiscidae	-	-
F. Elmidae	-	-
F. Gyrinidae	-	-
F. Haliplidae	-	-
F. Hydrophilidae	-	-

TABLE 3.33: BENTHIC MACROINVERTEBRATE DATA FOR THE LAKE SUPERIOR EMBAYMENTS (CONT.)

	Lake Superior	
	Port Monro[1]	Sturdee Cove[1]
MAYFLIES		
O. Ephemeroptera		
F. Baetidae	-	-
F. Caenidae	-	-
F. Ephemeridae	-	-
F. Ephemerellidae	-	-
F. Heptageniidae	-	-
F. Leptophlebiidae	-	-
AQUATIC MOTHS		
O. Lepidoptera		
F. Pyralidae	-	-
O. Megaloptera		
ALDERFLIES		
F. Sialidae	-	-
O. Odonata		
DAMSELFLIES		
F. Coenagrionidae	-	-
F. Lestidae	-	-
DRAGONFLIES		
F. Aeshnidae	-	-
F. Cordulegastridae	-	-
F. Corduliidae/Libellulidae	-	-
F. Corduliidae	-	-
F. Gomphidae	-	-
F. Libellulidae	-	-
STONEFLIES		
O. Plecoptera		
F. Capniidae	-	-
F. Chloroperlidae	-	-
F. Leuctridae	-	-
F. Nemouridae	-	-
F. Perlodidae	-	-
F. Taeniopterygidae	-	-
BUGS		
O. Hemiptera		
F. Corixidae	-	-
F. Gerridae	-	-
F. Notonectidae	-	-
CADDISFLIES		
O. Trichoptera		
F. Dipseudopsidae	<1%	-
F. Hydropsychidae	-	-
F. Hydroptilidae	-	-
F. Lepidostomatidae	-	-
F. Leptoceridae	<1%	<1%
F. Limnephilidae	-	-
F. Molannidae	-	-
F. Phryganeidae	-	-
F. Polycentropodidae	-	-
F. Rhyacophilidae	-	-
TRUE FLIES		
O. Diptera		
indeterminate	-	<1%
pupae	-	-
BITING-MIDGE		
F. Ceratopogonidae	-	<1%

TABLE 3.33: BENTHIC MACROINVERTEBRATE DATA FOR THE LAKE SUPERIOR EMBAYMENTS (CONT.)

	Lake Superior	
	Port Monro[1]	Sturdee Cove[1]
PHANTOM MIDGE		
F. Chaoboridae	-	-
MIDGES		
F. Chironomidae	46%	49%
F. Dixidae	-	-
F. Empididae	-	-
F. Ephydridae	-	-
F. Tabanidae	-	-
F. Tipulidae	-	-
MOLLUSCS		
P. Mollusca		
SNAILS		
Cl. Gastropoda		
F. Hydrobiidae	2%	<1%
F. Lymnaeidae	-	<1%
F. Physidae	-	-
F. Planorbidae	-	-
F. Valvatidae	1%	3%
CLAMS		
Cl. Bivalvia		
F. Sphaeriidae	14%	13%
F. Unionidae	-	-

1 - Calculated from a mean of 5 samples
Note: Lake Superior samples collected using a Petite ponar

TABLE 3.34: SUMMARY OF BENTHIC MACROINVERTEBRATE DATA FOR THE LAKE SUPERIOR EMBAYMENTS

	Lake Superior	
	Port Monro[1]	Sturdee Cove[1]
TOTAL NUMBER OF ORGANISMS[2]	276	502
DENSITY (No./m^2)	3941	7174
TOTAL NUMBER OF TAXA	46	42
MEAN NUMBER OF TAXA	23	25
SIMPSON'S DIVERSITY	0.89	0.87
SIMPSON'S EVENNESS	0.43	0.31
TOTAL EPT INDEX	2	1
MEAN EPT INDEX	0.6	0.6
HILSENHOFF INDEX	6.72	6.41
EPT/CHIRONOMIDAE	0.01	0.01
MAYFLIES	0%	0%
STONEFLIES	0%	0%
CADDISFLIES	<1%	<1%
EPT	<1%	<1%
CHIRONOMIDS	46%	49%
ANNELIDS	10%	11%
SPHAERIID CLAMS	14%	13%

1 - Calculated from a mean of 5 samples
Note: Lake Superior samples collected using a Petite ponar

TABLE 4.1: SUMMARY OF KEY METALS IN COMPOSITE AQUATIC VEGETATION SAMPLES

ANALYTE	Hare Lake[1]	Bamoos Lake[2]	C2[3]	C3[4]
Arsenic	<0.25	0.097	0.33	0.39
Barium	88.6	49.9	104	86.8
Cadmium	<2.5	<2.5	<2.5	<2.5
Copper	6	5.6	9.3	28.9
Iron	435	458	2530	2930
Lead	0.57	1.15	1.99	2.4
Magnesium	2440	4260	2340	2500
Manganese	522	298	591	498
Mercury	0.022	0.032	0.019	0.026
Molybdenum	0.88	0.382	0.31	0.28
Nickel	<2.5	1.34	2.5	4.2
Selenium	<5.0	<1.0	<5.0	<5.0
Zinc	58.4	117	74.6	60.2

1 - Composite from Hare Lake.
2 - Composite from Bamoos Lake.
3 - Composite from Stations L1, L2,L3, L4, L5, L6, L7, L8, L14, L15 and L26.
4 - Composite from Stations L9, L10, L11, L12, L13, L13a, L16 and L18.

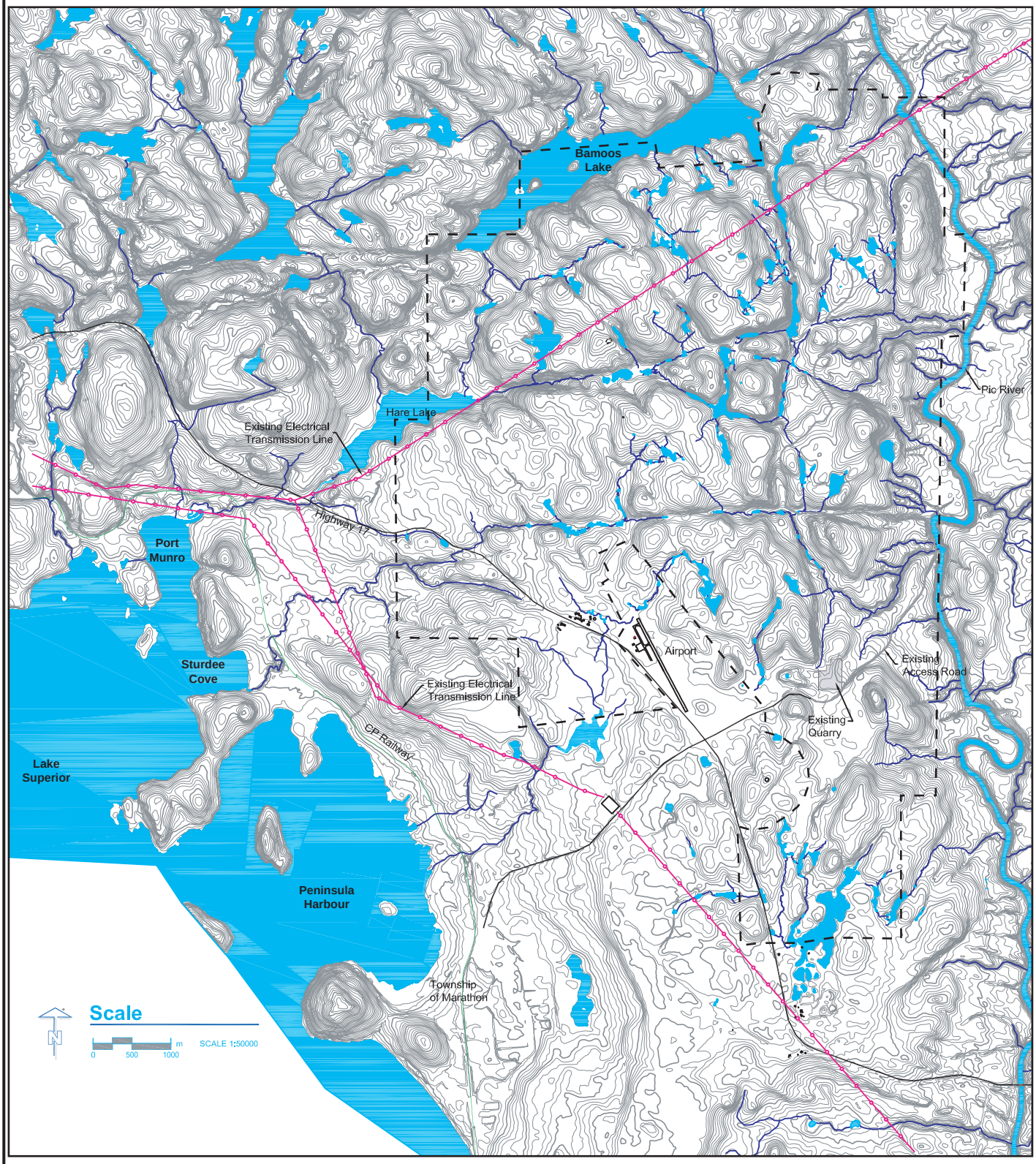
FIGURES



0 100 200 300 400 500

Kilometres

Stillwater Canada Inc.		
Location of the Proposed Marathon PGM-Cu Project Site near Marathon, Ontario		
EcoMetrix INCORPORATED	December 2011	**Figure 1.1**



Drawn By CL	Date Jan 28, 2010
Reviewed By BF	Date Jan 28, 2010
Revised By KP	Date July 15, 2010
Approved By BF	Date July 15, 2010
Revised By KP	Date Nov 29, 2011
Approved By BF	Date Nov 29, 2011

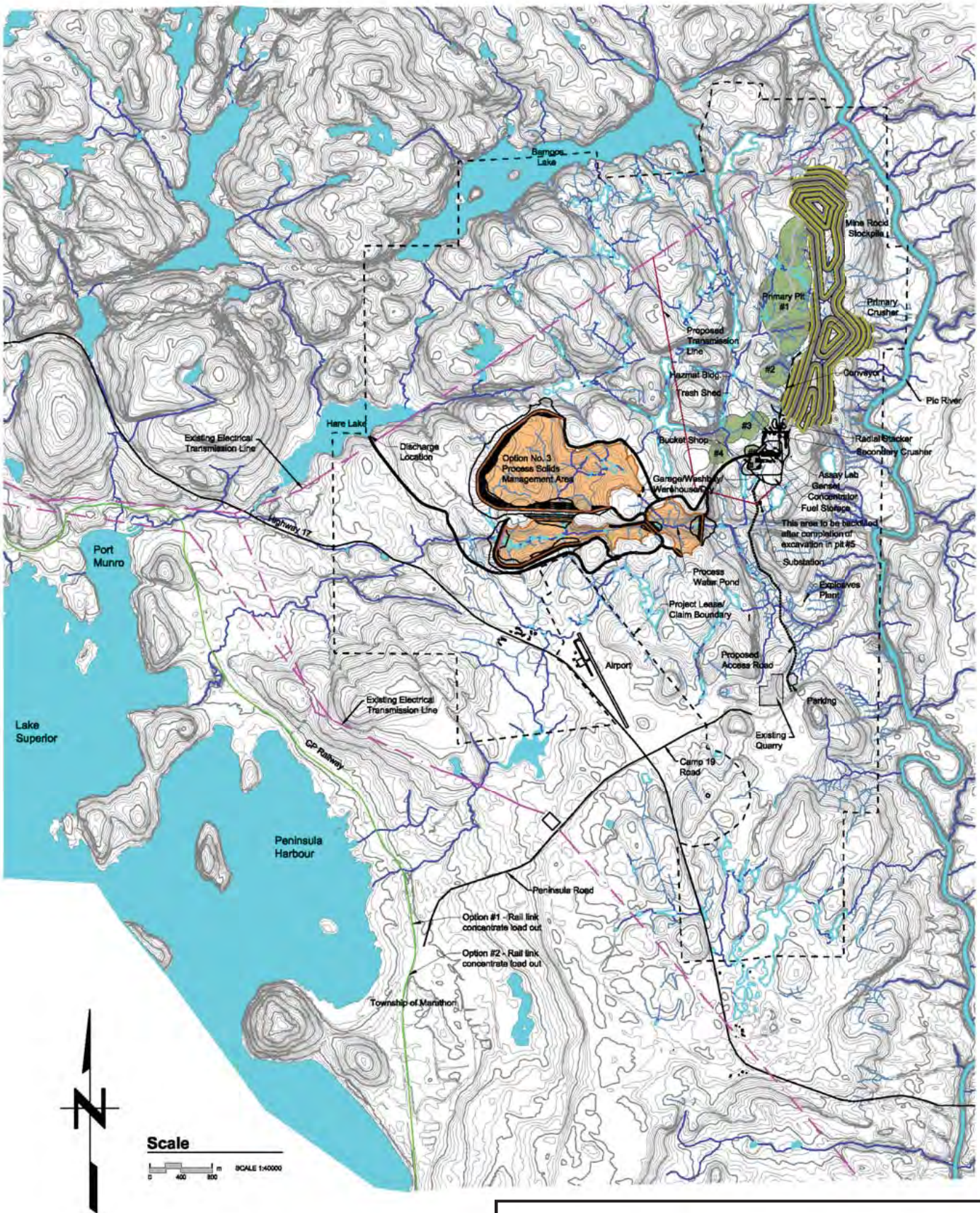
Stillwater Canada Inc.

Existing Conditions at the Marathon PGM-Cu Project Site

EcoMetrix INCORPORATED

December 2011

Figure 1.2



Stillwater Canada Inc.		
Marathon PGM-Cu Project General Site Layout		
EcoMetrix INCORPORATED	December 2011	**Figure 1.3**



Legend

- Seasonal Flow
- No Fish
- Coldwater Community
- Coolwater Community
- Property Boundary

Drawn By CL	Date Jan 28, 2010
Reviewed By BF	Date Jan 28, 2010
Revised By KP	Date July 15, 2010
Approved By BF	Date July 15, 2010
Revised By KP	Date Nov 29, 2011
Approved By BF	Date Nov 29, 2011

Stillwater Canada Inc.

Aquatic Resources Station Locations on and Around the Project Area

EcoMetrix INCORPORATED

December 2011

Figure 2.1



– – – Property Boundary

Drawn By CL	Date Jan 28, 2010
Reviewed By BF	Date Jan 28, 2010
Revised By KP	Date July 15, 2010
Approved By BF	Date July 15, 2010
Revised By KP	Date Nov 29, 2011
Approved By BF	Date Nov 29, 2011

Stillwater Canada Inc.

Major Watersheds Draining the Project Area

EcoMetrix INCORPORATED

November 2011

Figure 3.1



Scale

SCALE 1:50000

0 500 1000 m

Legend

- Seasonal Flow
- No Fish
- Coldwater Community
- Coolwater Community
- Property Boundary

Drawn By CL	Date Jan 28, 2010
Reviewed By BF	Date Jan 28, 2010
Revised By KP	Date July 15, 2010
Approved By BF	Date July 15, 2010
Revised By KP	Date Nov 29, 2011
Approved By BF	Date Nov 29, 2011

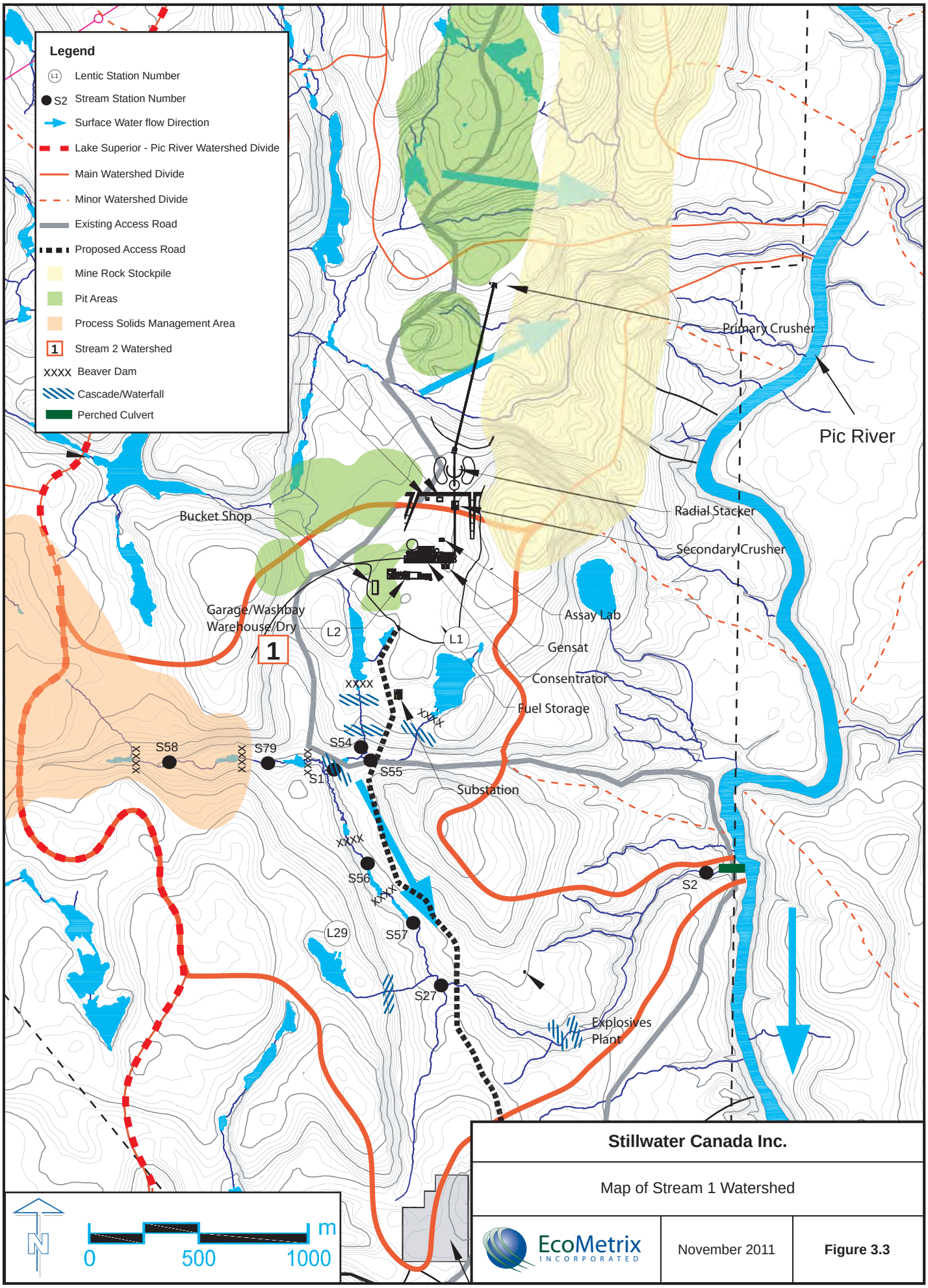
Stillwater Canada Inc.

Summary of Fisheries Resources in the Project Area

EcoMetrix INCORPORATED

November 2011

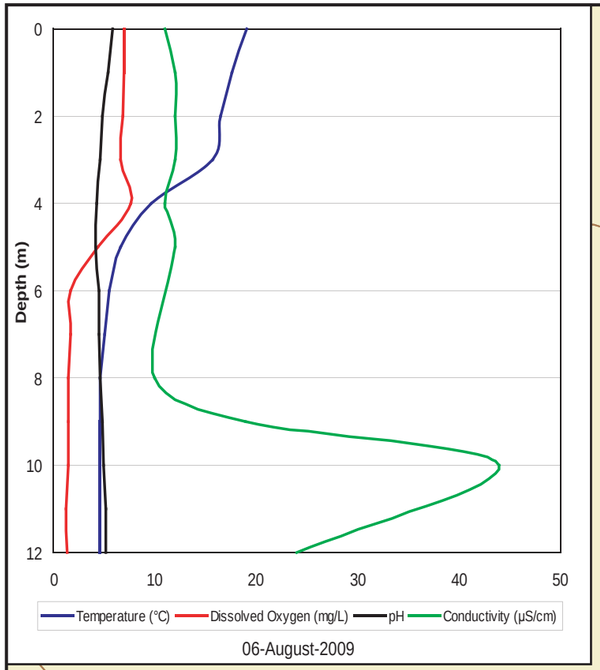
Figure 3.2

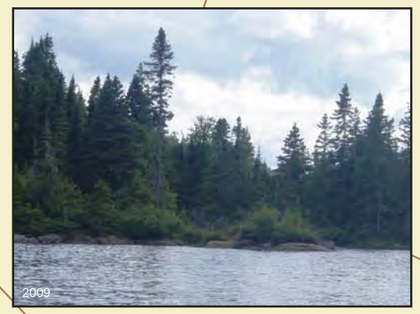


Stillwater Canada Inc.

Map of Stream 1 Watershed

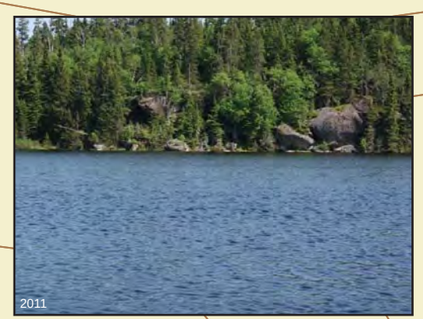
EcoMetrix INCORPORATED | November 2011 | **Figure 3.3**













N

350

360

250

xxxxxx

Terrestrial Vegetation

Black Spruce, White Spruce, Mountain Maple
Mountain Ash, Currant, Sweet Gale,
Bog Willow, Pink Lady's Slipper

Aquatic Vegetation

Yellow Pond Lily, Variable-leaved Pondweed

Depth

12 m
10
9
8
7
6
5
4
3
2
1
0

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

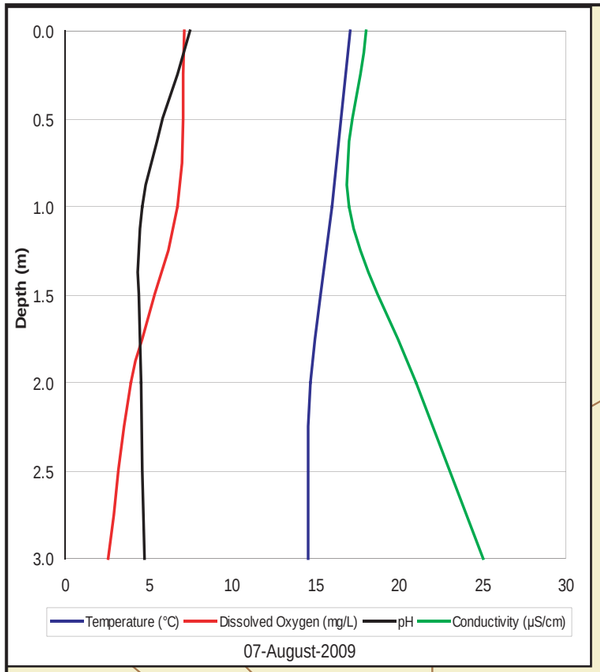
Key Features

Survey Date:	2009-08-06, 2011-06-17
Surface Area:	2.92 ha
Lake Elevation:	333 masl
Maximum Depth:	12 m
Secchi Depth:	2.5 m
Fish Species Observed:	None

Stillwater Canada Inc.

L1 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.4**

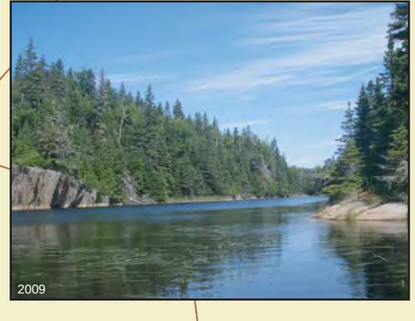


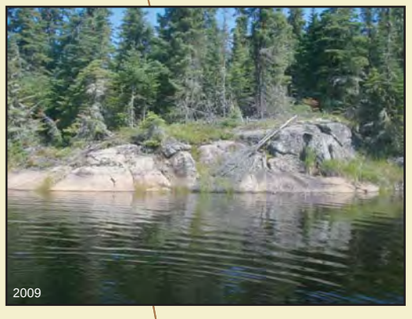


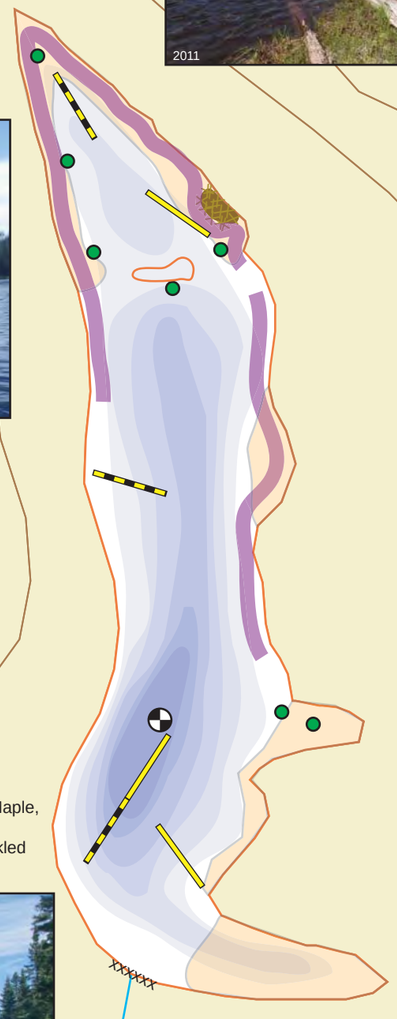












350

350

360

N

Aquatic Vegetation

Hardstem Bulrush, Floating-leaved Pondweed, Three-way Sedge, Wild Celery, Manna Grass, Flat-stemmed Pondweed, Floating Arrowhead, Yellow Pond Lily

Terrestrial Vegetation

Black Spruce, White Spruce, Mountain Maple, Balsam Fir, Mountain Ash, Canada Yew, White Birch, Eastern White Cedar, Speckled Alder

Depth

3.0 m
2.5
2.0
1.5
1.0
0.5
0

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

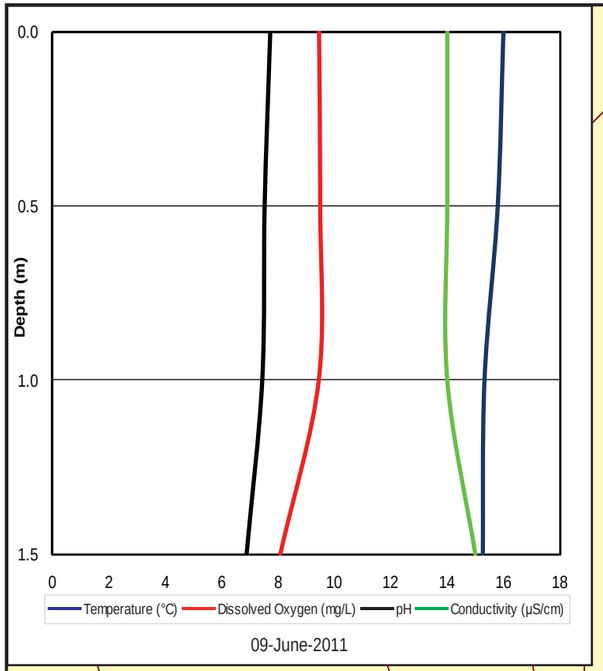
Key Features

Survey Date:	2009-08-12, 2011-06-17
Surface Area:	1.27 ha
Lake Elevation:	342 masl
Maximum Depth:	3.5 m
Secchi Depth:	1.66 m
Fish Species Observed:	None

Stillwater Canada Inc.

L2 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.5**













N

260

360

390

350

340

300

250

370

Aquatic Vegetation

Yellow Pond Lily, Northern Blue Flag, Sedge

Terrestrial Vegetation

White Spruce, Tamarack, Bog Willow, Sweet Gale, White Birch, Buckbean, Fern, Sphagnum

Depth

2.0
1.5
1.0
0.5
0.0

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

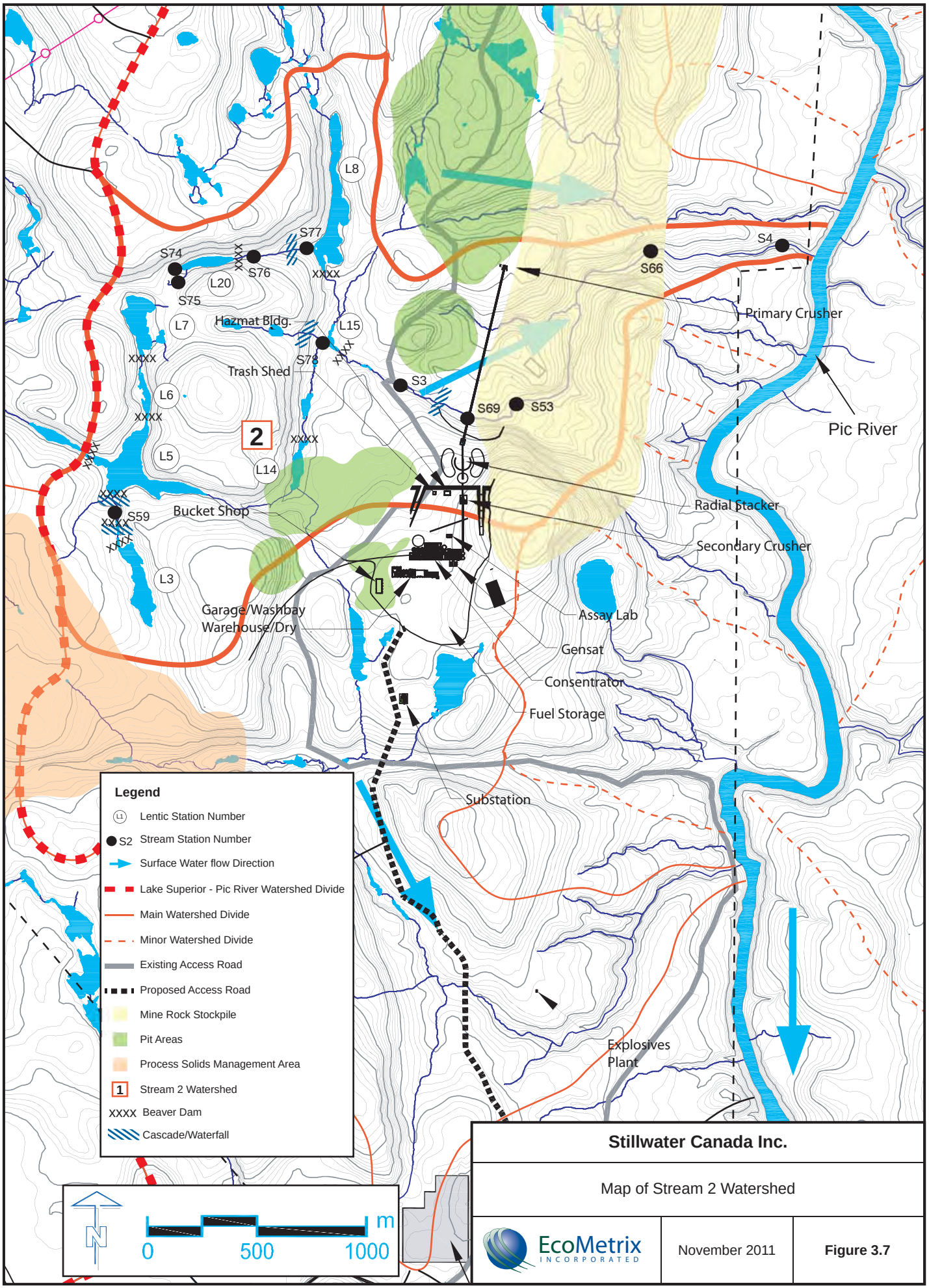
Key Features

Survey Dates:	2011-06-07
Surface Area:	1.3 ha
Lake Elevation:	339 masl
Maximum Depth:	1.8 m
Secchi Depth:	Bottom
Fish Species Observed:	None

Stillwater Canada Inc.

L29 Aquatic Habitat and Bathymetry

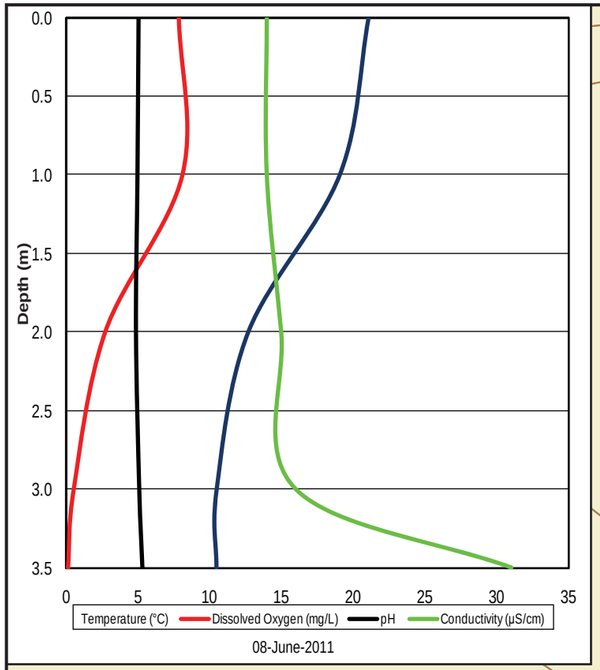
EcoMetrix INCORPORATED | July 2011 | **Figure 3.6**



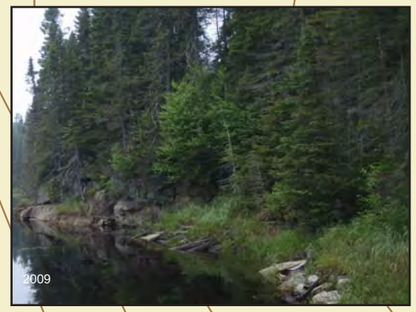
Stillwater Canada Inc.

Map of Stream 2 Watershed

EcoMetrix INCORPORATED | November 2011 | **Figure 3.7**













N

380

400

400

Aquatic Vegetation

Floating-leaved Burreed, Yellow Pond Lily, Hardstem Bulrush, Manna Grass, Common Mare's Tail, Northern Water Milfoil

Terrestrial Vegetation

Black Spruce, White Spruce, Balsam Fir, Mountain Ash, Balsam Poplar

Depth

4.5 m
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Beaver Lodge
- xxxxxx Beaver Dam

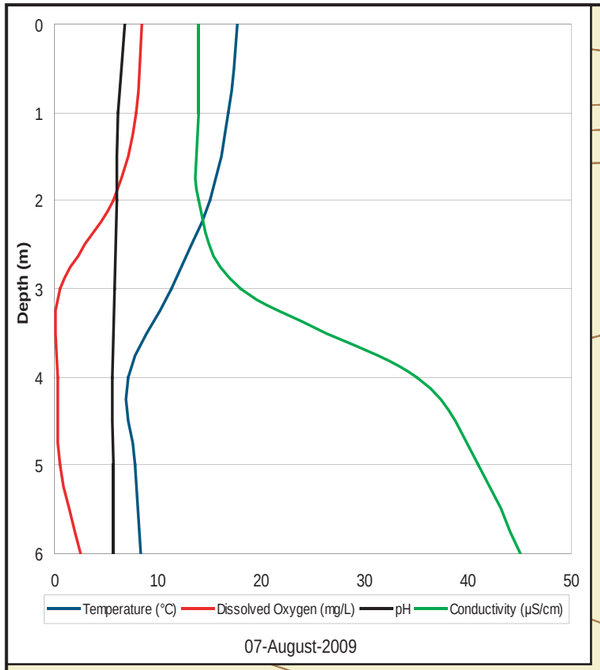
Key Features

Survey Date:	2009-08-06, 2011-06-17
Surface Area:	2.04 ha
Lake Elevation:	342 masl
Lake Volume:	26,120 m^3
Maximum Depth:	4.4 m
Secchi Depth:	1.66 m
Fish Species Observed:	None

Stillwater Canada Inc.

L3 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.8**













Terrestrial Vegetation

Black Spruce, White Spruce, White Birch, Balsam Fir, Balsam Poplar, Sweet Gale

Aquatic Vegetation

Floating-leaved Burreed, Variable-leaved Pondweed, Three-way Sedge, Beaked Sedge, Floating Arrowhead, Yellow Pond Lily, Northern Water Milfoil, Common Mare's Tail

Depth

8 m
7
6
5
4
3
2
1
0

0 0.1 0.2 Kilometers

360

390

xxxxxx

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

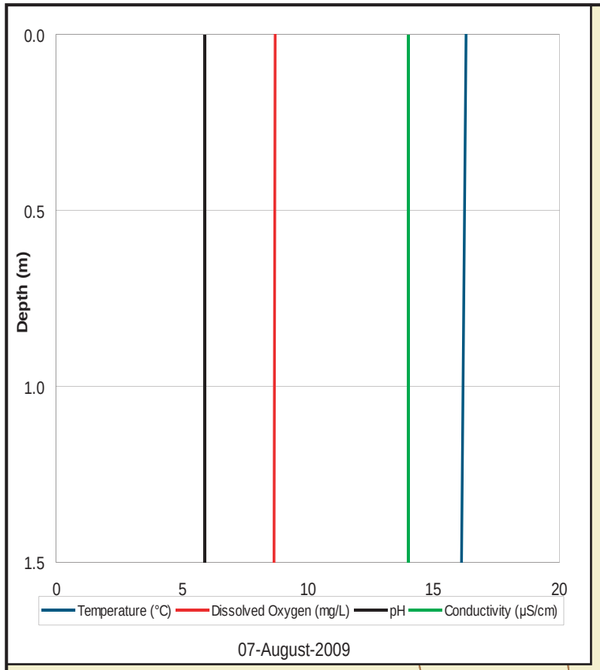
Key Features

Survey Date:	2009-08-07
Surface Area:	1.98 ha
Lake Elevation:	341 masl
Maximum Depth:	7.8 m
Secchi Depth:	4 m
Fish Species Observed:	Lake Chub

Stillwater Canada Inc.

L7 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.9**



360

400

xxxxxx

xxxxxxxxxxx

N







Aquatic Vegetation

Floating-leaved Burreed, Variable-leaved Pondweed, Northern Blue Flag, *Sphagnum* Moss, Freshwater Sponge

Terrestrial Vegetation

Black Spruce, White Spruce, White Birch, Balsam Fir, Balsam Poplar, Sweet Gale, Bog Willow

Depth

1.5 m
1.0
0.5
0.0

0 0.05 0.1 Kilometers

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

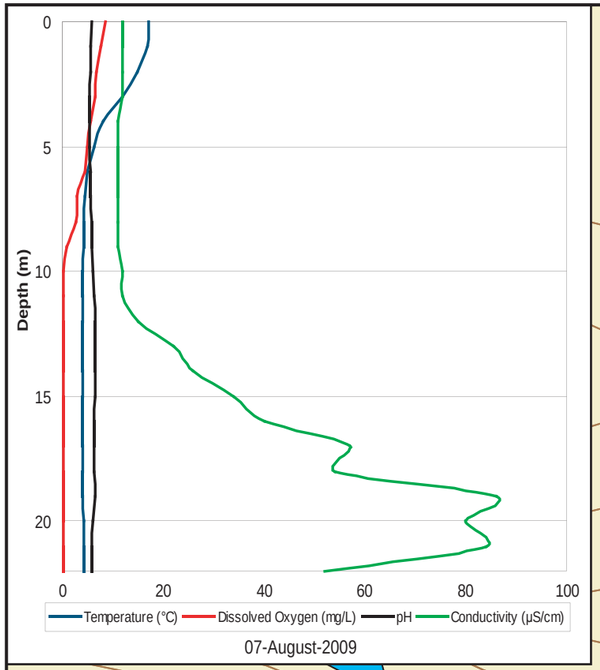
Key Features

Survey Date:	2009-08-08
Surface Area:	0.37 ha
Lake Elevation:	339 masl
Maximum Depth:	1.5 m
Secchi Depth:	Bottom
Fish Species Observed:	Lake Chub

Stillwater Canada Inc.

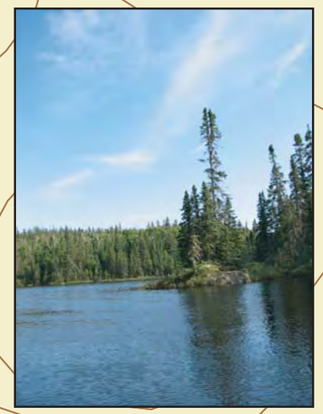
L6 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.10**













Terrestrial Vegetation

Black Spruce, White Spruce, White Birch, Balsam Fir, Mountain Ash, Sweet Gale, Bog Willow

Aquatic Vegetation

Floating-leaved Burreed, Variable-leaved Pondweed, Three-way Sedge, Hardstem Bulrush, Northern Blue Flag, Northern Water Milfoil

N

420
390
380
360

Depth

23 m
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0 m

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

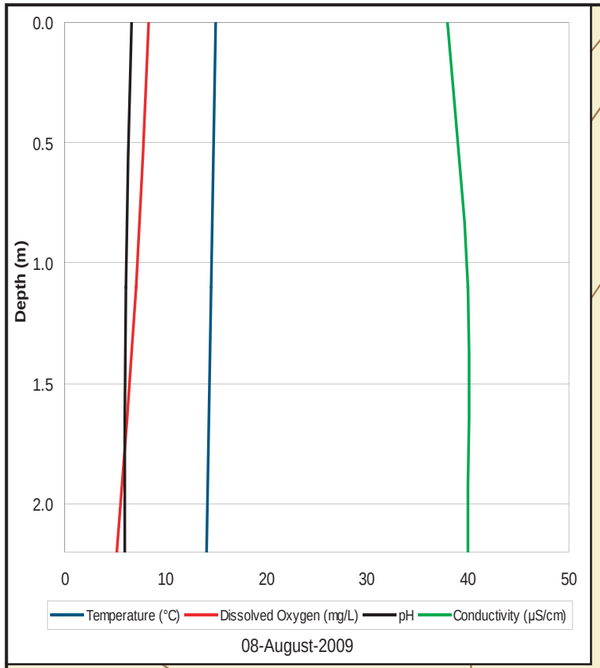
Key Features

Survey Dates:	2009-08-07, 2009-10-24
Surface Area:	4.03 ha
Lake Elevation:	337 masl
Lake Volume:	19,4043 m^3
Maximum Depth:	22.8 m
Secchi Depth:	7 m
Fish Species Observed:	Lake Chub

Stillwater Canada Inc.

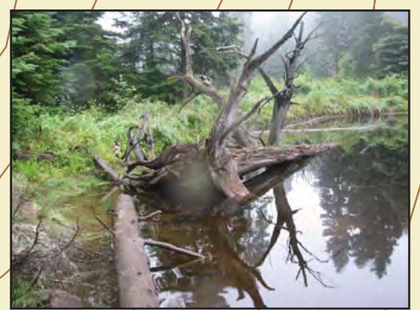
L5 (Canoe Lake) Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2010 | **Figure 3.11**



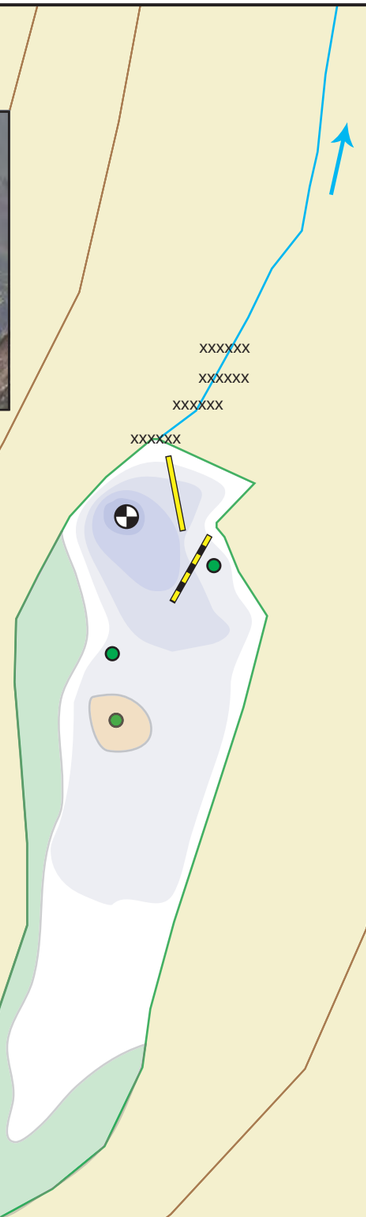














Terresterial Vegetation

Black Spruce, White Spruce, White Birch

Aquatic Vegetation

Common Waterweed, Common Mare's Tail, Northern Water Milfoil, Freshwater Sponge, Submerged Water Starwort, Sedge, Manna Grass

330

300

290

300

Depth

2 m
1.5
1
0.5
0 m

0 0.05 0.1 Kilometers

Legend

- Organic Fibrous Peat and Woody Debris
- Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

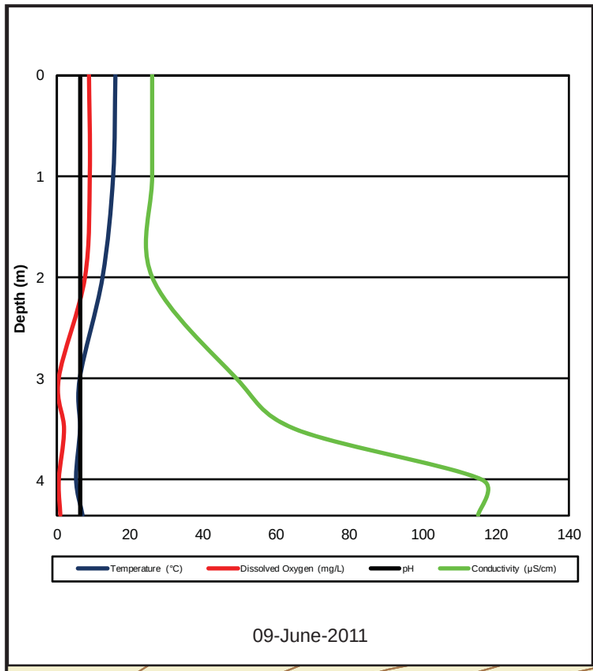
Key Features

Survey Dates:	2009-08-08
Surface Area:	0.37 ha
Lake Elevation:	286 masl
Maximum Depth:	2.2
Secchi Depth:	Bottom
Fish Species Observed:	Lake Chub, Brook Stickleback

Stillwater Canada Inc.

L14 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.12**



09-June-2011











Aquatic Vegetation

Floating-leaved Burreed, Variable-leaved Pondweed, Floating Arrowhead, Yellow Pond Lily, Sedge

Terrestrial Vegetation

Speckled Alder, White Spruce, White Birch

420
430
370
360
390

N

Depth
6 m
5
4
3
2
1
0 m

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

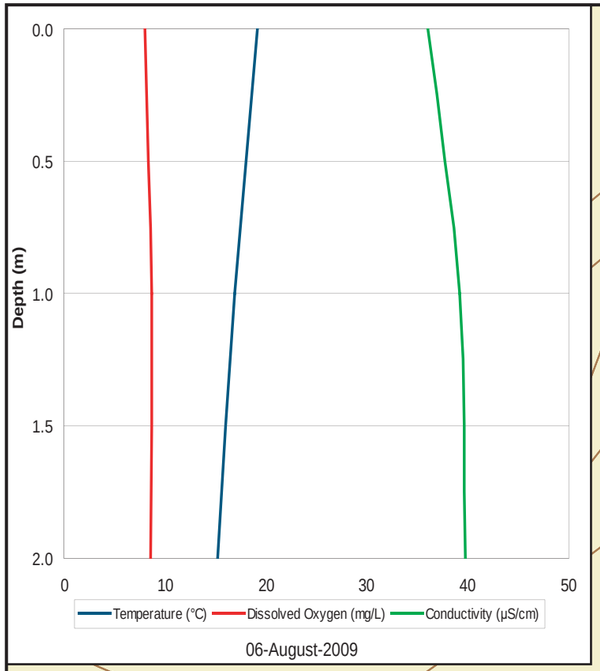
Key Features

Survey Dates:	2009-08-12, 2011-06-07
Surface Area:	0.60 ha
Lake Elevation:	339 masl
Maximum Depth:	6.5 m
Secchi Depth:	2.5 m
Fish Species Observed:	None

Stillwater Canada Inc.

L20 (Terru Lake) Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.13**















Aquatic Vegetation

Common Cattail, Beaked Sedge, Hardstem Bulrush, Northern Blue Flag, Northern Water Milfoil, Wild Celery, Water Smartweed, Marsh Cinquefoil, Variable-leaved Pondweed, Floating-leaved Burreed, Floating Arrowhead

Terrestrial Vegetation

Black Spruce, White Spruce, White Birch
Sweet Gale, Bog Willow

N

400
330
320
310

xxxxxx

Depth
2.5 m
2.0
1.5
1.0
0.5
0.0

0 0.2 0.4 Kilometers

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

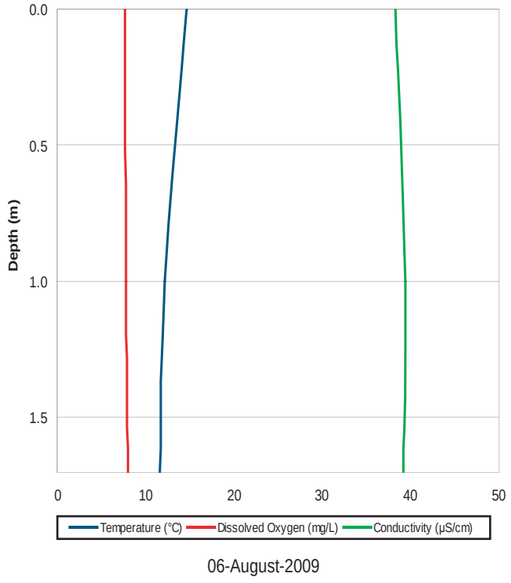
Key Features

Survey Date:	2009-08-06
Surface Area:	2.24 ha
Lake Elevation:	286 masl
Maximum Depth:	2.3 m
Secchi Depth:	Bottom
Fish Species Observed:	Brook Stickleback

Stillwater Canada Inc.

L8 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.14**











Aquatic Vegetation

Water Smartweed, Marsh Cinquefoil, Northern Water Milfoil, Common Waterweed, Submerged Water Starwort, Sedge, Manna Grass, Hardstem Bulrush

Terrestrial Vegetation

Black Spruce, White Spruce, Speckled Alder, Sweet Gale, Bog WIllow, White Birch

N

290

xxxxxx

xxxxxx

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam
- Beaver Lodge

Key Features

Survey Dates:	2009-08-06
Surface Area:	1.06 ha
Lake Elevation:	277 masl
Maximum Depth:	1.7 m
Secchi Depth:	Bottom
Fish Species Observed:	Brook Sitckleback

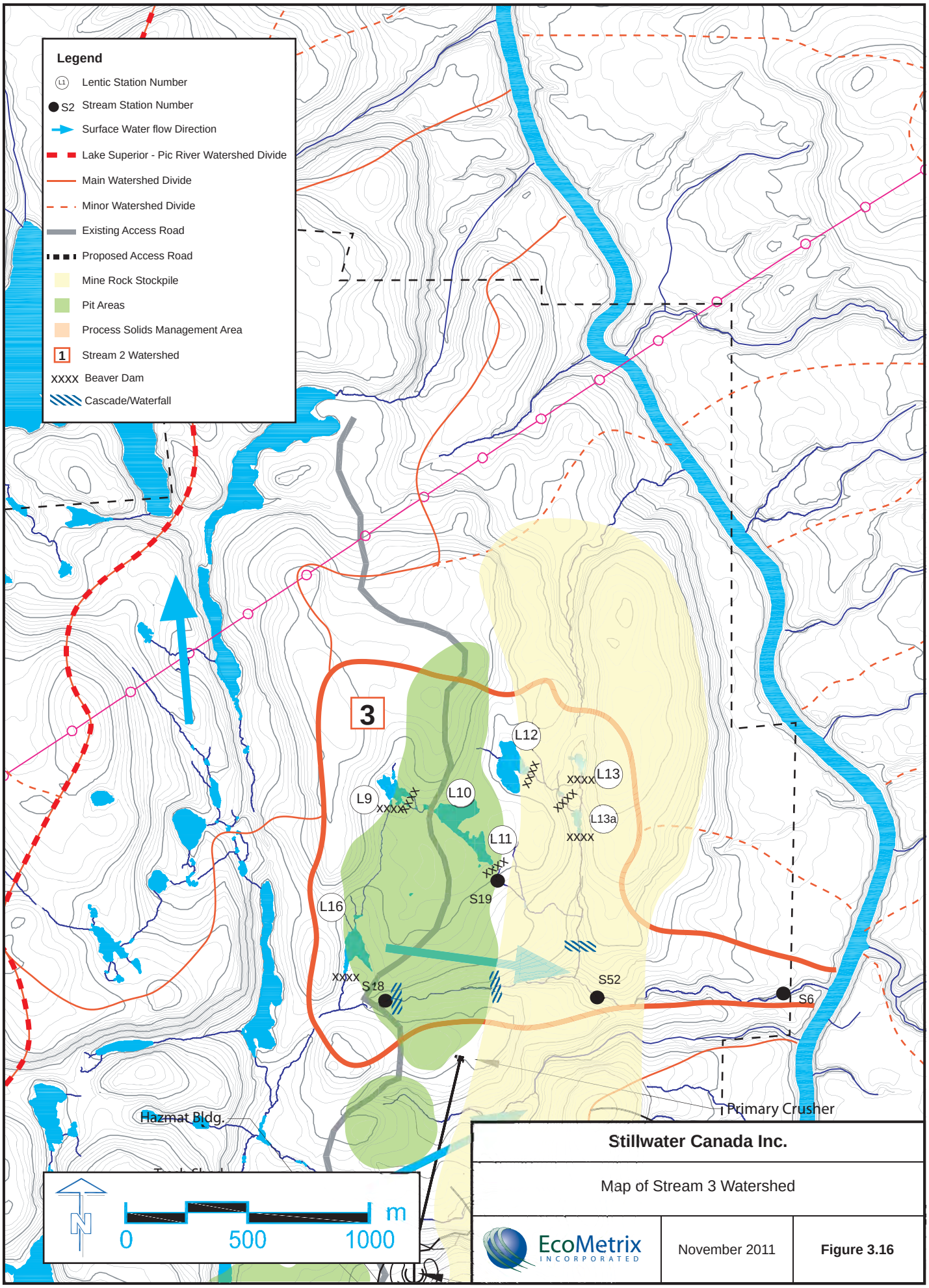
Depth
1.5 m
1.0
0.5
0.0 m

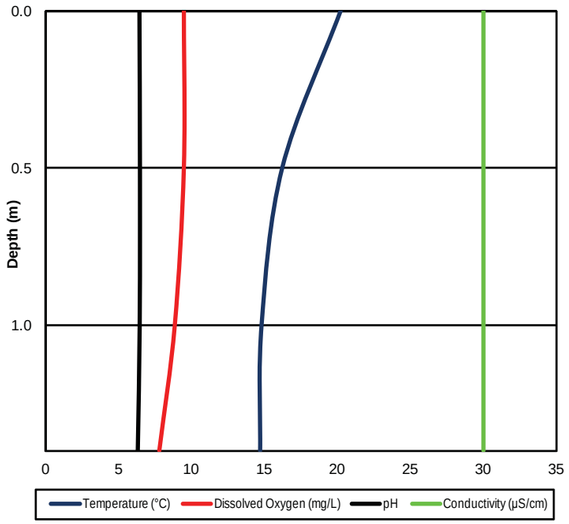
0 0.1 0.2 Kilometers

Stillwater Canada Inc.

L15 Aquatic Habitat and Bathymetry

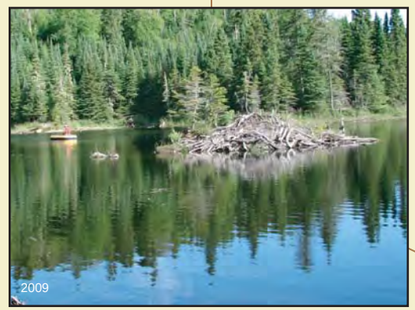
EcoMetrix INCORPORATED | October 2011 | **Figure 3.15**


Legend
L1 Lentic Station Number
S2 Stream Station Number
Surface Water flow Direction
Lake Superior - Pic River Watershed Divide
Main Watershed Divide
Minor Watershed Divide
Existing Access Road
Proposed Access Road
Mine Rock Stockpile
Pit Areas
Process Solids Management Area
1 Stream 2 Watershed
XXXX Beaver Dam
Cascade/Waterfall
3
L9
L10
L11
L12
L13
L13a
L16
S18
S19
S52
S6
XXXX
Hazmat Bldg.
Primary Crusher
N
0
500
1000
m
Stillwater Canada Inc.
Map of Stream 3 Watershed
EcoMetrix INCORPORATED
November 2011
Figure 3.16



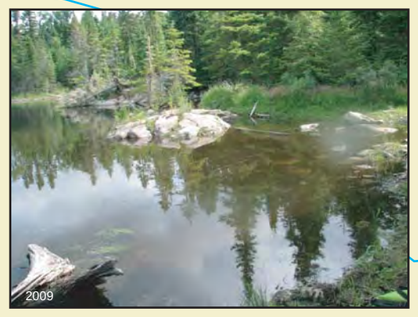
12-June-2011

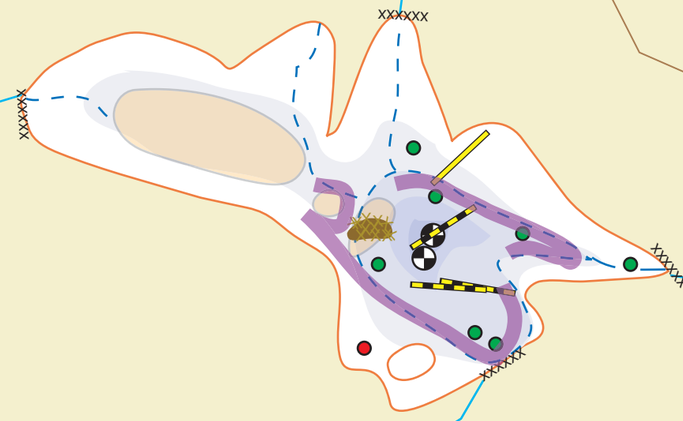












N

Terrestrial Vegetation

Black Spruce, White Spruce, White Birch, Balsam Fir, Mountain Ash, Currant, Sweet Gale

Aquatic Vegetation

Marsh Cinquefoil, Yellow Pond Lily, Floating-leaved Burreed, Hardstem Bulrush, Freshwater Sponge, Northern Water Milfoil

360

Depth

2.5 m
2.0
1.5
1.0
0.5
0.0

0 0.05 0.1 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- 2011 Shore
- Minnow Trap
- Water Profile
- Benthic Sample
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- xxxxxx Beaver Dam
- Beaver Lodge

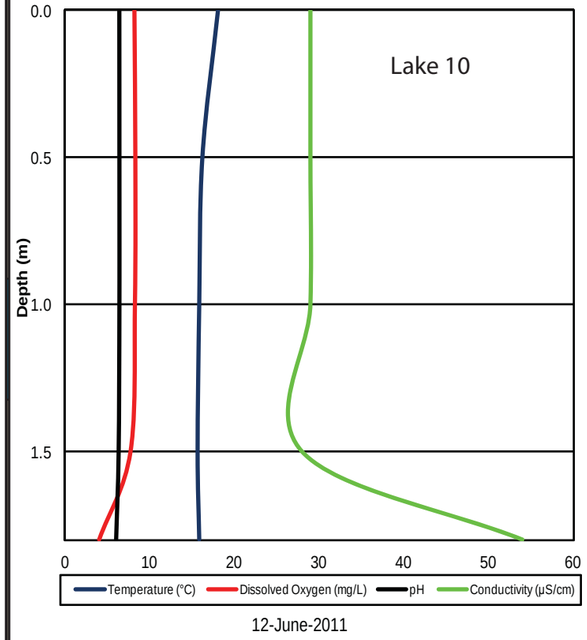
Key Features

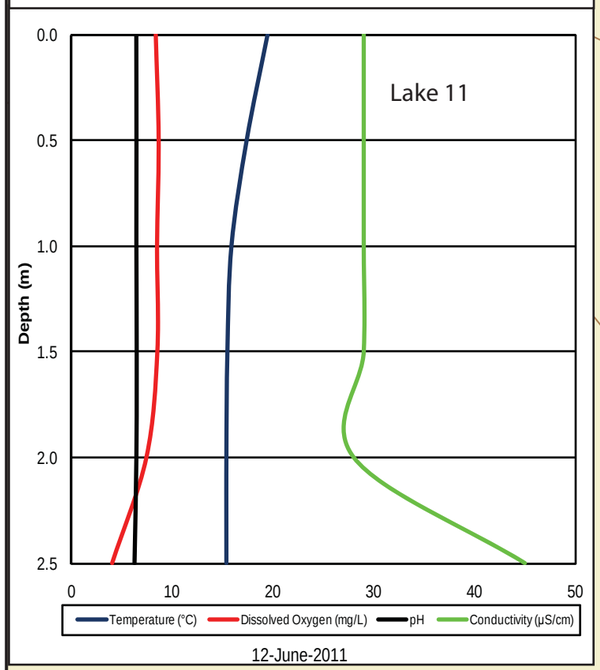
Survey Dates:	2009-08-07, 2009-10-24, 2011-06-12
Surface Area:	0.37 ha
Lake Elevation:	333 masl
Maximum Depth:	2.3 m
Secchi Depth:	Bottom
Fish Species Observed:	None

Stillwater Canada Inc.

L9 Aquatic Habitat and Bathymetry

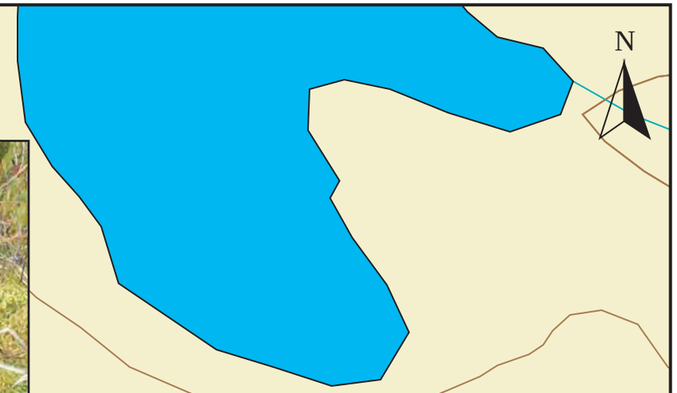
EcoMetrix INCORPORATED | October 2011 | **Figure 3.17**

















330

xxxxxx

Aquatic Vegetation

2009

Floating-leaved Burreed, Yellow Pond Lily, Hardstem Bulrush, Manna Grass, Three-way Sedge, Common Cattail, Sphagnum Moss

Terrestrial Vegetation

Black Spruce, White Spruce, White Birch, Balsam Fir, Tamarack, Currant, Sweet Gale, Bog Willow

Legend

- Rocky Shore
- Shoreline Electrofishing
- Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

Key Features

Survey Date:	2009-08-06, 2011-06-12
Surface Area:	1.66 ha
Lake Elevation:	328 masl
Maximum Depth:	3.1 m
Secchi Depth:	Bottom
Fish Species Observed:	None

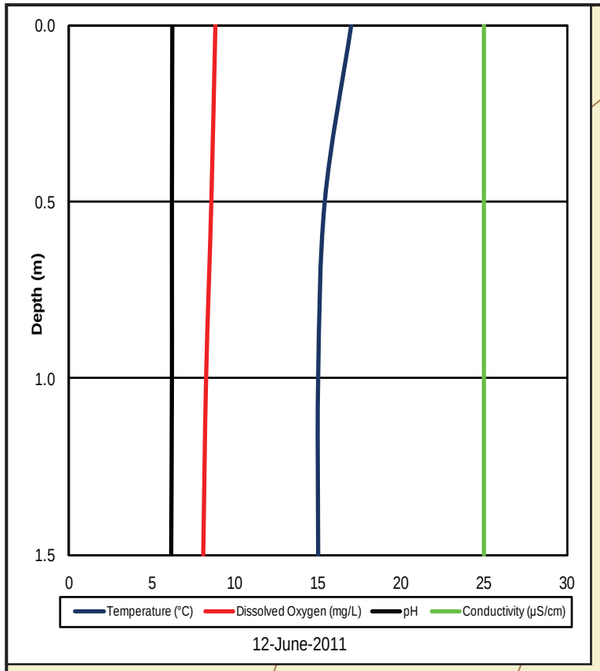
Depth
3.5 m
3.0
2.5
2.0
1.5
1.0
0.5
0.0

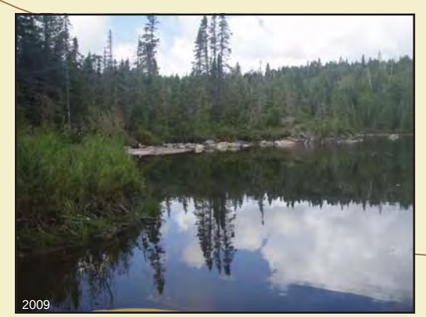
0 0.1 0.2 Kilometers

Stillwater Canada Inc.

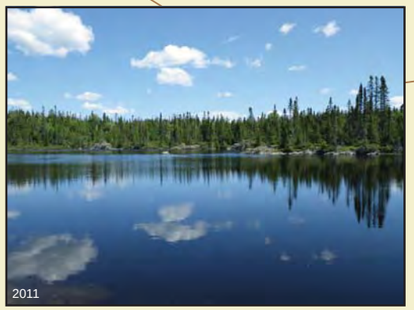
L10 and L11 (Two Duck Lake) Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.18**













330

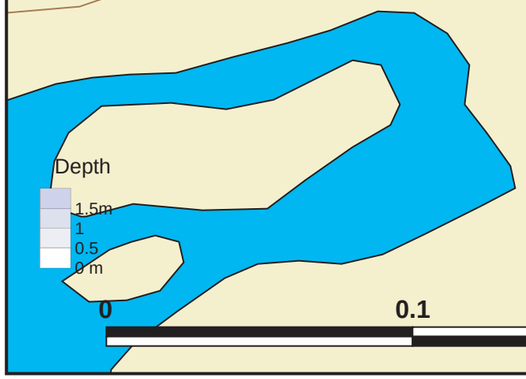
N

Aquatic Vegetation

Floating-leaved Burreed, Variable-leaved Pondweed, Yellow Pond Lily, Water Smartweed

Terrestrial Vegetation

Sweet Gale, Black Spruce, White Spruce, White Birch, Eastern White Cedar, Bog Willow, Pink Lady's Slipper



0 0.1 0.2 Kilometers

330

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

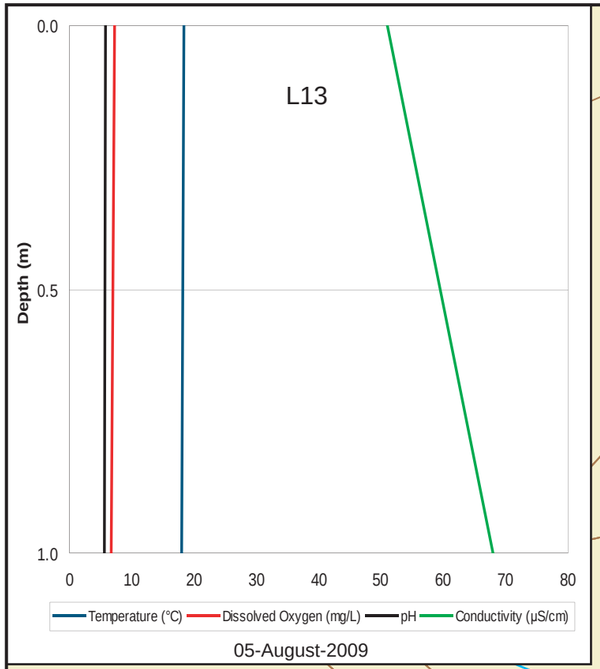
Key Features

Survey Date:	2009-08-06, 2011-06-12
Surface Area:	1.54 ha
Lake Elevation:	314 masl
Maximum Depth:	1.8 m
Secchi Depth:	Bottom
Fish Species Observed:	None

Stillwater Canada Inc.

L12 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | June 2011 | **Figure 3.19**



Terresterial Vegetation

Black Spruce, White Spruce, White Birch, Tamarack, Sweet Gale, Bog Rosemary, Round-leaved Sundew, Pitcher Plant, Sphagnum Moss, Bog Willow

Aquatic Vegetation

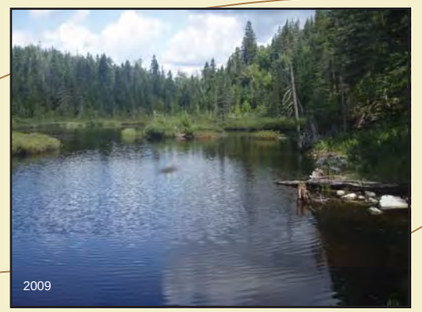
Yellow Pond Lily, Sedge, Manna Grass, Common Mare's Tail





340











330

xxxxxx

xxxxxx

xxxxxx

xxxxxx

xxxxxx

xxxxxx

Terresterial Vegetation

Black Spruce, White Spruce, White Birch, Speckled Alder, Sphagnum, Grass

Aquatic Vegetation

Variable-leaved Pondweed, Floating Arrowhead, Sedge, Yellow Pond Lily, Manna Grass

Depth
1.0 m
0.5
0.0

0 0.1 0.2 Kilometers

N

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

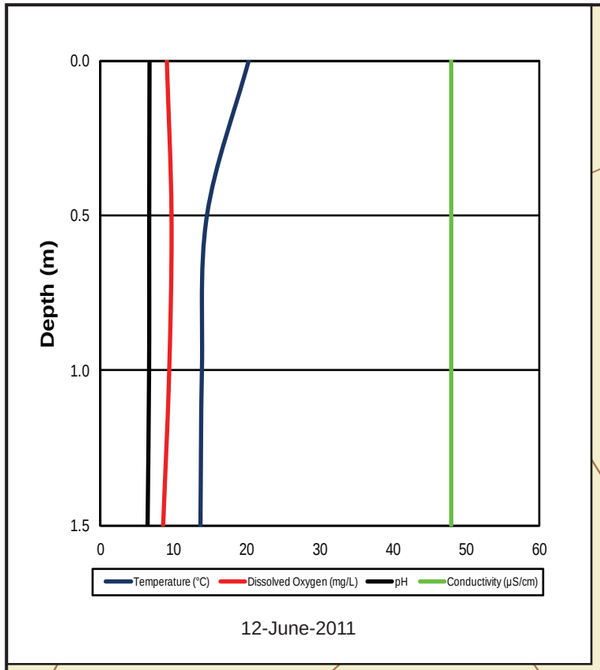
Key Features

	Lake 13	Lake 13a
Survey Date:	2009-08-06, 2011-06-12	2009-08-06, 2011-06-12
Surface Area:	0.18 ha	0.38 ha
Lake Elevation:	296 masl	288 masl
Maximum Depth:	1.5 m	1.0 m
Secchi Depth:	Bottom	Bottom
Fish Species Observed:	None	None

Stillwater Canada Inc.

L13 and L13a Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.20**



12-June-2011











330

N

Aquatic Vegetation

Water Smartweed, Northern Water Milfoil, Common Cattail, Floating-leaved Burreed, Yellow Pond Lily, Hardstem Bulrush, Common Burreed, Sedge, Northern Marsh Violet

Terrestrial Vegetation

Black Spruce, White Spruce, Speckled Alder, Sweet Gale, White Birch, Bog Willow

xxxxxx

Legend

- Rocky Shore
- Shoreline Electrofishing
- Minnow Trap
- Water Profile
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam
- Beaver Lodge

Key Features

Survey Dates:	2009-08-07, 2009-10-24, 2011-06-12
Surface Area:	0.55 ha
Lake Elevation:	305 masl
Maximum Depth:	2.2 m
Secchi Depth:	Bottom
Fish Species Observed:	None

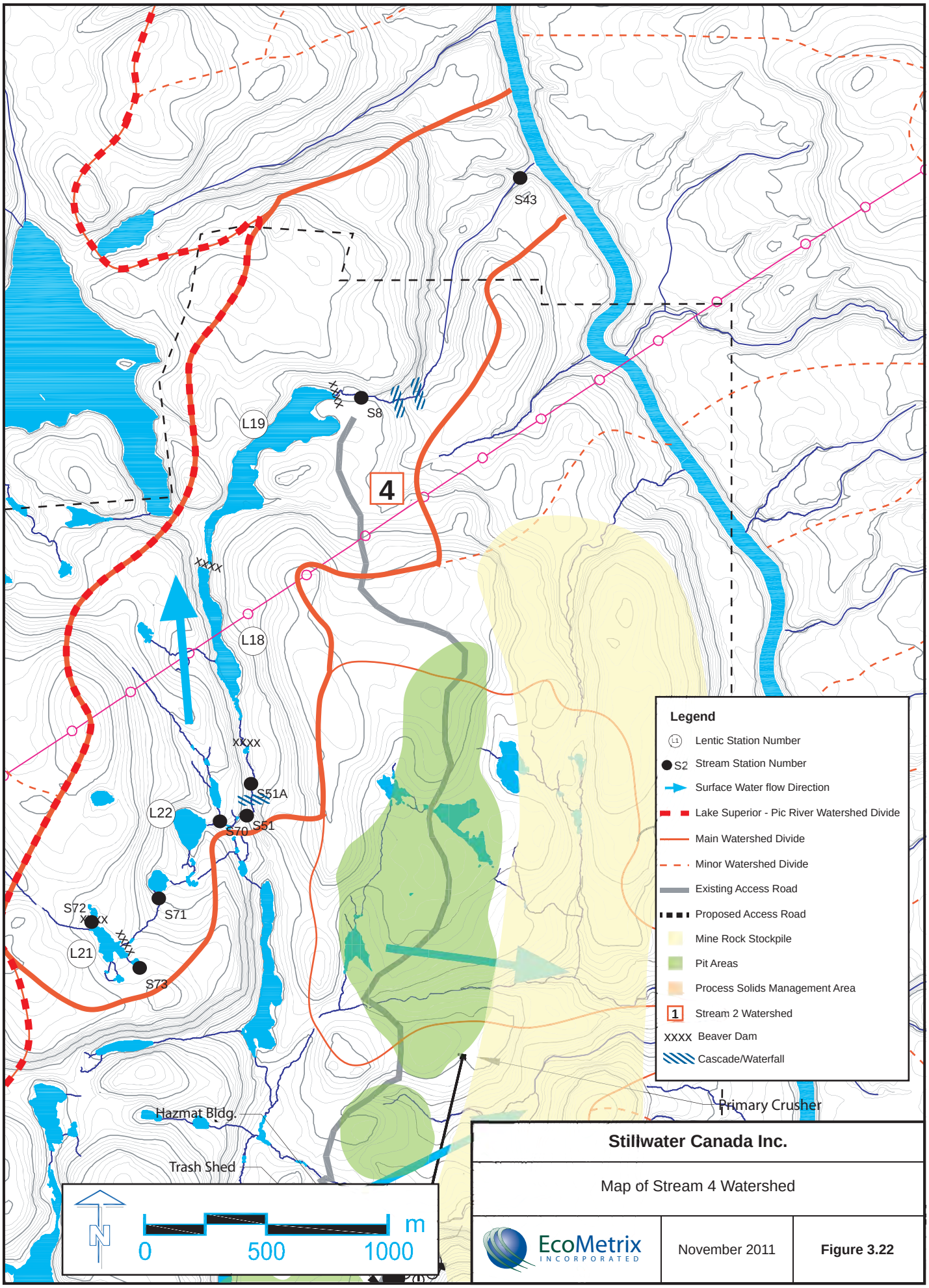
Depth
2.5 m
2.0
1.5
1.0
0.5
0.0

0 0.05 0.1 Kilometers

Stillwater Canada Inc.

L16 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.21**



Stillwater Canada Inc.

Map of Stream 4 Watershed

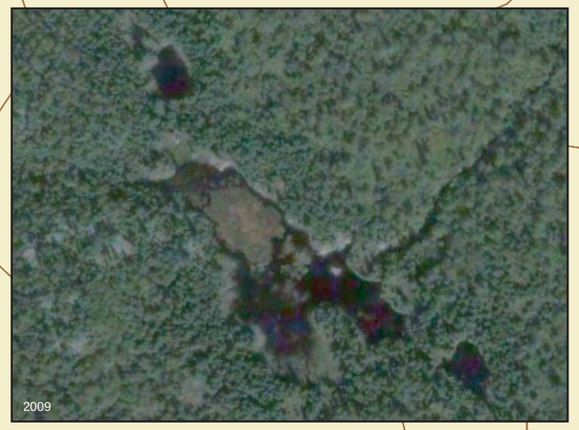
EcoMetrix INCORPORATED | November 2011 | **Figure 3.22**



Aquatic Vegetation

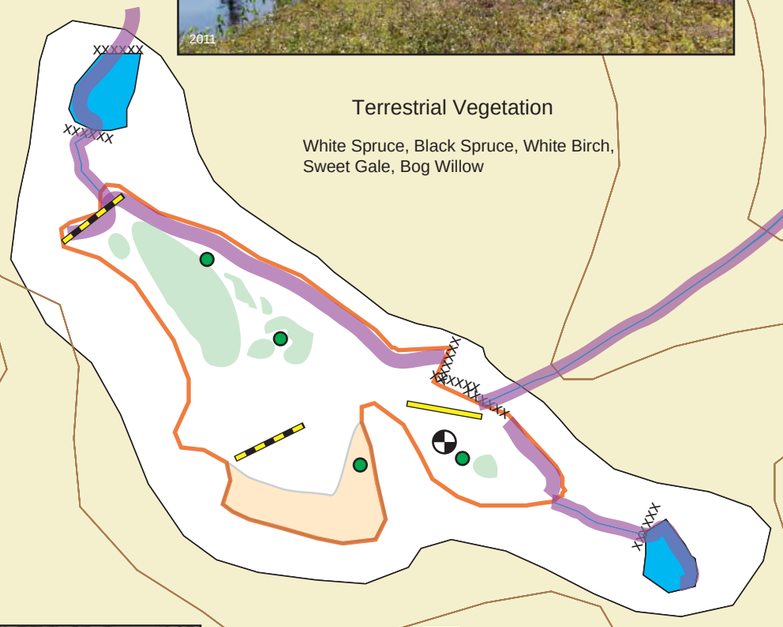
Floating-leaved Burreed, Manna Grass, Coontail





Terrestrial Vegetation

White Spruce, Black Spruce, White Birch, Sweet Gale, Bog Willow







N

420

430

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

Key Features

Survey Date:	2007-08-30, 2007-09-01, 2011-06-09
Surface Area:	1.03 ha
Lake Elevation:	405 masl
Maximum Depth:	1.2 m
pH Range:	4.4 to 6.1
Dissolved Oxygen (mg/L):	5.7
Secchi Depth:	Bottom
Fish Species Observed:	None

0 0.1 0.2 Kilometers

Stillwater Canada Inc.

L21 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.23**







549300 549400 549500 549600 549700

5405800 5405700 5405600 5405500

N

Aquatic Vegetation

Floating-leaved Burreed, Sedge, Manna Grass, Common Mare's Tail

Terrestrial Vegetation

White Spruce, Black Spruce, White Birch

Si/Or

75% BR , 25% Si/Or

BR

GR/SH/EM VEG

410 400 390 380 370 360 320

0 50 100

Metres

LEGEND

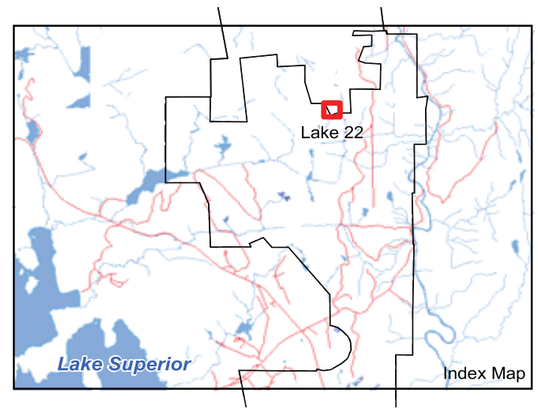
- Waterbody/Watercourse
- Wetland, Permanent
- Wooded Areas
- Benthic/Sediment Sampling Station
- Minnow Trap
- Fish Gill Net
- Water Quality Station
- Beaver Lodge
- Boulder
- Very Steep Slope
- Steep Slope
- Intermediate Slope
- FlowArrows
- Bathymetric Contours (0.5m Interval)
- Shoreline Electrofished
- Contours (masl)
- Rivers
- Bridge
- BR Bedrock
- Si/Or Silt/Organic
- BD Bedrock Face
- GR Grasses
- SH Shrubs
- EM VEG Emergent Vegetation
- WD Woody Debris

Key Features

Survey Date:	2007-09-03, 2007-09-04, 2011-06-07
Surface Area:	1.73 ha
Lake Elevation:	345 masl
Maximum Depth:	9.1 m
pH Range:	6.0 to 6.7
Dissolved Oxygen (mg/L):	8.7 to 3.6
Fish Species Observed:	None

REFERENCE

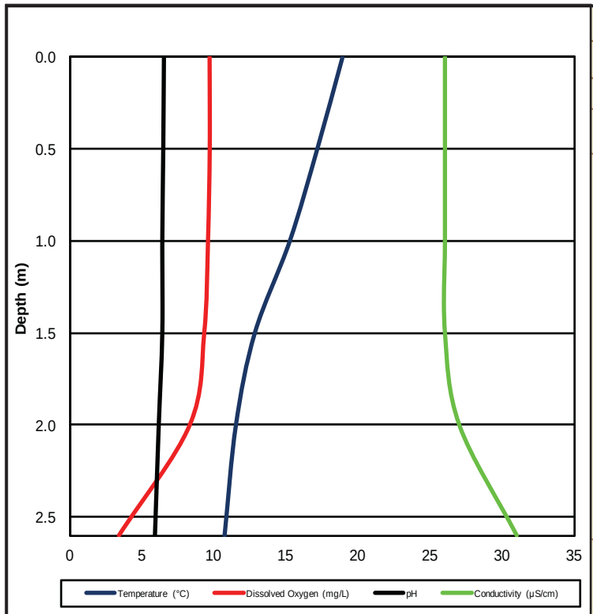
Base Data - MNR NRVIS, obtained 2004, CANMAP v2005.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2006
Datum: NAD 27 Projection: UTM Zone 16N



Stillwater Canada Inc.

L22 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2010 | **Figure 3.24**



13-June-2011

Terrestrial Vegetation

Black Spruce, White Spruce, White Birch, Balsam Fir, Sweet Gale, Speckled Alder





Aquatic Vegetation

Sedge, Water Smartweed, Hardstem Bulrush, Yellow Pond Lily, Floating-leaved Burreed, Manna Grass







N

370

380

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Small Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam
- Beaver Lodge

Key Features

Survey Date:	2009-08-09, 2011-06-13
Surface Area:	2.56 ha
Lake Elevation:	297 masl
Maximum Depth:	3.2 m
Secchi Depth:	1.75 m
Fish Species Observed:	Finescale Dace, Longnose Sucker, Brook Stickleback, Northern Redbelly Dace, Fathead Minnow, Blacknose Shiner, Finescale Dace

Depth

- 3.0 m
- 2.5
- 2.0
- 1.5
- 1.0
- 0.5
- 0.0 m

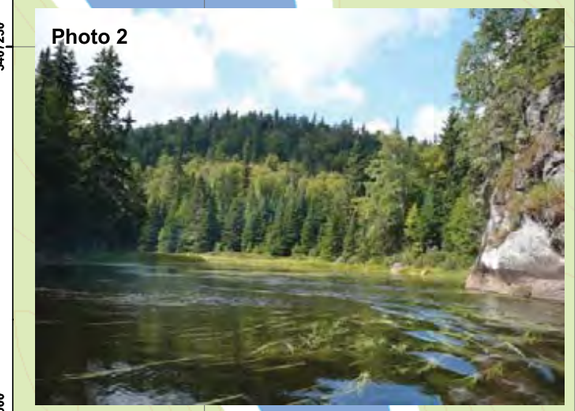
0 0.1 0.2 Kilometers

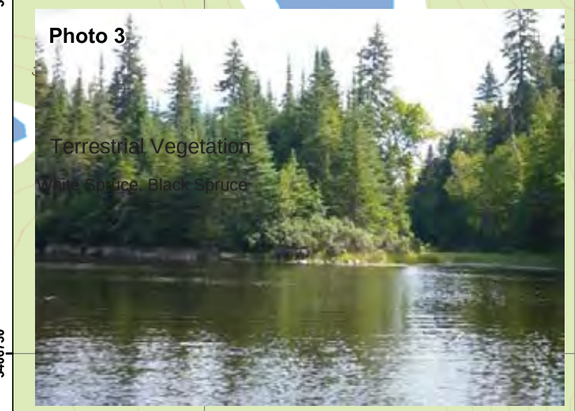
Stillwater Canada Inc.

L18 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.25**







549250 549500 549750 550000 550250

5407500 5407250 5407000 5406750

N

Terrestrial Vegetation

White Spruce, Black Spruce, White Birch

Aquatic Vegetation

Burreed

Organic Pile

MARSH

25% Si/Or , 75% BR

100% Si/Or

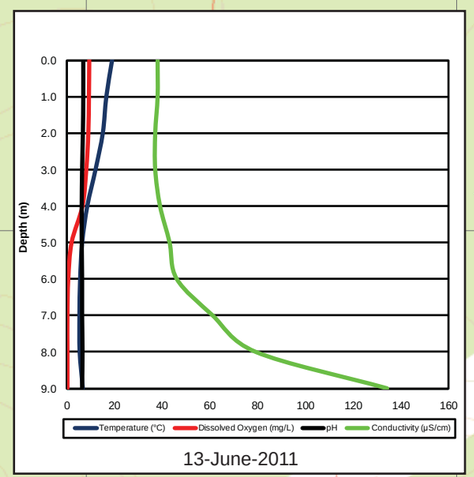
WD

BR

GR/SH

xxxxxx

0 50 100 200 300 Metres



13-June-2011

Key Features

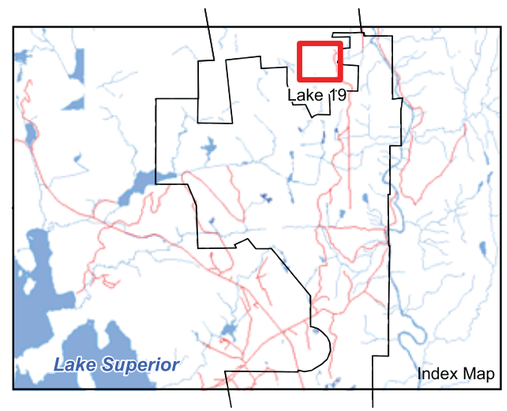
Survey Date:	2007-08-30, 2007-09-01, 2011-06-13
Surface Area:	9.53 ha
Lake Elevation:	293 masl
Maximum Depth:	9.0 m
Fish Species Observed:	Finescale Dace, Northern Redbelly Dace, Fathead Minnow, Lake Chub, Brook Stickleback, Longnose Sucker, Blacknose Shiner

LEGEND

- Waterbody/Watercourse
- Wetland, Permanent
- Wooded Areas
- Benthic/Sediment Sampling Station
- Minnow Trap
- Fish Gill Net
- Water Quality Station
- Beaver Lodge
- Boulder
- Very Steep Slope
- Steep Slope
- Intermediate Slope
- FlowArrows
- Bathymetric Contours (0.5m Interval)
- Roads
- Contours (masl)
- Rivers
- **Causeway**
- BR Bedrock
- Si/Or Silt/Organic
- BD Bedrock Face
- GR Grasses
- SH Shrubs
- EM VEG Emergent Vegetation
- WD Woody Debris
- xxxxxx **Beaver Dam**

REFERENCE

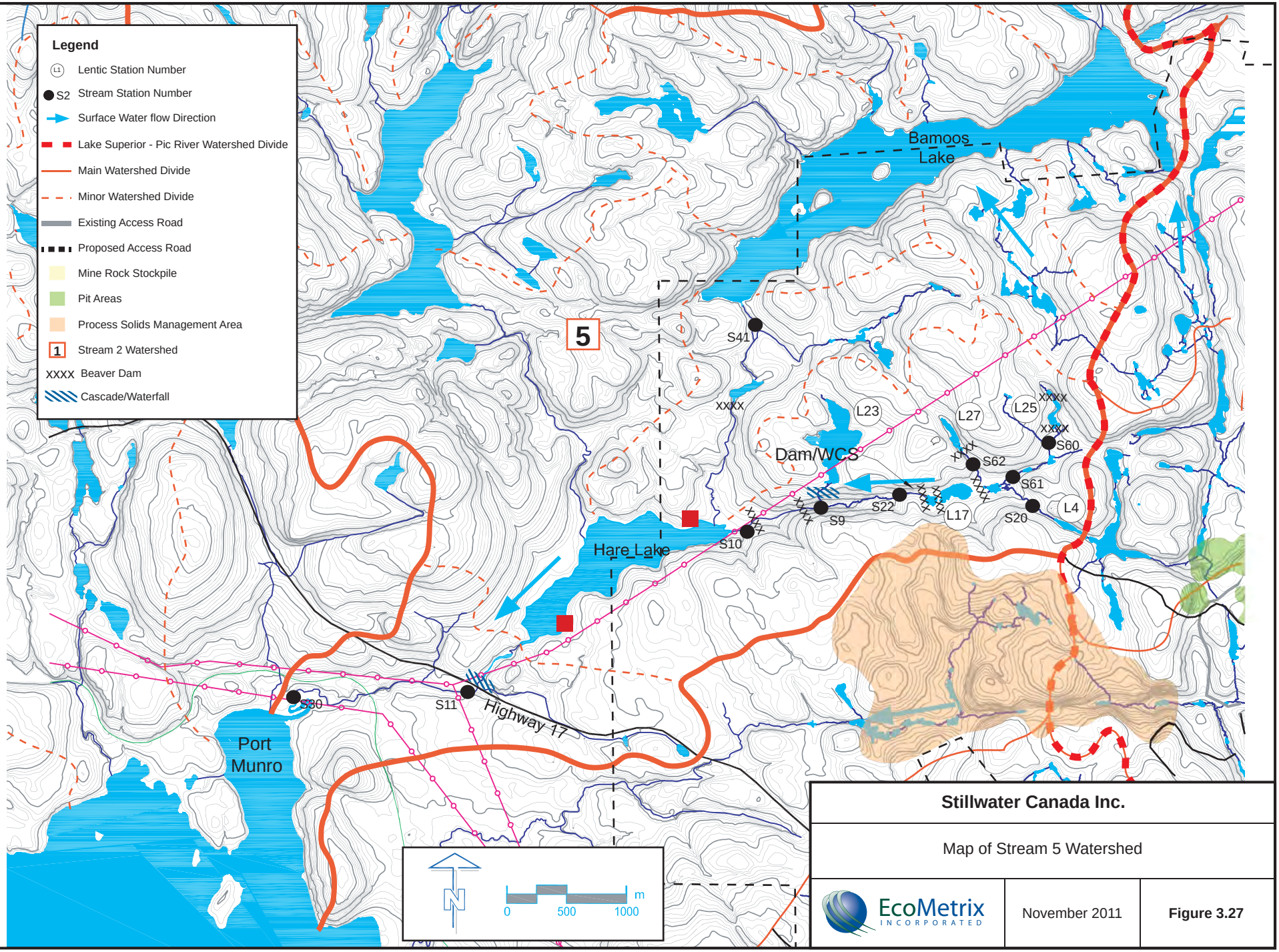
Base Data - MNR NRVIS, obtained 2004, CANMAP v2005.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2006
Datum: NAD 27 Projection: UTM Zone 16N



Stillwater Canada Inc.

L19 (Claw Lake) Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.26**



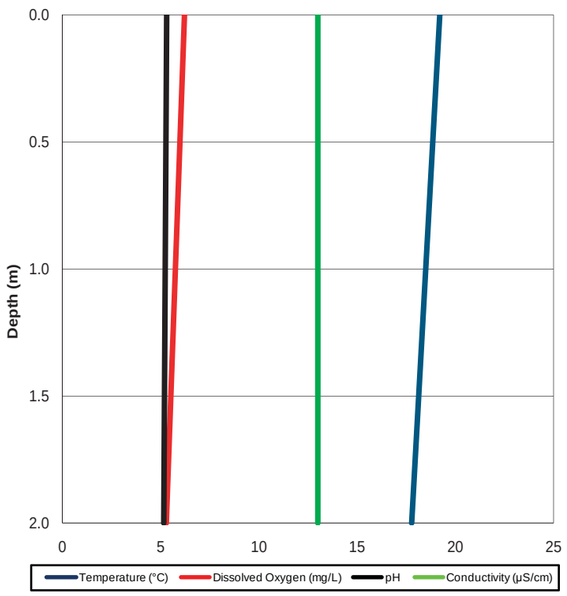
Stillwater Canada Inc.

Map of Stream 5 Watershed

EcoMetrix INCORPORATED

November 2011

Figure 3.27

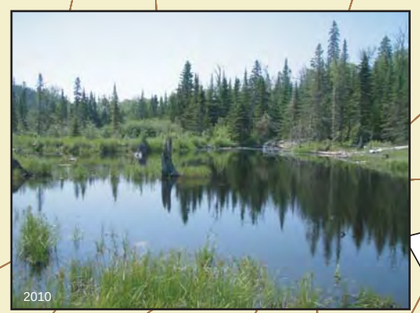


16-June-2010









Aquatic Vegetation

Sedge, Manna Grass, Hardstem Bulrush, Floating-leaved Burreed

Terrestrial Vegetation

Black Spruce, White Spruce, Speckled Alder, White Birch, Bog Willow, Sweet Gale

N

440

370

430

Depth

2.0m
1.0
0 m

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Organic Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

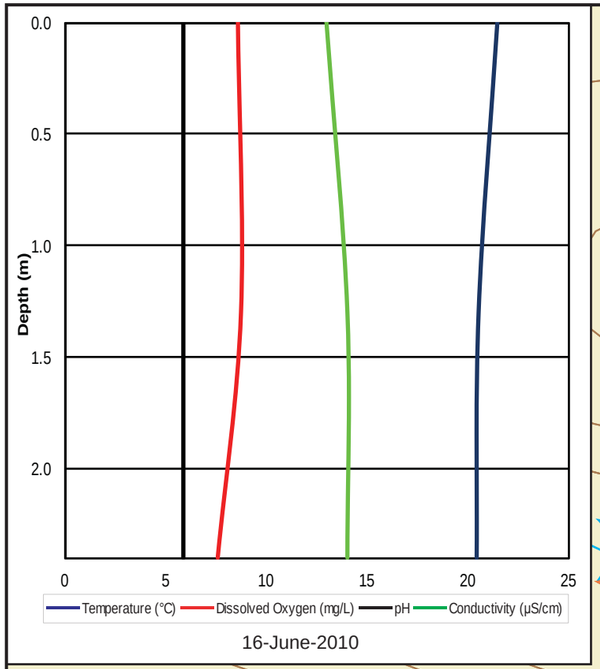
Key Features

Survey Date:	2010-06-16, 2011-06-07
Surface Area:	0.54 ha
Lake Elevation:	346 masl
Maximum Depth:	2 m
Secchi Depth:	Bottom
Fish Species Observed:	None

Stillwater Canada Inc.

L25 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.28**



16-June-2010











Terrestrial Vegetation

Black Spruce, White Spruce, Balsam Poplar, Speckled Alder, White Birch, Balsam Fir, Sweet Gale, Bog Willow

Aquatic Vegetation

Three-way Sedge, Variable-leaved Pondweed, Yellow Pond Lily, Freshwater Sponge, Hardstem Bulrush, Northern Water Milfoil, Wild Celery, *Sphagnum* Moss

N

390

280

xxxxxx

Depth
2.0 m
1.5
1.0
0.5
0

0 0.05 0.1 Kilometers

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Small Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

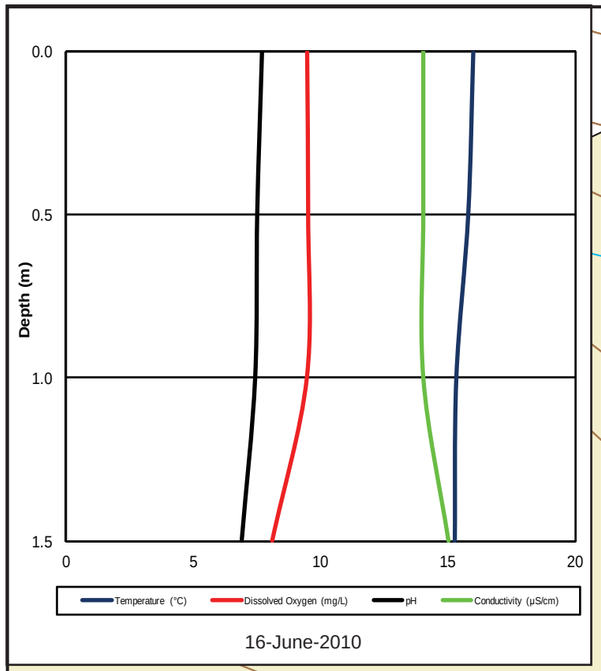
Key Features

Survey Dates:	2009-08-08, 2010-06-10
Surface Area:	0.54 ha
Lake Elevation	345 masl
Maximum Depth:	2.4 m
Secchi Depth:	Bottom
Fish Species Observed:	Lake Chub, Brook Stickleback

Stillwater Canada Inc.

L4 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.29**















N

430

410

370

Aquatic Vegetation

Variable-leaved Pondweed, Sedge, Northern Water Milfoil, *Sphagnum* Moss

Terrestrial Vegetation

Black Spruce, White Spruce, White Birch, Balsam Fir, Speckled Alder

Depth

1.5 m
1.0
0.5
0.0 m

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- Beaver Lodge
- xxxxxx Beaver Dam

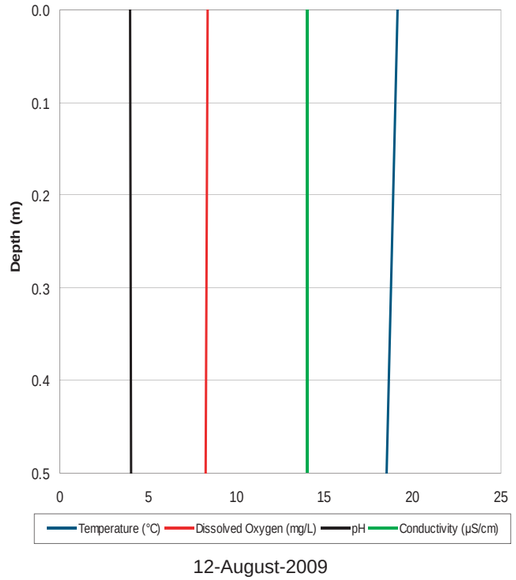
Key Features

Survey Dates:	2009-08-08, 2010-06-16, 2011-06-07
Surface Area:	0.84 ha
Lake Elevation:	339 masl
Maximum Depth:	1.7
Secchi Depth:	Bottom
Fish Species Observed:	None

Stillwater Canada Inc.

L27 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.30**

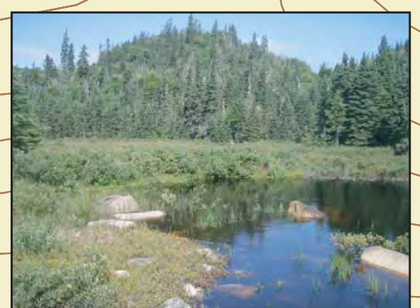


12-August-2009









N

Aquatic Vegetation

Yellow Pond Lily, Floating-leaved Burreed, *Sphagnum* Moss, Variable-leaved Pondweed, Northern Blue Flag, Manna Grass, Sedge

Terresterial Vegetation

Black Spruce, White Spruce, White Birch, Sweet Gale, Bog Willow, Speckled Alder

320

350

350

Depth

2.0 m
1.5
1.0
0.5
0.0

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam
- Beaver Lodge

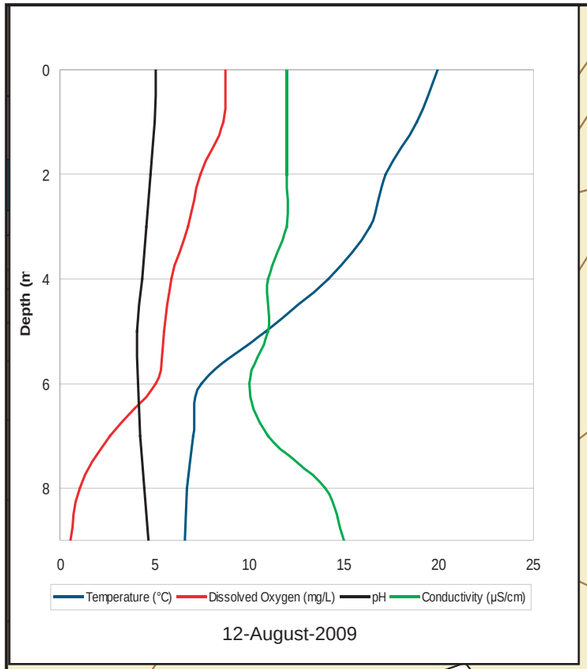
Key Features

Survey Dates:	2009-08-12, 2010-06-16
Surface Area:	0.37, 1.47, and 0.31 ha
Lake Elevation:	301 masl
Maximum Depth:	2 m
Secchi Depth:	Bottom
Fish Species Observed:	Brook Stickleback, Lake Chub

Stillwater Canada Inc.

L17 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.31**











Terrestrial Vegetation

White Birch, Bog Willow, Sweet Gale, Dwarf Cranberry, Round-leaved Sundew

Aquatic Vegetation

Variable-leaved Pondweed, *Sphagnum* Moss, Floating Arrowhead, Northern Water Milfoil

N

Depth

10 m
9
8
7
6
5
4
3
2
1
0 m

0 0.2 0.4 Kilometers

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam
- Beaver Lodge

Key Features

Survey Date:	2009-08-12
Surface Area:	10.46 ha
Lake Elevation:	324 masl
Maximum Depth:	10.0 m
Secchi Depth:	1.5 m
Fish Species Observed:	None

Stillwater Canada Inc.

L23 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.32**

Depth

80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0m

N

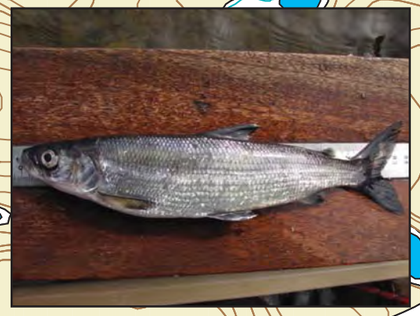






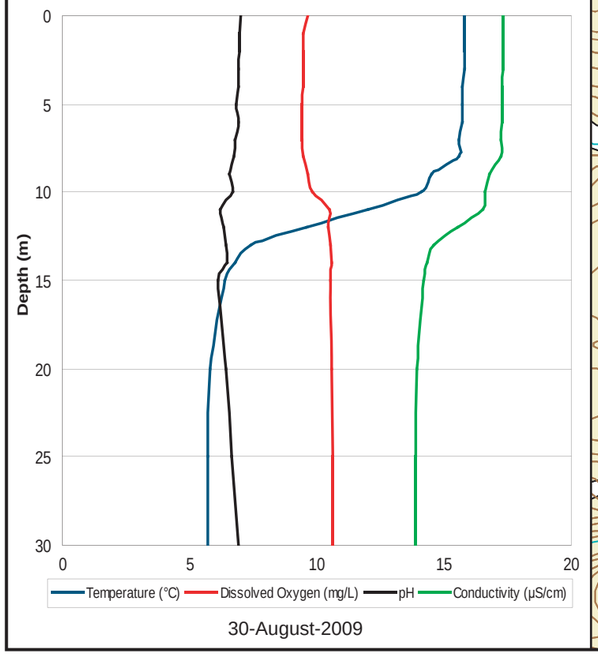
Terresterial Vegetation

White Spruce, White Birch,
Balsam Poplar, Speckled Alder









30-August-2009

Aquatic Vegetation

Floating-leaved Burreed

0 1 2 Kilometers

Legend

- Seine Net
- Trapnet
- Rocky Shore
- Sandy Shore
- Minnow Trap
- Water Profile
- Benthic Sample
- Small-mesh Experimental Gillnet
- Full Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- xxxxxx Beaver Dam
- Beaver Lodge

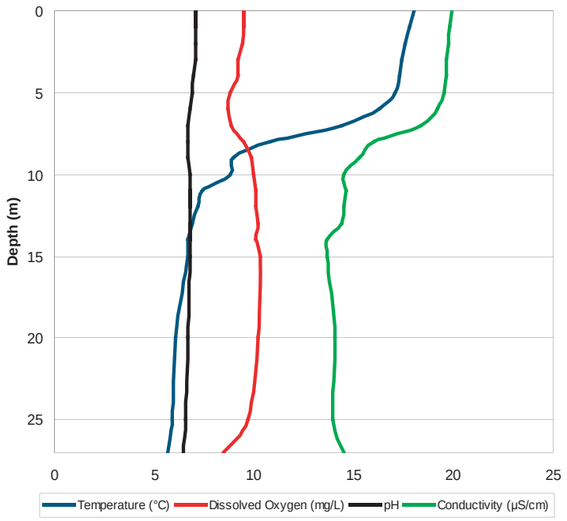
Key Features

Survey Dates:	2009-08-06, 2009-08-27 to 2009-08-30
Surface Area:	174.08 ha
Lake Elevation:	291 masl
Lake Volume:	48,101,733 m^3
Maximum Depth:	80 m
Secchi Depth:	4.9 m
Fish Species Observed:	White Sucker, Longnose Sucker, Lake Trout, Brook Trout, Cisco, Lake Chub, Trout-perch, Slimy Sculpin, Ninespine Stickleback, Brook Stickleback, Fathead Minnow, Finescale Dace

Stillwater Canada Inc.

Bamoos Lake Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.33**



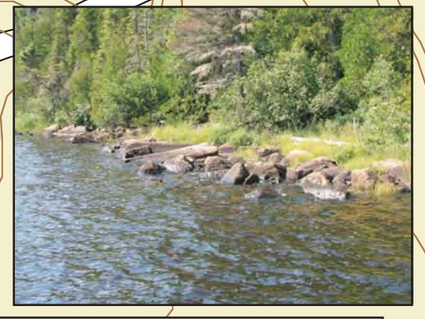
07-August-2009





















Terrestrial Vegetation

Balsam Poplar, Black Spruce, White Spruce, White Birch, Sweet Gale, Speckled Alder

Aquatic Vegetation

Wild Rice, Floating-leaved Burreed, Yellow Pond Lily, Variable-leaved Pondweed, Bladderwort, Water Horsetail

N

Depth

30 m
27
24
21
18
15
12
9
6
3
1.5
0 m

0 0.5 1 Kilometers

Legend

- Cabin
- Rocky Shore
- Sandy Shore
- Minnow Trap
- Water Profile
- Benthic Sample
- Nordic Net
- Small-mesh Experimental Gillnet
- Large-mesh Experimental Gillnet
- Full Experimental Gillnet
- Trapnet
- Seine Net
- Submergent-Emergent Macrophytes

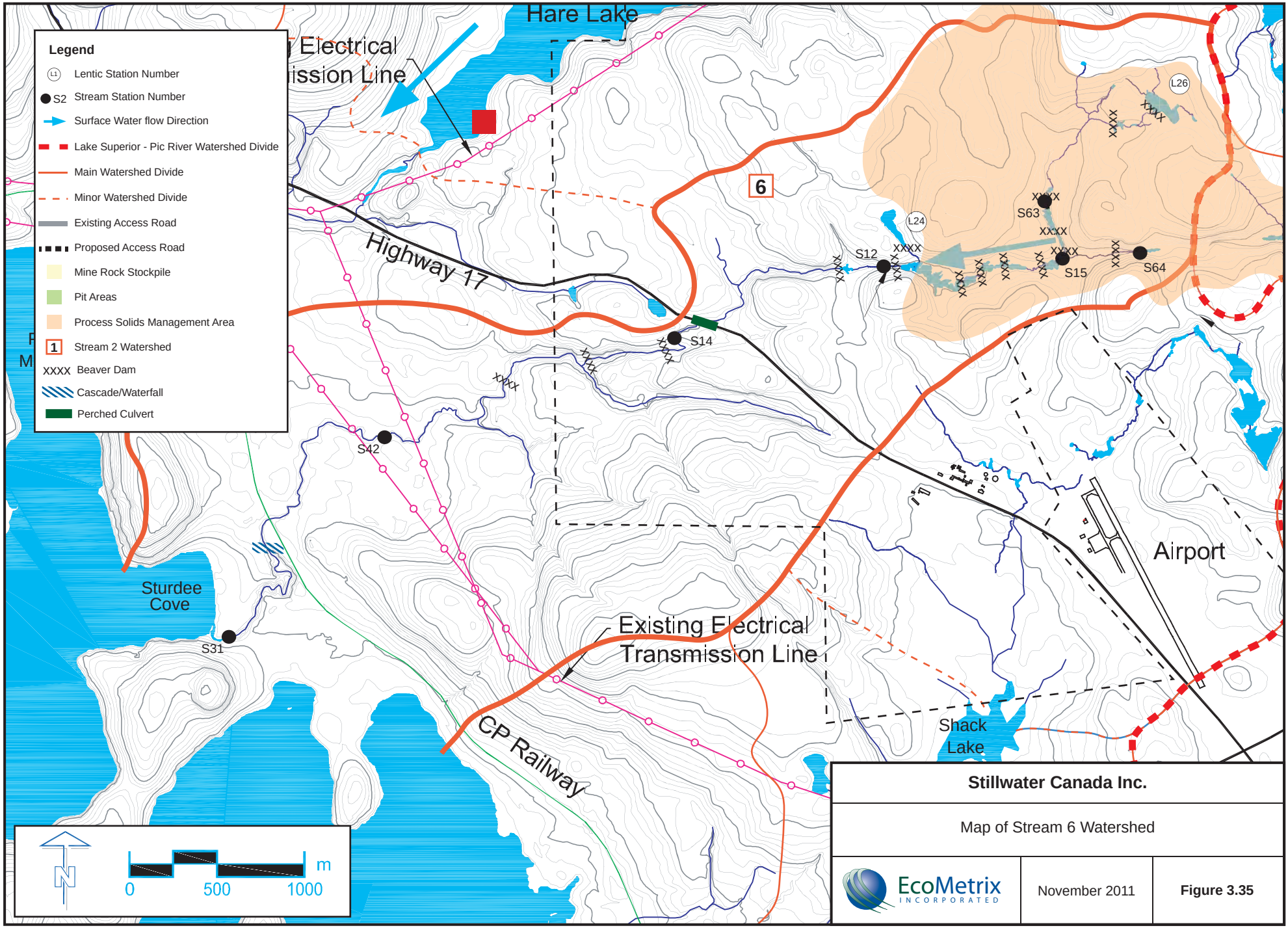
Key Features

Survey Dates:	2009-08-06 to 2009-08-09, 2011-09-07 to 2011-09-14
Surface Area:	56.73 ha
Lake Elevation:	226 masl
Maximum Depth:	29.2 m
Secchi Depth:	2.5 m, 4.5 m
Fish Species Observed:	Burbot, Cisco, Lake Trout, Logperch, Longnose Sucker, Northern Pike,Spoonhead Sculpin, Spottail Shiner, Trout-Perch, Yellow Perch

Stillwater Canada Inc.

Hare Lake Aquatic Habitat and Bathymetry

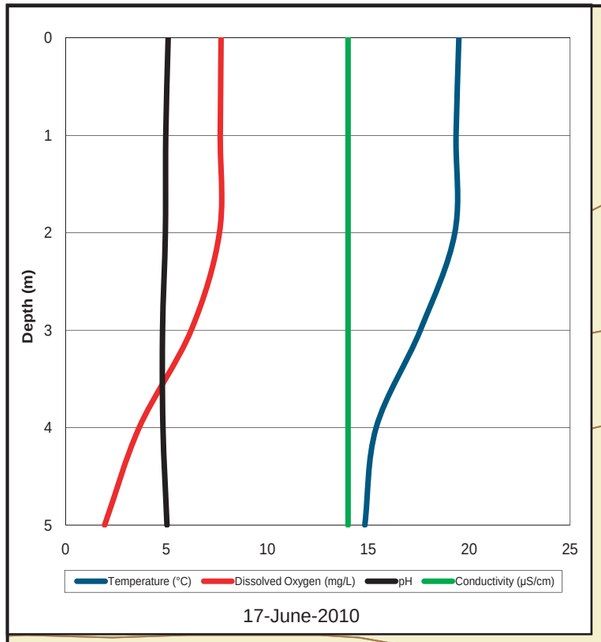
EcoMetrix INCORPORATED | October 2011 | **Figure 3.34**



Stillwater Canada Inc.

Map of Stream 6 Watershed

EcoMetrix INCORPORATED | November 2011 | **Figure 3.35**



17-June-2010

Terrestrial Vegetation

Black Spruce, White Spruce, Balsam Fir,
Speckled Alder, Tamarack,
Sweet Gale, Bog Willow, Bog Laurel,
Bog Rosemarry, Pitcher Plant, Round-leaved
Sundew



Aquatic Vegetation

Variable-leaved Pondweed, *Sphagnum* Moss
Woolgrass, Yellow Pond Lily, Sedge









360

XXXXXX

XXXXXX

Depth
5.0 m
4.0
3.0
2.0
1.0
0.0

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Shoreline Electrofishing
- Baited Minnow Trap
- Water Profile
- Small-mesh Experimental Gillnet
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam

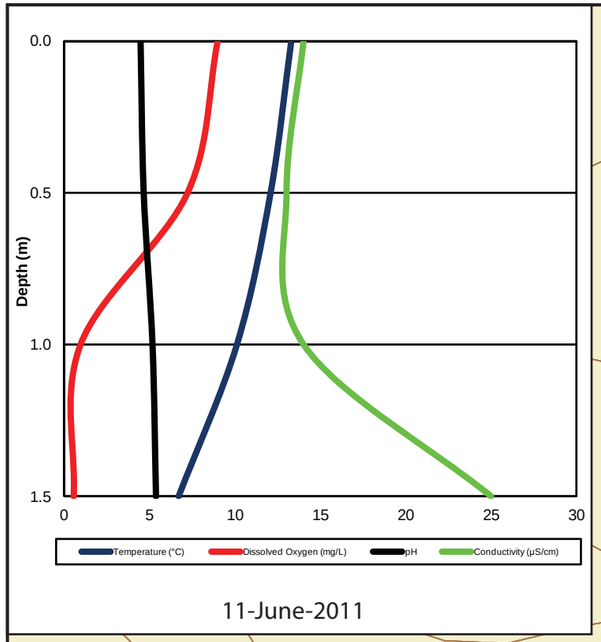
Key Features

Survey Dates:	2009-08-08, 2010-06-17, 2011-06-15
Surface Area:	1.91 ha
Lake Elevation:	351 masl
Maximum Depth:	5 m
Secchi Depth:	1 m
Fish Species Observed:	None

Stillwater Canada Inc.

L26 Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | July 2011 | **Figure 3.36**



11-June-2011





N

340

350

320

Aquatic Vegetation

Sedge, Common Mare's Tail, *Sphagnum* Moss







310

xxxxxx

Terrestrial Vegetation

Black Spruce, White Spruce, Speckled Alder, White Birch



320

0 0.1 0.2 Kilometers

Key Features

Survey Date:	2010-06-20, 2011-06-11
Lake Elevation:	312 masl
Fish Species Observed:	None

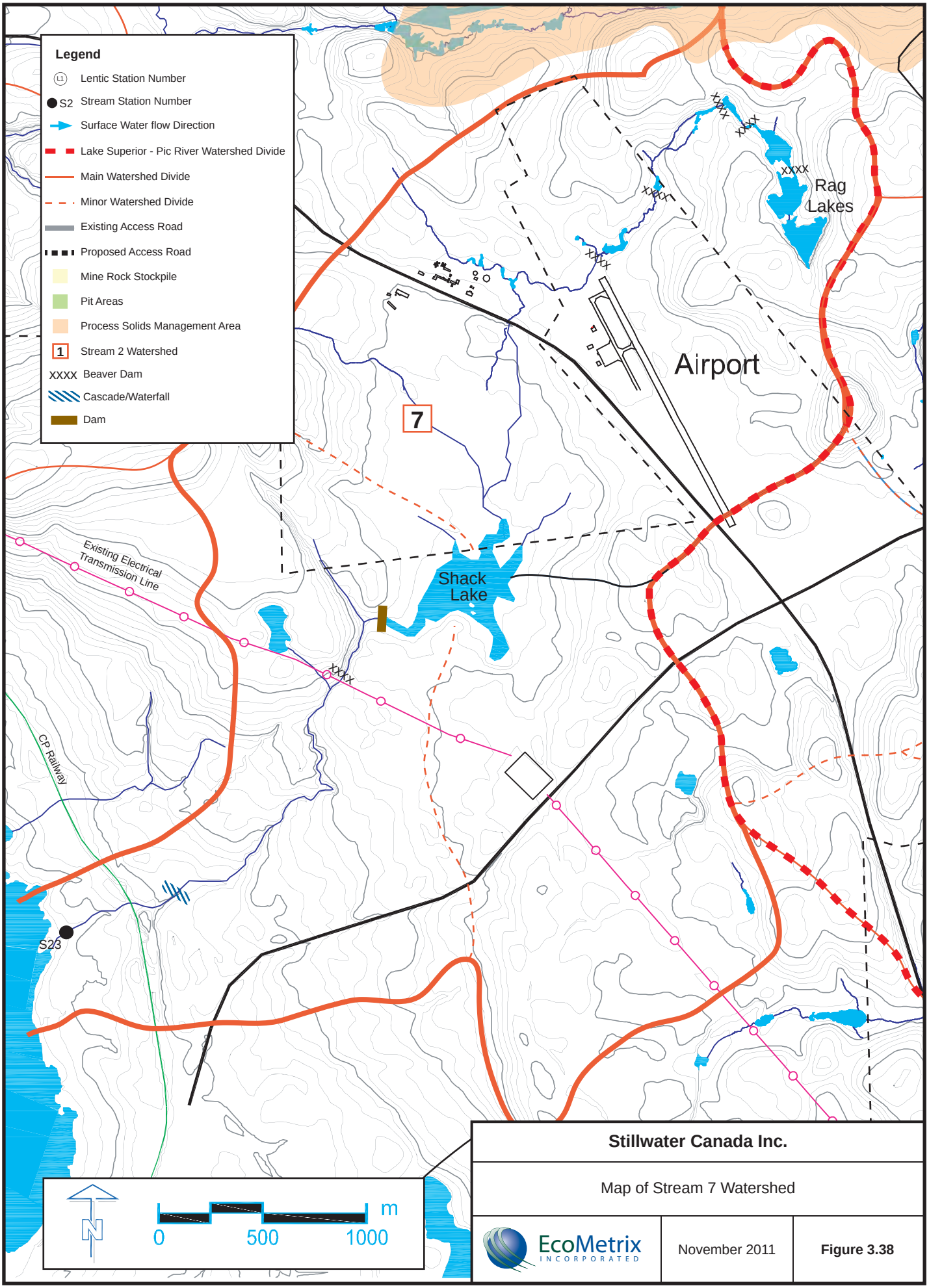
Legend

- Rocky Shore
- Shoreline Electrofishing
- 2011 Water Level
- xxxxxx Beaver Dam

Stillwater Canada Inc.

L24 Aquatic Habitat and Bathymetry

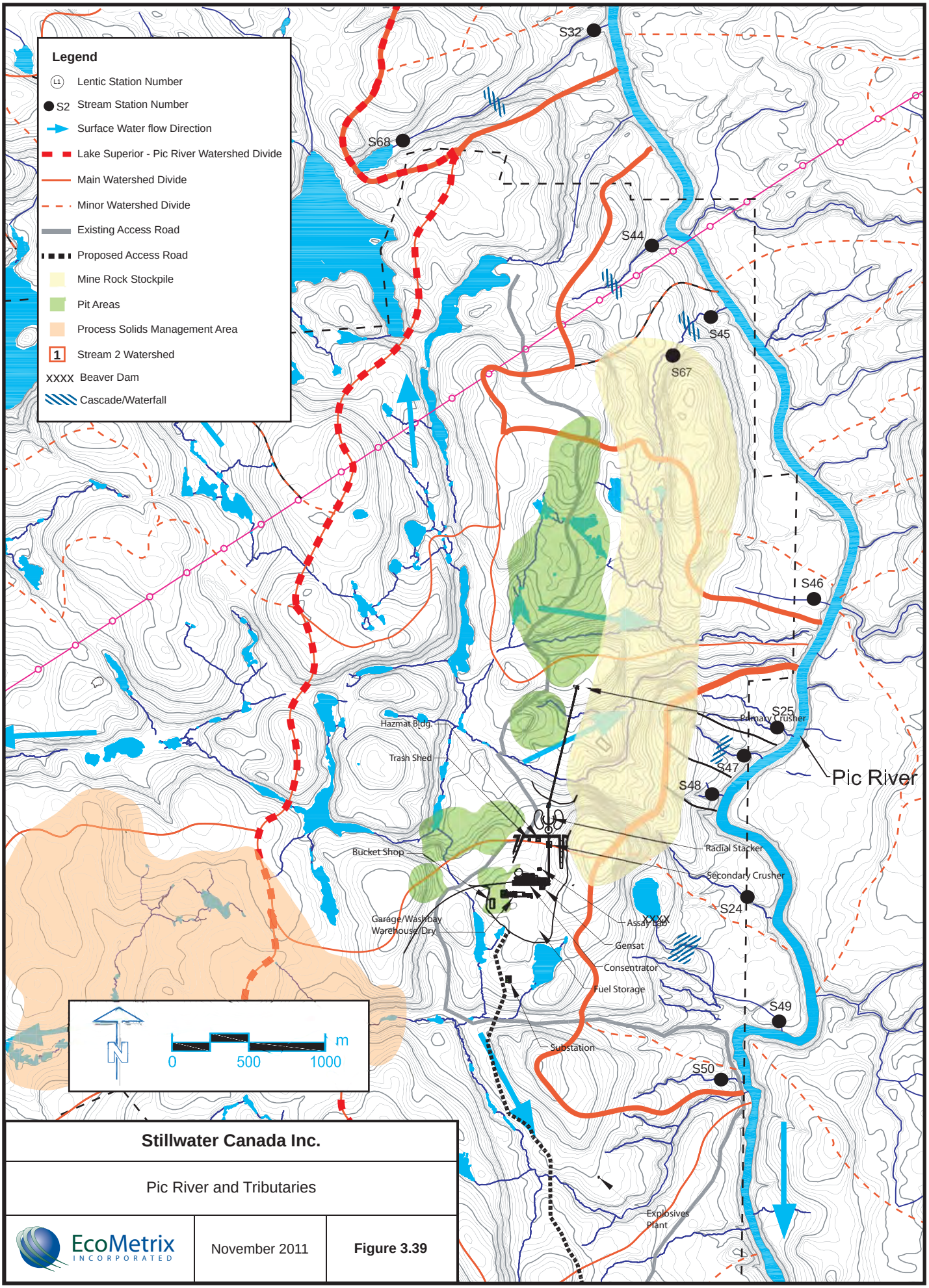
EcoMetrix INCORPORATED | July 2011 | **Figure 3.37**



Stillwater Canada Inc.

Map of Stream 7 Watershed

EcoMetrix INCORPORATED | November 2011 | **Figure 3.38**



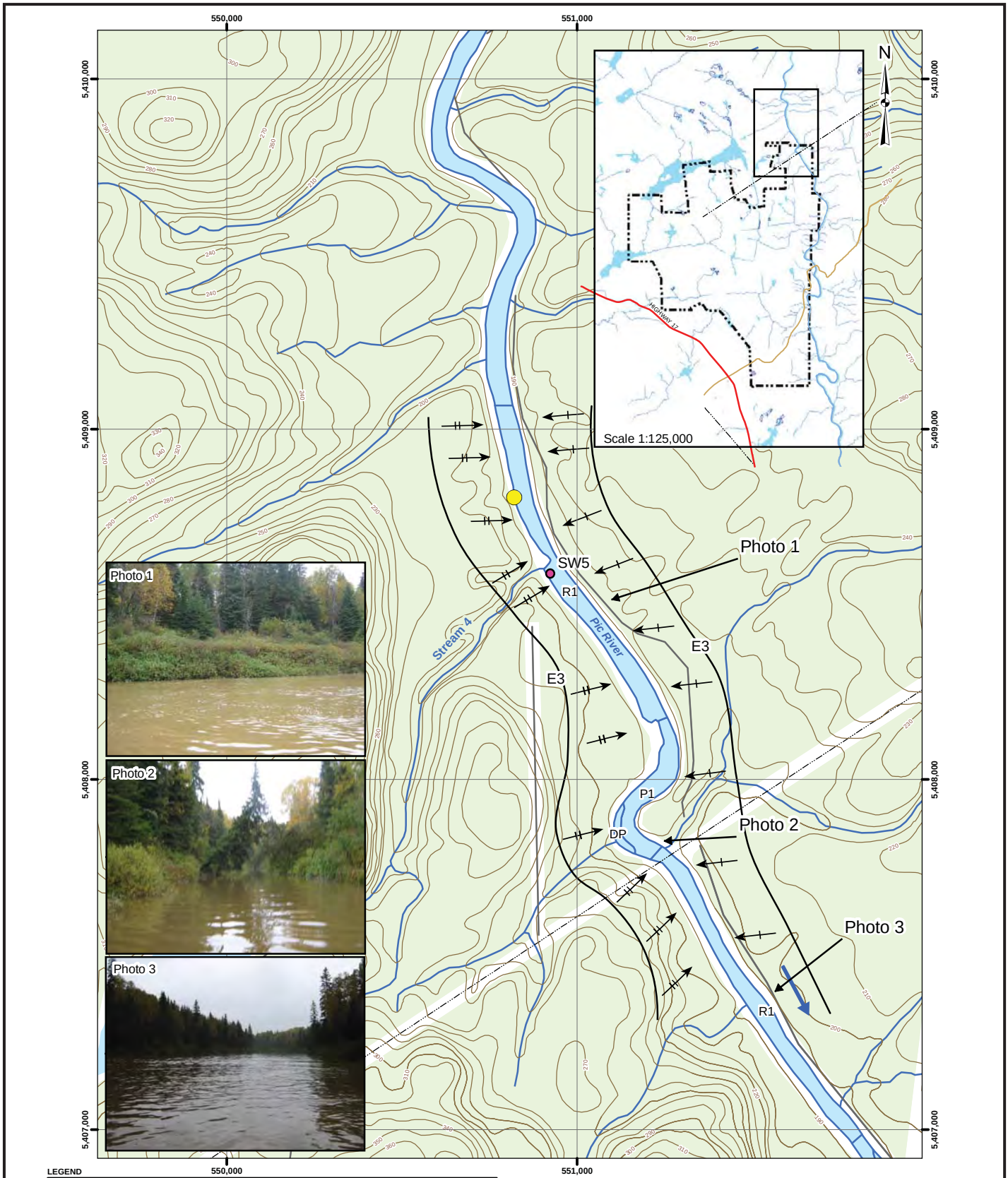
Stillwater Canada Inc.

Pic River and Tributaries

EcoMetrix INCORPORATED

November 2011

Figure 3.39



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

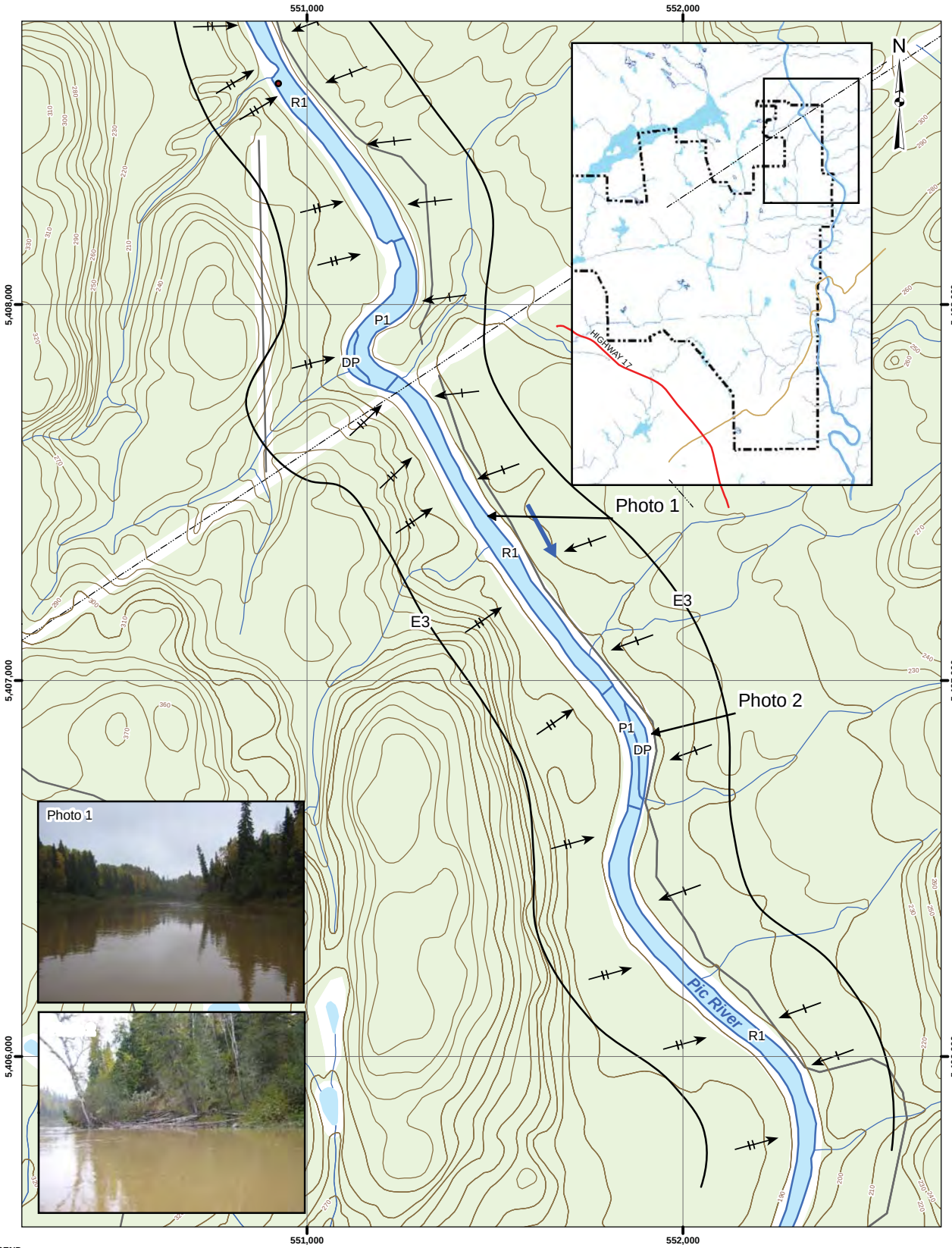
Stillwater Canada Inc.

Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.40



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

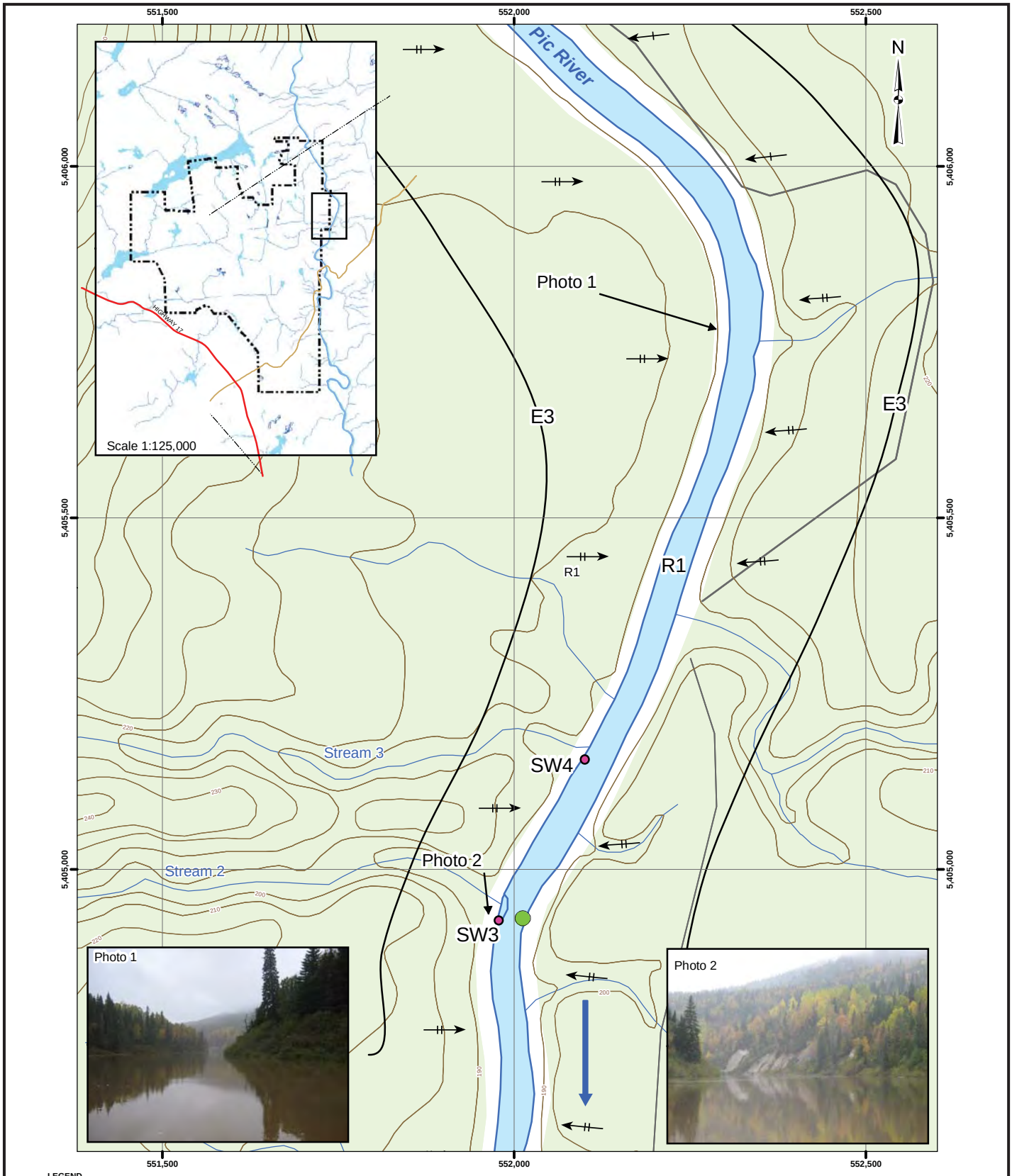
Stillwater Canada Inc.

Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.41



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

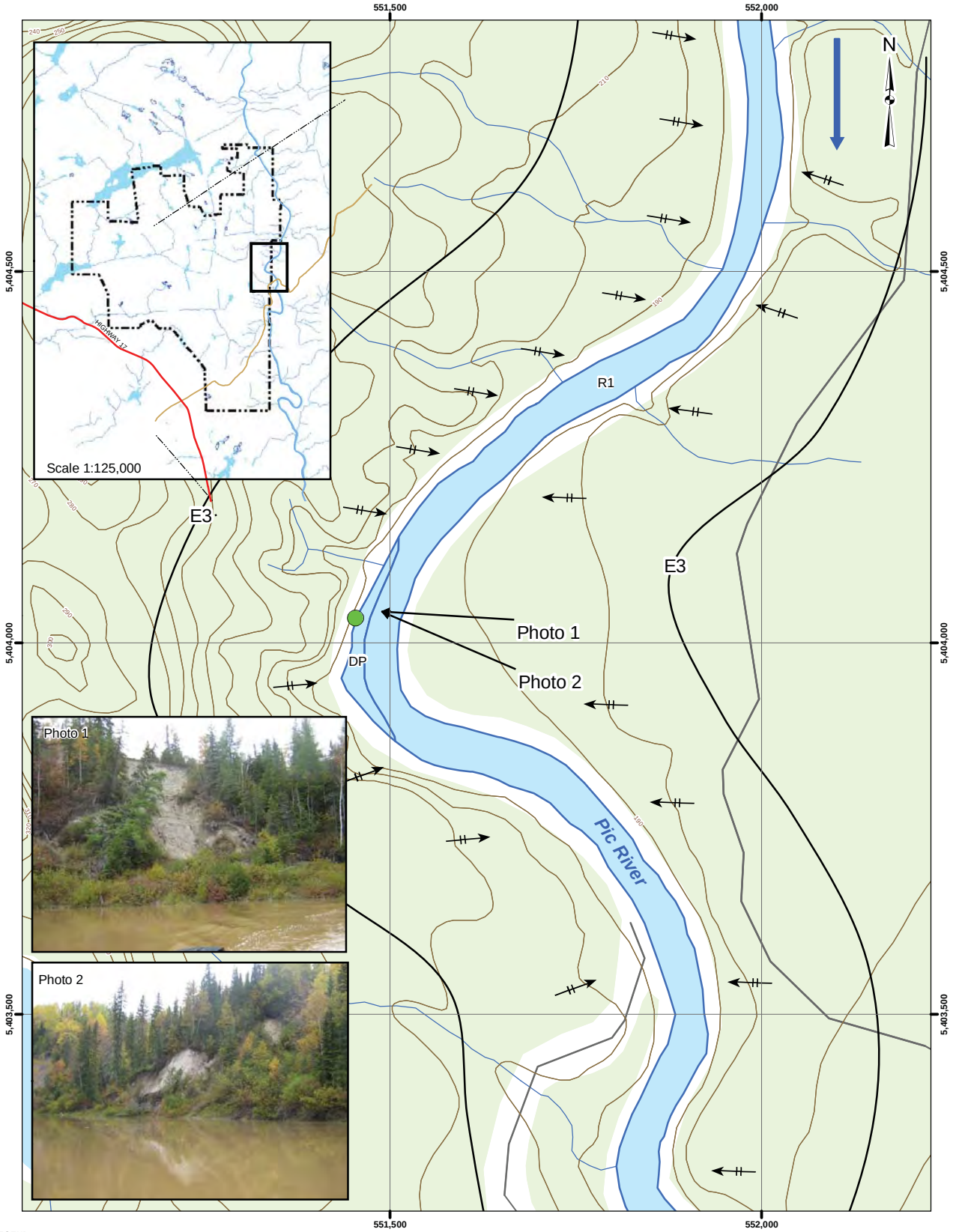
Stillwater Canada Inc.

Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.42



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

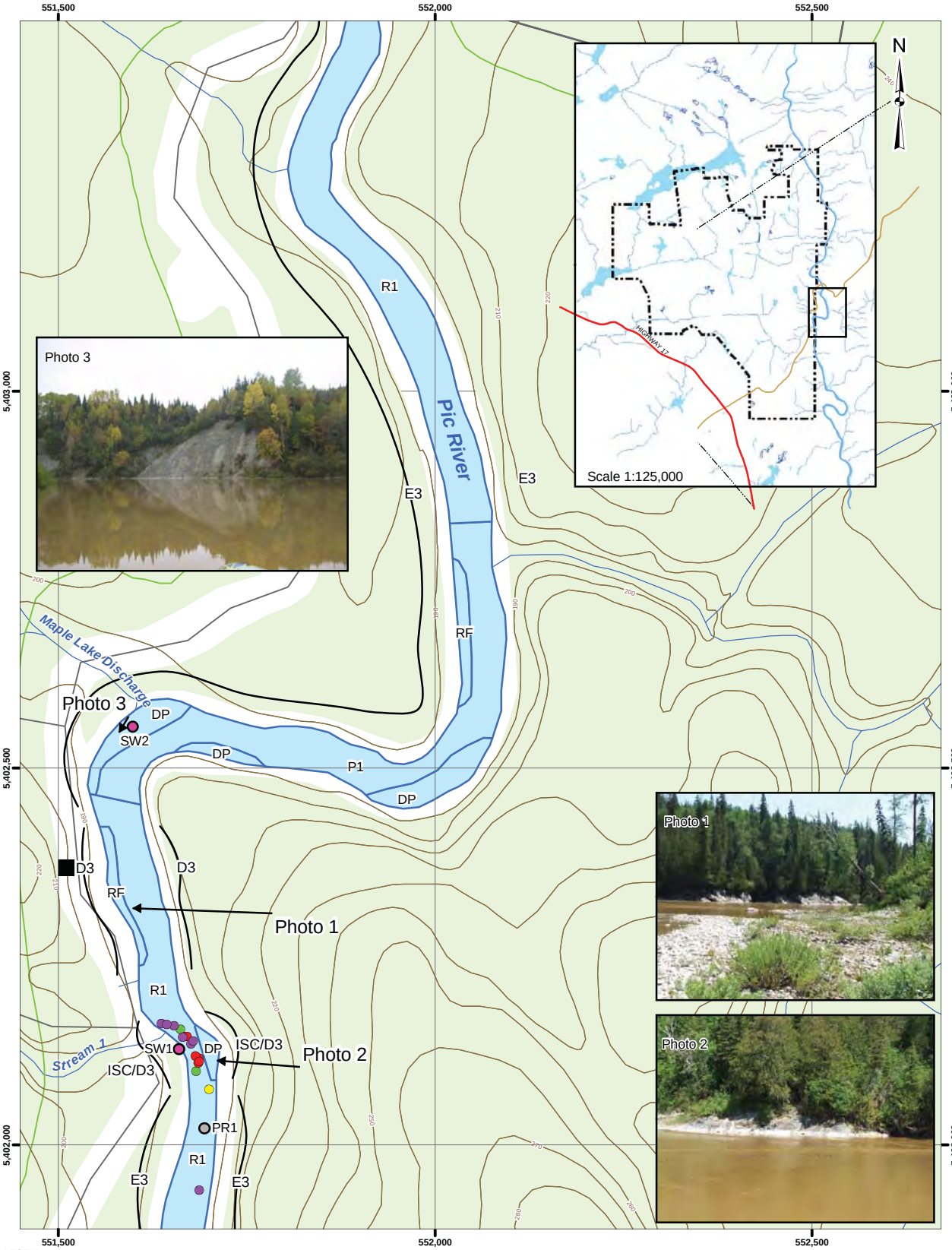
Stillwater Canada Inc.

Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.43



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

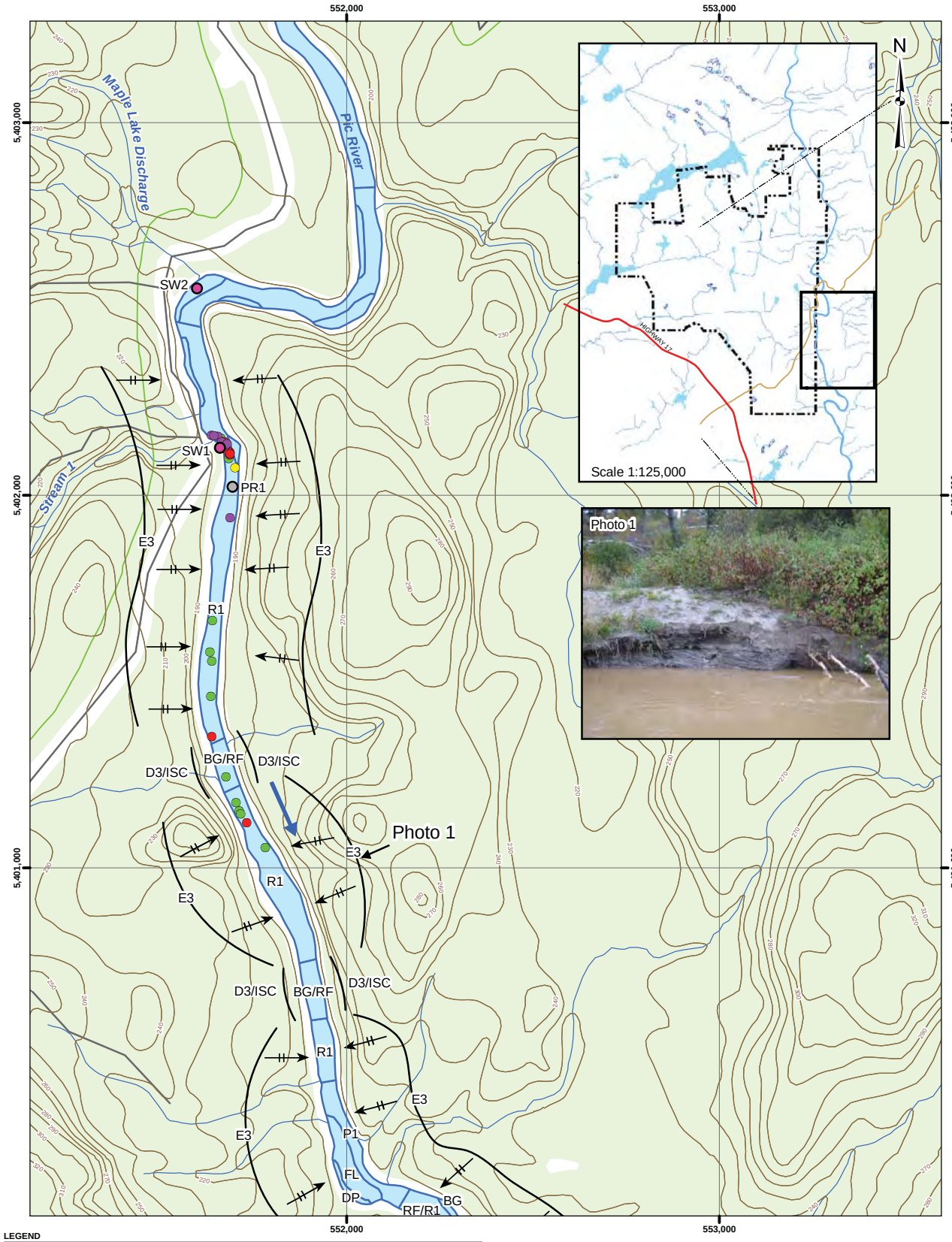
Stillwater Canada Inc.

Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.44



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

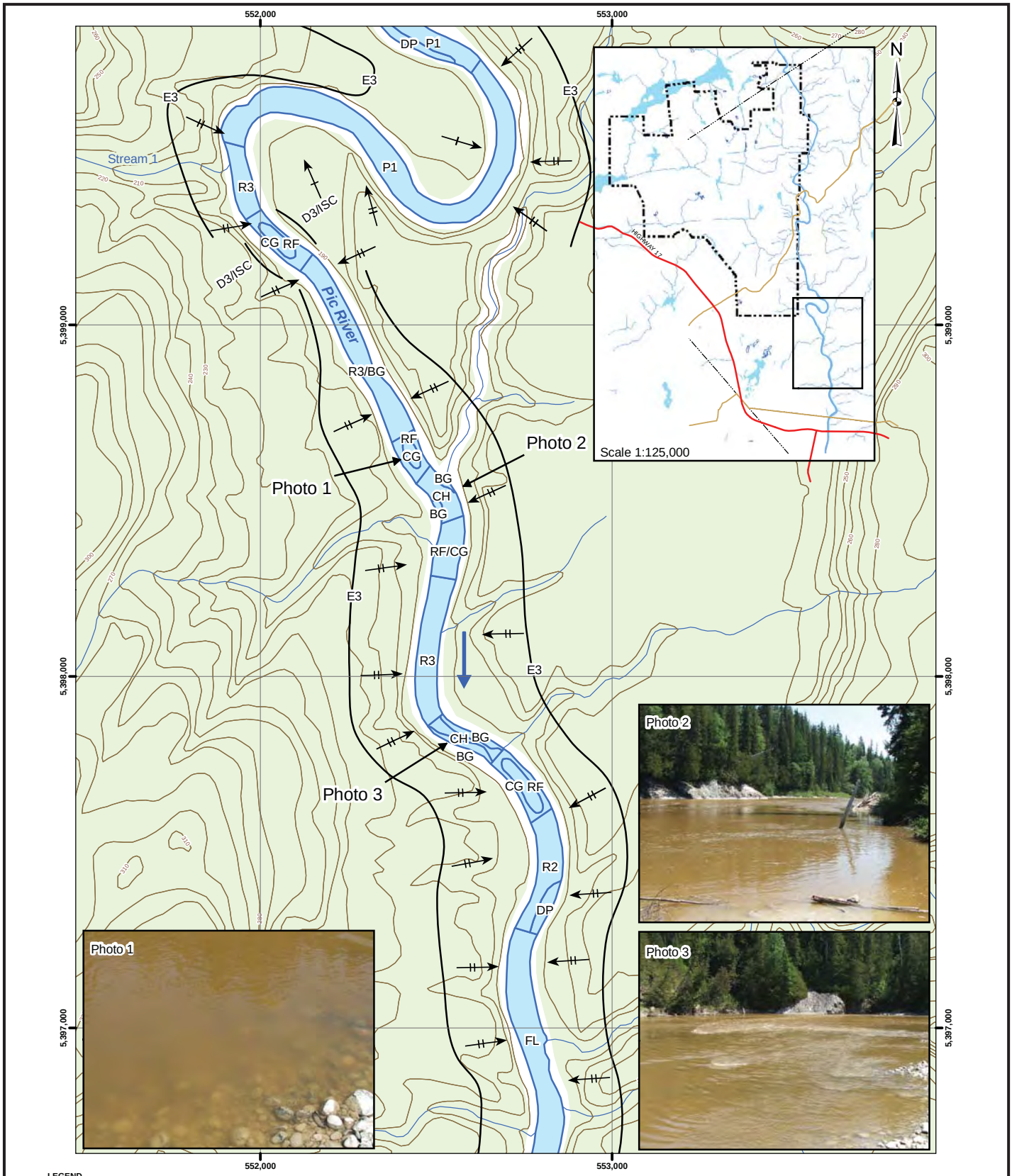
Stillwater Canada Inc.

Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.45



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

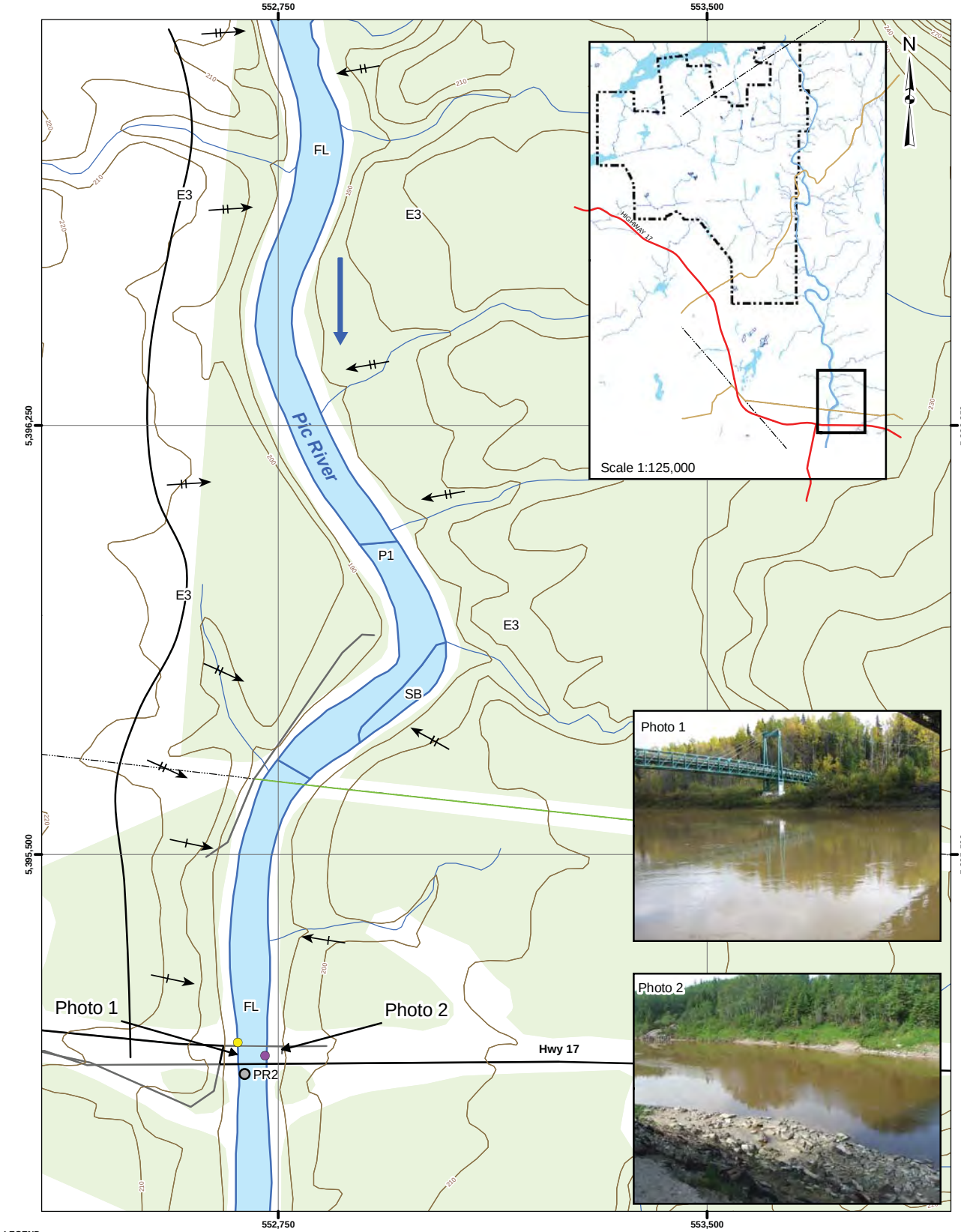
Stillwater Canada Inc.

Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.46



LEGEND

Highway	BG	Boulder Garden	P1	Pool Class 1	Steep Slope
Local Road	BG/RF	Boulder Garden / Riffle	RF	Riffle	Intermediate Slope
Trail	CG	Cobble Garden	RF/CG	Riffle / Cobble Garden	Water Quality (PSC 2001)
Utility	CH	Chute	RF/R1	Riffle / Run Class 1	Water Quality (NAR 2005)
Contour	DP	Debris Pile	R1	Run 1	Gill Net Station
Watercourse	D3	Depositional	R2	Run 2	Hoop Net Station
Waterbody	E3	Erosional	R3	Run 3	Minnow Trap
Wooded Area	FL	Flat	R3/BG	Run 3 / Boulder Garden	Water Quality, Sediment and Benthic Sampling Station
	ISC	Instream Cover	SB	Sand Bar	

REFERENCE

MNR NRVIS data produced by Golder Associates Ltd. under license from the Ontario Ministry of Natural Resources, © Queens Printer 2007
Projection: Transverse Mercator Datum: NAD 27
Coordinate System: UTM Zone 16N

0 100 200
Metres

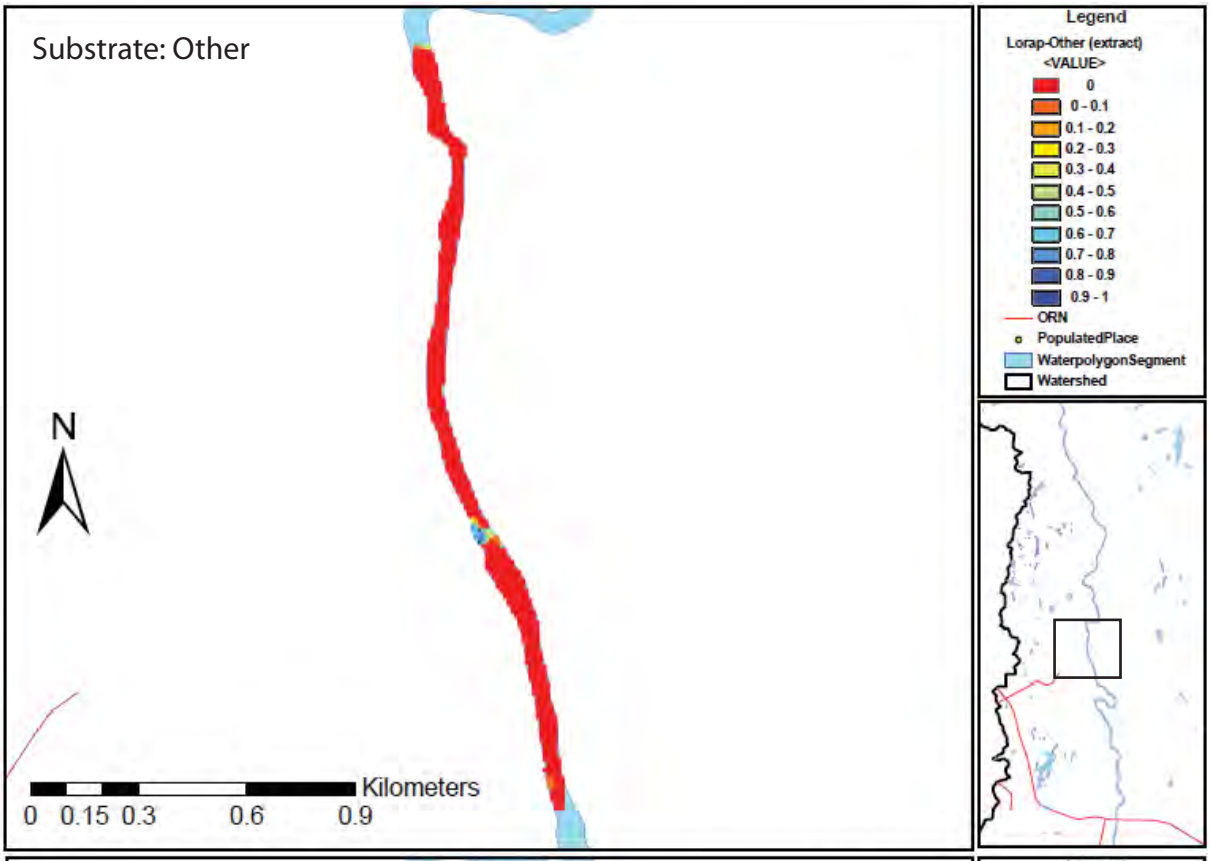
Stillwater Canada Inc.

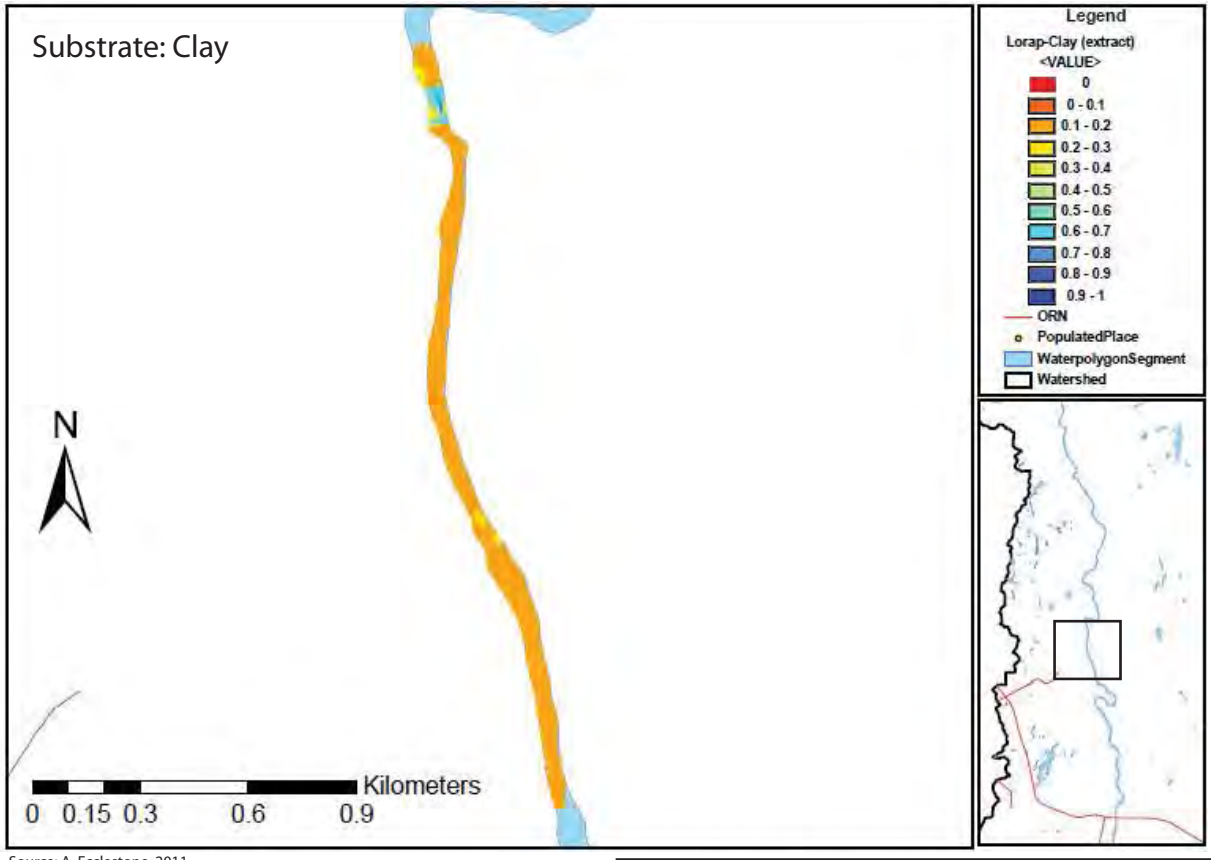
Pic River Habitat Mapping
(source: Golder 2009)

EcoMetrix INCORPORATED

November 2011

Figure 3.47



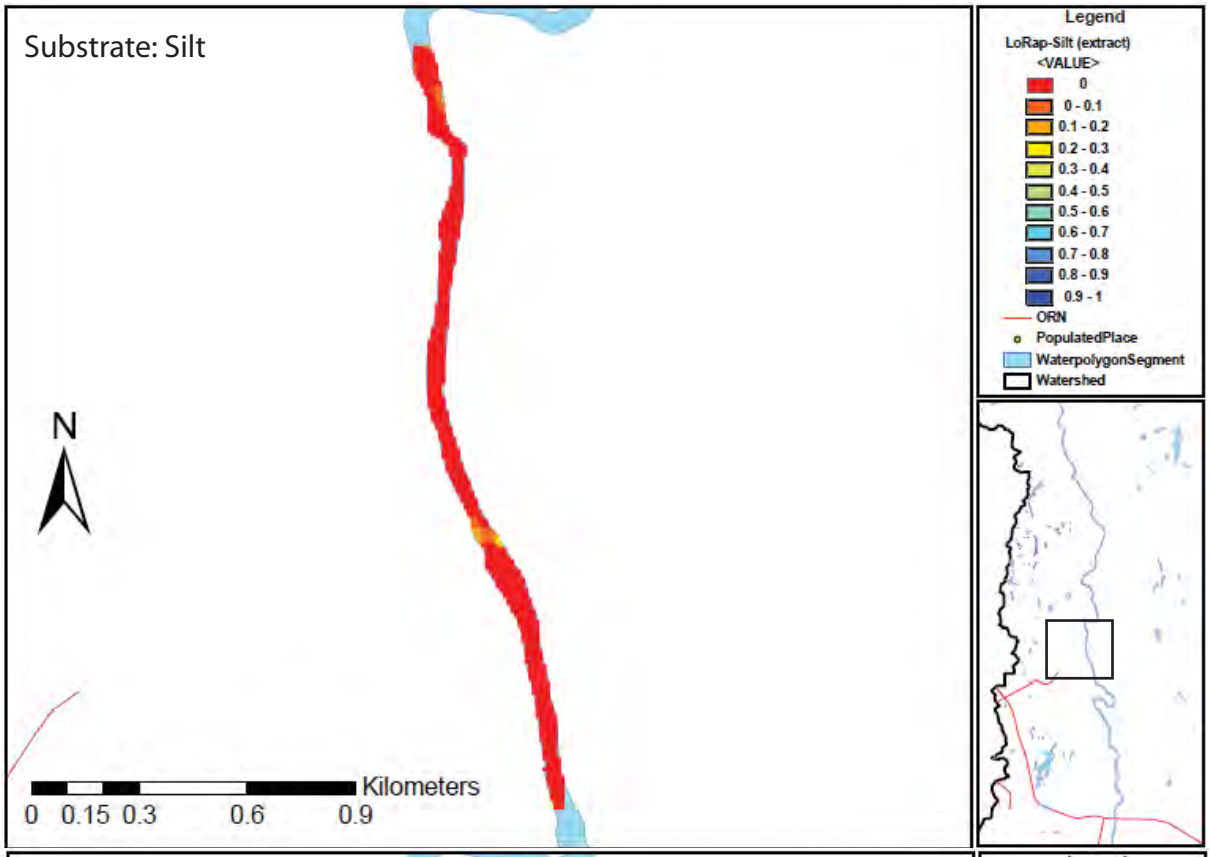


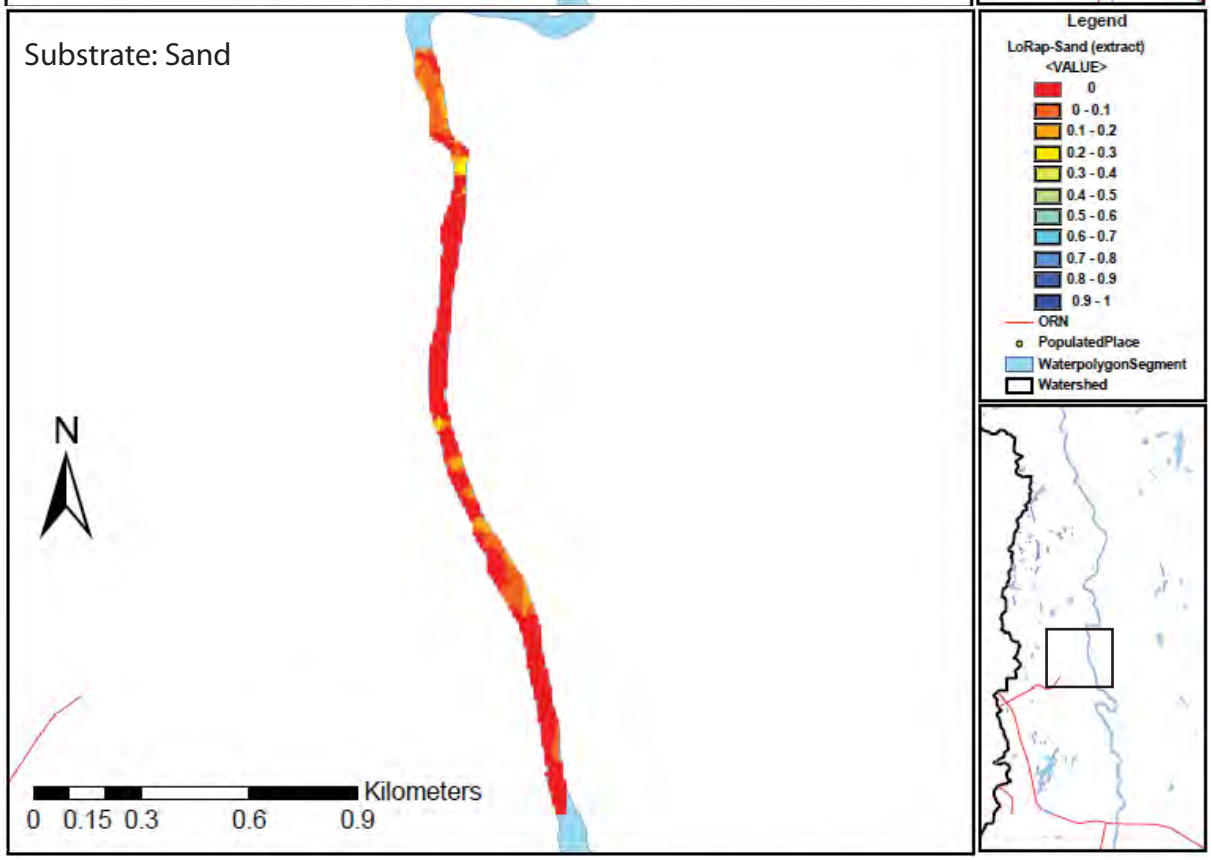
Source: A. Ecclestone, 2011

Stillwater Canada Inc.

Pic River Habitat Mapping
Lower Rapids

EcoMetrix INCORPORATED | November 2011 | **Figure 3.48**



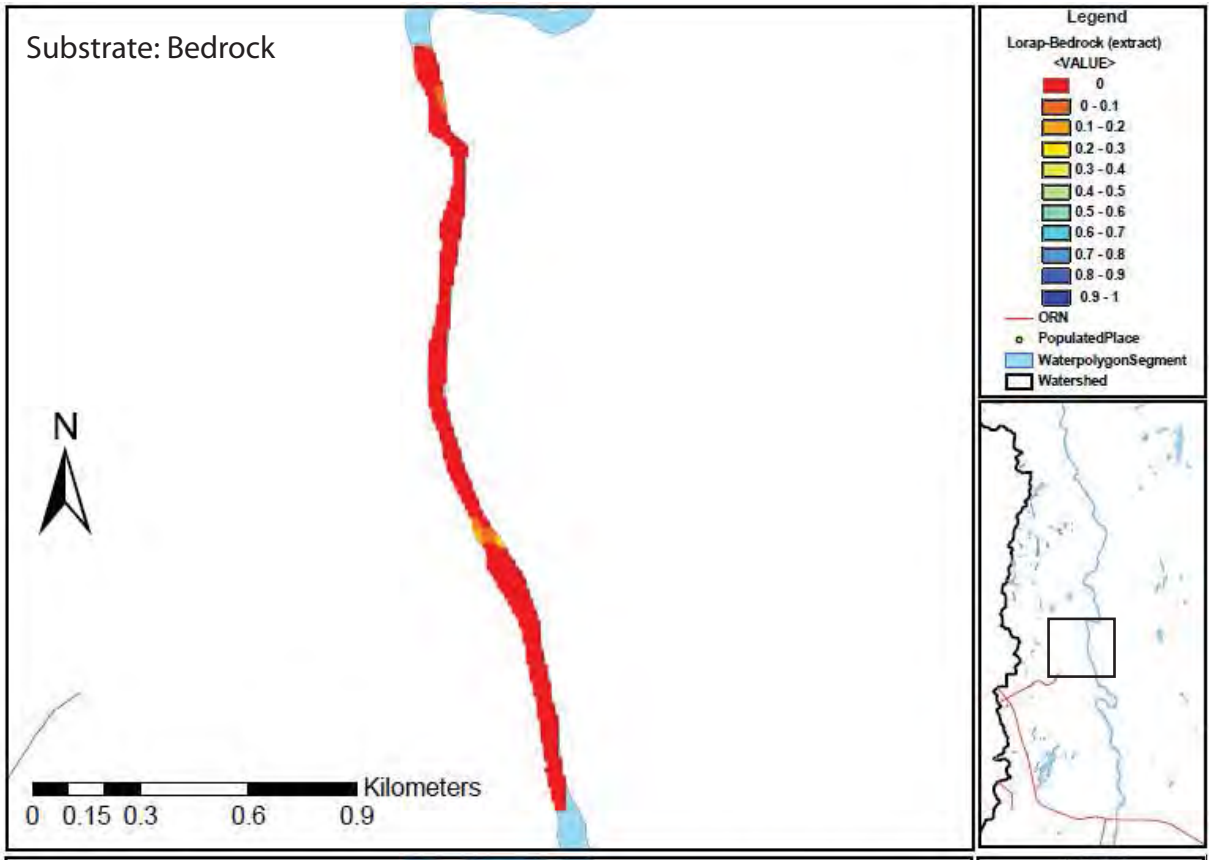


Source: A. Ecclestone, 2011

Stillwater Canada Inc.

Pic River Habitat Mapping
Lower Rapids

EcoMetrix INCORPORATED | November 2011 | **Figure 3.49**



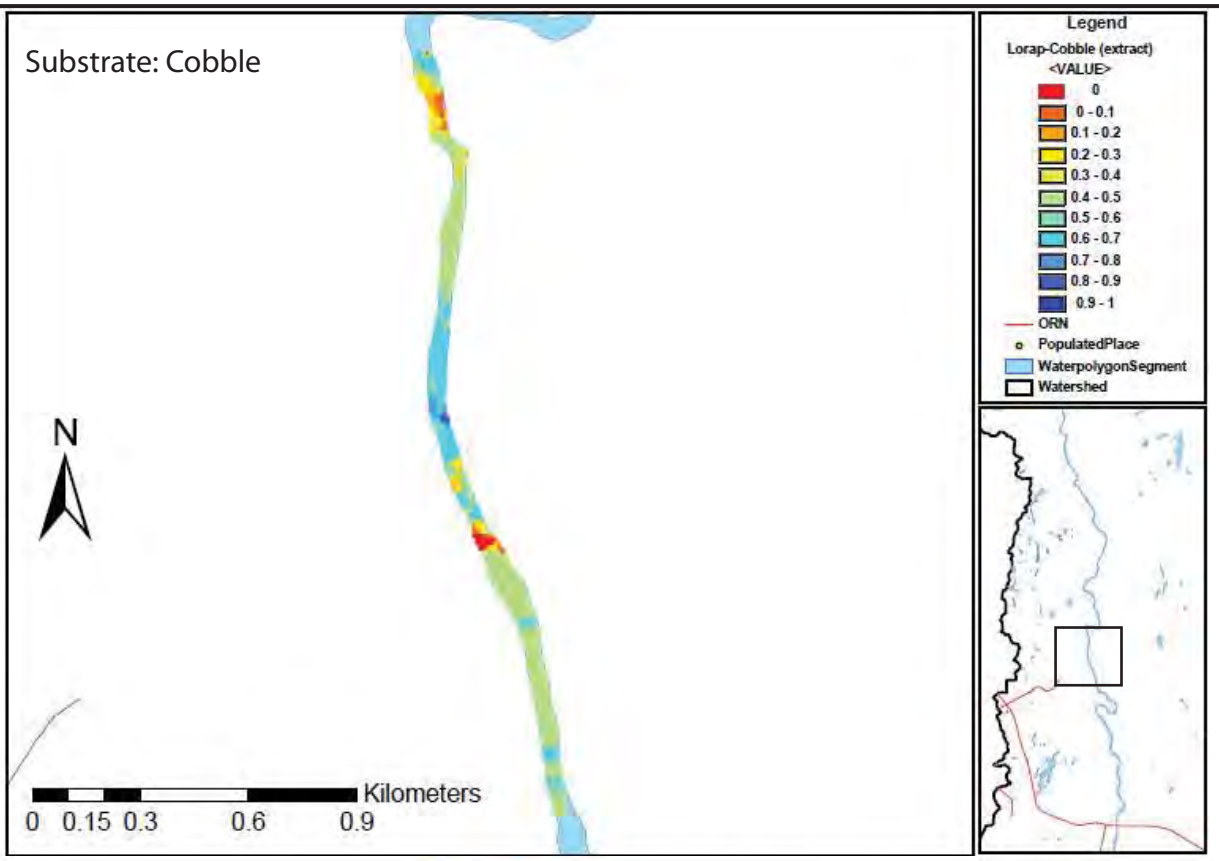


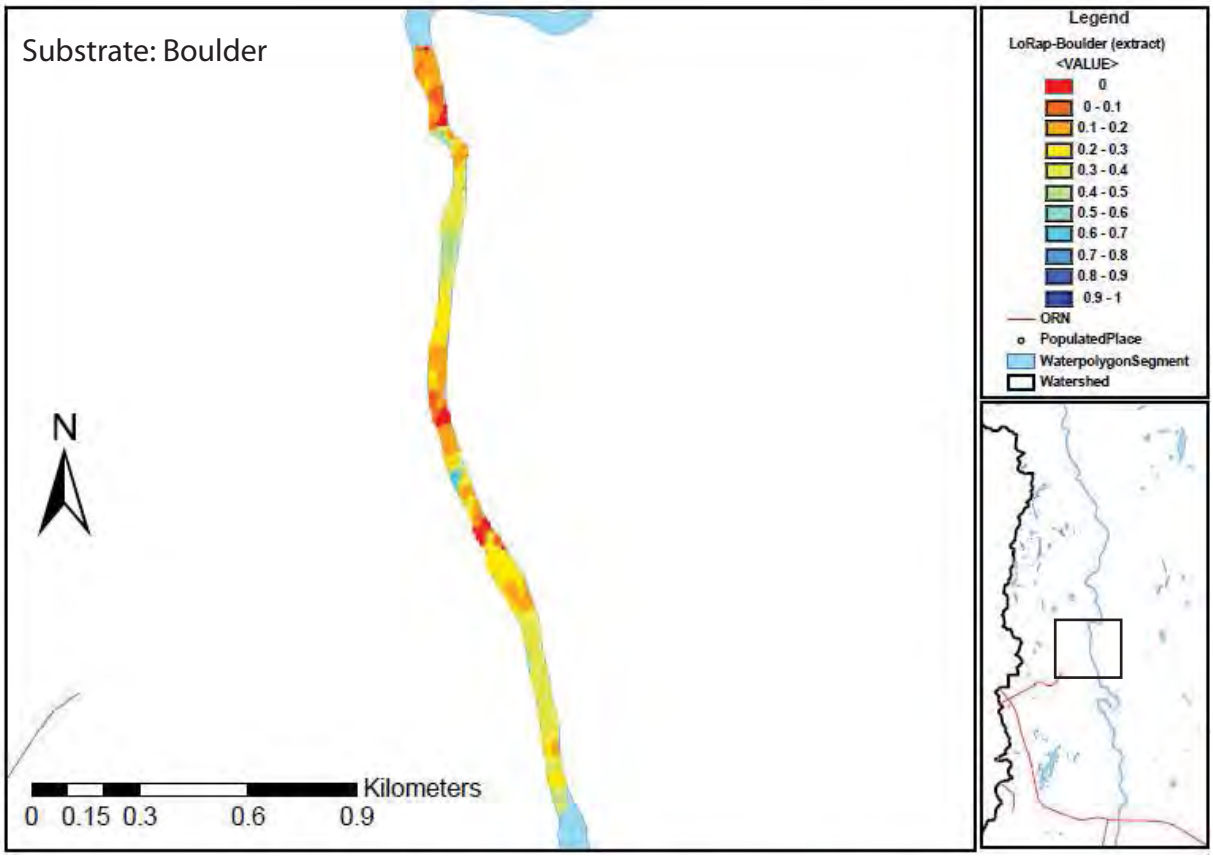
Source: A. Ecclestone, 2011

Stillwater Canada Inc.

Pic River Habitat Mapping
Lower Rapids

EcoMetrix INCORPORATED | November 2011 | **Figure 3.50**



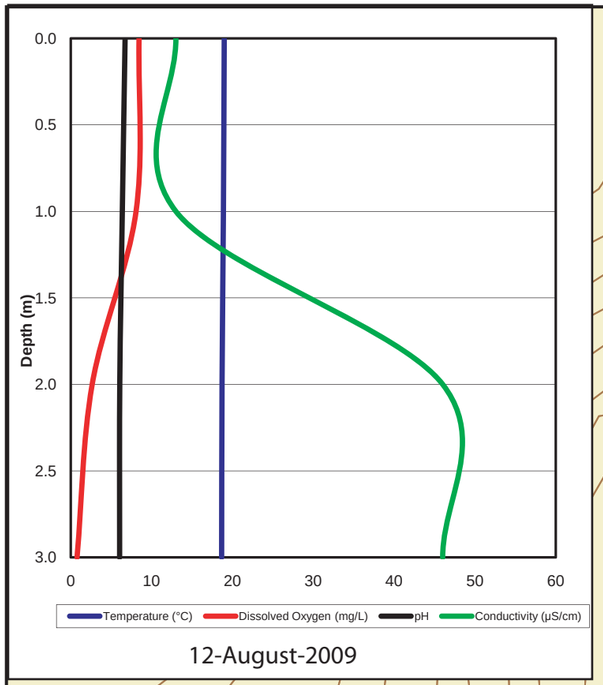


Source: A. Ecclestone, 2011

Stillwater Canada Inc.

Pic River Habitat Mapping
Lower Rapids

EcoMetrix INCORPORATED | November 2011 | **Figure 3.51**















N

300

Aquatic Vegetation

Floating Arrowhead, Three-way Sedge, Hardstem Bulrush, Northern Blue Flag, Beaked Sedge, Manna Grass, Bogbean, Freshwater Sponge, Common Mare's Tail, Sphagnum Moss, Round-leaved Sundew

Terresterial Vegetation

Black Spruce, White Spruce, White Birch, Eastern White Cedar, Sweet Gale, Bog Willow

Depth

3.5 m
3.0
2.5
2.0
1.5
1.0
0.5
0.0

0 0.1 0.2 Kilometers

Legend

- Rocky Shore
- Minnow Trap
- Water Profile
- Nordic Net
- Submergent-Emergent Macrophytes
- Scrub-Shrub Wetland
- xxxxxx Beaver Dam
- Beaver Lodge

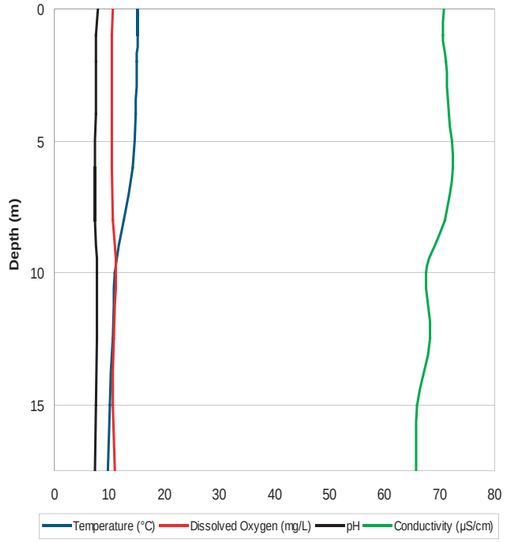
Key Features

Survey Date:	2009-08-12
Surface Area:	3.36
Lake Elevation:	276 masl
Maximum Depth:	3.1 m
Secchi Depth:	Bottom
Fish Species Observed:	None

Stillwater Canada Inc.

Malpa Lake Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2010 | **Figure 3.52**



05-August-2009











Terrestrial Vegetation

White Spruce, White Birch,
Balsam Poplar, Speckled Alder

Aquatic Vegetation

Pondweed, Muskgrass

Depth

18 m
15
12
9
6
3
0 m

0 0.2 0.4 Kilometers

N

Legend

- Rocky Shore
- Sandy Shore
- Logs
- Minnow Trap
- Water Profile
- Full Experimental Gillnet
- Seine Net
- Submergent-Emergent Macrophytes
- Cobble

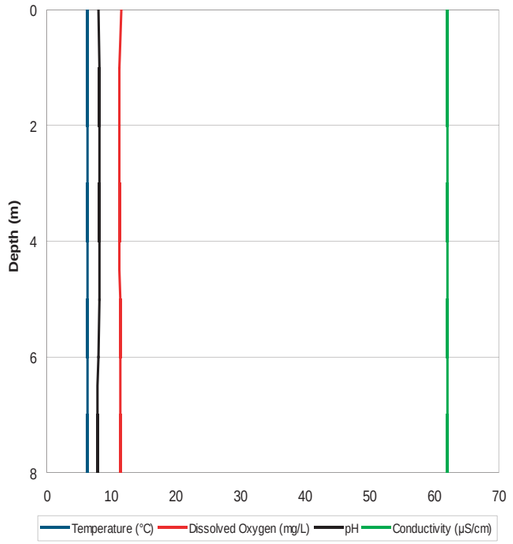
Key Features

Survey Dates:	2009-08-05 to 2009-08-06
Secchi Depth:	3.2 m
Fish Species Observed:	Round Whitefish, Lake Chub, Longnose Sucker, White Sucker, Mottled Sculpin

Stillwater Canada Inc.

Port Munro Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | December 2011 | **Figure 3.53**



22-October-2009

280

Terrestrial Vegetation

Black Spruce, White Spruce, White Birch,
Balsam Poplar, Speckled Alder



220

210

Aquatic Vegetation

Pondweed



N

Legend

- Cobble
- Submergent-Emergent Macrophytes
- Rocky Shore
- Sandy Shore
- Logs
- Water Profile
- Benthic Sample

Key Features

Survey Dates:	2009-10-22, 2010-06-15
Secchi Depth:	8 m

Depth

15
12
9
6
3
0 m

190

210

220

0 0.1 0.2 Kilometers

Stillwater Canada Inc.

Sturdee Cove Aquatic Habitat and Bathymetry

EcoMetrix INCORPORATED | October 2011 | **Figure 3.54**

APPENDIX 1: Photographs

Part A: Aquatic Resources Baseline Survey Stations



Photo 1 - Station L1 (05 August 2009)



Photo 2 - Station L1 (17 June 2011)



Photo 3 -Station S54 (17 June 2010)



Photo 4 - Station L2 (05 August 2009)



Photo 5 - Station L2 (17 June 2011)



Photo 6 - Station S55 (09 June 2011)



Photo 7 - Station S58 (18 June 2010)



Photo 8 - Station S79 (18 June 2011)



Photo 9 - Station S1 (30 May 2009)



Photo 10 - Station S56 (17 June 2010)



Photo 11 - Station S57 (18 June 2010)



Photo 12 - Station L29 (09 June 2011)



Photo 13 - Station S27 (30 May 2009)



Photo 14 - Station S2 (24 May 2010)



Photo 15 - Station L3 (20 October 2010)



Photo 16 - Station L3 (17 June 2011)



Photo 17 - Station S59 (08 June 2011)



Photo 18 - Station L7 (07 August 2009)



Photo 19 - Station L6 (07 August 2009)



Photo 20 - Canoe Lake, Station L5 (05 August 2009)



Photo 21 - Canoe Lake, Station L5 (07 August, 2009)



Photo 22 - Station L14 (15 June 2011)



Photo 23 - Station S74 (07 June 2011)



Photo 24 - Station S75 (11 June 2011)



Photo 25 - Terru Lake, Station L20 (07 June 2011)



Photo 26 - Station S76 (11 June 2011)



Photo 27 - Station S77 (18 June 2011)



Photo 28 - Station L8 (07 August 2009)



Photo 29 - Station S78 (18 June 2011)



Photo 30 - Station L15 (20 October 2010)



Photo 31 - Station L15 (18 June 2011)



Photo 32 - Station S3 (30 May 2009)

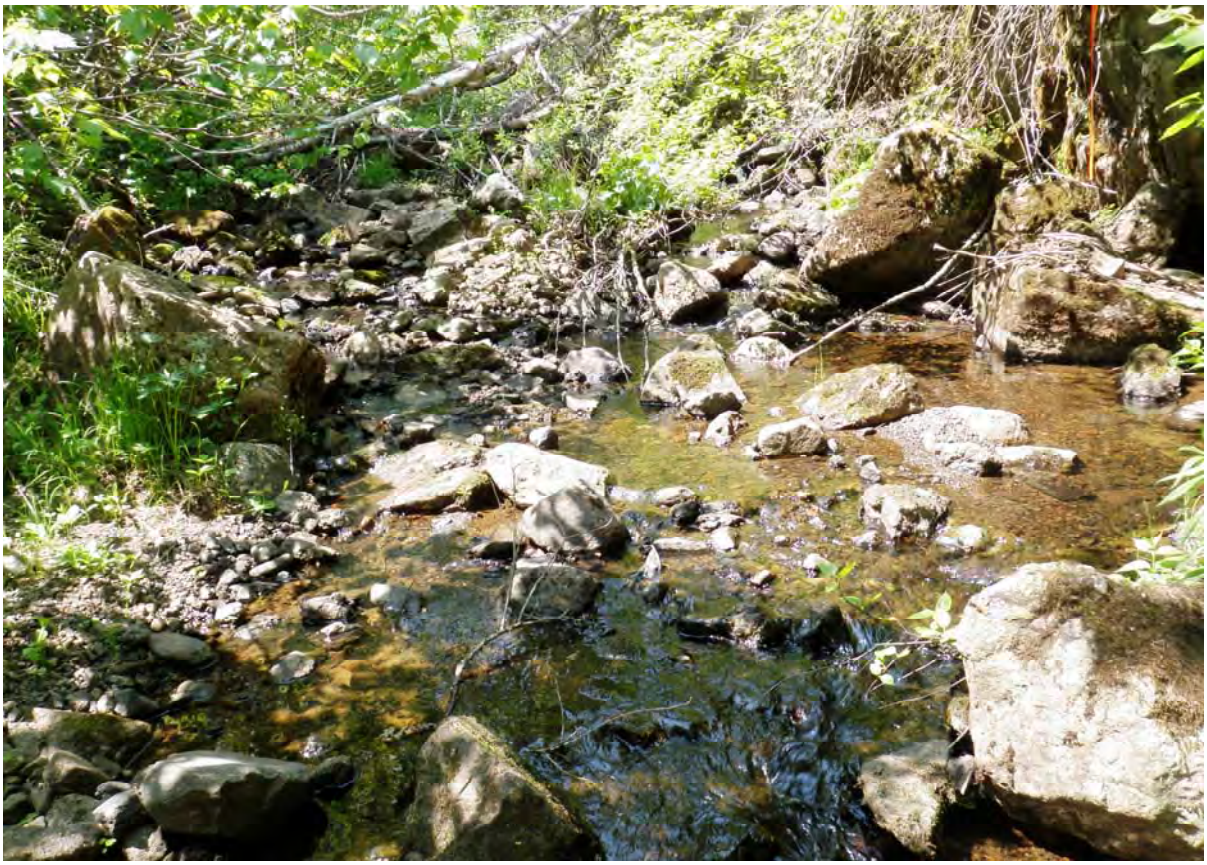


Photo 33 - Station S69 (14 June 2011)

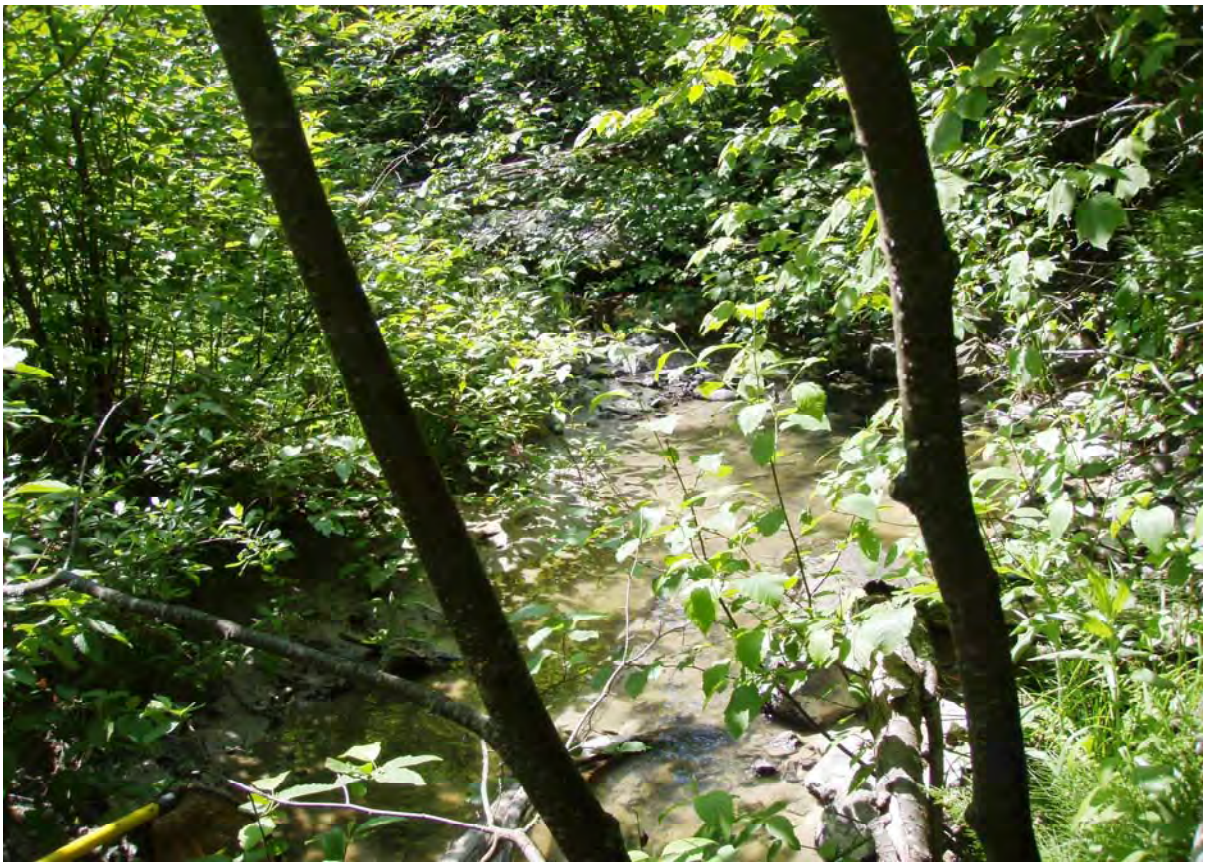


Photo 34 - Station S53 (21 June 2010)



Photo 35 - Station S66 (08 June 2011)



Photo 36 - Station S4 (29 May 2009)



Photo 37 - Station L9 (05 August 2009)



Photo 38 - Station L9 (14 June 2011)



Photo 39 - Station L9a (05 August 2009)



Photo 40 - Two Duck Lake, Station L10 (05 August 2009)



Photo 41 - Two Duck Lake, Station L11 (16 June 2011)



Photo 42 - Station L12 (05 August 2009)



Photo 43 - Station L12 (10 June 2011)



Photo 44 - Stations L13 (top) and L13a (bottom) (05 August 2009)



Photo 45 - Station L13 (12 June 2011)



Photo 46 - Station L13a (12 June 2011)



Photo 47 - Station L16 (12 June 2011)



Photo 48 - Station S18 (14 June 2011)



Photo 49 -Station S52 (08 June 2011)



Photo 50 - Station S6 (26 August 2009)



Photo 51 - Station S72 (11 June 2011)



Photo 52 - Station L21 (05 August 2009)



Photo 53 - Station L21 (11 June 2011)



Photo 54 - Station S73 (11 June 2011)

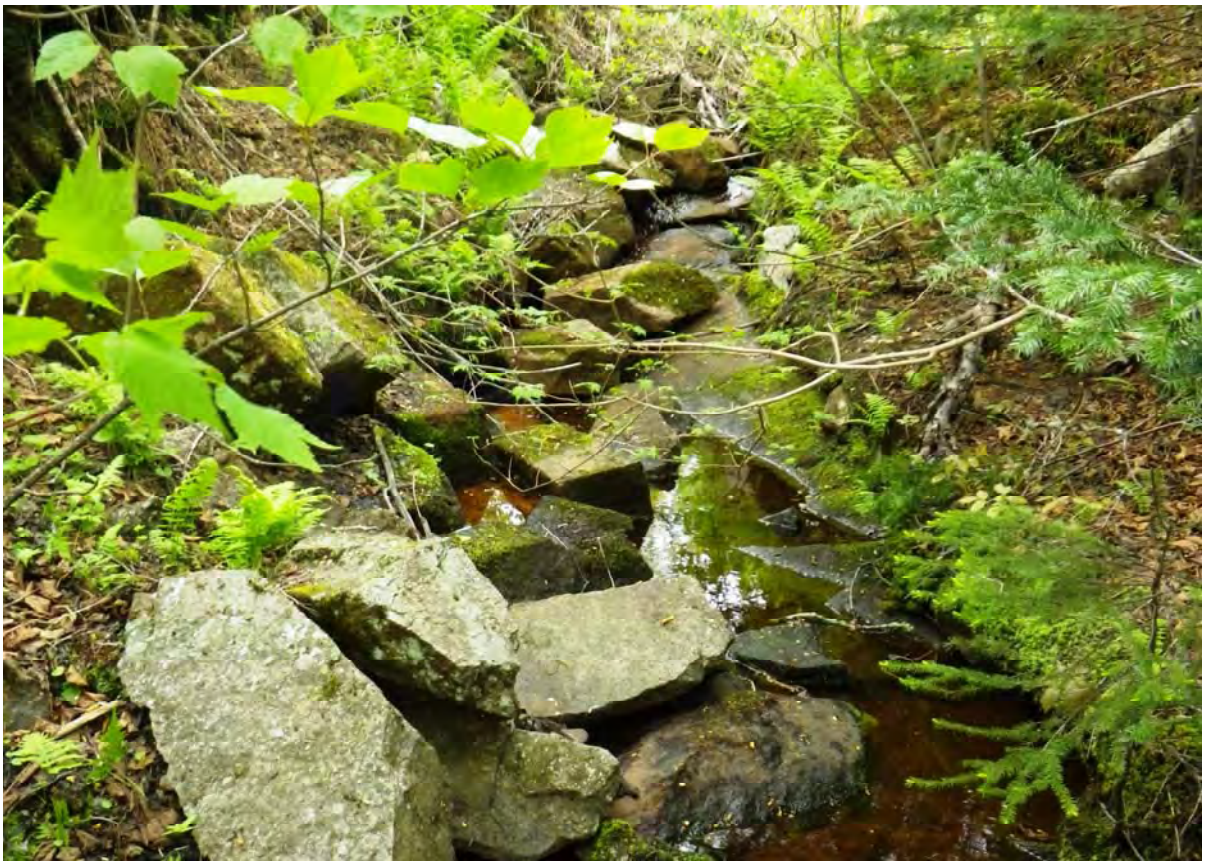


Photo 55 - Station S71 (09 June 2011)



Photo 56 - Station L22 (20 October 2010)



Photo 57 - Station L22 (07 June 2011)



Photo 58 - Station S70 (11 June 2011)



Photo 59 - Station L18 (09 August 2009)



Photo 60 - Claw Lake, Station L19 (05 August 2009)



Photo 61 - Station S8 (29 May 2009)



Photo 62 - Station S43 (28 May 2009)



Photo 63 - Station L25 (09 June 2011)



Photo 64 - Station S60 (09 June 2011)



Photo 65 - Station S61 (08 June 2011)



Photo 66 - Station L4 (16 June 2010)



Photo 67 - Station S20 (08 June 2011)



Photo 68 - Station L27 (11 June 2011)



Photo 69 - Station S62 (08 June 2011)



Photo 70 - Station L17 (20 June 2010)



Photo 71 - Station L17 (16 June 2010)

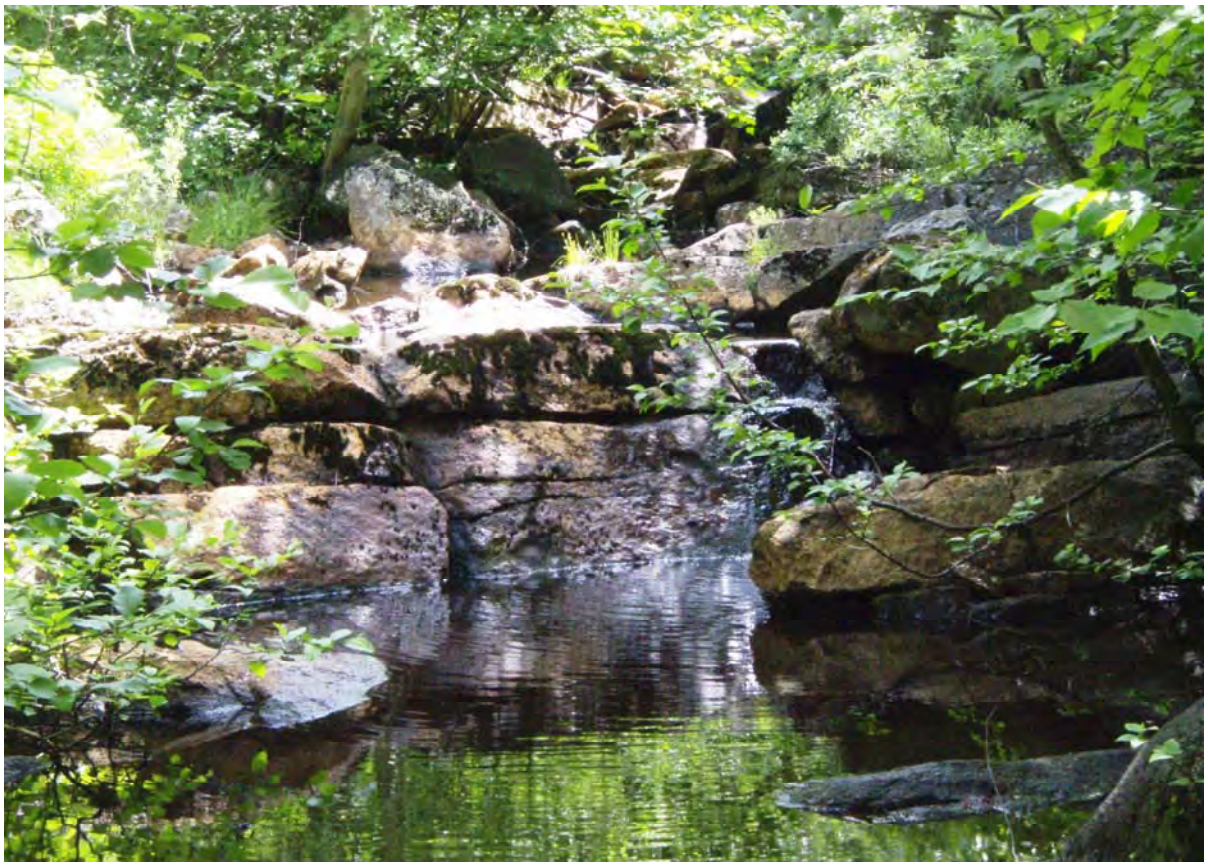


Photo 72 - Station S22 (18 June 2010)



Photo 73 - Station L23 (13 August 2009)



Photo 74 - Station L23 (13 August 2009)



Photo 75 - Station S10 (30 May 2009)



Photo 76 - Bamoos Lake (05 August 2009)



Photo 77 - Bamoos Lake (31 August 2009)



Photo 78 - Station S41 (23 October 2009)



Photo 79 - Hare Lake (05 August 2009)



Photo 80 - Hare Lake (07 August 2009)



Photo 81 - Station S11 (30 May 2009)



Photo 82 - Station S30 (27 May 2009)



Photo 83 - Station L26 (15 June 2011)



Photo 84 - Station S63 (19 June 2011)



Photo 85 - Station S64 (19 June 2011)



Photo 86 - Station S15 (15 June 2011)



Photo 87 - Station L24 (05 August 2009)



Photo 88 - Station L24 (11 June 2011)



Photo 89 - Station S12 (23 October 2009)



Photo 90 - Station S14 (30 May 2009)



Photo 91 - Station S42 (25 October 2009)



Photo 92 - Station S31 (27 May 2009)



Photo 93 - Upper Rag Lake (13 August 2009)



Photo 94 - Station S23 (27 May 2009)



Photo 95 - Pic River (20 October 2010)



Photo 96 - Pic River (24 May 2010)



Photo 97 - Malpa Lake (05 August 2009)



Photo 98 - Malpa Lake (13 August 2009)



Photo 99 - Malpa Creek, Station S49 (29 May 2009)



Photo 100 - Station S68 (13 June 2011)



Photo 101 - Station S32 (26 August 2009)



Photo 102 - Station S44 (28 May 2009)



Photo 103 - Station S67 (08 June 2011)



Photo 104 - Station S45 (28 May 2009)



Photo 105 - Station S24 (29 May 2009)



Photo 106 - Station S25 (26 May 2009)



Photo 107 - Station S46 (26 May 2009)



Photo 108 - Station S47 (26 May 2009)



Photo 109 - Station S48 (26 May 2009)



Photo 110 - Station S50 (26 May 2009)



Photo 111 Lake Superior, Port Munroe (05 August 2009)



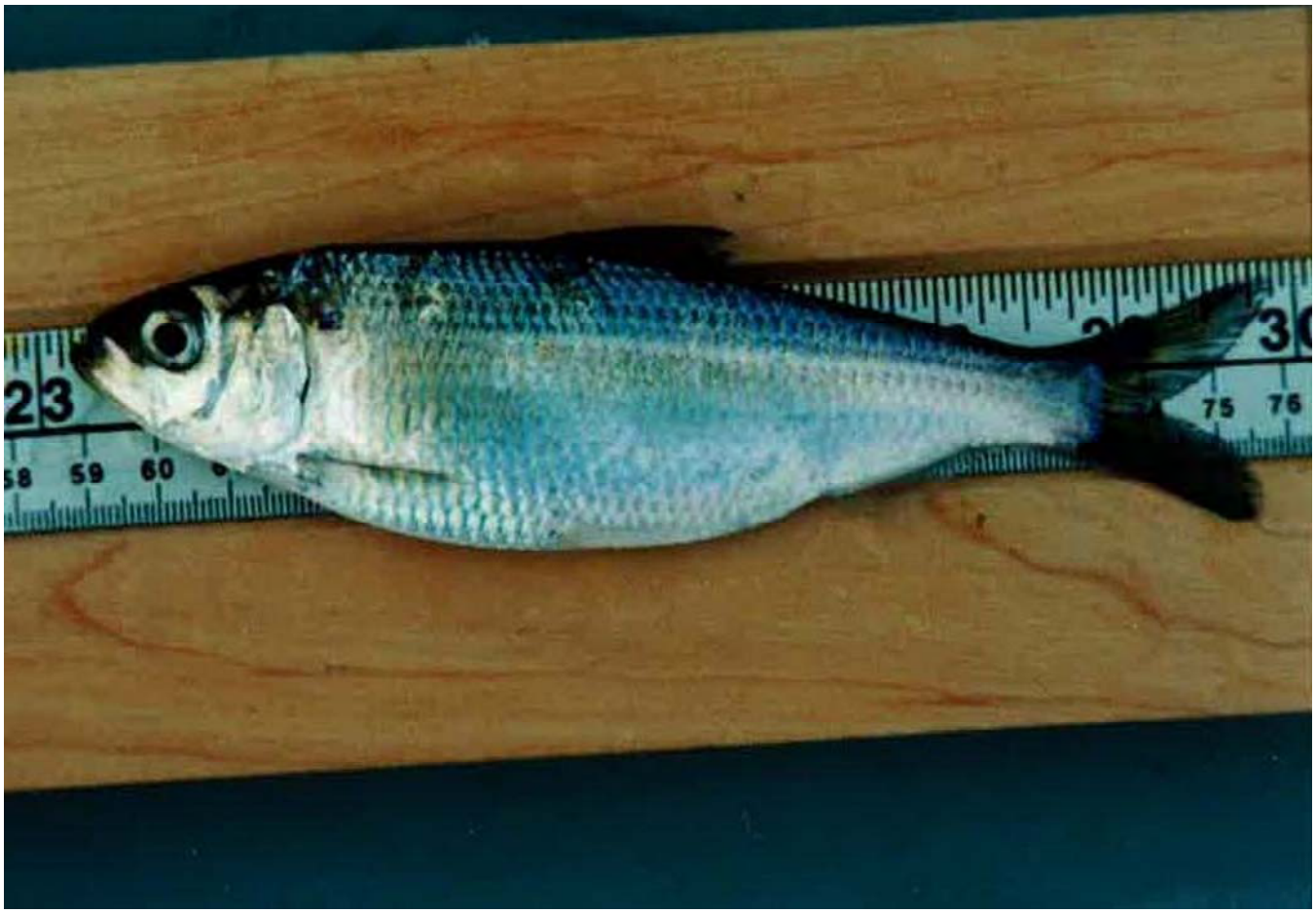
Photo 112 Lake Superior, Sturdee Cove (22 October 2009)

APPENDIX 1: Photographs

Part B: Fish Species Collected within the Project Area



Lake Sturgeon, *Acipenser fulvescens*



Alewife, *Alosa pseudoharengus*



Northern Redbelly Dace, *Chrosomus eos*



Finescale Dace, *Chrosomus neogaeus*



Lake Chub, *Couesius plumbeus*



Blacknose Shiner, *Notropis heterolepis*



Spottail Shiner, *Notropis hudsonius*



Fathead Minnow, *Pimephales promelas*



Longnose Dace, *Rhinichthys cataractae*



Longnose Sucker, *Catostomus catostomus*



White Sucker, *Catostomus commersonii*



Silver Redhorse, *Moxostoma anisurum*



Shorthead Redhorse, *Moxostoma macrolepidotum*



Northern Pike, *Esox lucius*



Muskellunge, *Esox masquinongy*



Rainbow Smelt, *Osmerus mordax*



Cisco, *Coregonus artedi* (normal form)



Cisco, *Coregonus artedi* (dwarf form)



Lake Whitefish, *Coregonus clupeaformis*



Pink Salmon, *Oncorhynchus gorbuscha*



Coho Salmon, *Oncorhynchus kisutch*



Rainbow Trout, *Oncorhynchus mykiss*



Steelhead, *Oncorhynchus mykiss* (smolt)



Chinook Salmon, *Oncorhynchus tshawytscha* (smolt)



Round Whitefish, *Prosopium cylindraceum*



Brook Trout, *Salvenlinus fontinalis*



Lake Trout, *Salvelinus namaycush*



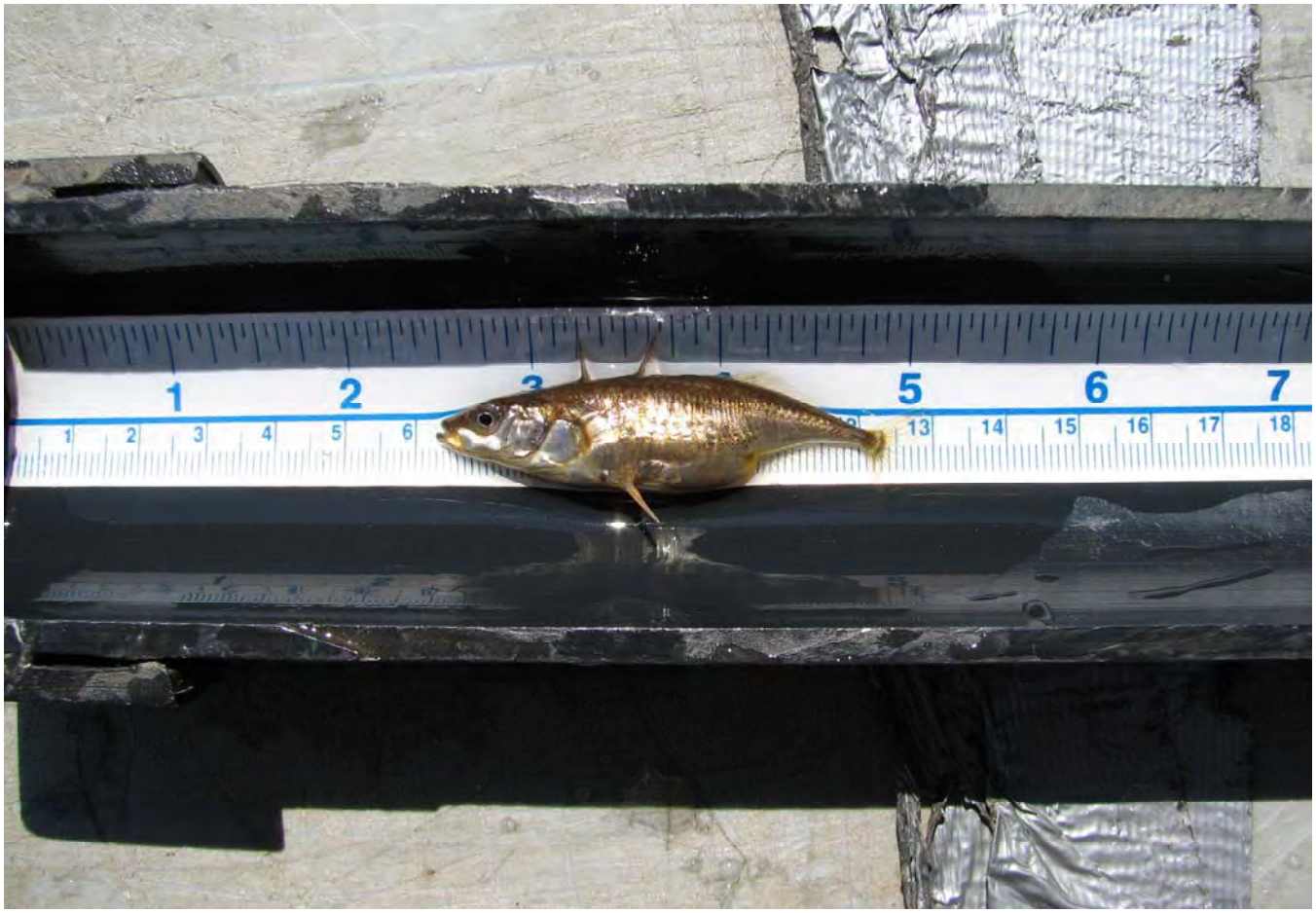
Trout-perch, *Percopsis omiscomaycus*



Burbot, *Lota lota*



Brook Stickleback, *Culaea inconstans*



Threespine Stickleback, *Gasterosteus aculeatus*



Ninespine Stickleback, *Pungitius pungitius*



Mottled Sculpin, *Cottus bairdii*



Slimy Sculpin, *Cottus cognatus*



Johnny Darter, *Etheostoma nigrum*



Walleye, *Sander vitreus*



Yellow Perch, *Perca flavescens*



Logperch, *Percina caprodes*

APPENDIX 2: Field Data Sheets

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON
Project No.: 09-1630
Investigators: RE, JT

Date: May 30/09
Time: 11:25 - 11:55

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S1
Local Name: Stream 1 u/s	Location: B/S OF ROAD CROSSING
Township: MARATHON MUNICIPAL	Coordinates: 5400365 'N 0549713 'E
Topographic Map Name/Number: GOOD CHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.35	Length (m): 75	Mean Width (m): 1.25	Mean Depth (m): 0.15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 0	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 60	Riffle: 30 (Cascades)	Run: 0	Flat: 10

Stream Gradient (% Reach)

High: 90	Moderate: 10	Low: 0

Stream Channel Type (% Reach)

Straight: 100	Meandering: 0	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 100	Partly Open: 0	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 0	Boulder: 20	Logs & Trees: 5	Log Jams: 5	Deep Pool: 30	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 50	Boulder: 10	Cobble: 30	Gravel: 10	Sand: 0
Silt: ✓ organic miner	Clay: 0	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: Balsam Fir, Alder, Dogwood, whitebirch, Balsam poplar, whitespruce
Dominant Aquatic Vegetation: Moss
Adjacent Land Use: Access Road.

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Logjam + Cascades

WEATHER

Cloud Cover (%): 0 Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 7 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 10.5	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: CADDISFLIES, LEECHES, MAYFLIES COMMON IN STREAM

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 5875 600V 60Hz FINESCALE DACE, NORTHERN REDBELLY DACE
AMERICAN TOAD ADULT AND FREE EGG MASS OBSERVED

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 27/09
Time: 18:40

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S2
Local Name: Stream 1 d/s	Location: U/S OF ACCESS ROAD
Township: MARATHON MUNICIPAL	Coordinates: 54°01889'N 0551490'E
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.2	Length (m): 150	Mean Width (m): 3.0	Mean Depth (m): 0.20

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 20	Stable: 80

Stream Morphology (% Total Surface Area)

Pool: 30	Riffle: 40	Run: 10	Flat: 20

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 85	Braided: 15	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open:

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 0	Logs & Trees: 10	Log Jams: 10	Deep Pool: 10	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 0	Boulder: 0	Cobble: 40	Gravel: 20	Sand: 30
Silt: 10	Clay: 0	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: White cedar, white spruce, willow, Alder, Dogwood, Black Birch
Dominant Aquatic Vegetation: none
Adjacent Land Use: Access Road

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural ( ) Artificial (X) Type: Perched Culvert @ road.

WEATHER

Cloud Cover (%): 40 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 13	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Finescale, Chinook Salmon, Rainbow Trout, Brook Trout
Slimy Sculpin, *Brook trout and sculpin captured only below perched culvert
Highly embedded sediment

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE JT

Date: May 30/09
Time: 10:00 - 10:50

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S3
Local Name: Stream 2 U/S	NAD27 Location: DIS ACCESS ROAD
Township: MARATHON MUNICIPAL	Coordinates: 5404097 'N 0550160 'W~~E~~
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 3

STATION DATA

Flow Vel. (m/s): 0.25	Length (m): 125	Mean Width (m): 2.5	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 90	Stable: 10

Stream Morphology (% Total Surface Area)

Pool: 40	Riffle: 40	Run: 5	Flat: 15

Stream Gradient (% Reach)

High: 10	Moderate: 90	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 30	Partly Open: 50	Open: 20

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder: 5	Logs & Trees: 15	Log Jams: 5	Deep Pool: 30	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 5	Boulder: 5	Cobble: 30	Gravel: 30	Sand: 10
Silt: 10 organic	Clay: 10	Marl: 0	Muck: 0	Detritus: ✓

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: Alder, Dogwood, White Birch, White Spruce, Balsam Poplar
Dominant Aquatic Vegetation: water cress, Marsh Marigold
Adjacent Land Use: ACCESS ROAD

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Waterfall

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 8 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 11	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Slight Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: LARGE NUMBERS OF MACROINVERTEBRATES OBSERVED
LEECHES, CADDISFLIES, MAYFLIES, WAT

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: MINNOWS SAW 6 OR 7 BROOKSTICKLEBACKS
2 Adult Bullfrogs observed

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 29/09
Time: 9:45 - 11:00

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S4
Local Name: Stream 2 d/s	Location: 20m u/s of mouth @ PIC RIVER
Township: MARATHON MUNICIPAL	Coordinates: 5404796 'N 0551822 'W E
Topographic Map Name/Number: GOODCHILD LAKE	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.15	Length (m): 110	Mean Width (m): 2.5	Mean Depth (m): 0.4

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 80	Moderately Unstable: 20	Stable: 0

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 30	Run: 10	Flat: 10

Stream Gradient (% Reach)

High: 0	Moderate: 100	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 25	Partly Open: 60	Open: 15

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder: 5	Logs & Trees: 15	Log Jams: 15	Deep Pool: 25	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 0	Boulder: 5	Cobble: 20	Gravel: 5	Sand: 35
Silt: 30	Clay: 5	Marl: 0	Muck: 0	Detritus: ✓

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: Alder, Dogwood, White spruce, Balsam fir, White Birch
Dominant Aquatic Vegetation: Sedges, Horsetail
Adjacent Land Use: None

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X) EXTREME
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: LOGJAMS

WEATHER

Cloud Cover (%): 5 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 13 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 9.5	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained ( ) Turbid (X)

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 15575 400V 60Hz
RAINBOW TROUT, CHINOOK SALMON, SLIMY SCULPIN, BROOK STICKLEBACK, Lake Chub, WHITE SUCKER, FINESCALE DACE, LONGNOSE DACE

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 28/09
Time: 15:30 - 16:20

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S6
Local Name: Stream 3 d/s	Location: U/S of Mouth @ Pic River
Township: MARATHON MUNICIPAL	Coordinates: 5409925 'N 0551890 'W E
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.2	Length (m): 180	Mean Width (m): 3	Mean Depth (m): 0.2

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 20	Stable: 80

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle: 60	Run: 5	Flat: 25

Stream Gradient (% Reach)

High: 0	Moderate: 100	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 15	Partly Open: 45	Open: 40

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 5	Logs & Trees: 5	Log Jams: 5	Deep Pool: 5	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 0	Boulder: 5	Cobble: 60	Gravel: 10	Sand: 10
Silt: 15	Clay: 0	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White Birch, Alder, Dogwood, Balsam Fir, White Spruce,
Dominant Aquatic Vegetation: Sedges,
Adjacent Land Use: none

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural (X) Artificial ( ) Type: LOGJAM

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 23 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 15.5	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained ( ) Turbid (X)

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: SLIMY SCULPIN
13695 400V 60Hz (IG)
NATURAL LOGJAM BARRIER AT MOUTH

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE JT

Date: May 29/09
Time: 15:30-16:30

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S8
Local Name: Stream 4 d/s	Location: 70m D/s of Beaver Dam
Township: UNORGANIZED	Coordinates: NAD 27 5407411 'N 0550238 'W E
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.45	Length (m): 70	Mean Width (m): 1.5	Mean Depth (m): 0.30

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 0	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 40	Riffle: 40	Run: 10	Flat: 10

CASCADES ~1/2 Riffle

Stream Gradient (% Reach)

High: 100	Moderate: 0	Low: 0

Stream Channel Type (% Reach)

Straight: 20	Meandering: 0	Braided: 80	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 20	Partly Open: 80	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 0	Boulder: 15	Logs & Trees: 5	Log Jams: 0	Deep Pool: 30	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 40	Boulder: 20	Cobble: 25	Gravel: 5	Sand: 0
Silt: 5 organic	Clay: 0	Marl: 0	Muck: 0	Detritus: 5

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White Birch, Balsam Fir, Alder, Dogwood
Dominant Aquatic Vegetation: Moss
Adjacent Land Use: None

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Bedrock cascades Beaver Dam.

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 14.5 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 19	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: Abundant Macroinvertebrates observed - Leeches, caddisflys Diptera flys, mayflies

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 98 S 600V 60Hz
Northern Redbelly Dace, Finescale Dace, Fathead Minnow, Brook Stickleback
Lake Chub, Blacknose Shiner. Lots of tadpoles observed in beaver pond upstream

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 30/09
Time: 19:05

LOCATION DATA

Watercourse: HARE CREEK	Station Number: S11
Local Name: HARE CREEK	Location: D/S OF HWY 17
Township: MARATHON MUNICIPAL	Coordinates: 5483580 'N 540°2545 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 0116	Stream Order: 3rd

STATION DATA

Flow Vel. (m/s): 0.40	Length (m): 75	Mean Width (m): 9	Mean Depth (m): 0.5

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 80	Stable: 20

Stream Morphology (% Total Surface Area)

Pool: 20	Riffle: 20	Run: 55	Flat: 5

Stream Gradient (% Reach)

High: 0	Moderate: 100	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 0	Braided: 100	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 0	Partly Open: 80	Open: 20

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 10	Logs & Trees: 10	Log Jams: 5	Deep Pool: 15	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 15	Boulder: 10	Cobble: 35	Gravel: 30	Sand: 5
Silt: 5	Clay: ✓	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White Spruce, Alder, White Cedar, Tamark
Dominant Aquatic Vegetation: Marsh Marigold
Adjacent Land Use: HWY 17 U/S

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 80 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 9.5 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 11°C	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: Caddisflies, Mayflies, Leeches, → Common

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 1551s 500V 60Hz
- Brook Trout, Chinook Salmon, Rainbow Trout, Slimy Sculpin, Brook Stickleback.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: KP/MM

Date: Oct 23, 2009
Time:

LOCATION DATA

Watercourse: Stream 6	Station Number: S12
Local Name:	Location: U/S Hwy 17 & D/S of L24
Township: Marathon Mun.	Coordinates: 16U 546523E 5402238N
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.10	Length (m): 75m	Mean Width (m): 1m	Mean Depth (m): 0.15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 15	Riffle: 40	Run: 40	Flat: 5

Stream Gradient (% Reach)

High:	Moderate: 40	Low: 60

Stream Channel Type (% Reach)

* Moose meadows

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 40	Open: 60

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 10	Logs & Trees:	Log Jams: 5	Deep Pool: 5	Aquatic Macrophyte: 5

Substrate Types (%)

Bedrock: 10	Boulder: 40	Cobble: 10	Gravel: 20	Sand: 10
Silt:	Clay:	Marl:	Muck: 20	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow: 60	Lawn:	Forested Upland: 40	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: grasses, willows, spruce
Dominant Aquatic Vegetation: sedge, moss
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 10 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 24 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 2.55	Dissolved Oxygen (mg/L): 13.54 mg/L
Conductivity (umhos/cm): 38	pH: 8.01

99.4%

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: 10 mm K+S of all available habitats.

Fish Community
Not Assessed (X) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Sticklebacks observed - June 15, 2011

055/1984

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 30/09
Time: 16:50

LOCATION DATA

Watercourse: ANGLER CREEK	Station Number: S14
Local Name: Angler Creek	Location: 120 m D/S OF HWY 17
Township: MARATHON MUNICIPAL	Coordinates: 5455517' N 540196 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2nd

STATION DATA

Flow Vel. (m/s): 0.25	Length (m): 120	Mean Width (m): 30	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 40	Stable: 60

Stream Morphology (% Total Surface Area)

Pool: 45	Riffle: 30	Run: 5	Flat: 20

Stream Gradient (% Reach)

High: 20	Moderate: 80	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 20	Boulder: 30	Logs & Trees: 5	Log Jams: 5	Deep Pool: 30	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 30	Boulder: 30	Cobble: 20	Gravel: 10	Sand: 5
Silt: 5	Clay:	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: Balsam Fir, White Spruse, Alder, Dogwood, White Birch
Dominant Aquatic Vegetation: Moss, Algae
Adjacent Land Use: D/s of Hyway 17

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Barriers Observed: None ( ) Natural (X) Artificial (X) Type: Cascades
Perched culvert

WEATHER

Cloud Cover (%): 10 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 10.5 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 13	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) (DARK) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: Mayflies, Leeches, Caddiseflies, Dragonflies

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 1143s 600V 60Hz
- Brook Stickleback
- Adult Wood Frog Observed.

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, BF

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream Catchment 16	Station Number: S15 D/S
Local Name: Angler Creek	Location: Marathon
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 48°46 23.0' N 86°21 29.8 W
Topographic Map Name/Number: GOODALL LAKE 42 D/16	Date Aug 9/11 2009

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 100	Partly Open:	Open:

Substrate Types (%)

Bedrock: 5	Boulder: 5	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 90	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland:
Marsh:	Beaver Pond: 100	Bog:	Swamp:	

Dominant Terrestrial Vegetation: 4 set of spruce, labtea, grass
Dominant Aquatic Vegetation: grass, sedge
Adjacent Land Use: Wild, ATV not far away.

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dams

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

515 d/s

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, BF

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: leeches, strideas,

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( )
Nortic Net
Sampling Methods: Qualitative ( ) Quantitative (X) I.B.I. ( ) Other ( )

Fish Community Notes: brook stickleBacks seen
kingfisher seen.

sechii = bottom

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	16.4	5.81	61.7	6.0	25.1/38.9	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

S15 u/s

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Angler Creek	Station Number: S-15 u/s
Local Name: Marathon Municipal	Location: By Bridge and above
Township: S	Picture Number: 227-263
Datum: NAD 27	Coordinates: 48° 46.408' N 86 °21 .309' W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 9, 2009

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 100	Stable:

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 90	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland:
Marsh: 5	Beaver Pond: 90	Bog:	Swamp: 5	

Dominant Terrestrial Vegetation: Spruce, birch
Dominant Aquatic Vegetation: Sedge, grasses
Adjacent Land Use: None

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver Dam

WEATHER

Cloud Cover (%): 100% Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

S15 at Tagline.

Terrain Characteristics (%)

Cultivated:	Meadow: 80	Lawn:	Forested Upland:	Forested Lowland: 20
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: grass, spruce, alder, willow, tamarack
Dominant Aquatic Vegetation: see photo
Adjacent Land Use: wilderness, moose prints.

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beavers

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None ( ) Light ( ) Moderate (X) Heavy (X)

CHEMICAL PARAMETERS

Water Temperature (°C): 16.16	Dissolved Oxygen (mg/L): 8.01 81.4
Conductivity (umhos/cm): 57	pH: 7.58

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: Oligochaete, bottle, dragon-fly

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Brook stickleback - 16+28 = 44
416sec 60Hz, 300V

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater Canada Inc. Date: June 15, 2011
Project No.: 11-1837 Time:
Investigators: JT, MM

LOCATION DATA

Watercourse: Stream 6	Station Number: S15 u/s
Local Name:	Location: By Bridge and above
Township: MARATHON	Coordinates: 547568E ~~N~~ 5402274 ~~W~~
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.1	Length (m): 50	Mean Width (m): 2.0	Mean Depth (m): 0.5

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 100	Stable:

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle:	Run: 80	Flat: 10

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder:	Logs & Trees:	Log Jams:	Deep Pool: 10	Aquatic Macrophyte: 10

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 90	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow: 60	Lawn:	Forested Upland: 30	Forested Lowland:
Marsh: 5	Beaver Pond:	Bog:	Swamp: 5	

Dominant Terrestrial Vegetation: spruce bird, alder
Dominant Aquatic Vegetation: sedge, grasses
Adjacent Land Use: _____

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver dams some have been breached

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: _____

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Stickleback observed throughout station.

Note: Station has changed from ponded (beaver dam system) to a meandering channel through a meadow with some bog/marsh area. Many beaver dams have been washed and or at least breached.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE JT

Date: May 29/09
Time: 17:35 – 18:25
BENTHIC COLLECTED JUNE 14/11 JT+MM

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S18
Local Name: Stream 3 U/S	Location: 120 m D/s of road crossing
Township: MARATHON MUNICIPAL	Coordinates: 5404903 'N 0550252 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.25	Length (m): 120	Mean Width (m): 1.5	Mean Depth (m): 0.15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 80	Stable: 20

Stream Morphology (% Total Surface Area)

Pool: 15	Riffle: 65	Run: 5	Flat: 15

Stream Gradient (% Reach)

High: 10	Moderate: 90	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 30	Partly Open: 60	Open: 10

Instream Cover (% Total Surface Area)

Undercut Banks: 0	Boulder: 10	Logs & Trees: 10	Log Jams: 5	Deep Pool: 5	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 10	Boulder: 15	Cobble: 25	Gravel: 15	Sand: 20
Silt: 10 organic	Clay: 5	Marl: 0	Muck: 0	Detritus: ✓

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: Alder, White Spruce, White Birch, Dogwood
Dominant Aquatic Vegetation: Water Cress, Horsetail
Adjacent Land Use: Access Road

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Cascade/Bedrock waterfall

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 13 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 13	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection (X) JUNE 14/11

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: Abundant Macroinvertebrates - caddisfly, mayflies
10 MIN K+S of all available habitats

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 63 5 SOOV Rattle NO Fish Collected
WOOD FROG ADULT OBSERVED

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: KP MM

Date: June 20/10
Time: 15:11

LOCATION DATA

Watercourse: Stream 5	Station Number: S 20
Local Name: Hare Lake Watershed	Location: D/S LAKE 4
Township: Marathon Municipality	Coordinates: 16U°548335N5404224 'W
Topographic Map Name/Number: Goodchild Lake 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.1	Length (m): 75	Mean Width (m): 1.5	Mean Depth (m): 0.15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle:	Run: 25	Flat: 25

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight: 50	Meandering:	Braided:	Ponded: 50

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 100	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 10	Logs & Trees: 20	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock: 15	Boulder: 20	Cobble: 50	Gravel: 15	Sand:
Silt:	Clay:	Marl:	Muck:	Detritus:

L4 D

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce fern Alder Balsam Fir
Dominant Aquatic Vegetation: Aquatic sponge Algal, BLUEFLAG, SEDGE
Adjacent Land Use: forest

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dams

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): —	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: leeches

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 154 sec
leopard frog, wood frog

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Bell Water
Project No.: 11-1837
Investigators: KP JT

Date: June 8/11
Time: 13:50

LOCATION DATA

Watercourse: Stream 5	Station Number: S20
Local Name: STREAM 5	Location: D/S of L4
Township: Marathon Municipality	Coordinates: 48°47.344' N 086°20.517' W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

PHOTOS: P6080068 – 74 (JOE)

STATION DATA

Flow Vel. (m/s): 0.25	Length (m): ~~200m~~ 150m	Mean Width (m): 1.5	Mean Depth (m): ~~0.15~~ 0.2

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 10	Stable: 90

Stream Morphology (% Total Surface Area)

Pool: 20	Riffle: 35	Run: 35	Flat: 10

↳ 20% is cascady in lower 1/2

Stream Gradient (% Reach)

High: 50	Moderate: 50	Low:

Stream Channel Type (% Reach)

Straight: 85	Meandering:	Braided:	Ponded: 15

Stream Canopy (% Stream Shaded)

Dense: 60	Partly Open: 40	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 10	Logs & Trees: 16	Log Jams:	Deep Pool:	Aquatic Macrophyte: 10

Substrate Types (%)

Bedrock: 20	Boulder: 30	Cobble: 30	Gravel: 10	Sand:
Silt:	Clay:	Marl:	Muck: 10	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce / Poplar, Birch, Maple, Ferns, Alder, Lily? (shrub + tree)
Dominant Aquatic Vegetation: Moss / periphyton / Algal
Adjacent Land Use: Forest

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Dam at top of beaver Multiple cascades + falls @ bottom

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 15 Recent Precipitation: None ( ) Light ( ) Moderate ( ) Heavy (X)

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: Cobble / Muck Number of Replicates: 1

Benthic Community Notes: Beetles, Leech, 10 min. K+S of available habitat.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: No fish, 453 sec leeches, wood frogs, water striders
Hz 60, 500V

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: MM+KP

Date: June 18/10
Time: 11:54

LOCATION DATA

Watercourse: Stream 5	Station Number: S22
Local Name: Unnamed Stream	Location: D/S LAKE 17
Township: Marathon Municipality	Coordinates: 16U 547043 5484363 ' N ' W
Topographic Map Name/Number: Goodahue Lake 42 D/16	Stream Order: 2

Photos 65-621

STATION DATA

Flow Vel. (m/s): 0.2	Length (m): 75	Mean Width (m): 2	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 100	Moderately Unstable:	Stable:

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 50	Run:	Flat:

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight: 90	Meandering: 10	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 50	Partly Open: 50	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 50	Logs & Trees:	Log Jams:	Deep Pool: 10	Aquatic Macrophyte:

Substrate Types (%)

Bedrock: 50	Boulder: 50	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck:	Detritus:

L17 West

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Birch, Maple, ferns, Alder, Spruce, Aspen Grass
Dominant Aquatic Vegetation: Moss
Adjacent Land Use: Forest

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 100 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 15 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 16.31	Dissolved Oxygen (mg/L): 8.48 86.4
Conductivity (~~umhos/cm~~ uS/cm): 18	pH: 6.78

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes:_____
11 Stickle Backs (Brook
460 seconds

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RG, JT, BF

Date: May 27/09
Time: 15:55

LOCATION DATA

Watercourse: SHACK CREEK	Station Number: S23
Local Name: SHACK CREEK	Location: MOUTH U/S OF LAKE SUPERIOR
Township: MARATHON MUNICIPAL	Coordinates: 5397870 'N 0545232 'W E
Topographic Map Name/Number: MARATHON LAKE 42 D/9	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.5	Length (m): 200	Mean Width (m): 4.75	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 20	Stable: 80

Stream Morphology (% Total Surface Area)

Pool: 20	Riffle: 55	Run: 15	Flat: 10

Stream Gradient (% Reach)

High: 10	Moderate: 90	Low: 0

Stream Channel Type (% Reach)

Straight: 60	Meandering: 30	Braided: 10	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 30	Partly Open: 40	Open: 30

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder: 10	Logs & Trees: 10	Log Jams: 15	Deep Pool: 10	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 20	Boulder: 5	Cobble: 40	Gravel: 30	Sand: 5
Silt: 0	Clay: 0	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White Birch, Dogwood, Alder, White Spruce
Dominant Aquatic Vegetation: Sedges
Adjacent Land Use: ACCESS TRAIL

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Log Jam

WEATHER

Cloud Cover (%): 5 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 14	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Slight Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 967s 300V 60Hz
LONGNOSE DACE, LONGNOSE SUCKER, RAINBOW TROUT, BROOK TROUT, CHINOOK SALMON SLIMY SCULPIN WHITE SUCKER

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 29/09
Time: 1300 - 13:40

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S24
Local Name:	Location: D/S of Road 50m / U/S of Road 50m
Township: MARATHON MUNICIPAL	Coordinates: 5403084 'N 0559787 'W,E @ Road
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.15/0.1	Length (m): 50/50	Mean Width (m): 0.25/0.40	Mean Depth (m): 0.05/0.05

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 20 D/S	Moderately Unstable: 180 D/S	Stable: 100 U/S

Stream Morphology (% Total Surface Area)

Pool: 5/10	Riffle: 50/0	Run: 0/0	Flat: 45/90

Stream Gradient (% Reach)

High: 0	Moderate: 100 D/S	Low: 100 U/S

Stream Channel Type (% Reach)

Straight: 0	Meandering: 150/100	Braided: 50/0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 100/100	Partly Open: 0	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 5/5	Boulder: 0/0	Logs & Trees: 15/15	Log Jams: 10/5	Deep Pool: 5/5	Aquatic Macrophyte: 0/0

Substrate Types (%)

Bedrock: 0	Boulder: 0	Cobble: 45/0	Gravel: 5/0	Sand: 20/80
Silt: 25/20	Clay: 5/0	Marl: 0/0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: Alder, White Spruce, White Birch, Dogwood
Dominant Aquatic Vegetation: NONE
Adjacent Land Use: NONE

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural ( ) Artificial (X) Type: Road No culvert Seepage under road bed

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 15 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

( ) = Oct 21/09 MM+KP

Water Temperature (°C): 8 /9.5 (3.4e)	Dissolved Oxygen (mg/L): (7.07mg/L) (6.43)
Conductivity (umhos/cm): ~(0.219mS/cm)	pH: ~(8.07)

Water Colour: Colourless (X) U/S Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) U/S Stained ( ) Turbid (X) D/S

BIOLOGICAL CHARACTERISTICS

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X) Oct 21/09

Substrate Sampled: N/A Toc +Metals +Grainsize Oct 21/09 Number of Replicates: N/A

Benthic Community Notes: N/A Oct 21/09 ~10 min K+S of all available habitats

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: D/S ~400V 60Hz(IG) ~11S U/S ~10S ~300V 60Hz(IG)
NO FISH COLLECTED

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE JT

Date: May 30/09
Time: 13:00-14:00

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S27
Local Name: Stream #1 Catchment	Location: D/S of SKIDDER TRAIL
Township: MARATHON MUNICIPAL	Coordinates: 5401350 'N 0550417 'E
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.10	Length (m): 150	Mean Width (m): 2.5	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 10	Moderately Unstable: 40	Stable: 50

Stream Morphology (% Total Surface Area)

Pool: 40	Riffle: 15	Run: 5	Flat: 15

Cascades - 25

Stream Gradient (% Reach)

High: 20	Moderate: 80	Low: 0

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 60	Partly Open: 40	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder: 15	Logs & Trees: 25	Log Jams: 10	Deep Pool: 25	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 30	Boulder: 10	Cobble: 15	Gravel: 10	Sand: 30
Silt: 5	Clay: ✓	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White spruce, Dogwood, Alder, White Cedar,
Dominant Aquatic Vegetation: MOSS
Adjacent Land Use: SKIDDER TRAIL

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( ) -SAND
Algae Overlaying Substrate: None ( ) Slight (X) Moderate (X) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 10.5 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 10.5	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: Mayflies, Caddisflies, leeches - common.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 12675 FINESCALE DACE, BROOK TROUT
400 V 60Hz.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 27/09
Time: 10:50

LOCATION DATA

Watercourse: HARE CREEK	Station Number: S30	
Local Name: HARE CREEK	Location: U/S OF MOUTH	
Township: McCOY / MARATHON	Coordinates: 5482525 'N 6542101 'WE	
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 3

STATION DATA

Flow Vel. (m/s): 0.3	Length (m): 200	Mean Width (m): 10.5	Mean Depth (m): 0.6

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 100	Stable: 0

Stream Morphology (% Total Surface Area)

Pool: 15	Riffle: 10	Run: 60	Flat: 15

Stream Gradient (% Reach)

High: 0	Moderate: 100	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 0	Partly Open: 20	Open: 80

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 5	Logs & Trees: 10	Log Jams: 15	Deep Pool: 15	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 0	Boulder: 5	Cobble: 15	Gravel: 60	Sand: 15
Silt: 15	Clay: 0	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White spruce, alder, tamarack, dogwood
Dominant Aquatic Vegetation: sedges, horsetail, marsh marigolds
Adjacent Land Use: Railway

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 5 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 9	Dissolved Oxygen (mg/L): –
Conductivity (umhos/cm): –	pH: –

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Slight Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Longnose Dace, Mulled Sculpin, Rainbow Trout, Brook Trout
Longnose Sucker, 9-Spine Stickleback, CHINOOK SALMON, Rainbow SMELT

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT, BF

Date: May 27/09
Time: 13:30

LOCATION DATA

Watercourse: ANGLER CREEK	Station Number: 531	
Local Name: ANGLER CREEK	Location: 300m U/S of Lake	
Township: MARATHON MUNICIPAL TOWNSHIP	NAD 27 Coordinates: 5400221 'N 0548987 'E	
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.1	Length (m): 160	Mean Width (m): 4.5	Mean Depth (m): 0.4

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 50	Moderately Unstable: 50	Stable: 0

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 10	Run: 20	Flat: 20

Stream Gradient (% Reach)

High: 0	Moderate: 20	Low: 80

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 20	Partly Open: 80	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 0	Boulder: 0	Logs & Trees: 20	Log Jams: 10	Deep Pool: 30	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 0	Boulder: 0	Cobble: 0	Gravel: 0	Sand: 100
Silt: ✓ (<5)	Clay: 0	Marl: 0	Muck: 0	Detritus: ✓ (25)

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White spruce, dogwood, Balsam fir, Alder, tamarack
Dominant Aquatic Vegetation: Sedges,
Adjacent Land Use: RAILWAY U/S

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 5 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 19 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 12	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Longnose Dace, RAINBOW TROUT, CHINOOK SALMON, MOTTLED SCULPIN
400V 60Hz -1/2 6sec

Stantec Consulting Ltd.
Stream Habitat Assessment Form

Client: MBRATION PGM
Project No.: 09-1630
Investigators: RE/RR

Date: 26/08/09
Time: 12:45

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S32	
Local Name:	Location: U/S PIC RIVER 200M	
Township: UNORGANIZED	Coordinates: Lat: 48° 49' 969	Long: 86° 18' 651
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 1

STATION DATA

Flow Vel. (m/s): .35	Length (m): 175	Mean Width (m): 1	Mean Depth (m): 15cm

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 100	Moderately Unstable:	Stable:

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle: 70	Run: 15	Flat: 5

Stream Gradient (% Reach)

High: 70	Moderate: 30	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 5	Partly Open: 65	Open: 30

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 5	Logs & Trees: 5	Log Jams: 20	Deep Pool: 5	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 5	Cobble: 30	Gravel: 15	Sand: 10
Silt: 10	Clay: 30	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: POPLAR, SPRUCE, BIRCH, ALDER
Dominant Aquatic Vegetation: SEDGES
Adjacent Land Use: NONE

Sediment Overlaying Substrate:	None ( )	Slight ( )	Moderate ( )	Heavy (X)
Algae Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )
Barriers Observed:	None ( )	Natural (X)	Artificial ( )	Type: LOG JAMS

WEATHER

Cloud Cover (%): 0	Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )
Air Temperature (°C): 17	Recent Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )

CHEMICAL PARAMETERS

( ) = Oct 21/09

Water Temperature (°C):	10 (2.93)	Dissolved Oxygen (mg/L):	(13.47/100%)
Conductivity (umhos/cm):	(0.140 mS/cm)	pH:	(8.05)

Water Colour:	Colourless ( )	Yellow/Brown ( )	Blue/Green (X)
Water Clarity:	Clear ( )	Stained ( )	Turbid (X)

BIOLOGICAL CHARACTERISTICS

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection (X) Oct 21/09

Substrate Sampled: COBBLE Oct 21/09 - cobble/muck Number of Replicates: NIL

Benthic Community Notes: NOT MUCH SOME BLACKFLY LARVAE
Oct 21/09 - 10 min K+S of all avail habitats

Fish Community

Not Assessed ( )	Electrofisher (X)	Seine ( )	Dipnet (X)	Angling ( )
Minnow Trap ( )	Visual ( )	Collection ( )		

Sampling Methods:	Qualitative (X)	Quantitative ( )	I.B.I. ( )	Other ( )

Fish Community Notes: RAINBOW TROUT FRY 959 seconds

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: MM & KP

Date: 23/10/2009
Time: 10:00

LOCATION DATA

Watercourse: Bamoos Creek	Station Number: S41
Local Name: Bamoos Creek	Location: DIS BAMOOS LAKE
Township: UNORGANIZED	Coordinates: 48 °48.228' N 86 °22.498' W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.15	Length (m): 130	Mean Width (m): 3.5	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 35	Riffle: 50	Run: 15	Flat:

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 100	Partly Open:	Open:

Instream Cover (% Total Surface Area)

Undercut Banks: 2%	Boulder: 2	Logs & Trees: 5	Log Jams: 10	Deep Pool: 5	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 5	Cobble: 80	Gravel: 10	Sand: 5
Silt:	Clay:	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 90
Marsh:	Beaver Pond: 10	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce, alder
Dominant Aquatic Vegetation: algae, mossy,
Adjacent Land Use: forest

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dams

WEATHER

Cloud Cover (%): 100 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 1°C Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
snow

CHEMICAL PARAMETERS

Water Temperature (°C): 5.11	Dissolved Oxygen (mg/L): 90.2 / 10.48
Conductivity (umhos/cm): 16 / 26	pH: 8.16

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: cobble / gravel Number of Replicates: 1

Benthic Community Notes: qualatative

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 623s 60Hz 500V
Brook Trout 6
slimy Sculpin (3½ fin rays) 12

sediment - sand fine layer on top.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM Date: Oct 25/09
Project No.: 09-1630 Time:
Investigators: KB MM

LOCATION DATA

Watercourse: ANGLER CREEK	Station Number: S42
Local Name:	Location: US of S31 ADJACENT POWER LINE
Township: MARATHON MUNICIPAL	Coordinates: 48 °45.810' N 86 °24.403 W
Topographic Map Name/Number: GOOD CHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s):	Length (m):	Mean Width (m): 3	Mean Depth (m): 1-2 m

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 5	Moderately Unstable: 95	Stable:

Stream Morphology (% Total Surface Area) Meandering creek

Pool:	Riffle:	Run:	Flat:

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 10	Open: 90

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder:	Logs & Trees:	Log Jams:	Deep Pool:	Aquatic Macrophyte: 90

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand:
Silt: 60	Clay:	Marl:	Muck: 30	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow: 50	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, Alder - Cones sm Leaves gone
Dominant Aquatic Vegetation: Sedges
Adjacent Land Use: Power lines / Forest

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 25 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 4 Recent Precipitation: Snow None ( ) Light ( ) Moderate (X) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 1	Dissolved Oxygen (mg/L): 12.57
Conductivity (umhos/cm): 115	pH: 7.88

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman (X) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: TOC / Grain / Metals Number of Replicates: 3

Benthic Community Notes: See Benthic collection form

Fish Community
Not Assessed (X) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: NA

EcoMetrix INCORPORATED

BENTHIC FIELD SHEET – LAKE SURVEYS

PROJECT DETAILS	Client: Marathon PGM	Study Area: S42	Date: Oct 25/09
	Project No.: 09-1630	Investigators: KP MM	

STATION/SAMPLING DETAILS **Waterbody Name:** ANGLER CREEK

Station No.: S31-1 **Location:**

Latitude 48°45.918'N
Longitude 86°24.478'W

Temp. 1.14 °C
Cond. 133 umhos
pH 7.61 units
D.O. 11.98 mg/L
Spec cond 0.245 ms °C/m

D.O. % Sat. 84.6
Water Depth (m) 1-2 m
Secchi Depth (m) ~~~
Substrate Muck/Silt/Detritus
Algae/Macrophytes yes

Station No.: S31-2 **Location:**

Latitude 48°45.903' N
Longitude 86°24.434'W

Temp. 0.72 °C
Cond. 122 umhos
pH 7.90 units
D.O. 11.69 mg/L
0.226

D.O. % Sat. 81.5
Water Depth (m) 0.5
Secchi Depth (m) ~~~
Substrate Fine sand/Muck/woody debris
Algae/Macrophytes Some

Station No.: S31-3 **Location:** Old beaver dam D/S

Latitude 48°45.890'N
Longitude 86°24.403'W

Temp. 0.72 °C
Cond. 115 umhos
pH 7.88 units
D.O. 12.57 mg/L
Spec 0.215

D.O. % Sat. 87.7
Water Depth (m) 0.5
Secchi Depth (m) ~~~
Substrate Sandy Fines lots of woody debris
Algae/Macrophytes Some

Station No.: S31-4 **Location:**

Latitude 48°45.896'N
Longitude 86°24.337'W

Temp. 0.74 °C
Cond. 128 umhos
pH 7.71 units
D.O. 12.65 mg/L
0.240

D.O. % Sat. 87.8
Water Depth (m) 0.5
Secchi Depth (m) ~~~
Substrate Sandy & detritus
Algae/Macrophytes none

Station No.: S31-5 **Location:**

Latitude 48°45.903'N
Longitude 86°24.271'W

Temp. 0.82 °C
Cond. 67 umhos
pH 7.73 units
D.O. 13.06 mg/L
0.125

D.O. % Sat. 91.4
Water Depth (m) 0.5m
Secchi Depth (m) ~~~
Substrate Sandy & some wood
Algae/Macrophytes None

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 28/09
Time: 11:15

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: 543	
Local Name: D/S of Stream #4 Catchement	Location: U/S FROM PIC RVER	
Township: UNORGANIZED	Coordinates: 5408299 °N 0550811 °W E	
Topographic Map Name/Number: GOODCHILD LAKE 42 O/16		Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.10	Length (m): 100	Mean Width (m): 2	Mean Depth (m): 0.20

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 80	Moderately Unstable: 20	Stable: 0

Stream Morphology (% Total Surface Area)

Pool: 60	Riffle: 10	Run: 5	Flat: 25

Stream Gradient (% Reach)

High: 0	Moderate: 100	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 100	Braided: 0	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: ✓	Logs & Trees: 50	Log Jams: 5	Deep Pool: 20	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: ✓	Boulder: ✓	Cobble: 5	Gravel: 10	Sand: 50
Silt: 25	Clay: 0	Marl: 0	Muck: 0	Detritus: 10

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White Cedar, White Spruce, Alder, Dogwood, White Birch
Dominant Aquatic Vegetation: Sedges
Adjacent Land Use: NONE

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS ( ): Oct 21/09

Water Temperature (°C): 9 (3.42)	Dissolved Oxygen (mg/L): 12.33/90.7%
Conductivity (umhos/cm): — (0.099 mS/cm)	pH: 8.05

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained ( ) Turbid (X) Slight

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X) Oct 21/09

Substrate Sampled: N/A TOC Metals Grainsize Number of Replicates: N/A

Benthic Community Notes: N/A Oct 21/09 10 MIN KTS of all avail. habitats

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: BROOK TROUT RAINBOW TROUT CHINOOK SALMON, WHITE SUCKER FINESCALE DACE, NORTHERN SCULPIN, BROOK STICKLEBACK.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE JT

Date: May 28/09
Time: 12:20 - 13:00

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S44
Local Name: D/S Stream #4 Catchment	Location: MOUTH PROCEEDING U/S FROM PIC RIVER
Township: UNORGANIZED	Coordinates: NAD 27 540755 'N 0559049 'E ±6m
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.3	Length (m): 65	Mean Width (m): 1.0	Mean Depth (m): 0.15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 20	Stable: 80

Stream Morphology (% Total Surface Area)

Pool: 20	Riffle: 50	Run: 0	Flat: 30

Stream Gradient (% Reach)

High: 100	Moderate: 0	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 80	Braided: 20	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 15	Logs & Trees: 10	Log Jams: 10	Deep Pool: 10	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 5	Boulder: 30	Cobble: 50	Gravel: 0	Sand: 5
Silt: 10	Clay: 0	Marl: 0	Muck: 0	Detritus: 0

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: White Birch, Balsam Fir, Alder, Dogwood
Dominant Aquatic Vegetation: Moss
Adjacent Land Use: Road

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural ( ) Artificial (X) Type: Logjam Falls

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 10 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

( ) = Oct 21/09

Water Temperature (°C): 6 (3.19)	Dissolved Oxygen (mg/L): (12.48/93.3%)
Conductivity (umhos/cm): (0.216 mS/cm)	pH: (8.43)

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear ( ) Stained ( ) Turbid (X) Slight

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X) Oct 21/09

Substrate Sampled: N/A Number of Replicates: 1

Benthic Community Notes: N/A
Oct 21/09 - 10 MIN KTS of all avail. habitats
Metals TOC, grain size

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: NO FISH CAPTURED 400V 60Hz (I6) -4975

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: RE JT

Date: May 28/09
Time: 14:05-14:35

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: 545
Local Name: Two streams above the Stream 3 Catchment	Location: started 20m u/s of mouth @ Pic River
Township: UNORGANIZED	Coordinates: 5407055 'N 0559403 'E
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.2	Length (m): 50	Mean Width (m): 1.0	Mean Depth (m): 0.10

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 10	Moderately Unstable: 60	Stable: 30

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle: 30	Run: 10	Flat: 50

Stream Gradient (% Reach)

High: 30	Moderate: 60	Low: 10

Stream Channel Type (% Reach)

Straight: 0	Meandering: 70	Braided: 30	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 100	Partly Open: 0	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder: 5	Logs & Trees: 30	Log Jams: 10	Deep Pool: 5	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 0	Boulder: 5	Cobble: 20	Gravel: 20	Sand: 30
Silt: 20	Clay: 0	Marl: 0	Muck: 0	Detritus: 5

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: White Spruce, Alder, White Birch
Dominant Aquatic Vegetation: Moss Sedges
Adjacent Land Use: None

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 19.5 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS ( )= Oct 21/09

Water Temperature (°C): 8.0 (3.36)	Dissolved Oxygen (mg/L): (9.27/6 9.91)
Conductivity (umhos/cm): (0.054 mS/cm)	pH: (8.07)

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X) Oct 21/09

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A
Oct 21/09 - 10 MIN K+S of all avail. habitats

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 315 s 400V 60Hz (IG)
No Fish collected

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM Date: Oct 21/09
Project No.: 09-1630 Time: 10:15
Investigators: KP/MM

LOCATION DATA

Watercourse: Pic River Tributary	Station Number: S46	
Local Name:	Location: U/S Pic River	
Township: Marathon Municipal	Coordinates: 48 °47.888' N 86 °17.407' W	
Topographic Map Name/Number: Gonochico Lake 42 D/16		Stream Order: 1

STATION DATA

Flow Vel. (m/s):	Length (m):	Mean Width (m): 1	Mean Depth (m): 0.1

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 90	Moderately Unstable: 10	Stable:

Stream Morphology (% Total Surface Area)

Pool: 90	Riffle: 10	Run:	Flat:

Stream Gradient (% Reach)

High:	Moderate: 10	Low: 90

Stream Channel Type (% Reach)

Straight: 5	Meandering:	Braided:	Ponded: 95

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 15	Open: 85

Instream Cover (% Total Surface Area)

Undercut Banks: 0	Boulder: 0	Logs & Trees: 20	Log Jams: 20	~~Deep~~ Pool: 60	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand: 35
Silt: 15	Clay: 20	Marl:	Muck:	Detritus: 30

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Cedar Spruce
Dominant Aquatic Vegetation: None
Adjacent Land Use: None

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 90 Precipitation: None ( ) Light ( ) Moderate ( ) Heavy (X)
Air Temperature (°C): Recent 4 °C Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 3.60	Dissolved Oxygen (mg/L): 76.7% 10.33
Conductivity (umhos/cm): 0.418 ms/cm 0.048 ms/cm °C	pH: 7.01

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: TOC Grain Size Metals Number of Replicates: 1

Benthic Community Notes: 10 Min DNET

Fish Community
Not Assessed (X) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes:_____

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: MARATHON PGM
Project No.: 09-1630
Investigators: RE, JT

Date: May 29/09
Time: 14:00 - 1425

LOCATION DATA

Watercourse: PIC RIVER TRIBUTARY	Station Number: S49
Local Name: MALPA CREEK	Location: D/S of Road 50m
Township: MARATHON MUNICIPAL	Coordinates: 5402506 'N 0551748 'W E
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.05	Length (m): 50	Mean Width (m): 0.75	Mean Depth (m): 0.10

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 100	Stable: 0

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle: 100	Run: 0	Flat: 80

Stream Gradient (% Reach)

High: 20	Moderate: 80	Low: 0

Stream Channel Type (% Reach)

Straight: 0	Meandering: 90	Braided: 10	Ponded: 0

Stream Canopy (% Stream Shaded)

Dense: 100	Partly Open: 0	Open: 0

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder: 0	Logs & Trees: 20	Log Jams: 10	Deep Pool: 5	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock: 0	Boulder: 0	Cobble: 20	Gravel: 20	Sand: 20
Silt: 20	Clay: 20	Marl: 0	Muck: 0	Detritus: 0 ✓

Terrain Characteristics (%)

Cultivated: 0	Meadow: 0	Lawn: 0	Forested Upland: 100	Forested Lowland: 0
Marsh: 0	Beaver Pond: 0	Bog: 0	Swamp: 0	

Dominant Terrestrial Vegetation: Balsam Fir, Balsam Poplar, White Spruce, Dogwood, Alder, White spruce
Dominant Aquatic Vegetation: Marsh Marigold
Adjacent Land Use: Access road

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 5 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 9.5	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: N/A Number of Replicates: N/A

Benthic Community Notes: N/A

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 16/s 300V 60Hz - NO FISH CAPTURED

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: JT, MM

Date: JUNE 13, 2011
Time: 14:30

LOCATION DATA

Watercourse: CLAW LAKE WATERSHED	Station Number: SS1A	
Local Name: SS1A	Location: Marathon.	
Township: UNORGANIZED	Coordinates: 0549729E 5405752N	
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.20	Length (m): 35	Mean Width (m): 1.0	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 20	Stable: 80

Stream Morphology (% Total Surface Area)

Pool: 25	Riffle: 20	Run: 40	Flat: 15

↳ some is cascades.

Stream Gradient (% Reach)

High: 20	Moderate: 80	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 95	Partly Open: 5	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 5	Logs & Trees: 15	Log Jams: 15	Deep Pool: 5	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble:	Gravel:	Sand:
Silt: 20 (organic)	Clay:	Marl:	Muck: 60	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 25	Forested Lowland: 75
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Alder, Black spruce, birch, poplar, multiple ferns (ostrich), Maple
Dominant Aquatic Vegetation: Moss
Adjacent Land Use: FOREST

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Cascades waterfall

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 22 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: Mucle, Number of Replicates: 1

Benthic Community Notes: 10 Min Kicks of available habitats.
stoneflys, caddis, dragonflys, water striders, beetles.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 107s 500V 60Hz - Lots of wood frogs and American toads throughout station (various sized). No fish above waterfall. Dace in pool below falls.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: MM, KP

Date: 21·06·10
Time: 12:21

LOCATION DATA

Watercourse: Pic River Tributary	Station Number: S52
Local Name: Stream 3	Location: MID - REACH
Township: Marathon Municipal	Coordinates: 16U 55M23'N 5405107 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.25	Length (m): 100	Mean Width (m): 1.5	Mean Depth (m): .08

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 20	Riffle: 60	Run: 5	Flat: 15

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight: 100	Meandering:	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 100	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 50	Log Jams: 15	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble: 60	Gravel: 20	Sand:
Silt:	Clay: 10	Marl:	Muck:	Detritus:

SGUS

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: alder, birch, spruce, cedar, fern, raspberry, aspen
Dominant Aquatic Vegetation: none
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate (X) Heavy (X)
Air Temperature (°C): 15 Recent Precipitation: None ( ) Light ( ) Moderate ( ) Heavy (X)

CHEMICAL PARAMETERS

Water Temperature (°C): 10	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 373sec 60Hz 400V - Karen tested fish on her self NFish

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon Stillwater PGM
Project No.: 11-1837
Investigators: MM + TH

Date: June 8th/11
Time: 16:30

LOCATION DATA

Watercourse: Pic River Tributary	Station Number: S52
Local Name: Stream 3	Location: Near confluence of tribs from U2 and L10/11
Township: Marathon	Coordinates: 48°47.49'N 86°18.02.9'W
Topographic Map Name/Number: Goodchild Lake 42 D/16	Stream Order:

STATION DATA

Flow Vel. (m/s): ~0.2	Length (m): 250m	Mean Width (m): 1.5	Mean Depth (m): 0.1

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 10	Stable: 90

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle: 80	Run: 5	Flat: 5

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 5	Partly Open: 90	Open: 5

Instream Cover (% Total Surface Area)

Undercut Banks: 0	Boulder: 2	Logs & Trees: 30	Log Jams: 2	Deep Pool: 0	Aquatic Macrophyte: 0

Substrate Types (%)

Bedrock:	Boulder: 5	Cobble: 75	Gravel:	Sand:
Silt: 15	Clay:	Marl:	Muck:	Detritus: 5

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Alder
Dominant Aquatic Vegetation: none
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (✓)
Algae Overlaying Substrate: None (✓) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (✓) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (✓) Moderate ( ) Heavy ( )
Air Temperature (°C): 14 Recent Precipitation: None ( ) Light (✓) Moderate (✓) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless (✓) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (✓) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (✓) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: Abundant mayfly

Fish Community
Not Assessed ( ) Electrofisher (✓) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (✓) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 734 seconds, 60 Hz, 400 V No Fish

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1636
Investigators: KP MM

Date: June 21/2010
Time: 12:00

LOCATION DATA

Watercourse: Stream 2	Station Number: 553
Local Name: Pic River Tributary	Location: MID REACH
Township: Marathon Municipal	Coordinates: 16U 550891 N 5404617 W
Topographic Map Name/Number: GOOD CHILD Lake 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.2	Length (m): 60m	Mean Width (m): 1	Mean Depth (m): 20

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 10	Stable: 90

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 25	Run:	Flat: 25

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight: 90	Meandering:	Braided:	Ponded: 10

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 100	Open:

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 5	Logs & Trees: 10	Log Jams: 5	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock: 20	Boulder: 10	Cobble: 20	Gravel:	Sand:
Silt:	Clay: 50	Marl:	Muck:	Detritus:

AM

RC

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce Aldll, Maple, Grass, trillium, fern
Dominant Aquatic Vegetation: only Algal
Adjacent Land Use: forest

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( ) — Clay
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____ some log jams

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 12°C	Dissolved Oxygen (mg/L): →
Conductivity (umhos/cm): —	pH: —

Between
Water Colour: Colourless (X) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 2 Brook trout
404 sec 1 Rainbow trout
Hz 60 400 Vt 5 Slimy Sculpin

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: MM & KP

Date: 17.06.10
Time: 14:30

LOCATION DATA

Watercourse: stream 1	Station Number: S54	
Local Name: Lake 2 outflow stream	Location: D/S. LAKE 2	
Township: Marathon Municipality	Coordinates: 16U° 349921 N 5402668 'W	
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.02	Length (m): 50	Mean Width (m): .3	Mean Depth (m): 0.05

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle: 10	Run:	Flat: 80

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 15	Open: 85

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 10 grass	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder:	Cobble: 5	Gravel: 5	Sand: 20
Silt:	Clay:	Marl:	Muck: 50	Detritus: 20

RC2

Terrain Characteristics (%)

Cultivated:	Meadow: 50	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: grass, willow, alder, aspen, spruce
Dominant Aquatic Vegetation: —
Adjacent Land Use: road

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: ~~FALLS~~ U/S

WEATHER

Cloud Cover (%): 40 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
mist this morning

CHEMICAL PARAMETERS

Water Temperature (°C): 12.48	Dissolved Oxygen (mg/L): 9.01 (84.5)
Conductivity (~~umhos~~ uS/cm): 17	pH: 6.72

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: lots of bugs, large bugs.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 96 sec 60Hz 300V+ No Fish

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: MM & KP

Date: 17-06-10
Time: ~~2~~ 1400

LOCATION DATA

Watercourse: Stream 1	Station Number: S55
Local Name: Lake 1 outflow stream	Location: D/S LAKE 1
Township: Marathon Municipality	Coordinates: 16U 549945 5402652 'N 'W
Topographic Map Name/Number: Goodchild Lake 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): .02	Length (m): 100m	Mean Width (m): 30	Mean Depth (m): 0.05

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 5	Riffle:	Run:	Flat: 95

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Instream Cover (% Total Surface Area)

Undercut Banks: 10	Boulder:	Logs & Trees: 5	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand: 20
Silt:	Clay:	Marl:	Muck: 60	Detritus: 20

RC1

Terrain Characteristics (%)

Cultivated:	Meadow: 60	Lawn:	Forested Upland:	Forested Lowland: 40
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: ~~grass spruce~~ willow, alder, spruce, strawberries, raspberries
Dominant Aquatic Vegetation: — none.
Adjacent Land Use: road, wilderness.

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Falls U/S

WEATHER

Cloud Cover (%): 90 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
misty

CHEMICAL PARAMETERS

Water Temperature (°C): 11.41	Dissolved Oxygen (mg/L): 8.98 (82.2%)
Conductivity (~~umhos~~ uS/cm): 68	pH: 6.82

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: _____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 117 sec 60Hz 300 Volts no Fish many inverts. - wood frogs.

D/S of RC1&RC2 confluence, U/S of S1 station.
Cond = 39 pH = 6.72
Temp = 12.4 DO = 9.27 (86.3%)

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-163G
Investigators: KP MM

Date: JUNE 17/2010
Time: 15:31

LOCATION DATA

Watercourse: Stream 1	Station Number: SS6
Local Name: Stream 1	Location: UPPER REACH DS CONFLUENCE
Township: Marathon Municipality	Coordinates: 16U 549785 5402454 'N . 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

Photos: 605-614

STATION DATA

Flow Vel. (m/s): 0.02	Length (m): 30	Mean Width (m): 5	Mean Depth (m): .40 Max 1.5

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 95	Riffle: 5	Run:	Flat:

Stream Gradient (% Reach)

High:	Moderate: 5	Low: 95

Stream Channel Type (% Reach)

Straight:	Meandering:	Braided:	Ponded: 100

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 10	Open: 90

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 15	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand:
Silt: ~~55~~ 55	Clay: 45	Marl:	Muck:	Detritus:

TA1

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond: 50	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, Ferns, Maple
Dominant Aquatic Vegetation: _____
Adjacent Land Use: _____

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Multiple Beaver Dams

WEATHER

Cloud Cover (%): 50 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 19.38	Dissolved Oxygen (mg/L): 11.06 / 120.4%
Conductivity (umhos/cm): 82	pH: 8.29

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: No Number of Replicates: ____

Benthic Community Notes: _____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Seephotos 599-604
197 sec. 60Hz 300V
Caught 6 - Dace (Finescale and Red belly)
2 - Finescale dace
4 - N Red belly dace.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: KP MM

Date: June 18/10
Time: 17:24

LOCATION DATA

Watercourse: Stream 1	Station Number: S57
Local Name: Stream 1	Location: MID REACH
Township: Marathon Municipality	Coordinates: 16U 550108 'N 5401929 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

Photos: 669 - 677

STATION DATA

Flow Vel. (m/s): 0.08	Length (m): 60	Mean Width (m): 1.5	Mean Depth (m): 0.08

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 25	Riffle: 25	Run: 25	Flat: 25

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight: 75	Meandering: 25	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 25	Open: 75

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 10	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble: 20	Gravel: 10	Sand: 30
Silt:	Clay: 30	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce Mint Alder elderberry Golden Rod Grass Raspberries
Dominant Aquatic Vegetation: None
Adjacent Land Use: Forest

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver Dams.

WEATHER

Cloud Cover (%): 25 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 19.02	Dissolved Oxygen (mg/L): 8.10 87.4
Conductivity (umhos/cm): 161	pH: 7.74

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: •

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 363 seconds Nothing !!

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: KP MM

Date: June 18/10
Time: 15:06

LOCATION DATA

Watercourse: Stream 1	Station Number: 558
Local Name: Stream 1	Location: UPPER REACH
Township: Marathon Municipality	Coordinates: 16U 548826 5402653 'N 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

Photos 642-667

STATION DATA

Flow Vel. (m/s): 0.02	Length (m): 120	Mean Width (m): 2.0	Mean Depth (m): .15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle:	Run:	Flat: 50

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 50	Braided:	Ponded: 50

Stream Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 10	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder:	Cobble: 3	Gravel: 3	Sand: 3
Silt: 30	Clay:	Marl:	Muck: 30	Detritus: 30

Terrain Characteristics (%)

Cultivated:	Meadow: 100	Lawn:	Forested Upland:	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, Grasses, Maple, Aspen Sedge
Dominant Aquatic Vegetation: See photos
Adjacent Land Use: Forest

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dams, falls.

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 21.29	Dissolved Oxygen (mg/L): 6.956/107.7
Conductivity (~~umhos~~ uS/cm): 26	pH: 6.42

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: leaches, Many Many oligochaetes.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: None 249sec 60Hz 300V

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: MM+KP

Date: June 18/10
Time: 13:38

LOCATION DATA

Watercourse: stream 2	Station Number: S59
Local Name: stream from L3 to L5	Location: D/S LAKE 3
Township: Marathon Municipality	Coordinates: 16U 548797 'N 5403757 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

Photos - 624 - 641

STATION DATA

Flow Vel. (m/s): 0.08	Length (m): 100	Mean Width (m): 1	Mean Depth (m): .10

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 50	Run:	Flat:

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 50	Braided:	Ponded: 50

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 25	Open: 75

Karen inve
rock pools
d/s.
- waterfall

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 5	Logs & Trees: 10	Log Jams:	Deep Pool:	Aquatic Macrophyte: 5

Substrate Types (%)

Bedrock:	Boulder: 5	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 50	Detritus: 45

RC3

Terrain Characteristics (%)

Cultivated:	Meadow: 50	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce Birch Ferns Grass Alder Aspen Sumac
Dominant Aquatic Vegetation: coon tail, Sedge? See photos C.24-
Adjacent Land Use: Forest

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Waterfall Beaver Dam

WEATHER

Cloud Cover (%): 25 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 20.42	Dissolved Oxygen (mg/L): 7.91 87.7%
Conductivity (~~umhos~~ uS/cm): 13	pH: 5.95

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: dragonflies, Damselflies, waterboatmen, leeches, striders,

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: NO Fish 60Hz 300V 303 seconds.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 11-1837
Investigators: JT + KP

Date: June 8/11
Time: 12:00

LOCATION DATA

Watercourse: Stream 2	Station Number: S59	
Local Name: Stream from L3 to L5	Location: D/S Lake 3	
Township: Marathon Municipality	Coordinates: 16U 548797 E 5403757 W	
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.1	Length (m): 100	Mean Width (m): 1	Mean Depth (m): 0.10

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 50	Run:	Flat:

Stream Gradient (% Reach)

High: 10	Moderate: 40	Low: 50

Stream Channel Type (% Reach)

Straight:	Meandering: 50	Braided:	Ponded: 50

Stream Canopy (% Stream Shaded)

Dense: 50	Partly Open: 40	Open: 10

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 15	Logs & Trees: 10	Log Jams:	Deep Pool: 5	Aquatic Macrophyte: 5

Substrate Types (%)

Bedrock:	Boulder: 15	Cobble: 15	Gravel: 10	Sand:
Silt:	Clay:	Marl:	Muck: 30	Detritus: 30

Terrain Characteristics (%)

Cultivated:	Meadow: 50	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce, Birch, ferns, grasses, Alder, aspen, sumac.
Dominant Aquatic Vegetation: coontail
Adjacent Land Use: _____

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Waterfall @ bottom Beaver dam @ top.

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light ( ) Moderate ( ) Heavy (X)

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: Cobbles, gravel, muck bottom Number of Replicates: 1

Benthic Community Notes: _____

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz, 600V, 1.5A/sec - No fish. ~4 woodfrogs sampled from water fall up past beaver dam into ponded area. stream reach ~0.5m wide.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: KP MM

Date: June 20/10
Time: 13:45

LOCATION DATA

Watercourse: Stream 5	Station Number: S60
Local Name: L17 Tributary	Location: DIS LAKE 25
Township: Marathon Municipality	Coordinates: 16U 548441 E 5404986 N
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.01	Length (m): 100 M	Mean Width (m): 1	Mean Depth (m): 30

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle:	Run:	Flat: 50

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 10	Log Jams:	Deep Pool:	Aquatic Macrophyte: 30

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble:	Gravel:	Sand:
Silt: 30	Clay:	Marl:	Muck: 30	Detritus: 30

L25DS

Terrain Characteristics (%)

Cultivated:	Meadow: 90	Lawn:	Forested Upland:	Forested Lowland:
Marsh:	Beaver Pond: 10	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce Moss Grass, Sedge, Alder
Dominant Aquatic Vegetation: Buried, lots of Algal - 0
Adjacent Land Use: Wilderness

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver dam U/S + D/S

WEATHER

Cloud Cover (%): 10 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 20	Dissolved Oxygen (mg/L): –
Conductivity (umhos/cm): –	pH: –

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X) JUNE 8/11 JT+KP

Substrate Sampled: muck, silt, aquatic macrophytes Number of Replicates: 1

Benthic Community Notes: 10 min K+S. - sample did not sieve well clogged bag.
Big dragonfly instars, beetles, water striders, small clam

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual (V) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Tadpoles + Bugs
278 SC
JUNE 8/11 - NO FISH OBSERVED

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-1630
Investigators: KP MM

Date: June 20/10
Time: 10:00

LOCATION DATA

Watercourse: Stream 5		Station Number: S 61	
Local Name: Inflow to L17		Location: U/S LAKE 17	
Township: Marathon Municipality		Coordinates: 16U 548087 'N 5404573 'W	
Topographic Map Name/Number: GOOD CHILD LAKE 42 D/16			Stream Order: 1

* 3 inflows to L17

STATION DATA

Flow Vel. (m/s): 0.1	Length (m): 75	Mean Width (m): 2	Mean Depth (m): .15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 60	Riffle: 20	Run: 10	Flat: 10

Stream Gradient (% Reach)

High:	Moderate: 35	Low: 65

Stream Channel Type (% Reach)

Straight: 90	Meandering: 10	Braided:	Ponded:

↳ Ponded (BD) as it ends at L17

Stream Canopy (% Stream Shaded)

Dense: 65	Partly Open: 30	Open: 5

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 25	Logs & Trees: 5	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble: 10	Gravel: 20	Sand: 30
Silt:	Clay:	Marl:	Muck: 30	Detritus:

L17 D/S

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, Raspberry, Mountain maple, alder, fern, (ostrich) bunchberry.
Dominant Aquatic Vegetation: — BLUE FLAG,
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver Dams on lower end

WEATHER

Cloud Cover (%): 20 Precipitation: None (X) Light ( ) Moderate (X) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None ( ) Light ( ) Moderate (X) Heavy ( )

saw no stickleback above the last BD but saw them in all 3 others

CHEMICAL PARAMETERS

Water Temperature (°C): —	Dissolved Oxygen (mg/L): —
Conductivity (umhos/cm): —	pH: —

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X) JUNE 8/11

Substrate Sampled: Riffle Co/BO, Muck, sandy pool Number of Replicates: 1

Benthic Community Notes: 10 MIN Kes of all available habitats
beetles, waterstriders

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: No Fish 222 sec 60Hz 400V.
JUNE 8/11 - NO FISH OBSERVED DURING BENTHIC COLLECTION
DAM below single location may serve as barrier

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM
Project No.: 09-630
Investigators: MM KP

Date: June 20/10
Time: 12:00

LOCATION DATA

Watercourse: Stream 5	Station Number: S62
Local Name: Stream from L27 to L47	Location: DIS LAKE 27
Township: Marathon Municipality	Coordinates: 16U 547656 5484730 'N 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.1	Length (m): 54	Mean Width (m): 2.5	Mean Depth (m): .15

+ 1 big pool (BP)

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 65	Riffle: 10	Run: 5	Flat: 20

Stream Gradient (% Reach)

High:	Moderate: 10	Low: 90

Stream Channel Type (% Reach)

Straight: 1	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 20	Open: 80

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 30	Logs & Trees: 10	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 20	Cobble: 20	Gravel: 20	Sand:
Silt: 10	Clay:	Marl:	Muck: 10	Detritus:

L27 DS

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: alder, sedges, red maple, birch, spruce, fern
Dominant Aquatic Vegetation: mana grass, reeds, grass, ~~reeds~~
Adjacent Land Use: Wilderness, ~~reeds~~

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: 3 Beaver dams.
JUNE 8/11 - Below Stn Multiple High gradient reaches of impassable cascades and waterfalls (JT+KP)

WEATHER

Cloud Cover (%): 5 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 21 Recent Precipitation: None ( ) Light ( ) Moderate (X) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 20	Dissolved Oxygen (mg/L): –
Conductivity (umhos/cm): –	pH: –

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X) JUNE 8/11

Substrate Sampled: cobble, boulder, gravel, muck Number of Replicates: 1

Benthic Community Notes: 10 MIN KICKS of all avail. habitats, riffles, beaver pond with muck, chutes w cobble and organic matter (i.e. leaf litter)

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Tadpoles 60 Hz 400 V 198 sec
wood frog NO Fish

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: PGM (Marathon)
Project No.: 09-1630
Investigators: MM+KP

Date: 19.06.10
Time: 15:02

LOCATION DATA

Watercourse: Stream 6		Station Number: S63	
Local Name: Outflow Stream of L26		Location: O/S LAKE 26	
Township: Marathon Municipality		Coordinates: 16U 547511 5402981	'N 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 1	

STATION DATA

Flow Vel. (m/s): 0	Length (m): 50	Mean Width (m): 5	Mean Depth (m): 1

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 100	Riffle:	Run:	Flat:

Stream Gradient (% Reach)

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering:	Braided:	Ponded: 100

Stream Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 20	Log Jams:	Deep Pool: 60	Aquatic Macrophyte: 10

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand: 100
Silt:	Clay:	Marl:	Muck: ?	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow: 20	Lawn:	Forested Upland:	Forested Lowland: 60
Marsh: 6020	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: alder, spruce, grass
Dominant Aquatic Vegetation: water horsetail, sedge,
Adjacent Land Use: Wilderness

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: giant beaver dams.

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light ( ) Moderate ( ) Heavy (X)

CHEMICAL PARAMETERS

2:48 (34.2)

Water Temperature (°C): 21.68	Dissolved Oxygen (mg/L): 1.82 (20.3
Conductivity (umhos/cm): 54	pH: 6.55

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: leeches.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 556 sec 60Hz 400V
Brook stickleback (5)

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: MM & KP

Date: 19.06.10
Time: 13:00

LOCATION DATA

Watercourse: Stream 6	Station Number: S64	
Local Name: Tributary of Angler Ck.	Location: U/S CONFLUENCE S15	
Township: Marathon Municipality	Coordinates: 16U 548636 5402520	'N 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.02	Length (m): 30	Mean Width (m): .75	Mean Depth (m): 0.08

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 15	Run:	Flat: 35

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 100	Partly Open:	Open:

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder:	Logs & Trees: 15	Log Jams:	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock: ✓	Boulder:	Cobble:	Gravel: 40	Sand: 60
Silt:	Clay:	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: alder, raspberries, spruce, horsetail fern
Dominant Aquatic Vegetation: none
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: falls - upstream/ beaver dam - d/s

WEATHER

Cloud Cover (%): 60 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None ( ) Light ( ) Moderate ( ) Heavy (X)

CHEMICAL PARAMETERS

Water Temperature (°C): 12.80	Dissolved Oxygen (mg/L): 8.02 (75.8%)
Conductivity (umhos/cm): 31	pH: 7.51

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 140 sec 60 Hz 300 Volts
No Fish → Water too low, barely enough to shock.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon Shillwater PGM Date: June 8th 11
Project No.: 11-1837 Time: ~~PM~~ 17:45
Investigators: Mich + Tahnee

LOCATION DATA

Watercourse: Stream 2	Station Number: S66
Local Name: S66	Location: 650m U/S of S4
Township: MARATHON MUNICIPALITY	Coordinates: 16U E 055°1329 N 5404°724 NW
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.4	Length (m): 150m	Mean Width (m): 2	Mean Depth (m): 0.2

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 10	Stable: ~~80~~ 90

Stream Morphology (% Total Surface Area)

Pool: ~~20~~ 30	Riffle: ~~40~~ 55	Run: 5	Flat: 10

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 10	Partly Open: 80	Open: 10

Instream Cover (% Total Surface Area)

Undercut Banks: 2	Boulder: 3	Logs & Trees: 20	Log Jams: 10	Deep Pool: 5	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder:	Cobble: ~~70~~ 80	Gravel:	Sand:
Silt: 15	Clay:	Marl:	Muck:	Detritus: 5

S66

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Alder
Dominant Aquatic Vegetation: none
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (✓) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (✓) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (✓) Artificial ( ) Type: Beaver Dam

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (✓) Moderate ( ) Heavy ( )
Air Temperature (°C): 10 Recent Precipitation: None ( ) Light ( ) Moderate (✓) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless (✓) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (✓) Stained ( ) Turbid ( )
turbid when disturbed

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (✓) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: abundant mayfly leeches

Fish Community
Not Assessed ( ) Electrofisher (✓) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (✓) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 10 brook trout 10 slimy sculpin
60Hz 400V 540s

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MMF TM

Date: June 8, 11
Time: 13:30pm

LOCATION DATA

Watercourse: Trib of Pic River	Station Number: S67
Local Name: S67	Location: U/S ~~450~~ 350m of S45
Township: Unorganized	Coordinates: 551204E ~~N~~ 5406776 ~~N~~
Topographic Map Name/Number: GOODCHILD LAKE 42D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): nil	Length (m): 100	Mean Width (m): 0.1	Mean Depth (m): 0.01

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area) – Too little water to be sure

Pool: 50	Riffle: 50	Run:	Flat:

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 100	Partly Open:	Open:

Instream Cover (% Total Surface Area) – goes under ground at times

Undercut Banks:	Boulder:	Logs & Trees: 30	Log Jams: 5	Deep Pool:	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder:	Cobble: 15	Gravel:	Sand:
Silt: 20	Clay: 30	Marl:	Muck:	Detritus: 55

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: alder
Dominant Aquatic Vegetation: ——
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____
(no water = natural barrier?)

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 14 Recent Precipitation: None ( ) Light ( ) Moderate (X) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: stream too small to fish
No Fish observed, stream too silted,

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.:
Investigators: MM & JT

Date: June 13, 2011
Time: 10:20 am

LOCATION DATA

Watercourse: Stream W532 at bottom	Station Number: S68
Local Name: S68	Location: u/s of S532 at road crossing
Township: UNORGANIZED	Coordinates: 0549403 E 5408202 N W NAD27
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.2	Length (m): 120	Mean Width (m): 0.6	Mean Depth (m): 0.1

channel

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 30	Riffle: 40	Run: 20	Flat: 10

Stream Gradient (% Reach)

High: 25	Moderate: ~~75~~ 5	Low: 0

Stream Channel Type (% Reach)

Straight:	Meandering: ~~70~~	Braided: 30	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open:

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 15	Logs & Trees: 16	Log Jams:	Deep Pool: 5	Aquatic Macrophyte: -

Substrate Types (%)

Bedrock: ~~45~~ 5	Boulder: 15	Cobble: 10	Gravel: ~~40~~	Sand:
Silt: ~~50~~	Clay:	Marl:	Muck: 10	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: alder, birch, white ~~spruce~~ pine, maple, sumac
Dominant Aquatic Vegetation: moss,
Adjacent Land Use: none, future road crossing

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____
- bedrock sheet x2

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )
→ No fish

Fish Community Notes: in stream 250s 60Hz, 400V lots of inverts
5 wood frogs, in pond 32s 60Hz, 400V lots of invert
- leeches, striders, amphipod, beetles, caddis, mites, beetle larva
- stonefly
- amphipod
- mayfly
tadpoles

X very recent evidence of bear activity - scat, bent grass - can hear lots of birds - broken trees
did not go further downstream since bear trail headed that way. 0% only fished 100M

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stantec Canada Inc. Date: JUNE 14, 2011
Project No.: 11-1837 Time: 14:34
Investigators: JT, MM

LOCATION DATA

Watercourse: Stream 2 Watershed	Station Number: 569	
Local Name: 569	Location: U/s of Beaver Pond and Clearbank Side	Ht 53+553
Township: Marathon Municipality	Coordinates: 0550534E N5403983N	
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2	

STATION DATA

Flow Vel. (m/s): 0.25	Length (m): 40	Mean Width (m): 0.5	Mean Depth (m): 0.15

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 60	Moderately Unstable: 20	Stable: 20

Stream Morphology (% Total Surface Area)

Pool: 60	Riffle: 20	Run: 10	Flat: 5

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 70	Braided: 30	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 40	Partly Open: 60	Open:

Instream Cover (% Total Surface Area)

Undercut Banks: ✓	Boulder: 20	Logs & Trees: 10	Log Jams: 10	Deep Pool: 20	Aquatic Macrophyte:

Substrate Types (%)

Bedrock: 20	Boulder: 15	Cobble: 15	Gravel: 5	Sand: 5
Silt: 10	Clay: 30	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 20	Forested Lowland: 60
Marsh:	Beaver Pond: 20	Bog:	Swamp:	

Dominant Terrestrial Vegetation: ferns, birch, alder, spruce, cedar, maple
Dominant Aquatic Vegetation: moss, algae
Adjacent Land Use: FOREST

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( ) Some in bottom of pool
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver dam/pond x2 below station
2 landslides above

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) SLIGHT Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: Cobbles, silt/clay, pool, gravel, riffle Number of Replicates: 1

Benthic Community Notes: caddis, stonefly

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Brook fry (17+?) just above station, adult Brook trout - Lots of wood frogs

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM+TM

Date: June 9, 2011
Time: 9:30

LOCATION DATA

Watercourse: Stream 4	Station Number: S70
Local Name: S70	Location: D/S of L22
Township: UNORGANIZED	Coordinates: 16U 0549608N 5405872 W
Topographic Map Name/Number: GOODCHILD Lake 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.15	Length (m): 200	Mean Width (m): 0.4 (Stream)	Mean Depth (m): 0.15

Pools/pond: 10m : 0.3

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 55	Riffle: 30	Run: 10	Flat: 5

Stream Gradient (% Reach)

High: 30	Moderate: 50	Low: 20

Stream Channel Type (% Reach)

Straight:	Meandering: 80	Braided:	Ponded: 20

Stream Canopy (% Stream Shaded)

Dense: 60	Partly Open: 30	Open: 10

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 5	Logs & Trees: 5	Log Jams: 10	Deep Pool: 1	Aquatic Macrophyte:

Substrate Types (%)

Bedrock: 20	Boulder: 20	Cobble: 20	Gravel: 10	Sand:
Silt:	Clay:	Marl:	Muck: 20	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow: 20	Lawn:	Forested Upland: 80	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce
Dominant Aquatic Vegetation: none, moss
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: _____
gradient barriers.

WEATHER

Cloud Cover (%): 80 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: saw caddis, mayfly, amphipods, leeches
1 dg

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 500V 259 seconds No fish
- 1 leopard frog, 6 tad poles, 3 wood frogs, 2 leeches.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM + TM

Date: June 9, 2011
Time: 10:30

LOCATION DATA

Watercourse: Stream 4	Station Number: S 71
Local Name: S 71	Location: stream between L21 & L22
Township: UNORGANIZED	Coordinates: 16U 549312 N5405448 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 2

STATION DATA

Flow Vel. (m/s): 0.15	Length (m): 550	Mean Width (m): .75	Mean Depth (m): .10

check ponds width > 20-60m Depth: unwadeable

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 40	Riffle:	Run:	Flat:

↳ due to ponds

Stream Gradient (% Reach)

High: 20	Moderate: 55	Low: 25

Stream Channel Type (% Reach)

Straight:	Meandering: 45	Braided: 15	Ponded: 40

Stream Canopy (% Stream Shaded)

Dense: 60	Partly Open: 30	Open: 10

Instream Cover (% Total Surface Area)

Undercut Banks: 1	Boulder: 10	Logs & Trees: 10	Log Jams: 10	Deep Pool: 15	Aquatic Macrophyte: 5

Substrate Types (%)

Bedrock: 10	Boulder: 20	Cobble: 10	Gravel: 5	Sand: 5
Silt:	Clay:	Marl:	Muck: 30	Detritus: 20

due to ponds, pools

Terrain Characteristics (%)

Cultivated:	Meadow: 10	Lawn:	Forested Upland:	Forested Lowland: 70
Marsh:	Beaver Pond: 20	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce
Dominant Aquatic Vegetation: moss
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dams gradient barrier

WEATHER

Cloud Cover (%): 50 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: amphipods, mayfly, leeches, dragonfly nymphs

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: frogs, tadpoles – 8 wood frogs, 20 tads. many leeches!
60Hz 500V 410 seconds No Fish

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM+TM

Date: June 9, 2011
Time: 12:30

LOCATION DATA

Watercourse: Stream 4	Station Number: S72
Local Name: S72	Location: East satelite pond of L21
Township: UNORGANIZED	Coordinates: 11U 549079 N 5405494 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): .1	Length (m): 100	Mean Width (m): .35	Mean Depth (m): .05

pond : 0.7 .5

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 30	Riffle: 65	Run: 5	Flat:

Stream Gradient (% Reach)

High:	Moderate: 80	Low: 20

Stream Channel Type (% Reach)

Straight:	Meandering: 70	Braided: 10	Ponded: 20

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 10	Log Jams: 10	Deep Pool: 5	Aquatic Macrophyte: 5

Substrate Types (%)

Bedrock:	Boulder:	Cobble: 30	Gravel: 10	Sand: 10
Silt:	Clay:	Marl:	Muck: 30	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow: 10	Lawn:	Forested Upland: 70	Forested Lowland:
Marsh:	Beaver Pond:	Bog: 20	Swamp:	

Dominant Terrestrial Vegetation: Spruce
Dominant Aquatic Vegetation: sedge
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dam

WEATHER

Cloud Cover (%): 40 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: amphipods, leeches, mayflies.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 500V 1/16 sec No Fish
4 wood frogs 7 tadpoles

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM + TM

Date: June 9, 2011
Time: 15:45

LOCATION DATA

Watercourse: Stream 4	Station Number: S73
Local Name: S73	Location: South Satelite / Trib of L21
Township: Marathon Municipal	Coordinates: 16U 549264 N 5405256 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s):	Length (m): 80 of stream + shore	Mean Width (m):	Mean Depth (m):

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 90	Riffle: 10	Run:	Flat:

↳ upstream dry creek bed.

Stream Gradient (% Reach)

High:	Moderate: 30	Low: 70

Stream Channel Type (% Reach)

Straight:	Meandering: 10	Braided:	Ponded: 90

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 5	Log Jams:	Deep Pool: 10	Aquatic Macrophyte:

Substrate Types (%)

Bedrock: 5	Boulder: 5	Cobble: 5	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 65	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 90	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp: 10	

Dominant Terrestrial Vegetation: Spruce
Dominant Aquatic Vegetation: sedges
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver Dam

WEATHER

Cloud Cover (%): 40 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: dragon fly nymph, leeches, mayflies

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 500V 140sec No fish
-1 leech, 1 wood frog

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: HM + TM

Date: June 9, 2011
Time: 12:50

LOCATION DATA

Watercourse: Stream 2	Station Number: S74
Local Name: S74	Location: North tributary L20
Township: Marathon Municipal	Coordinates: 16U 549098 N 5404907 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): .02	Length (m): 60	Mean Width (m): .10	Mean Depth (m): .05

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 10	Riffle: 30	Run:	Flat:

60 - Dry

Stream Gradient (% Reach)

High: 50	Moderate: 50	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 30	Open: 70

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees:	Log Jams:	Deep Pool:	Aquatic Macrophyte: 50

- grasses

Substrate Types (%)

Bedrock:	Boulder:	Cobble: 10	Gravel: 5	Sand:
Silt:	Clay:	Marl:	Muck: 65	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow: 80	Lawn:	Forested Upland: 20	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: grass
Dominant Aquatic Vegetation: sedge
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: wood jam

WEATHER

Cloud Cover (%): 40 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60 Hz 400V 40sec No Fish Not much fishible stream, low wate. 1 wood frog

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM + TM

Date: June 9, 2011
Time: 12:60

LOCATION DATA

Watercourse: Stream 2	Station Number: S75
Local Name: S74	Location: South trib of L20
Township: Marathon Municipal	Coordinates: 16V 549082 N 5404854 W
Topographic Map Name/Number: Goodchild Lake 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): .05	Length (m): 100	Mean Width (m): .2	Mean Depth (m): .08

HABITAT CHARACTERISTICS

Some deeper pools ~ 0.7

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 30	Riffle: 50	Run: 10	Flat: 10

Stream Gradient (% Reach)

High: 10	Moderate: 50	Low: 40

Stream Channel Type (% Reach)

Straight:	Meandering: 50	Braided: 50	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 50	Partly Open: 20	Open: 30

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder:	Logs & Trees: 5	Log Jams: 5	Deep Pool: 5	Aquatic Macrophyte: 10

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble: 10	Gravel: 10	Sand:
Silt:	Clay:	Marl:	Muck: 50	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow: 10	Lawn:	Forested Upland: 50	Forested Lowland:
Marsh:	Beaver Pond:	Bog: 40	Swamp:	

Dominant Terrestrial Vegetation: Spruce, grass
Dominant Aquatic Vegetation: sedge
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: wood jams underground flow low flow

WEATHER

Cloud Cover (%): 45 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 400 Vs 10x3

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM + TM

Date: June 9, 2011
Time: 13:00

LOCATION DATA

Watercourse: Stream 2	Station Number: S76
Local Name: S76	Location: D/S of L20
Township: MARATHON MUNICIPAL	Coordinates: 549502E 5404744N
Topographic Map Name/Number: GOODCHILD LAKE 40 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): .03	Length (m): 200	Mean Width (m): 0,2	Mean Depth (m): 0,1

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 20	Riffle: 70	Run: 5	Flat: 5

Stream Gradient (% Reach)

High: 15	Moderate: 85	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 90	Braided: 10	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 20	Logs & Trees: 5	Log Jams: 5	Deep Pool: 5	Aquatic Macrophyte: 10

Substrate Types (%)

Bedrock: 5	Boulder: 30	Cobble: 20	Gravel: 15	Sand:
Silt:	Clay:	Marl:	Muck: 20	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 90	Forested Lowland:
Marsh: 10	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: rush vegetation ferns Ostrich
Dominant Aquatic Vegetation: sedges
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: gradient

WEATHER

Cloud Cover (%): 40 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light (X) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: amphipods, stoneflies, mayflies,

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 400V 481sec, No Fish
- wood snags 3
- gradient natural barriers

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM + JT

Date: June 18, 2011
Time: 9:40

LOCATION DATA

Watercourse: Stream 2	Station Number: S77
Local Name: S77	Location: Lower end of stream between L20 & L8
Township: MARATHON MUNICIPAL	Coordinates: 549628E NW 5404764 NW
Topographic Map Name/Number: POOPCH LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.10	Length (m): 50	Mean Width (m): 0.30	Mean Depth (m): 0.05

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 40	Riffle: 40	Run: 10	Flat: 10

Stream Gradient (% Reach)

High: 20	Moderate: 80	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 90	Braided: 10	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 80	Partly Open: 20	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 20	Logs & Trees: 5	Log Jams: 5	Deep Pool: 5	Aquatic Macrophyte: 10

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble: 30	Gravel: 40	Sand: 5
Silt:	Clay:	Marl:	Muck: 5	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Ostrich fern, maple, birch, spruce
Dominant Aquatic Vegetation: sedge, marsh marigold, moss
Adjacent Land Use: none

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: woody debris dam gradient barrier u/s

WEATHER

Cloud Cover (%): 20 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: at Lake stickleback were observed but none were captured above the woody debris (old beaver dam) where the stream meets LB. E-fish 11gs 600V 60Hz over 50m above old dam to definitive fish barrier - no fish captured.

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Stillwater
Project No.: 11-1837
Investigators: MM+JT

Date: June 18, 2011
Time: 11:30

LOCATION DATA

Watercourse: Stream 2	Station Number: S78
Local Name: S78	Location: Middle trib of L15
Township: MARATHON MUNICIPAL	Coordinates: 549707E 5404560 ~~W~~N
Topographic Map Name/Number: GOOPCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.01	Length (m): 30	Mean Width (m): 0.2	Mean Depth (m): 0.05

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 20	Riffle: 60	Run: 15	Flat: 5

Stream Gradient (% Reach)

High:	Moderate: 90	Low: 10

Stream Channel Type (% Reach)

Straight:	Meandering:	Braided: 100	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

↳ Toolittle flows or none at the treeline

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder:	Logs & Trees:	Log Jams: 15	Deep Pool:	Aquatic Macrophyte: 5

↳ small woody debris jam.

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble: 20	Gravel: 20	Sand: 30
Silt: 5	Clay:	Marl:	Muck:	Detritus: 15

↳ sort of a combination of both channels.

Terrain Characteristics (%)

Cultivated:	Meadow: 100	Lawn:	Forested Upland:	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: grass
Dominant Aquatic Vegetation: sedge
Adjacent Land Use: none

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Low Water

North arm has ~30m cascade into trib from L14.

WEATHER

Cloud Cover (%): 20 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 22 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

C sticklebacks observed in L15 but not in channel

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (µS/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: No fish observed in tributaries. only in L15 itself. L15 water level much reduced compared to 2009 with maximum depth now ~0.75m compared to 1.5m previously

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Still Water
Project No.: 11-1837
Investigators: MM + JT

Date: June 18, 2011
Time: 13:00

LOCATION DATA

Watercourse: Stream 1	Station Number: S79
Local Name: S79	Location: Between S1 & S58 - Fish Barrier
Township: MARATHON MUNICIPAL	Coordinates: 549368E 5482407N
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.1	Length (m): 250	Mean Width (m): 0.7	Mean Depth (m): 0.25

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle: 30	Run: 10	Flat: 10

Stream Gradient (% Reach)

High:	Moderate: 90	Low: 10

Stream Channel Type (% Reach)

Straight:	Meandering: 80	Braided: 20	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 70	Partly Open: 20	Open: 10

Instream Cover (% Total Surface Area)

Undercut Banks: 5	Boulder: 5	Logs & Trees: 15	Log Jams: 10	Deep Pool: 10	Aquatic Macrophyte: 10

Substrate Types (%)

Bedrock:	Boulder: ✓	Cobble: 10	Gravel: 20	Sand: 25
Silt: 15	Clay: 10	Marl:	Muck: 10	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow: 10	Lawn:	Forested Upland: 90	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: speckled alder, grass, spruce
Dominant Aquatic Vegetation: sedge, algae, moss.
Adjacent Land Use: N/A

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( ) → were there is disturbance.
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial (X) Type: _____
└ Beaver Dams └ skidder trails (the one farthest up stream)
└ Woody debris jams. Old

WEATHER

Cloud Cover (%): 5 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 24 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C):	Dissolved Oxygen (mg/L):
Conductivity (umhos/cm):	pH:

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: _____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: dace & stickleback observed downstream of
in downstream 120m. In upper 130 m used 2 1/4 of effect (600V 60Hz)
No fish collected

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE ST

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 1 u/s Station No.: S1 Location: D/S of Road Crossing
Coordinates: 5402365 N 0549743 W/E Datum: NAD 27
Date: May 30/09 Time: 11:05-11:55 Water Temperature: 10.5 (°C)
Electrofishing Effort: 587 (seconds) Length of Stream Sampled: 75 (m) Mean Width: 1.25 (m)

Species	YOY	Juvenile	Adult
FINESCALE DACE			1 (1)
NORTHERN REDBELLY DACE			1 (1)
TOTALS			

Comments:
587S 600V 60Hz.
Reach was between old beaver pond U/S of road crossing and new pond D/S
both fish caught @ mouth of stream @ DS pond.

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 1 d/s Station No.: S2 Location: d/s OF ACCESS ROAD
Coordinates: 5401895 N 0551488 WAE Datum: NAD 27
Date: May 27/09 Time: 1755 - 1840 Water Temperature: 13 (°C)
Electrofishing Effort: 1363 (seconds) Length of Stream Sampled: 150 (m) Mean Width: 3.0 (m)

Species	YOY	Juvenile	Adult
RAINBOW TROUT		1+ - IIII (7) (8) 2+ - I (1)	
CHINOOK SALMON		III (3)	
SLIMY SCULPIN			II (2)
BROOK TROUT		I (1)	
FINESCALE DACE		IIII I (6)	
TOTALS			

Comments:
400V 60Hz (F6) NOTE: BROOK TROUT + SCULPINS ONLY CAPTURED D/S OF PERCHED CULVERT IN PLUNGE POOL.
WIDTH 4, POOR CONDITION FISH

Client: MALAHAT PGM
Project No. 09-1630
Investigators: RE ST

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 2 u/s Station No.: S3 Location: d/s of Steelbridge @ Access Road
Coordinates: 540159 N 0550031 E Datum: NAD 27
Date: May 20 '09 Time: 10:00 - 10:50 Water Temperature: 11 (°C)
Electrofishing Effort: 452 (seconds) Length of Stream Sampled: 125 (m) Mean Width: 25 (m)

Species	YOY	Juvenile	Adult
BROOK STICKLEBACK			(14) 𝍸 𝍸 ||||
TOTALS			

Comments:
500 V 60 Hz

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE ST

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 2 d/s Station No.: S4 Location: 20m U/S of MOUTH @ PIC RIVER
Coordinates: 5404796 N 0551822 WE Datum: NAD 27
Date: May 29/09 Time: 9:45/100 Water Temperature: 9.5 (°C)
Electrofishing Effort: 1557 (seconds) Length of Stream Sampled: 110 (m) Mean Width: 2.5 (m)

Species	YOY	Juvenile	Adult
RAINBOW TROUT		2-3+ -11 SMOLT	
CHINOOK SALMON		II	
SLIMY SCULPIN		IIII IIII IIII II (22)	IIII
Lake Chub		II	
BROOK STICKLEBACK			I
LONGNOSE DACE			II
WHITE SUCKER		II 1+ 4 2 or 3+	
FINESCALE DACE			I
TOTALS			

Comments:
400V 60Hz (IG)
1 of the adult sculpin had 4 fin rays but last was 1/2 length of other 3 & only occurred on 1 of 2 pelvic fins

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE/RR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: PIC RIVER TRIBUTARY Station No.: S4 Location: U/S PIC RIVER 80 m.
Coordinates: 48 47.754 N 86 17.617 W Datum: NAD 27
Date: 26/08/09 Time: 18:15 Water Temperature: 12 (°C)
Electrofishing Effort: 1093 (seconds) Length of Stream Sampled: 50 (m) Mean Width: 1.05 (m)

Species	YOY	Juvenile	Adult
RAINBOW TROUT	𝍸 𝍸 𝍸 I		
Brook Trout			II
Slimy Sculpin.	𝍸	𝍸	𝍸 II
Longnose Dace.			𝍸
White sucker.		I	
Lake chub.		III	III
Brook stickleback.			I
Trout Perch.	I	I	I
TOTALS	22	10	19

Comments:
500 VOLTS 60 Hz MODERATE TURBID YELLOW BROWN SIMILAR FLOWS TO MAY SOURCES
Crayfish (1)

Client: MARATHON PGM
Project No. 09-1630
Investigators: RJST

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 3d/s Station No.: S6 Location: U/S of Mouth @ Pic River
Coordinates: 16U 0552056 E 5464962 N Datum: NAD 27
Date: May 28/2009 Time: 1530-1620 Water Temperature: 15.5 (°C)
Electrofishing Effort: 1369 (seconds) Length of Stream Sampled: 180 (m) Mean Width: 3 (m)

Species	YOY	Juvenile	Adult
SLIMY SCULPIN		II (2)	III (3)
TOTALS			

Comments:
400 V 60 Hz (I 6)
1 Adult was 12.4 cm ♂

Client: MARATHON PGM
Project No. 09-1630
Investigators: BE/RR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: PIC RIVER TRIBUTARY Station No.: S6 Location: U/S PIC RIVER ~20M.
Coordinates: 48° 47.838 N 86 17.557 W Datum: NAD 27
Date: 26/08/09 Time: 12:00 Water Temperature: 12.5 (°C)
Electrofishing Effort: 1059 (seconds) Length of Stream Sampled: 120 (m) Mean Width: 1.30 (m)

Species	YOY	Juvenile	Adult
LONGNOSE DACE			1
SLIMY SCULPIN	𝍸 𝍸 𝍸

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE, ST

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 4 d/s Station No.: S8 Location: 70m D/s of Beaver Dam
Coordinates: 5407411 N 05502 38 E Datum: NAD 27
Date: May 29/09 Time: 15:30 16:30 Water Temperature: 19 (°C)
Electrofishing Effort: 981 (seconds) Length of Stream Sampled: 70 (m) Mean Width: 1.5 (m)

Species	YOY	Juvenile	Adult
FINESCALE DACE			17
N. Red BELLY DACE			18
BROOK STICKLEBACK		1 (1)	8
FATHEAD MINNOW			1 (1)
LAKE CHUB		1 (1)	
BLACKNOSE SHINER			1 (1)
TOTALS			

Comments:
600V 60Hz (T6) HYBRIDS Between FINESCALE & NORTHERN REDBELLY LIKELY

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE, JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARE CREEK Station No.: S11 Location: D/S of HWY 17
Coordinates: 5402545 N 0543580 E Datum: NAD 27
Date: May 30/09 Time: 16:45:17:45 Water Temperature: 11 (°C)
Electrofishing Effort: 1551 (seconds) Length of Stream Sampled: 75 (m) Mean Width: 9M (m)

Species	YOY	Juvenile	Adult
BROOK TROUT		7	2
CHINOOK SALMON		2 SMOLT	
RAINBOW TROUT	2	1+ - 1 2+ - 8	
SLIMY SCULPIN		1	1
BROOK STICKLEBACK			2
TOTALS			

Comments:
500 V 60Hz SCULPINS WITH 3 PELVIC RAYS PLUS 1 SHORT ONE

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE, ST

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: ANGLER CREEK Station No.: S14 Location: D/S of HWY 17
Coordinates: 5401906 N 0545517 W E Datum: NAD 27
Date: May 31/09 Time: 1500 - 1600 Water Temperature: 13 (°C)
Electrofishing Effort: 1143 (seconds) Length of Stream Sampled: 120 (m) Mean Width: 3 (m)

Species	YOY	Juvenile	Adult
BROOKSTICKLE BACK		1	𝍸 𝍸 𝍸 𝍸 𝍸 II (27)
TOTALS			

Comments:
600 V 60HZ AIR 10.5 BEAVER POND U/S OF HWY. GOOD COLD WATER HABITAT
CULVERT. PERCHED

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Anglu Creek S15 Station No.: S15 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 9/11 2009 Water Temperature: 15.5 (°C)

Gear	Set Time Aug 9	Lift Time Aug 11	Depth	Effort/Area (h)	Substrate	Comments
Nordic 1	17:48	13:01		44		Wash
MT 22	17:13	12:59		44		Wash
MT 23	17:25	13:02		44		
MT 24	17:29	13:05		44		
MT 25	17:30	13:08		44		
MT 26	17:32	13:10		44		

Lifted by Michelle + Client

Gear	Species	YOY	Juvenile	Adult
MT23	Brook Stickleback	—	—	1

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, BF

___ of ___

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Anaker Creek SC 6 Station No.: S15 d/s Location: Marathon
Datum: NAD 27 Pictures taken: _____
Date: Aug 9/11 2009 Water Temperature: 16.4 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
NN	18:08	11:50	1m-1.5m-1m	42	mucky & sticks	near lodge (old above dam)
MT 1	18:00	13:20	.8m	42	mud, root wads	moose trail inflow, bog
MT2	18:04	12:01	.4m	43	mud & sticks	by old lodge
MT3	18:15	12:40	.7m	42	soft, grass roots	in sedge & grass
MT4	18:23	12:45	.6m	42	mud & wood	in SWD
MT5	18:28	12:50	.8m	42	mud, wood & roots.	* Black mummy trap ↓ in sedge & SWD

Gear	Species	YOY	Juvenile	Adult
NN	brook stickleback	—	—	1
MT3	"	—	—	1
MT4	"	—	—	1
MT5	"	—	—	4

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE JT, BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: SHACK CREEK Station No.: S23 Location: Mouth u/s of Lake Superior
Coordinates: 5397870 N 0545232 WE Datum: NAD 27
Date: May 27 09 Time: 1500 - 1555 Water Temperature: 14 (°C)
Electrofishing Effort: 967 (seconds) Length of Stream Sampled: 150 (m) Mean Width: 4.75 (m)

Species	YOY	Juvenile	Adult
RAINBOW TROUT	II (2)	1+ - 𝍸 𝍸 III (20) 2+ - 𝍸 3+ - I	
BROOK TROUT	I (1)	2+ - 𝍸 I (6)	𝍸 I (6)
CHINOOK SALMON		I (1)	
WHITE SUCKER		I (1)	
MOTTLED SCULPIN			
LONG-NOSE DACE		I (1)	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 III (38)
LONGNOSE SUCKER			100 +
SLIMY SCULPIN		III (3)	III (3)
TOTALS			

Comments:
300 V 60 Hz (I6) YOY RAINBOWS WERE OBSERVED READILY BUT NOT CAPTURED
LONGNOSE SUCKERS SPAWNING AT TIME OF SURVEY LARGE SCHOOLS
SCULPIN WITH 4 PELVIC FIN RAYS BUT THE 4TH IS REALLY SHORT

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE, JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 1 Catchment Station No.: S27 Location: D/S of SKIDDER TRAIL
Coordinates: 640350 N 0550417 m E Datum: NAD 27
Date: May 30/09 Time: 13:00 14:00 Water Temperature: 10.5 (°C)
Electrofishing Effort: 1267 (seconds) Length of Stream Sampled: 150 (m) Mean Width: 2.5 (m)

Species	YOY	Juvenile	Adult
BROOK TROUT		THL ⑥	THL ⑤
FINESCALE DACE			III ③
TOTALS			

Comments:
400V 60Hz. Small trout - adults ~ 10cm

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE, JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARE CREEK Station No.: 530 Location: 500m U/S of mouth
Coordinates: 16U 5402525 N 0542101 WE Datum: NAD 83
Date: May 27/09 Time: 0950 - 1050 Water Temperature: 9 (°C)
Electrofishing Effort: 1814 (seconds) Length of Stream Sampled: 200 (m) Mean Width: 10.5 (m)

Species	YOY	Juvenile	Adult
RAINBOW TROUT	𝍸 III (8)	III (1+) (3)	
CHINOOK SALMON		I (1+) (1)	
BROOK TROUT		II (2+) (2)	
LONGNOSE DACE		𝍸 𝍸 𝍸 𝍸 𝍸 /// (34)	𝍸 𝍸 IIII (14)
RAINBOW SMELT			I - MALE
LONGNOSE SUCKER			I - (A)
MOTTLED SCULPIN		𝍸 𝍸 I (11)	𝍸 𝍸 𝍸 𝍸 𝍸 I (26)
9-Spine Stickleback			I (1)
TOTALS			

Comments:
PHOTOS WIDTH 5 of 13, EFISHER - I6 500V.
(A) Female - lamprey scar, leech.

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE, JT, BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: ANGLER CREEK Station No.: S31 Location: 300m U/S from lake
Coordinates: 5400221 N 0542987 E Datum: NAD 27
Date: May 27/09 Time: 12:45 - 13:30 Water Temperature: 12 (°C)
Electrofishing Effort: 1126 (seconds) Length of Stream Sampled: 250 (m) Mean Width: 4.5 (m)

Species	YOY	Juvenile	Adult
RAINBOW TROUT		3+-I 1+-IIII 2+-II (8)	
CHINOOK SALMON		2+-IIII (5)	
LONGNOSE DACE		I (1)	IIII II (7)
MOTTLED SCULPIN		II (2)	II (2)
TOTALS			

Comments:
I6 400V. Width - 7, Length 40+
3+ - SMOLT RAINBOW 2+ - SMOLT CHINOOKS

Client: MARATHON PGM
Project No. 09-1630
Investigators: RB/KA

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: PIC RIVER TRIBUTARY Station No.: S32 Location: 200m U/S PIC RIVER
Coordinates: 48°49.969' N 86°18.651' W Datum: NAD 27
Date: 26/08/09 Time: 12:45 Water Temperature: 10 (°C)
Electrofishing Effort: 959 (seconds) Length of Stream Sampled: 125 (m) Mean Width: 1 (m)

Species	YOY	Juvenile	Adult
RAINBOW TROUT	III (3)		
TOTALS	(3)		

Comments:
VERY LOW DENSITY OF FISH 400 VOLTS 60 HZ

Client: MARATHON PGM
Project No. 09-1630
Investigators: RE, JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: PIC RIVER TRIBUTARY Station No.: S43 Location: U/S Fm PIC RIVER
Coordinates: 5408299 N 0550811 W E Datum: NAD 27
Date: May 08/09 Time: 10:10 - 11:15 Water Temperature: 9 (°C)
Electrofishing Effort: 1097 (seconds) Length of Stream Sampled: 100 (m) Mean Width: 2 (m)

Species	YOY	Juvenile	Adult
BROOK TROUT		I (1)	
RAINBOW TROUT		1+ = IIII III (9)	
CHINOOK SALMON		II (2)	
SLIMY SCULPIN		I (1)	II (2)
FINESCALE DACE		I (1)	
WHITE SUCKER		2+ - I 1+ - III (7)	
Brook Stickleback		I (1)	I (1)
TOTALS			

Comments:
400 V 60Hz (I6)
SCULPIN - 4 pelvic rays dorsal fins joined

Client: MARATHON PGM
Project No. 09-1630
Investigators: RS/RR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: PIC RIVER TRIBUTARY Station No.: S43 Location: 140M U/S PIC RIVER
Coordinates: 48 49.638 N 86 18.496 W Datum: NAD 27
Date: 26/08/09 Time: 14:30 Water Temperature: 14 (°C)
Electrofishing Effort: 964 (seconds) Length of Stream Sampled: 130 (m) Mean Width: 1.5 (m)

Species	YOY	Juvenile	Adult
Trout Perch.		1	1
Rainbow Trout.	𝍸 𝍸 III 𝍸 𝍸		
Brook stickleback.			1
Johnny Darter.			1
Slimy Sculpin			1
TOTALS	23	1	4

Comments:

400-500 VOLTS 60Hz
Yellow/brown stain water
Flow similar to MAY.

Client: Still water
Project No. 11-1837
Investigators: MM + TM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream 2 Station No.: S66 Location: 630m U/s of S4
Coordinates: 6U 0551329 E 5404724 N Datum: NAD27
Date: June 8 '11 Time: 17:45 Water Temperature: 10 (°C)
Electrofishing Effort: 540 (seconds) Length of Stream Sampled: ~~150~~ (m) Mean Width: 2 (m)

Species	YOY	Juvenile	Adult
slimy sculpin			6
Brook Trout			6
TOTALS			12

Comments: - Trout in the available pools, sculpin in the cobble riffles.

Client: PGM
Project No. 09-1680
Investigators: RP VS

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake1	Station Number: L-1
Local Name: Lake I	Location: PGM
Township: Marathon	Picture Number:
Datum: NAD 27	Coordinates: 16V550284N5402877 W
Topographic Map Name/Number: GOOD CHILD LAKE 42 D/16	Date Aug 6/07

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 5%	Stable: 95%

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100%

Substrate Types (%)

Bedrock: 5%	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 95	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, BIRCH, MOUNTAIN MAPLE, MOUNTAIN ASH
Dominant Aquatic Vegetation: Yellow Pond Lily, BURREED, PONDWEED
Adjacent Land Use: N/A

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 25
Air Temperature (°C): ~ 17

Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Marathon PGM
Project No. 09-1630
Investigators: KP VS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: Sand, Silt & Fl Number of Replicates:____

Benthic Community Notes: beetles.

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Baited. Visual ( ) Collection ( ) GNordic ✓ Smexp ✓

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: None found E-fish 593s 600V 60Hz. ~250m of shoreline
11 adult Eastern Newts, leeches, lots of caddis, beetles, waterboatmen, Gastropods —June 17/11

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity ~~(µmhos/cm)~~ mS/cm	Other
0	19.02	6.97	75.3	5.85	0.011	
1	17.65	6.9	72.5	5.34	0.012	
2	16.51	6.81	69.8	4.83	0.012	
3	15.73	6.63	66.7	4.55	0.012	
4	9.62	7.66	6.77	4.23	0.011	
5	8.66	4.39	36.1	4.17	0.012	
6	5.54	1.66	13.3	4.47	———	cond wouldn't stabilize
7	5.07	1.65	13.0	4.48	———	
8	4.64	1.44	11.3	4.57	0.010	
9	4.62	1.42	11.2	4.77	0.019	
10	4.62	1.43	11.1	4.89	0.044	
11	4.60	1.28	10.1	5.12	———	
12	4.56	1.33	10.3	5.19	0.024	
13						
14						
15						

Client: STILLWATER CANADA INC
Project No. 11-1837
Investigators: ST, MM, VS, KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake 2	Station Number: L2
Local Name: Lake 2	Location: MP GM
Township: Marathon	Picture Number:
Datum: NAD 27	Coordinates: 16 0549909 5403029
Topographic Map Name/Number: GOOD CHILD LAKE 42 D/16	Date JUNE 17/11

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 5	Stable: 95

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 20	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 80	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 70	Forested Lowland: 25
Marsh:	Beaver Pond:	Bog:	Swamp: 5	

Dominant Terrestrial Vegetation: spruce, maple, alder, birch, balsam fir, white cedar
Dominant Aquatic Vegetation: aquatic grass, floating/yellow Pond lily, SEDGE, PONDWEED, ARROWHEAD, COONTAIL
Adjacent Land Use: N/A

Sediment Overlaying Substrate:	None ( )	Slight (X)	Moderate ( )	Heavy ( )	
Algae Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )	
Barriers Observed:	None ( )	Natural (X)	Artificial ( )	Type: Beaver Dam @ outlet	

WEATHER

Cloud Cover (%): 0	Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )
Air Temperature (°C): ~17	Recent Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )

Water Colour:	Colourless ( )	Yellow/Brown (X)	Blue/Green ( )
Water Clarity:	Clear (X)	Stained ( )	Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Stillwater Canada Inc
Project No. 11-1837
Investigators: ST, MM, VS, KP

Benthic Community

Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: Secchi 1.67m - Aug 7/09 Number of Replicates: ____

Benthic Community Notes: NONE

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) BAITED Visual ( ) Collection ( ) Smelt X Nordic X

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: FISHED ~280m of shoreline 600V 60Hz 618 seconds
leeches 2 wood frogs, tadpoles, caddis, beetles, odonate nymphs
NO FISH

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	17.09	7.16	74.3	7.46	0.018	
1	16.00	6.71	67.6	4.65	0.017	} Aug 7/09
2	14.66	3.92	39.0	4.54	0.021	
3	14.55	2.59	25.4	4.77	0.025	
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: STILLWATER CANADA INC
Project No. 11-1637
Investigators: ST, MM, KP, VS

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake 3	Station Number: L3
Local Name: Lake 3	Location: MPGM
Township: Marathon	Picture Number: 184-197 (2009)
Datum: NAD 27	Coordinates: ° . 'N ° . 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date JUNE 8/11

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 5	Stable: 95

Bank Canopy (% Stream Shaded)

Dense:	Partly Open: 20	Open: 80

Substrate Types (%)

Bedrock: 5	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 95	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 100
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, Aspen
Dominant Aquatic Vegetation: Yellow Pond lily / Bur reed / Northern Water Milfoil / MARE'S TAIL
Adjacent Land Use: NONE

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver dam @ outlet

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Aug 8/09
Air Temperature (°C): 18 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: St. Mutter Canada Inc.
Project No. 11-1837
Investigators: ST, KP, MH, VS

Benthic Community

Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: secchi 1.67m - Aug 8/09 Number of Replicates:____

Benthic Community Notes: NONE

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap (X) Baited Visual ( ) Collection ( ) Swexp X Nordic X

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: E-fished shoreline from trail entrance to ½ way down west side 314s 60HZ 600V - NO FISH Amphipods, water striders, dragonfly nymphs ~250m shoreline

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	17.27	8.54	88.9	4.69		
1	17.25	8.47	88.1	4.43		Aug 8/09
2	15.59	7.62	77.1	4.24	0.033 m/scm	
3	14.41	5.07	49.7	4.09		
4						
~~0~~	21.08	7.81	88.0	5.06	14	
~~1~~	19.08	8.07	87.0	4.98	14	
~~2~~	12.72	2.70	25.7	4.87	15	
~~3~~	10.52	0.51	4.2	5.11	16	
~~3.5~~	10.50	0.11	1.1	5.34	31	
10						
11						
12						
13						
14						
15						

Client: Marathon
Project No. 09-1630
Investigators: MM & KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake on Hare Lake Tributary	Station Number: Lake 4
Local Name: Lake on Hare Lake Tributary	Location: Marathon
Township: Marathon Municipality	Picture Number: 544→560
Datum: NAD27	Coordinates: 16V 548427 'N 5404167 . 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date 16/06/10

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 10	Boulder: 10	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 30	Detritus: 40

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 70
Marsh: 20	Beaver Pond: 10	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce, sweet gale, alder, aspen.
Dominant Aquatic Vegetation: pond weeds, sedges, types of yellow pond lily, sponge
Adjacent Land Use: Wilderness

Sediment Overlaying Substrate:	None ( )	Slight ( )	Moderate (X)	Heavy ( )
Algae Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )
Barriers Observed:	None ( )	Natural (X)	Artificial ( )	Type: beaver ponds.

WEATHER

Cloud Cover (%): 60	Precipitation:	None (X)	Light ( )	Moderate ( ) Heavy ( )
Air Temperature (°C): 22	Recent Precipitation:	None ( )	Light (X)	Moderate ( ) Heavy ( )

Water Colour:	Colourless ( )	Yellow/Brown (X)	Blue/Green ( )
Water Clarity:	Clear (X)	Stained ( )	Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Marathon PGM
Project No. 09-1630
Investigators: MM & KP

Lake 4

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: —

Benthic Community Notes: many & large

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual (X) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 2NN + 1EN csm
JUNE 8/11 – e-fish test – 2 wood frogs, 1 leopard frog

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	21.47	8.58	96.9	5.90	15	
1.3	20.50	8.73	96.9	5.89	14	
2.4	20.4	7.60	84.5	5.87	14	
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1630
Investigators: MM JT

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream Catchment 2	Station Number: L5
Local Name: Canoe Lake	Location: Marathon
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 548698 'N 5403783 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 7 '09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 85	Partly Open: 10	Open: 5

Substrate Types (%)

Bedrock: 40	Boulder: 40	Cobble: 10	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 10	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 70
Marsh: 30	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, Willow, FIR, BIRCH
Dominant Aquatic Vegetation: willows, sedge, BLUEBERRY, MILFOIL
Adjacent Land Use: Forest

Sediment Overlaying Substrate: None (X) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dam

WEATHER

Cloud Cover (%): 10 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None ( ) Light ( ) Moderate (X) Heavy ( )

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L5

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, JT

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual (X) Collection ( ) NN GN

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Max Depth 23
sechii 7m.

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	17.19	8.55	88.7	5.75	14/12	
1	16.83	7.77	80.0	5.71	14/12	
2	14.95	6.79	67.0	5.61	15/12	
3	11.95	6.64	60.1	5.50	16/12	
4	8.00	5.73	48.4	5.48	16/11	
5	6.20	4.95	39.4	5.51	17/11	
6	4.93	4.52	35.3	5.60	18/11	
7	4.56	2.99	23.1	5.73	18/11	
8	4.34	2.65	20.5	5.80	19/11	
9	4.18	0.89	6.0	5.91	19/11	
10	4.13	0.15	1.1	6.16	19/12	
11	4.12	0.15	1.2	6.36	20/12	
12	4.07	0.16	1.3	6.51	25/15	
13	4.05	0.17	1.3	6.47	36/22	
14	4.03	0.17	1.3	6.47	44/26	
15	4.03	0.17	1.3	6.42	56/34	
16	4.04	0.17	1.3	6.36	69/40	
17	4.06	0.16	1.2	6.38	90/57	
18	4.07	0.17	1.3	6.39	89/54	

F

Client: Marathon PGM
Project No. 09-1630
Investigators: MM/JT

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream Catchment 2	Station Number: L6
Local Name: Lake 6	Location: Marathon
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 548931 'N 5404110 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 7/8, 2009

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 65	Partly Open: 30	Open: 5

Substrate Types (%)

Bedrock: 20	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 80	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 60
Marsh: 40	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: willow, spruce, BIRCH, BALSAM FIR, BALSAM POPLAR
Dominant Aquatic Vegetation: willow, pond weed, sponge-lots
Adjacent Land Use:

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural ( ) Artificial ( ) Type: beaver dam

WEATHER

Cloud Cover (%): 100
Precipitation: None ( ) Light ( ) Moderate (X) Heavy ( )
Air Temperature (°C): 15
Recent Precipitation: None ( ) Light (X) Moderate (N) Heavy ( )

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L6

Client: Marathon PGM
Project No. 09-1630
Investigators: MM/JT

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: leeches, mayfly, striders

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Lake chub, frogs, toads.

Secchi = bottom

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	16.28	8.71	89.1	5.9	17/14	
1.5	16.10	8.68	87.1	5.9	17/14	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1636
Investigators: MMJT

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream Catchment 2	Station Number: L7
Local Name: L7	Location: Marathon
Township: Marathon	Picture Number: on server
Datum: NAD 27	Coordinates: 548909E N5409278 NW
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 7/8, 09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 90	Partly Open: 10	Open:

Substrate Types (%)

Bedrock: 40	Boulder: 25	Cobble: 5	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 20	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 60
Marsh: 30	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce, willow, grass, birch, fir, poplar
Dominant Aquatic Vegetation: pond lily, blue-green algae, waterfowl
Adjacent Land Use: forest

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:

WEATHER

Cloud Cover (%): 100
Air Temperature (°C): 15

Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Recent Precipitation: None ( ) Light ( ) Moderate (X) Heavy ( )

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L7

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, JT

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (×) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: skaters, beetles, leeches

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( ) NN GN

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: saw sculpin in Pearl Lake, below dam
max depth 7.8m
Secchi: 4

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	17.69	8.49	89.1	6.78	16/14	
1	16.84	7.95	82.6	6.16	16/14	
2	15.02	5.69	50.8	6.07	17/14	
3	11.31	0.50	4.4	5.86	24/18	
4	7.13	0.31	2.5	5.63	53/35	
5	7.85	0.50	4.4	5.70	62/41	
6	8.39	2.57	22.0	5.70	66/43	
7	hit weeds.					
8						
9						
10						
11						
12						
13						
14						
15						

L8

Client: Marathon PGM
Project No. 09-L630
Investigators: MM TT

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Canoe Lake Watershed	Station Number: L8
Local Name: L8	Location: Marathon
Township: Marathon	Picture Number:
Datum: NAD27	Coordinates: 5497444 E 5404733 N
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 6 '09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% ~~Stream Shaded~~)

Dense: 100	Partly Open:	Open:

Substrate Types (%)

Bedrock: 10	Boulder: 5	Cobble: 5	Gravel: 5	Sand:
Silt:	Clay:	Marl:	Muck: 70	Detritus: 5

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 85
Marsh: 5	Beaver Pond: 10	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce, willow, grass, birch.
Dominant Aquatic Vegetation: sedge, arrow weed, cattails, willow, submerged veg abundant
Adjacent Land Use: forest as far as I can see

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____
↳ beaver dams.

WEATHER

Cloud Cover (%): 60 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Marathon PGM
Project No. 09-1630
Investigators: MM JT

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: brown black leeches, water striders, boatmen, beetles.

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual (X) Collection ( ) Experimental GN Nordic net

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: stickleback's.

Secchi bottom

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	19.1	7.98	85.8		28.1/36.0	
1	16.9	8.64	91.4		29.8/35.2	
2	15.2	8.60	83.5		32.2/39.7	
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Stillwater Canada Inc
Project No. 11-1837
Investigators: ST, MM

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: TWO DUCK WATERSHED	Station Number: L9
Local Name: L9	Location: MPGM
Township: UNORGANIZED	Picture Number:
Datum: NAD 27	Coordinates: 550332E 5405716N
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date June 16/11

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open: 90	Open: 10

Substrate Types (%)

Bedrock: 10	Boulder: 5	Cobble:	Gravel: 5	Sand: 5
Silt:	Clay:	Marl:	Muck: 65	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce grasses
Dominant Aquatic Vegetation: milfoil, grasses, bulrush
Adjacent Land Use: NONE

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver dams @ inlets + outlets

WEATHER

Cloud Cover (%): 30 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 24 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: St. Mosher Canada Inc
Project No. 11-1837
Investigators: ST, MM

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: 10 min K+S of all avail habitats - Aug 6/09 Number of Replicates: 1

Benthic Community Notes: waterstriders, leeches, amphipods, damsel fly nymphs

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Boiled Visual ( ) Collection ( ) sm exp X Nordic X

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: salamanders, giant water bugs + giant water beetles, leeches.
E-fish - 363s 600V 60Hz - NO fish
~170 m of shoreline - wood frogs, leopard frogs, American toad, lots of tadpoles - Aug 6/09
↳ >50% of L9 shoreline.

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	16.7	8.56	87.9		28.3 / 33.7	
1	16.1	8.55	87.1		27.7 / 33.2	} Aug 6/09
2	15.2	7.96	81.7		34.0 / 33.7	Bottom max 2.3 m
3						$\bar{x}$ = 0.9 m }
4	H2O level decreased			~	1.0m since	Aug 2009
5						
~~0~~	20.2	9.50	106.1	6.41	30	
~~0~~ 0.5	16.21	9.50	106.1	6.45	30	} June 16/11
~~1~~ 1.0	14.8	8.87	87.7	6.43	30	
~~1~~ 1.4	14.7	7.79	76.9	6.28	33	
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1630
Investigators: MMJT

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Two Ducks Watershed	Station Number: L9a
Local Name: L9a	Location: Marathon
Township: UNORGANIZED	Picture Number: on server
Datum: NAD27	Coordinates: 550332 'N 5405704 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 5-6 '09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 40	Partly Open: 20	Open: 40

Substrate Types (%)

Bedrock: 5	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 95	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow: 35	Lawn:	Forested Upland: 55	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp: 10	

Dominant Terrestrial Vegetation: grass, goldenrod, spruce, choke cherry
Dominant Aquatic Vegetation: sedge.
Adjacent Land Use:

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial (X) Type:
↳ culvert out

WEATHER

Cloud Cover (%): 95 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 17 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L9a

Client: Marathon Pipe
Project No. 09-180
Investigators: MMJT

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: water striders

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: None seen

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0.5	18.9	7.60	82.2a		31.1/31.1	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

sechii bottom

Client: SCI
Project No. 11-1837
Investigators: JT, MM

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: TWO DUCK WATERSHED	Station Number: L10 + L11
Local Name: TWO DUCK LAKE	Location: MPGM
Township: UNORGANIZED	Picture Number:
Datum: NAD 27	Coordinates: 550536 E 6405623 N
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date JUNE 16/11

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 10	Stable: 90

Bank Canopy (% Stream Shaded)

Dense: 70	Partly Open: 20	Open: 10

Substrate Types (%)

Bedrock: 5	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 95	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, birch, FIR
Dominant Aquatic Vegetation: Sedges, grass, pond lily, cattail, pitcher plant, sundew
Adjacent Land Use: NONE

Sediment Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )
Algae Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )
Barriers Observed:	None ( )	Natural (X)	Artificial (X)	Type: Beaver dam @ outlet Perched culvert @ inlet ~6" high

WEATHER

Cloud Cover (%): 40	Precipitation:	None (X)	Light ( )	Moderate ( ) Heavy ( )
Air Temperature (°C): 22	Recent Precipitation:	None (X)	Light ( )	Moderate ( ) Heavy ( )

Water Colour:	Colourless ( )	Yellow/Brown (X)	Blue/Green ( )
Water Clarity:	Clear (X)	Stained ( )	Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Stillwater Canada Inc
Project No. 11-1837
Investigators: MMST

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: Odonate Nymphs

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Baited Visual ( ) Collection ( ) Smexp X Nordic X
Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: E-fish – 600V 60Hz 420 seconds ~225m in L11 and 409s in L10 ~235m.
NO FISH – tadpoles, wood frogs, American toad, salamanders

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	18.4	7.33	80.2		30.5/34.7	} Avg 5/09 in L11
1	18.1	6.82	73.5		30.1/34.9	
2	17.6	7.25	78.6		29.9/34.9	
3	17.1	7.15	75.2		29.7/35.0	
4	L10					
0	18.08	8.25	87.0	6.40	29	
0.5	16.18	8.36	85.8	6.41	29	
1.0	15.8	8.31	85.3	6.41	29	
1.5	15.6	7.79	77.4	6.32	28	
1.8	15.8	4.07	40.2	6.02	54	JUNK 16/11
	L11					
0	19.46	8.38	91.4	6.47	29	
0.5	17.4	8.67	88.8	6.49	29	
1.0	15.9	8.51	86.9	6.48	29	
1.5	15.5	8.54	86.3	6.52	29	
2.0	15.4	7.48	74.6	6.98	28	
2.5	15.4	4.07	40.8	6.24	45	

Client: PGM
Project No. 09-1630
Investigators: KP VS

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake 12	Station Number: L12
Local Name: Lake 12	Location: Marathon PGM Project Site
Township: Unorganized	Picture Number:
Datum: NAD 27	Coordinates: 550830 'N 5405883W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 6/7, 2009

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 10%	Stable: 90%

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 30%	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 60%	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 65%	Forested Lowland:
Marsh:	Beaver Pond: 5%	Bog: 30%	Swamp:	

Dominant Terrestrial Vegetation: Spruce / lab tea
Dominant Aquatic Vegetation: [illegible], bulrush, pondweed, smartweed
Adjacent Land Use: N/A

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver

WEATHER

Cloud Cover (%): 40% Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 12 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L12

Client: MarathonPGM
Project No. 09-1630
Investigators: KP, VS

Benthic Community

Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes:_____

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( ) 3m exp ✓ Nordic ✓

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes:_____

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	17.37	9.13	95.1		0.045	
1	16.78	9.10	93.5		0.174	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1630
Investigators: KP VS

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake 13A	Station Number: L-13A
Local Name: Lake 13A	Location: PGM
Township: UNORGANIZED	Picture Number:
Datum: Nad 27	Coordinates: 48° 48.240' N 86° 18.281' W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 5/09

Bank Stability (%)

Highly Unstable: 0	Moderately Unstable: 10	Stable: 90

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: ✓ 100

Substrate Types (%)

Bedrock:	Boulder: 5	Cobble:	Gravel:	Sand: 0
Silt: 0	Clay:	Marl:	Muck: 70	Detritus: 25

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog:	Swamp: 50	

Created by beaver dam

Dominant Terrestrial Vegetation: Spruce, birch, alder
Dominant Aquatic Vegetation: Aquatic Grasses, Pondweed, Arrowhead, Pond lily
Adjacent Land Use: None

Sediment Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )
Algae Overlaying Substrate:	None ( )	Slight ( )	Moderate (X)	Heavy ( )
Barriers Observed:	None ( )	Natural (X)	Artificial ( )	Type: Beaver Dam

WEATHER

Cloud Cover (%): 25%	Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )
Air Temperature (°C): ~20	Recent Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )

Water Colour:	Colourless ( )	Yellow/Brown (X)	Blue/Green ( )
Water Clarity:	Clear (X)	Stained ( )	Turbid ( )

BIOLOGICAL CHARACTERISTICS

L13

Client: Marathon PGM
Project No. 09-11030
Investigators: KP VS

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: D Net 10 min Number of Replicates:

Benthic Community Notes: Soft bottom, leeches, caddis, water striders, amphipods
giant water beetles

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Baited Visual ( ) Collection ( ) Nordic X

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 500V 480S ~485m of shoreline - no fish (>75% of Pond 5A)
3 wood frogs, tadpoles (0+?) leeches, American toad, toad eggs., Leopard frog
Lots of inverts caught & Newts in passive fishgear. -JUNE 10/11

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	15.85	11.48	117.2	6.09	0.038 ms/cm	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Deepest - 1
mean depth - 0.75

Client: PGM
Project No. 09-1630 PGM
Investigators: KP, VS

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake 13	Station Number: L13
Local Name: Lake 13	Location: Lake 13 Marathon
Township: Unorganized.	Picture Number: 106 - 118
Datum: NAD 27	Coordinates: 551060 'N 5405676 'W
Topographic Map Name/Number: Goodchild Lake 42 O/16	Date Aug. 5/09

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 25	Stable: 75

Beaver Dam unstable

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble: 5	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 60	Detritus: 25

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 80
Marsh:	Beaver Pond: 10	Bog:	Swamp: 10	

Dominant Terrestrial Vegetation: Spruce, Speckled alder, tamarack, birch
Dominant Aquatic Vegetation: Aquatic Grasses, Yellow Pond Lily, Common Water Tail
Adjacent Land Use: None

Sediment Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )
Algae Overlaying Substrate:	None ( )	Slight (X)	Moderate ( )	Heavy ( )
Barriers Observed:	None ( )	Natural (X)	Artificial ( )	Type: Beaver Dam

WEATHER

Cloud Cover (%): 70	Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )
Air Temperature (°C): ~ 20	Recent Precipitation:	None ( )	Light (X)	Moderate ( )	Heavy ( )

Water Colour:	Colourless ( )	Yellow/Brown (X)	Blue/Green ( )	
Water Clarity:	Clear (X)	Stained ( )	Turbid ( )	

BIOLOGICAL CHARACTERISTICS

L13

Client: Marathon PGM
Project No. 09-1630
Investigators: KP, VS, JT, MM

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: D Net 10 Min Number of Replicates:____

Benthic Community Notes: See Bottom, leeches, caddis, waterstriders, amphipods, beetles

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Baited Visual ( ) Collection ( ) Nordic X

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 500V 367s, ~75m of shoreline - No fish
Wood Frogs, tadpoles, leeches, 1 Leopard Frog in NORDIC. - JUNE 10/11

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	18	1152	122.5	5.82	0.051 ms/cm	Sed severely disturbed
1	16.25	10.66	113.0	5.58	0.068 ms/cm	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Max. 1.5m
Mean - 0.75m

F

Client: Marathon PGM
Project No. 09-1630
Investigators: HMET

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream Catchment 12	Station Number: L14
Local Name: Lake 14	Location: Marathon PGM Property
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 54 06 343 N 5403704 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/11G	Date Aug 3 '09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 20	Partly Open: 50	Open: 30

Substrate Types (%)

Bedrock:	Boulder: 10	Cobble:	Gravel: 5	Sand:
Silt:	Clay: 5	Marl:	Muck: 80	Detritus:

4 - total of down trees & branch bearings

Terrain Characteristics (%)

Cultivated:	Meadow: 20	Lawn:	Forested Upland:	Forested Lowland: 30
Marsh: 50	Beaver Pond: nil	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce, birch
Dominant Aquatic Vegetation: emergent, submerged, floating
Adjacent Land Use: forest, trail

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate (X) Heavy ( ) - organic silt
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dam

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 15 Recent Precipitation: None ( ) Light ( ) Moderate (X) Heavy ( )

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L14

Client: Marathon PGM
Project No. 09-1630
Investigators: MMJT

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (✓) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: ~~stickle~~, leeches,

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (✓) Visual ( ) Collection ( )

MN SM

Sampling Methods: Qualitative (✓) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: trout, stickleb backs caught when repositioning MT3

max depth: 2.2

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other – in field book
0 T	15	8.32	84.2	6.59	47/38	
1 M	14.56	7.06	69.4	6.08	49/40	
2 B	14.11	5.19	50.5	6.00	51/40	
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Too old beaver dams.

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, JT

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Canoe Lake Watershed	Station Number: L15
Local Name: L15	Location: Marathon PGM property
Township: Marathon Municipality	Picture Number:
Datum: NAD 27	Coordinates: 549743 E 5404345 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 6th '09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 10	Partly Open: 20	Open: 70

Substrate Types (%)

Bedrock: 5	Boulder: 5	Cobble:	Gravel:	Sand:
Silt: 10	Clay: 30	Marl:	Muck: 10	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 40	Forested Lowland:
Marsh: 10	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: grass, mint, spruce, sweet gale
Dominant Aquatic Vegetation: grasses, marsh cinquefoil, elodea? Skunk cabbage.
Adjacent Land Use:

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (✓) Artificial ( ) Type: beaver dams

WEATHER

Cloud Cover (%): 70 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L15

Client: Marathon PGM
Project No. 09-1630
Investigators: MM JT

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: chiron. stridens, bratmen, beetles amphipod; caddis flylarvae.

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual (X) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: stickleback

secchi: could see bottom

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	14.6	7.80	76.2		38.3/49.0	
1	12.2	7.80	72.2		39.4/51.7	
2	11.6	8.05	72.8		34.2/52.6.	
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1630
Investigators: MM JT

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Two Ducks Watershed	Station Number: L16
Local Name: L16	Location: Marathon
Township: Marathon	Picture Number: start at moose print.
Datum: NAD27	Coordinates: 550155 E 5405098 N
Topographic Map Name/Number: Goodchild Lake 42 D/16	Date Aug 5 09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 60	Partly Open: 40	Open:

Substrate Types (%)

Bedrock: 20 (fractured)	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 80	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow: 5	Lawn:	Forested Upland: 45	Forested Lowland:
Marsh: 50	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: grass, spruce
Dominant Aquatic Vegetation: sedge, cattail, pond lily, bullrush, bullrush
Adjacent Land Use: possible mine, forest

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____
- step pools, beaver dams

WEATHER

Cloud Cover (%): 80 Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 17 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L16

Client: Marathon PGM
Project No. 09-1630
Investigators: MM JT

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: stridents, leeches, dragonfly midge.

Fish Community

Not Assessed ( )	Electrofisher (X)	Seine ( )	Dipnet ( )	Angling ( )
Minnow Trap (X) Baited	Visual ( )	Collection ( )	5m exp X	Nordic X

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: sechin bottom 60 Hz 460V 3 555, ~200m of shoreline
Max. 2.2 all age classes of tadpoles, waterstriders, leeches
No fish - June 10/2011

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	16.8	7.12	77.6		44 / 52.1	
1	15.5	7.72	73.		42.7 53.1	
2	14.3	8.38	84.5		42.2 53.9	
3						
0	20.28	9.05	100.3	6.77	48	
0.5	14.59	9.67	93.7	6.72	48	JUNE 12, 2011
1.0	13.9	9.57	90.6	6.7	48	
1.5	13.7	8.57	83.9	6.72	48	
8						
9						
10						
11						
12						
13						
14						
15						

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

actually L17

Watercourse: S21 pondus us & ds	Station Number: L17
Local Name: Stream Catchment 5	Location: Marathon PGM Project Site
Township: Marathon Municipal	Picture Number:
Datum: NAD27	Coordinates: 54 75 15 'N 86 40 20 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 12/09

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 100	Stable:

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 5	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 90	Detritus: 5

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 50	Forested Lowland:
Marsh:	Beaver Pond:	Bog: 50	Swamp:	

Dominant Terrestrial Vegetation: Spruce / Birch / Labrador Tea
Dominant Aquatic Vegetation: Burreed, Sedge
Adjacent Land Use:

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:

WEATHER

Cloud Cover (%): 10 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L17

Client: PGM
Project No. 09-1630
Investigators: KP, VS

Benthic Community

Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: Can See bottom

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( ) Gill Net X

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes:_____

ms/cm

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (~~µmhos/cm~~)	Other
0	19.16	8.39	90.8	4.02	0.014	
0.5	18.52	8.26	88.2	4.06	—	"
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1630
Investigators: MM + KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake 17	Station Number: Lake 17
Local Name: Lake 17	Location: Marathon PGM
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 16U 547509 5404432 ° ' N ° ' W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date 16-06-10

Bank Stability (%)

Highly Unstable: 100	Moderately Unstable:	Stable:

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 15	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 80	Detritus: 5

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 80
Marsh:	Beaver Pond:	Bog: 20	Swamp:	

Dominant Terrestrial Vegetation: spruce, bog willow, sweet gale
Dominant Aquatic Vegetation: sedge, Pondweed, Yellow Pond lily
Adjacent Land Use: forest

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dam
↳ recent activity
so water higher

WEATHER

Cloud Cover (%): 20 - thin cloud
Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 12
Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Marathon PGM
Project No. 09-1630
Investigators: MM & KP

Lake 17

Benthic Community

Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: _____

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: Nordic Net 4 5m Exp. L2

Max Depth - 2m

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	19.2		7.44		15 uS/cm	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 04-1630
Investigators: MM, JT, Reg

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

Holy! This lake is Way bigger than mapped lake.

LOCATION DATA

Watercourse: Clay Lake Watershed	Station Number: L18
Local Name: L18	Location: Marathon
Township: UNORGANIZED	Picture Number:
Datum: NAD 27	Coordinates: 550254 'N 5404897 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 O/16	Date Aug 10th 2009

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 85	Partly Open: 10	Open: 5

Substrate Types (%)

Bedrock: 50	Boulder: 10	Cobble: 5	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 35	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 55
Marsh: 45	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: spruce, alder, aspen, grass, rush, bulrush
Dominant Aquatic Vegetation: smartweed, sedge, grass, pond lily, burr reed, celery,
Adjacent Land Use: forest.

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (✓) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dam

WEATHER

Cloud Cover (%): 100 Precipitation: None ( ) Light (✓) Moderate ( ) Heavy ( )
Air Temperature (°C): 13.1 Recent Precipitation: None ( ) Light ( ) Moderate (✓) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (✓) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L18

Client: Marathon PGM
Project No. 09-1630
Investigators: HM, JT

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: giant water bug

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual (X) Collection ( )
NN GN
Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: fine scale in stream

secchi = 1.75m

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	17.8	7.78	80.5		13.1 / 16.5	
1	16.8	7.85	82.1		25.7 / 31.6	
2	13.5	4.74	46.5		25.9 / 33.1	
3	13.2	2.99	28.5		27.6 / 35.7	
4						
0	18.89	9.69	104.6	6.54	26	
0.5	17.15	9.7	99.7	6.49	26	
1.0	15.26	9.58	99.6	6.42	26	JUNE 13 2011
1.5	12.85	9.32	95.5	6.42	26	
2.0	11.55	8.32	72.6	6.16	27	
2.6	10.77	3.43	31.4	SEE	31	
11						
12						
13						
14						
15						

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

Lake Name/Station: L19 Claw Lake **Date/Time:** June 13, 2011

Location: ~~Latitude~~ 549881 E ~~Longitude~~ 5407360 N Datum: NAD 27
Elevation: _____ m

Water Chemistry: Secchi depth: NA m Time: 12:00 % Cloud: 30

Water Colour: colourless yellow/brown brown
light yellow blue/green

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	18.70	9.28	99.3	6.6	38	
1	16.28	9.41	96.1	6.6	38	
2	14.80	8.89	87.5	6.5	37	
3	11.75	8.04	76.2	6.3	37	
4	8.30	6.46	58.3	6.2	39	
5	6.14	1.94	15.7	6.2	43	
6	5.28	0.55	4.3	6.3	46	
7	5.00	0.19	1.5	6.3	61	
8	5.09	0.26	1.6	6.4	79	
9	6.41	0.20	1.6	6.3	134	
10						
11						
12						
13						
14						
15						

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream Catchment 12	Station Number: Lake 20
Local Name: Lake 20	Location: Marathon
Township: Marathon Municipal	Picture Number: 351 - 358
Datum: NAD 27	Coordinates: 5449 307' N 54047.24' W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 12/09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 10	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 90	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow: 10	Lawn:	Forested Upland: 90	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: SPRUCE, ALDER, GRASSES, BIRCH
Dominant Aquatic Vegetation: BURREED, YELLOW POND LILY, ARROWHEAD, PONDWEED, SEDGE
Adjacent Land Use: None

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: BEAVER DAM

WEATHER

Cloud Cover (%): 10 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L20

Client: PGM
Project No. 09-1630
Investigators: KP, VS

Benthic Community

Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: Secchi = 2.5 m

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) (BAITED) Visual ( ) Collection ( ) Nordic x Sm Exp x

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 400V 387sec - fished ~ m of shoreline -No fish

mS/cm

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (~~µmhos~~/cm)	Other
0	17.46	8.25	86.0	5.38	0.034	
1	16.75	7.91	81.5	5.36	—	
2	17.17	7.89	81.9	5.60	—	
3	15.25	7.69	76.6	5.15	—	
4	13.35	6.98	66.3	5.05	—	
5	9.14	2.76	23.0	4.58	—	
6	7.09	2.74	23.0	5.71	0.060	
7						
0	15.99	8.78	89.4	6.4	26	
1	15.38	9.00	87.9	6.3	26	
2	12.46	7.67	76.3	6.4	25	
3	6.87	1.83	11.8	6.3	49	
3.5	6.27	0.80	15.7	6.2	65	
4	6.2	0.37	3.0	6.3	116	
4.3	15.12	0.35	27	6.3	115	
15						

Client: Stillwater
Project No. 11-1837
Investigators: MM + TM

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream 4	Station Number: L21
Local Name: L21	Location: U/S of L22, Marathon
Township: MARATHON	Picture Number:
Datum: NAD27	Coordinates: 549168 E 5405148 N
Topographic Map Name/Number: GEORGE HILD LAKE 42 O/16	Date June 9th 2011

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 1	Stable: 99

Bank Canopy (% Stream Shaded)

Dense:	Partly Open: 5	Open: 95

Substrate Types (%)

Bedrock: 60	Boulder:	Cobble:	Gravel:	Sand:
Silt: 20	Clay:	Marl:	Muck:	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 65	Forested Lowland:
Marsh:	Beaver Pond: 20	Bog: 10	Swamp: 5	

Dominant Terrestrial Vegetation: White Spruce
Dominant Aquatic Vegetation: managrass & some coontail
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (✓)
Algae Overlaying Substrate: None ( ) Slight (✓) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (✓) Artificial ( ) Type: Beaver dam

WEATHER

Cloud Cover (%): 90 Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): Recent Precipitation: None ( ) Light (✓) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (✓) Blue/Green ( )
Water Clarity: Clear (✓) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Stillwater
Project No. 11-1837
Investigators: MM+TM

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (✓) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: Leeches

Fish Community
Not Assessed ( ) Electrofisher (✓) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (✓) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: no fish 60Hz 500V 306seconds ~405m shoreline in main + satellite pits
2 wood frogs, some leeches & tadpoles, lots of inverts.

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Stillwater
Project No. 11-1837
Investigators: MM+TM

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream 4	Station Number: L22
Local Name: L22	Location: Marathon, u/s of L18
Township: MARATHON	Picture Number:
Datum: NAD27	Coordinates: 549482 E 5405540N
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date June 9, 2011

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 1	Stable: 99

Bank Canopy (% Stream Shaded)

Dense:	Partly Open: 5	Open: 95

Substrate Types (%)

Bedrock: 100	Boulder:	Cobble:	Gravel:	Sand:
Silt: 20	Clay:	Marl:	Muck:	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: White Spruce
Dominant Aquatic Vegetation: ~~grasses~~ conical marigrass
Adjacent Land Use: Wilderness

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (✓) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Gradient barrier on inlet
Beaver dam on outlet.

WEATHER

Cloud Cover (%): 80 Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): ~15 Recent Precipitation: None ( ) Light (✓) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (✓) Blue/Green ( )
Water Clarity: Clear (✓) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Stillwater
Project No. 11-1837
Investigators: MM+TM

coontail
mangrove

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (√) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: leaches + boatman

Fish Community
Not Assessed ( ) Electrofisher (√) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (√) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 500V 286s No Fish
~225 m shoreline fished.

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Lake 23	Station Number: L23
Local Name: Lake 23	Location: Marathon
Township: Unorganized	Picture Number:
Datum: NAD27	Coordinates: 48 ° 47.654' N 86 ° 21.958 W
Topographic Map Name/Number: GOODCHILD LAKE 42 O/16	Date Aug 12/09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open: 10	Open: 90

Substrate Types (%)

Bedrock: 10	Boulder: 5	Cobble: ✓	Gravel: ✓	Sand: ✓
Silt:	Clay:	Marl:	Muck: 75	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: SPRUCE, ALDER, BOG WILLOW, SWEET GALE, BIRCH,
Dominant Aquatic Vegetation: Pondweed, arrowhead, milfoil, moss, sundew
Adjacent Land Use: HYDRO ROW

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

L23

Client: PGM
Project No. 09-1630
Investigators: KP, VS

Benthic Community

Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: Secchi 1.5m Number of Replicates:____

Benthic Community Notes:_____

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( ) (X) gill net

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes:_____

µS/cm

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity ~~(µmhos/cm)~~	Other
0	19.94	8.75	96.2	5.05	12	
1	18.86	8.64	92.2	5.01	12	"
2	17.22	7.44	77.7	4.80	12	
3	16.35	6.77	69.1	4.58	12	
4	14.19	5.89	57.7	4.34	11	
5	10.90	5.49	49.3	4.07	101	
6	7.47	5.04	42.4	4.14	10	
7	7.01	262	21.6	4.21	11	
8	6.72	1.04	8.4	4.41	14	
9	6.58	0.55	4.7	4.66	15	
10						
11						
12						
13						
14						
15						

Client: Stillwater
Project No. 11-1837
Investigators: ST KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream 6 Watersted	Station Number: L24
Local Name: Stream 6 Watersted	Location: Headwaters of Stream 6
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 54 6676E 54 82402N
Topographic Map Name/Number: Goodchild Lake L12 D/16	Date JUNE 11, 2014

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 20	Partly Open: 50	Open: 30

Substrate Types (%)

Bedrock: 15	Boulder: 10	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 55	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 40	Forested Lowland: 30
Marsh:	Beaver Pond:	Bog: 30	Swamp:	

Dominant Terrestrial Vegetation: Black spruce, birch, moss, blueberry
Dominant Aquatic Vegetation: grasses, sedges, coontail,
Adjacent Land Use: None

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( ) observed none.
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: Beaver dam @ outlet

WEATHER

Cloud Cover (%): 100 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Stillwater
Project No. 11-1837
Investigators: JT, MM

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: mucle, vegetation, / Number of Replicates: 1

Benthic Community Notes: 10 MIN. K+S sampling of available habitats

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 600V 60Hz - 320sec - very few inverts sampled ~100m.

NOTE: THIS STATION L24 was treated as a stream station in June 2010 but water level has increased since then.

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other spCond
0	13.27	8.96	84.4	4.44	14	19
0.5	12.06	7.20	66.9	4.63	13	17
1.0	10.09	0.95	8.4	5.16	14	19
1.5	6.68	0.55	4.5	5.37	25	38
1.8	max depth.					
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: Marathon PGM
Project No.: 09-1630
Investigators: MM KP

Date: June 20, 2010
Time: 16:37

LOCATION DATA

Watercourse: Stream 5	Station Number: L24
Local Name: Hare Lake Tributary	Location: 1/4
Township: Marathon Municipal	Coordinates: 16U 546674 N 5402628 W
Topographic Map Name/Number: Goodchild Lake 42 D/16	Stream Order: 1

* no longer a lake more like a bog.

STATION DATA

Flow Vel. (m/s): 0.03	Length (m): 50	Mean Width (m): 1 m*	Mean Depth (m): .30

* There was one deeper area of about 2m where logs had jammed between some rocks.

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 50	Riffle:	Run:	Flat: 50

Stream Gradient (% Reach) → bedrock shute below lake → fish barrier → rock boulder cobble lower reach - Partly open.

High:	Moderate:	Low: 100

Stream Channel Type (% Reach)

Straight:	Meandering: 100	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 10	Partly Open:	Open: ~~100~~ 90

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 5	Logs & Trees:	Log Jams: 30	Deep Pool: 2	Aquatic Macrophyte: 30

Substrate Types (%)

Bedrock: 30	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 60	Detritus: 10

L24

Terrain Characteristics (%)

Cultivated:	Meadow: 50	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: Spruce, bunchberry, moss, sedge spp, birch, blueberry.
Dominant Aquatic Vegetation: coontail, filamentous algae, sedges.
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: BD bottom of Lake 24 logjam on BD.

WEATHER

Cloud Cover (%): 0 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 20 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Water Temperature (°C): 18	Dissolved Oxygen (mg/L): –
Conductivity (umhos/cm): –	pH: –

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: _____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet (X) Angling ( )
Minnow Trap ( ) Visual (X) Collection ( )

Sampling Methods: Qualitative ( ) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: shocked tadpoles 87 seconds
Millions of tadpoles 60Hz 400Volts.

Client: Marathon PGM
Project No. 09-1630
Investigators: MM + KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: L25	Station Number: Lake 25
Local Name: Lake 25	Location: Marathon
Township: Marathon Municipality	Picture Number: 522 - 542
Datum: NAD27	Coordinates: 16U548379 'N 5405064 'W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date 16·08·10

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 10	Boulder: 5	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 85	Detritus:

middle more bedrock & boulder

Terrain Characteristics (%)

Cultivated:	Meadow: 10	Lawn:	Forested Upland: 30	Forested Lowland:
Marsh:	Beaver Pond: 30	Bog: 30	Swamp:	

Dominant Terrestrial Vegetation: spruce, alder, grass, birch
Dominant Aquatic Vegetation: sedges, bush reed, bulrush
Adjacent Land Use: wilderness

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dam

old, solid & vegetated
3 B/T middle + lower pond
New work on dam @ outlet of upper

WEATHER

Cloud Cover (%): 5
Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 22
Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: Marathon P&M
Project No. 09-1630
Investigators: MM + KP

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ~~_____~~

Benthic Community Notes: large & many - no fish probable.

Fish Community

Not Assessed ( )	Electrofisher (X)	Seine ( )	Dipnet ( )	Angling ( )
Minnow Trap (X) Baited	Visual ( )	Collection ( )	Nordic ×	5m exp ×
Sampling Methods: Qualitative (X)		Quantitative ( )	I.B.I. ( )	Other ( )

Fish Community Notes: → 2NN & 1 FN . NO FISH IN JUNE 2011 SETS.
POND 1 - 4 Frogs, POND 2 - 2 tadpoles POND 3 - INVERTS ONLY
large Tadpoles in middle JUNE 8/11 - E-Fish 60Hz 600V 510S ~250m total.
max depth ~2m. mostly 1m or less.

Depth (~~m~~)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	19.21	6.21	67.3	5.31	13	
1.8	17.78	5.29	55.7	5.15	13	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

POND 3 - MUCH LARGER THAN LAST SURVEY, GRASS UNDER H2O
- NO SIGN OF ACTIVE LODGE BUT FRESH CUT TREES + NEW WORK ON DAM

Client: PGM
Project No. 09-1630
Investigators: KP MM

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: U/S of S15	Station Number: L 26
Local Name: L 26	Location: Marathon
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 16U 548156 N 5403445 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date 17 06 10

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open:	Open: 100

Substrate Types (%)

Bedrock: 10	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 70	Detritus: 20

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog: 50	Swamp:	

Dominant Terrestrial Vegetation: Alder Spruce sundew, pitcher plants tamarack Sweet gale, Hemlock
Dominant Aquatic Vegetation: Large yellow Pond Lily, See photos, pondweed. bog laurel, labrador tea.
Adjacent Land Use: Forest

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 100 Precipitation: Mist None ( ) Light (X) Moderate ( ) Heavy ( )
Air Temperature (°C): 15 Recent Precipitation: None ( ) Light ( ) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear ( ) Stained (X) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: PGM
Project No. 09-1630
Investigators: KP MM

Lake 26

Benthic Community
Not Assessed (Y) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection ( )

Substrate Sampled: _____ Number of Replicates: ____

Benthic Community Notes: _____

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( ) Nordic (X) Sm Exp (X)
BAITED

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: See Fish Collection Form
36ls 500V 60Hz ~275m of shoreline sampled - NO FISH
WOODFROGS, REDHEAD DUCK OBSERVED ON LAKE.

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other
0	19.49	7.71	83.9	5.09	14	
1	19.35	7.67	83.2	4.97	14	
2	19.29	7.63	82.7	4.95	14	JUNE 17, 2010
3	17.58	6.23	65.2	4.81	14	
4	15.39	3.65	36.7	4.83	14	
5	14.83	1.94	19.1	3.03	14	
6						
0	17.41	7.76	81.0	3.38	0.0.18 mS/cm	
1	17.28	7.49	78.0	3.54	-	AUG 8, 2009
2	12.22	1.22	4.9	3.25	-	
3	11.12	-	-	3.26	-	
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, Ray, BF

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: L27 (above Hare L.)	Station Number: L27
Local Name: Kidney bean Bog	Location: Marathon
Township: Marathon	Picture Number: Labelled on server
Datum: NAD 27	Coordinates: 5975535N 5404674W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 12-13 '09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 60	Partly Open: 30	Open: 10

Substrate Types (%)

Bedrock: 60	Boulder: 20	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 10	Detritus: 10

Terrain Characteristics (%)

Cultivated:	Meadow: 5	Lawn:	Forested Upland: 75	Forested Lowland: 10
Marsh:	Beaver Pond:	Bog: 10	Swamp:	

Dominant Terrestrial Vegetation: spruce, poplar, Alder, birch
Dominant Aquatic Vegetation: coontail, sedge pondweed, grass, milfoil,
Adjacent Land Use: forest

Sediment Overlaying Substrate:	None ( )	Slight ( )	Moderate (X)	Heavy ( )
Algae Overlaying Substrate:	None ( )	Slight (X)	Moderate ( )	Heavy ( )
Barriers Observed:	None ( )	Natural (X)	Artificial ( )	Type: beaver dam 2 @ bottom.

WEATHER

Cloud Cover (%): 0	Precipitation:	None (X)	Light ( )	Moderate ( )	Heavy ( )
Air Temperature (°C): 19	Recent Precipitation:	None ( )	Light (X)	Moderate ( )	Heavy ( )

Water Colour:	Colourless ( )	Yellow/Brown (X)	Blue/Green ( )
Water Clarity:	Clear (X)	Stained ( )	Turbid ( )

BIOLOGICAL CHARACTERISTICS

F L27

Client: Marathon PGeM
Project No. 09-1630
Investigators: MM, Ray, BF

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection (X)

Substrate Sampled: muck, boulder, bedrock, submerged woody debris 10 MIN 1<+S Number of Replicates: ____

Benthic Community Notes: water boatmen, water striders, mayfly, chironomid, dragonfly nymphs,

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )

BAITED Minnow Trap (X) Visual ( ) Collection ( ) sm exp X

Nordic Net X

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: saw none

JUNE 9/11 - E-fish 600V 60Hz 3765 ~ M - NO FISH.

secchii = bottom. max depth 1.7 m

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	18.45	7.57	80.1	4.35	17/14	
0.6	15.95	5.68	60.3	4.09	17/15	Aug 12, 2009
1.3	15.77	5.56	55.4	4.5	34/28	
3						
0	18.9	8.22	88.5	5.95	14	
0.3	18.8	7.72	83.2	5.63	14	JUNE 16, 2010
0.7	17.7	7.23	75.4	5.38	15	
1.0	16.9	5.7	56.4	5.25	15	
8						
9						
10						
11						
12						
13						
14						
15						

Client: Stillwater
Project No. 11-1937
Investigators: JT, KP

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Stream 1	Station Number: L29
Local Name: Lake 29	Location: Marathon, Headwater lake on Stream 1
Township: Marathon Municipality	Picture Number:
Datum: NAD 27	Coordinates: 549744E 5401501N
Topographic Map Name/Number: Goodchild Lake 016	Date June 9, 2011

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 20	Stable: 80

Bank Canopy (% Stream Shaded)

Dense: 30	Partly Open: 10	Open: 60

~ 30% of Lake SA would be shaded depending on time of day

Substrate Types (%)

Bedrock: 10	Boulder: 5	Cobble:	Gravel:	Sand:
Silt: organic 15	Clay:	Marl:	Muck: 30	Detritus: 30

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 80	Forested Lowland: 20
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: black spruce, birch, poplar, tamarack
Dominant Aquatic Vegetation: sedges, sphagnum moss, bog willow
Adjacent Land Use:

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate (X) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type:_____
Dam + two culverts at outlet

WEATHER

Cloud Cover (%): 90
Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 12
Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: St. Mary Water Canada Inc.
Project No. 11-1837
Investigators: JT, KP

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual ( ) Collection (X)

Substrate Sampled: Mucky Sticks + Grasses Number of Replicates: 1

Benthic Community Notes: 10 kicks of all available habitat
Beetles, water striders, leech, dragon fly.

Fish Community

Not Assessed ( ) Electrofisher (X) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: 60Hz 600V ~363 sec lots of tadpoles, tricopteran, leeches beatles, water striders. → 1300 → 14:00 -sampled ~475m of shoreline

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µS/cm)	Other SP cond
0	16.00	9.46	95.8	7.70	14	17
0.5	~~18~~ 15.8	9.50	95.9	7.51	14	17
1	~~15.37~~	9.45	94.4	7.43	14	17
3	15.27	8.08	80.6	6.9	15	19
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: Marathon PGM
Project No. 09-1630
Investigators: MINRAY, BF

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: Malpa Lake	Station Number: Malpa Lake
Local Name: Malpa Lake	Location: Marathon
Township: Marathon Municipal	Picture Number:
Datum: NAD 27	Coordinates: 55°948 'N 540 3298 W
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16	Date Aug 12-13 '09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 70	Partly Open: 20	Open: 10

Substrate Types (%)

Bedrock: 25	Boulder: 10	Cobble:	Gravel:	Sand:
Silt:	Clay:	Marl:	Muck: 45	Detritus: 20

lots of exposed bedrock

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland:	Forested Lowland: 90
Marsh:	Beaver Pond:	Bog: 10	Swamp:	

Dominant Terrestrial Vegetation: spruce, sweet gale
Dominant Aquatic Vegetation: cattail, sedge, [illegible] pondweed, [illegible]
Adjacent Land Use: forest

Sediment Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None ( ) Natural (X) Artificial ( ) Type: beaver dam

WEATHER

Cloud Cover (%): 10 Precipitation: None ( ) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None ( ) Light (X) Moderate ( ) Heavy ( )

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Malpa

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, Ray, BF

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar ( ) Visual (X) Collection ( )

Substrate Sampled:_____ Number of Replicates:____

Benthic Community Notes: striders, water boatmen, odonates, leeches

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( )
Nordic Net
Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: no fish seen → 2 Eastern Newt.
- beaver evidence
- loon

Secchi = bottom max 3.1 m
mean 1.6 m

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	18.98	8.44	91.0	6.73	15/13	
1	18.38	8.07	88.3	6.38	15/13	
2	18.21	26.5	36.6	6.06	50/46	
3	18.66	0.78	8.4	6.28	50/46	
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE BF

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: HARE LAKE	Station Number: HL	
Local Name:	Location: ENTIRE LAKE	
Township: MARATHON MUNICIPAL	Picture Number:	
Datum: NAD 27	Coordinates: 48 °47.197' N 86 °23.381' W	
Topographic Map Name/Number: GOODCHILD LAKE 42 D/16		Date 07/08/09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense: 90	Partly Open: 10	Open:

Substrate Types (%)

Bedrock: 5	Boulder: 10	Cobble: 5	Gravel: 5	Sand: 5
Silt: 65	Clay:	Marl:	Muck:	Detritus: 5

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 95	Forested Lowland:
Marsh: 5	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: POPLAR SPRUCE BIRCH ALDER
Dominant Aquatic Vegetation: WILD RICE, BUREED, YELLOW WATER LILY, PONDWEED, BLADDERWORT, HORSETAIL
Adjacent Land Use: RECREATIONAL (COTTAGES)

Sediment Overlaying Substrate:	None ( )	Slight ( )	Moderate ( )	Heavy (X)
Algae Overlaying Substrate:	None (X)	Slight ( )	Moderate ( )	Heavy ( )
Barriers Observed:	None (X)	Natural ( )	Artificial ( )	Type:

WEATHER

Cloud Cover (%): 2	Precipitation:	None (X)	Light ( )	Moderate ( ) Heavy ( )
Air Temperature (°C): 18	Recent Precipitation:	None (X)	Light ( )	Moderate ( ) Heavy ( )

Water Colour:	Colourless ( )	Yellow/Brown (X)	Blue/Green ( )
Water Clarity:	Clear ( )	Stained (X)	Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE BF

Benthic Community
Not Assessed ( ) Ekman ( ) Surber ( ) Ponar (X) Visual ( ) Collection (X)

Substrate Sampled: ORGANIC SILT Number of Replicates: 3

Benthic Community Notes: CLAMS OBSERVED 5 LITTORAL + 5 PROFUNDAL

Fish Community
Not Assessed ( ) Electrofisher ( ) Seine (X) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection ( )

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: NORTHERN PIKE, YELLOW PERCH, SPOTTAIL SHINER, COREGONUS, CISCO BURBOT

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0.5	18.0	9.5	100	7.1	23	
1	17.8	9.5	100	7.1	23	
2	17.6	9.45	99	7.1	23	SECCHI DEPTH 2.5
3	17.4	9.2	96	7.1	23	
4	17.3	9.2	95	7.0	23	
5	17.1	8.8	92	6.9	23	
6	16.3	8.7	88	6.8	23	
7	14.4	8.9	87	6.7	23	
8	10.8	9.5	86	6.7	22	
9	9.0	9.9	85	6.7	22	
10	8.8	10.0	85	6.8	21	
11	7.4	10.1	83	6.8	22	
12	7.2	10.1	83	6.8	22	
13	6.9	10.2	83.5	6.8	22	
14	6.7	10.1	83	6.8	21	
15	6.7	10.3	84.3	6.8	21	
20	6.1	10.2	83.2	6.7	22	
25	5.9	9.7	80	6.6	22	
27	5.7	8.5	70	6.5	23	

Client: MALAHAT PGM
Project No. 09-130
Investigators: KF/RL

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: BAMOOS LAKE	Station Number: BL
Local Name:	Location: EAST BASIN
Township: UNORGANIZED	Picture Number:
Datum: NAD 27	Coordinates: 48 °49 293' N 86 °20 . 195' W
Topographic Map Name/Number: GOOD CHILD LAKE 42 D/16	Date 30/08/09

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open: 5	Open: 95

Substrate Types (%)

Bedrock: 15	Boulder: ✓	Cobble: ✓	Gravel: ✓	Sand: ✓
Silt: 80	Clay:	Marl:	Muck:	Detritus: ✓

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: WHITE SPRUCE, WHITE BIRCH, POPLAR, ALDER
Dominant Aquatic Vegetation: BURREED
Adjacent Land Use: NONE

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 15 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 18 Recent Precipitation: None ( ) Light ( ) Moderate ( ) Heavy (X)

Water Colour: Colourless ( ) Yellow/Brown (X) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Client: MARATHON PGM
Project No. 04-1658
Investigators: RE/RR

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar (X) Visual ( ) Collection (X)

Substrate Sampled: ORGANIC SILT Number of Replicates: 3

Benthic Community Notes: 5 LITTORAL ZONE 5 PROFUNDAL

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine ( ) Dipnet ( ) Angling ( )
Minnow Trap (X) Visual ( ) Collection (X) GILLNET (X)

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: LAKE TROUT, BROOK TROUT, LONGNOSE SUCKER, WHITE SUCKER, CISCO LAKE CHUB, FATHEAD MINNOW, BROOK STICKLEBACK, 9-SPINE STICKLEBACK, SLIMY SCULPIN TROUT-PERCH, FINESCALE DACE

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0	15.8	9.63	97.5	7.01	21	
1	15.8	9.46	95.6	6.96	21	"
2	15.8	9.47	95.5	6.95	21	
3	15.8	9.46	95.3	6.90	21	
4	15.7	9.45	95.2	6.90	21	
5	15.7	9.44	95.1	6.89	21	SECCHI DEPTH 4.9m @ 11:10
6	15.7	9.44	95.0	6.91	21	
7	15.6	9.43	94.8	6.78	21	
8	15.6	9.41	94.2	6.74	21	
9	14.5	9.63	94.1	6.55	21	
10	14.1	9.82	94.5	6.69	21	
11	12.0	10.48	96.5	6.19	22	
12	9.6	10.46	92.2	6.33	22	
13	7.4	10.54	87.6	6.41	22	
14	6.8	10.59	86.3	6.46	22	
15	6.4	10.53	84.9	6.10	22	
20	5.8	10.59	84.7	6.48	22	
25	5.7	10.61	84.7	6.65	22	
30	5.7	10.61	84.7	6.91	22	

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE BE

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

LOCATION DATA

Watercourse: LAKE SUPERIOR	Station Number: LS
Local Name: PORT MUNRO	Location: OFF HARD CREEK INLET
Township: MARATHON MUNICIPALITY	Picture Number:
Datum: NAD 27	Coordinates: 48 °45 .891' N 86 °25 .805' W
Topographic Map Name/Number: GOODCHILD LAKE 42 O/16	Date 05 AUGUST 2009

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Bank Canopy (% Stream Shaded)

Dense:	Partly Open: 1	Open: 99

Substrate Types (%)

Bedrock: 5	Boulder:	Cobble: 5	Gravel:	Sand: 10
Silt: 80	Clay:	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow:	Lawn:	Forested Upland: 100	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	

Dominant Terrestrial Vegetation: BIRCH, POPLAR, SPRUCE, ALD
Dominant Aquatic Vegetation: CHARA, POND WEED
Adjacent Land Use: LINEAR (HYDRO + RAILWAY)

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None ( ) Slight (X) Moderate ( ) Heavy ( )
Barriers Observed: None (X) Natural ( ) Artificial ( ) Type:_____

WEATHER

Cloud Cover (%): 95 Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Air Temperature (°C): 16 Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

Water Colour: Colourless ( ) Yellow/Brown ( ) Blue/Green (X)
Water Clarity: Clear ( ) Stained ( ) Turbid (X)

BIOLOGICAL CHARACTERISTICS

Client: MARATHON PGM
Project No. 09-1658
Investigators: RT BF

Benthic Community

Not Assessed ( ) Ekman ( ) Surber ( ) Ponar (X) Visual ( ) Collection (X)

Substrate Sampled: SILT WITH SAND Number of Replicates: 3

Benthic Community Notes: SEE FIELD BOOK

Fish Community

Not Assessed ( ) Electrofisher ( ) Seine (X) Dipnet ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Collection ( ) GILLNET (X)

Sampling Methods: Qualitative (X) Quantitative ( ) I.B.I. ( ) Other ( )

Fish Community Notes: WHITE SUCKER, ROUND WHITEFISH, LAKE CHUB, MOTTLED SCULPIN
LONGNOSE SUCKER

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (SPECIFIC µmhos/cm)	Other
0.5	15.2	10.6	102	7.9	87	
1	15.1	10.5	102	7.6	87	
2	15.0	10.5	102	7.5	88	
3						3.2m SECCHI DEPTH 11:50 AM 06/08/09
4	14.8	10.5	102	7.5	89	
5						
6	14.3	10.5	102	7.4	91	
7						
8	12.6	10.7	101	7.4	93	
9						
10	11.1	11.2	103	7.7	92	
11						
12.5	10.7	10.9	103	7.7	94	
13						
14						
15	10.2	10.6	103	7.5	92	
17.5	9.7	11.1	99	7.4	93	

ECOMETRIX INCORPORATED
LAKE SURVEY FORM

Lake Name/Station: SC-3 (Sturdee Cove/Lake Superior) **Date/Time:** Oct 22

Location: Latitude 48 ° 45 • 316' N Longitude 86 ° 25 • 261' W Datum: NAD 27
Elevation: _____ m

Water Chemistry: Secchi depth: 8 m Time: 11:00 % Cloud: 20

Water Colour: colourless light yellow yellow/brown blue/green brown

Depth (m)	Temp. (°C)	D.O. (mg/L)	Saturation (%)	pH	Conductivity (µmhos/cm)	Other
0						See Sheet
1	6.28	11.27	91.4	8.21	62	
2	6.28	11.26	91.3	8.22	62	
3	6.28	11.36	91.3	8.18	62	
4	6.28	11.36	91.4	8.16	62	
5	6.28	11.34	91.5	8.14	62	
6	6.28	11.34	91.8	8.05	62	
7	6.28	11.35	93.9	7.81	62	
8						See Sheet
9						
10						
11						
12						
13						
14						
15						

EcoMetrix INCORPORATED

BENTHIC FIELD SHEET – LAKE SURVEYS

PROJECT DETAILS	Client: Marathon	Study Area: SC	Date: oct 22/2009
	Project No.: 09-1630	Investigators: KP MM	

STATION/SAMPLING DETAILS **Waterbody Name:** LAKE SUPERIOR - STURGEON COVE

Station No.: SC-1	Location:			
Latitude 48°45.362'N	Temp. 6.2 °C	6.29	D.O. % Sat.	95.8 95.5
Longitude 86°25.262'W	Cond. 62 umhos	62	Water Depth (m)	32 ft
	pH 8.16 units	8.28	Secchi Depth (m)	8m
	D.O. 11.86 mg/L	11.79	Substrate	Sand Fine
	SpC (cond) 0.097 ms/cm	0.097	Algae/Macrophytes	None

Station No.: SC-2	Location:			
Latitude 48°45.293'N	Temp. 6.11 °C	6.28	D.O. % Sat.	92.8 93.5
Longitude 86°25.319'W	Cond. 62 umhos	62	Water Depth (m)	32 Ft
	pH 7.84 units	8.04	Secchi Depth (m)	
	D.O. 11.50 mg/L	11.55	Substrate	Muddy Sand
	0.098	0.097	Algae/Macrophytes	None

Station No.: SC-3	Location:			
Latitude 48°45.316'N	Temp. 6.28 °C	6.28	D.O. % Sat.	92.1 93.0
Longitude 86°25.261'W	Cond. 62 umhos	62	Water Depth (m)	27ft
	pH 7.80 units	8.05	Secchi Depth (m)	Bottom
	D.O. 11.39 mg/L	11.47	Substrate	Muddy Sand
	0.09	0.097	Algae/Macrophytes	None

Station No.: SC-4	Location:			
Latitude 48°45.407'N	Temp. 6.18 °C	6.31	D.O. % Sat.	89.7 90.7
Longitude 86°25.253'W	Cond. 62 umhos	62	Water Depth (m)	27Ft
	pH 7.79 units	8.17	Secchi Depth (m)	Bottom
	D.O. 11.4 mg/L	11.26	Substrate	Muddy Sand More Sand w Sparse
	0097	0.097	Algae/Macrophytes	None

Station No.: SC-5	Location:			
Latitude 48°45.456'N	Temp. 6.27 °C	6.36	D.O. % Sat.	89.1 90.0
Longitude 86°25.291'W	Cond. 62 umhos	62	Water Depth (m)	30ft
	pH 7.86 units	8.20	Secchi Depth (m)	8.5m
	D.O. 11.01 mg/L	11.12	Substrate	Sand
	0.097	0.097	Algae/Macrophytes	None

Client: PGM
Project No. 09-1630
Investigators: KP JS

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 1 Station No.: L-1 Location: PGM
Datum: NAD27 Pictures taken: 141 - 154
Date: Aug 6/09 Water Temperature: _____ (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area(h)	Substrate	Comments
Nordic/sm	17:05	10:15	0 - 4m	17	Muck	gang set
MT 10	16:45	10:20	1 x 3ft	17	↓	
MT 11	16:47	10:25	6 ft	17		
MT 12	16:55	10:30	20 ft	17		

Gear	Species	YOY	Juvenile	Adult
10	Beetles x2 Pic 156 - 158			

Client: Stillwater
Project No. 11-1837
Investigators: MM + JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L1 Station No.: L1 Location: Stream 1, Marathon
Datum: NAD27 Pictures taken:
Date: June 17-21, 2011 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
Exp 1	16:01	13:15	1.21 – 1.83m	93h 14m	Muck + rock	in north bay
Exp 2	16:32	12:45	1.07 → 1.22m	92h 13m	rocky	off rock face
BMT 1	16:05	12:45	0.91m	92h 40m	rocky	
BMT 2	16:14	13:05	0.61m	92h 51m	emergent Muck sedge bed	
BMT 3	16:18	12:45	0.61m	92h 27m	rock + muck	
BMT 4	16:37	12:50	1.22m	92h 13m	muck + woody debris	off beaver lodge
NN 1	16:07	12:45	0.91 - 1.22m	92h 38m	Muck + Detrital	in bay in bog
NN 2	16:46	12:55	0.61 → 1.22m	92h 9m	Muck Detrital	off Sweet Gale on west shore

Gear	Species	YOY	Juvenile	Adult
NN1	CADDIS		10	
	LEECH		2	
	EASTERN NEWT			15
	DRAGONFLY NYMPH		1	
	GIANT DIVING BEETLE			1
BMT1	EASTERN NEWT			2
BMT2	EASTERN NEWT			13
	TADPOLES		3	
	GIANT DIVING BEETLES			2
	CADDIS		2	
EXP1	CADDIS		11	
BMT4	EASTERN NEWT			1
	CADDIS		many	
NN2	EASTERN NEWT			6

Client: PGM
Project No. 09-1638
Investigators: KP VS

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 2 Station No.: L-2 Location: PGM
Datum: NAD 27 Pictures taken: 155 - 181
Date: July 7/09 Water Temperature: ____ (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
Gill Net 3	12:05	10:55	25 m	23		MT - gang set 5m exp & non
MT 13	11:48	11:10	2ft	24.5		↓
MT 14	11:50	11:05	8 ft	24.5		↓
MT 15	11:58	11:00	2 ft	25.0		↓

Gear	Species	YOY	Juvenile	Adult
				Death to small biting bugs.

Client: Stillwater
Project No. 11-1837
Investigators: MM+JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L2 Station No.: L2 Location: Stream 1, Marathon
Datum: NAD 27 Pictures taken:
Date: June 17-21, 2011 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
EXP1	14:13	11:05	1.22 → 1.52m	92h 52m	weed bed + muck	
EXP2	14:34	11:05	0.61 – 1.83m	92h 31m	Muck + rock	weed/algae
BMT1	13:59	10:55	0.91m	92h 56m	Muck + weed bed	
BMT2	14:07	11:20	1m	93h 3m	rocky + woody debris	
BMT3	14:17	11:10	0.75m	92h 53m	rock + weeds	shoal in middle of L2
BMT4	14:27	11:00	0.91m	92h 33m	rock + woody debris.	near yellow pond lily
NN1	14:04	11:00	0.61 → 0.91m	92h 56m	weeds, woody debris + muck	
NN2	14:20	11:10	0.61 → 1.22m	92h 50m	rocky + weedy area	off of dead fall tree.

Gear	Species	YOY	Juvenile	Adult
BMT1	GIANT DIVING BEETLES			2
NN1	Leech			2
	caddis		1	
EXP1	Leech			2
BMT3	EASTERN NEWT			2
	tadpoles		2	
	GIANT DIVING BEETLE			1
BMT2	GIANT DIVING BEETLE			2
BMT4	LEECH		2	8
	TADPOLES			
	GIANT DIVING BEETLES			5
NN2	EASTERN NEWT			1

Client: Marathon PGM
Project No. 09-1630
Investigators: KP, VS

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 3 Station No.: L3 Location: Marathon PGM Project Site
Datum: Nad 27 Pictures taken: 184 - 197
Date: Aug 8/09 Water Temperature: 17.2 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area(h)	Substrate	Comments
Gillnet 4	13 15	12:40	1.5m	23		gang set sm exp & Nordic
MT 16	1300	↓	2Ft	23		
MT 17	1305		1Ft	23		
MT 18	1310		4Ft	23		

Gear	Species	YOY	Juvenile	Adult

Client: Stillwater
Project No. 11-1837
Investigators: MM+JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L3 Station No.: L3 Location: Stream 2, Marathon
Datum: NAD 27 Pictures taken:
Date: June 17-21, 2011 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
BMT1	10:15	09:16	0.7m	95h 1m	Muck	SW shoreline in lilies next to rock
BMT2	10:24	09:20	0.7m	94h 56m	Muck/weed bed.	
BMT3	10:33	09:28	0.9m	94h 55m	Muck	
NN1	10:42	09:35	0.7-0.9m	94h 53m	Muck/rock sticks	
BMT4	10:30	0925	0.6 m.	94h 55m	Muck/logs woody debris	Next to log pile NE corner.
Nordic Net 2 (NN2)	10.40	0930	0.8 → 1.1m	94h 50m	Muck	N Bay near outlet
Sm Exp 1	10:50	0940	1.0m	94h 50m	Muck	Along E. shore.
Sm Exp 2	10.55	0935	1.2 → 3.1m	94h 40m	Muck	off W shore into deep hole.

BMT - Baited Minnow Trap, NN = Nordic Gillnet

Gear	Species	YOY	Juvenile	Adult
BMT4	Dragonfly Nymph		1	
NN2	GIANT WATER BUG			1
SmExp1	Redhead Duck?			1
BMT1	GIANT DIVING BEETLE			3
	DRAGONFLY NYMPH		1	

Client: Marathon PGM
Project No. 09-1630
Investigators: MM & KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake on Hare Lake Tributary Station No.: Lake 4 Location: Marathon
Datum: NAD27 Pictures taken: 544-560
Date: 16-06-10 Water Temperature: 21 (°C)

Gear	Set Time (June 16)	Lift Time (June 20)	Depth	Effort/Area (hrs)	Substrate	Comments
MT 12	12:44	14:41	.5	4d 2hrs	rocky	
MT 13	12:46	14:42	.4	4d 2hrs	rocky	
MT 14	13:01	14:55	.8	4d 1.8hrs	boulders	
MT 15	13:02	15:00	1.3	4d 2hrs	boulder wood	
MT 16	13:04	15:00	.3	4d 2hrs	sedges	
N7	12:50	15:10	.6-1.5	4d 2.7hrs	rock to weedbed	

Gear	Species	YOY	Juvenile	Adult
12	Lake Chub	—	—	8
13	N/A			
14	Lake Chub	—	—	1
15	N/A			
16	N/A			
N7	Lake Chub	—	—	100's → (259)
N7	Stickle Back	—	—	2

Client: Marathon PGM
Project No. 09-1630
Investigators: MMJT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream Catchement 2 Station No.: L5 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 7 '09 Water Temperature: ~17 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	18:55	13:20	0.6	18	willows rock	
MT2	19:00	14:25	1.0	18.5	cobble	
MT3	could not use					
NN	19:09	14:45	2.4 - 9.5	18.5	"	
GN	18:50	14:30	1.6 - 11.3	18.5	"	

Gear	Species	YOY	Juvenile	Adult
NN	Lake Chub	—	15	73

Depth	Temp	D.O (mg/L)	saturation (%)	pH	conductivity
19	4.12	1.3	.17	6.44	144/86
20	4.19	1.5	1.5	679	133/80
21	4.35	1.7	1.7	5.88	133/80
22	4.25	2.0	2.0	5.82	82/52

F

Client: Marathon PGM
Project No. 09-1630
Investigators: MM/JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream Catchement 2 Station No.: L6 Location: Marathon
Datum: NAD27 Pictures taken: Yes
Date: Aug 7/8, 2009 Water Temperature: 16 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	17:25	12:40	.3	19	weeds	
MT2	17:30	12:47	0.6	19	weeds	
MT3	17:35	12:55	0.7	19	rock	

Gear	Species	YOY	Juvenile	Adult
MT1	Lake Chub	—	—	1
MT2	Lake Chub	—	—	4
MT3	Lake Chub	—	—	26

Client: Marathon PGM
Project No. 09-1630
Investigators: MM JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream Catchement 2 Station No.: 17 Location: Marathon
Datum: _____ Pictures taken: Yes
Date: Aug 7/8, 09 Water Temperature: 17 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
~~MT1~~	16:25	~~11:05~~	~~0.40~~	~~185~~	~~soft w wood & sand~~	
MT2	16:55	11:05	0.7	18	wood	
MT3	16:59	11:10	1.0	18	boulders	
NN	16:30	11:15	~~0.8~~ 1.8	18	soft	
GN	16:50	12:00	1-6.2	18	soft	

Slimy sculpin, Pearl dace in stream

Gear	Species	YOY	Juvenile	Adult
NN	Lake Chub	—	—	149
GN	Lake Chub	—	—	1

Client: Marathon PGM
Project No. 09-1630
Investigators: NM JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Canoe Lake Watershed Station No.: L8 Location: Marathon
Datum: NAD27 Pictures taken: Yes
Date: Aug 6 '09 Water Temperature: 17.1 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	14:45	10:30	.6	19.5	fractured rock, wooden debris, muck	
MT2	14:55	10:50	.8	20	"	
MT3	15:05	10:35	.7	19	"	
NN	15:30	10:40	~~8~~-1m	19	"	
GN	15:45	10:45	~~1~~.- 2m	19	"	

mean depth .9
max 2.3

Gear	Species	YOY	Juvenile	Adult
MT1	Brook Stickleback			///
MT3	"			//
NN	"			/
MT2	"			THL THL ////

Client: Marathon PAM

Project No. 04-16-20

Investigators: MM JT

Gear	Species	YOY	Juvenile	Adult
	TOTALS			

Comments:

saw ducks, small frogs, stickleBacks, black & brown leeches

Client: Marathon (BRW)
Project No. 09-1630
Investigators: MMTT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: TWO MILE WATERSHED Station No.: L9 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 6, 2009 Water Temperature: 17-15 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	11:10	10:02	.7	23		Myriophyllum submergent veg
MT2	11:15	10:04	.7	23		"
MT3	11:45	10:10	.6	23		Rock, muck, tree stump
~~MT~~GN	11:20	10.12	1-1.5	6x75, 23		same as MT1
NN	11:38	10:20	0.9-1.4	6x46, 23		"

Wash

Gear	Species	YOY	Juvenile	Adult

Client: Marathon PGM
Project No. 09-1630
Investigators: MW TT

Gear	Species	YOY	Juvenile	Adult
	TOTALS			

Comments: moose tracks, small toads, wood frog, leeches, dragonflies,

Client: Stillwater
Project No. 11-1837
Investigators: ST, MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L9 Station No.: L9 Location: Headwaters of stream 3 Watershed.
Datum: NAD 27 Pictures taken:
Date: June 12-16/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
Baited MT1	15:50	14:00	0.3m	94h 10min	Muck/sticks detritus	E. side of old beaver lodge
Baited MT2	16:00	13:55	0.9m.	93h 55min	Muck	Near S beaver dam.
Baited MT3	16:05	14:10	0.4m.	94h 5min	Muck/logs.	@ old outlet Near N beaver dam
Baited MT4	16:10	14:00	0.6m	93h 50min	Muck/bedrock.	off bedrock near inlet
Nordic Net 1	16:00	13:55	0.91→1.21	93h 55min	Muck	off rocky point towards ridge
Nordic Net 2	16:10	14:05	0.35-0.91	93h 55min	Muck woody debris	off rock shelf out to deeper water

Gear	Species	YOY	Juvenile	Adult
NN1	GIANT DIVING WATER BEETLE			1
	EASTERN NEWT			1
	GIANT WATER BUG			5
BMT2	leeches			2
BMT4	GIANT DIVING WATER BEETLE			1
	EASTERN NEWT			2
BMT1	leech			2
	GIANT DIVING WATER BEETLES			2
	GIANT WATER BUG			2
NN2	leech			5
BMT3	EASTERN NEWT			5
	LEECH			4
	GIANT DIVING WATER BEETLE			1

17:30
Kd V headed to 13

Client: Marathon PGM
Project No. 09-16-30
Investigators: MM JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Two Ducks Watershed Station No.: L9 a Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 5 17:10 Water Temperature: 1 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	17:15	10:30	.5	17	soft, woody debris	Wash
MT2	17:20	10:31	.6	17	"	Wash
MT2	17:25	10:32	.6	17	"	Wash
NT	17:33	10:33	.6-.5	6x40 17	"	Wash

Gear	Species	YOY	Juvenile	Adult

Client: _____
Project No. _____
Investigators: _____

Gear	Species	YOY	Juvenile	Adult
	TOTALS			

Comments:

Wood frog

Client: Marathon PGM
Project No. 09-1630
Investigators: JT, MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Two Duck Lake Station No.: L10 & L11 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 5th 09 Water Temperature: _____ (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area (h)	Substrate	Comments
MT 1	15:53	10:15	.5	18	soft, wood debris emerg veg	Wash
GN+NN1	16:10	9:50AM	.5>3.2>2.5	75x6, 40x6 18		Wash leech newt Fantail. Damselfly
MT 2	16:15	9:55	1.8m	18	soft, weed bed	
MT 3	16:35	10:00	1.8m	17.5	soft silt fractured rock	Wash
GN2	16:41	10:10	.5 to 1.2m	75x6 17.5	soft, woody debris	Wash

Gear	Species	YOY	Juvenile	Adult

Client: Stillwater
Project No. 11-1837
Investigators: ST, MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L10 Station No.: L10 Location: Headwaters of Stream 3 Watershed
Datum: NAD27 Pictures taken:
Date: June 13-16/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
Baited MT 1	14:20	12:20	0.7m	94hr	Muck / macrophytes	Near inflow
Baited MT2	14:35	12:30	0.75m	93h 55min	Bedrock/Muck	IN CHANNEL BTT 2 sections of bog.
Baited MT3	14:40	12:40	0.60m	94h	Muck/woody debris	NE basin next to Woody debris
Baited MT4	14:50	12:50	1.20m.	94h	Bedrock/Muck	off point near channel to L11
Nordic Net 1	14:45	12:45	1.21m	94h.	Muck	off NE sided bog stretching E.
Nordic Net 2	15:15	13:15	0.91>1.83m	94h	Muck/woody debris	off W shore out to deep hole.
Sm. Exp 1	14:35	12:25	1.5→3.4m	93h 50min	Muck	IN deep hole off bog.
Sm. Exp 2	15:05	12:55	0.91→2.1m	93h 50min	Muck	tied off snag in bog stretching SW

Gear	Species	YOY	Juvenile	Adult
BMT1	tadpole		6	
BMT2	Giant DIVING WATER BEETLES			3
BMT3	EASTERN NEWT			3
	TADPOLES		4	
	GIANT DIVING WATER BEETLE			6
	DRAGONFLY NYMPH		2	
BMT 4	GIANT DIVING WATER BEETLE			3

Client: Stillwater
Project No. 11-1837
Investigators: JT + MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L11 Station No.: L11 Location: Headwater of Stream 3
Datum: NAD 27 Pictures taken: 139 - 165 (MM)
Date: June 12-16, 2011 Water Temperature: _____ (°C)

Gear	Set Time June 12	Lift Time June 16	Depth (feet)	Effort/Area	Substrate	Comments
BMT1	14:10	12:22	0.91m	94h 12min	Muck + rock	next to dead fall in channel on right
BMT2	14:15	12:30	0.30m	94h 15min	Muck + weed bed	manna, burr reed sedge, near dead stand.
NN	14:20	12:26	0.61-1.22m	94h 6min	Muck + weed bed	tied to dead stand
BMT3	14:28	12:35	0.3m	94h 7min	fractured rock	macro bed. sedges, manna.
BMT4	14:30	12:39	1.22m	94h 9min	muck + weed bed	set off rock face near beaver dam
Exp	14:40	12:42	0.61-2.44m	94h 2min	Muck + weed	from dead fall

BMT = Baited Minnow Trap, NN = Nordic

Gear	Species	YOY	Juvenile	Adult
BMT1	tadpole		4	
BMT2	Eastern Newt			1
BMT3	Dragonfly Nymph		2	
BMT4	Eastern Newt			1
	tadpole		2	
	leech			2

Client: PGM
Project No. 09-1630
Investigators: KP VS

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream Catchment 3 Station No.: Lake 12 Location: Marathon
Datum: NAD 27 Pictures taken:
Date: Aug 6/09 Water Temperature: 17.3 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT 7	10:38	14:33	1.5m	26		
8	10:41	14:30	0.75m	26		
9	10:44	14:24	1.5m	26		
GNet 1	11:00	14:22	Net Height	25		

Gear	Species	YOY	Juvenile	Adult

Client: Stillwater
Project No. 11-1837
Investigators: ST, MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L12 Station No.: L12 Location: Headwaters of Stream 3 watershed
Datum: NAD27 Pictures taken:
Date: June 12-16/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
Baited MT1	11:45	11:10	0.6m	95h 25min	Muck	off bog in S. bay
Baited MT2	12:00	11:00	0,90m	95h	Rocky / woody debris w some muck	off rocky shelf in SE shoreline
Baited MT3	12:25	10:55	0.8m	94h 30min	Muck/wood debris	E shore near stick pile
Baited MT4	12:30	11:05	1.1m	94h 35min	Boulder/Muck	Near outlet off rocky shelf
Nordic Net 1	11:55	11:05	0.91→1.21m	95h 10min	Muck	off bog in S bay
Nordic Net 2	12:45	11:00	1.52→1.83m	94h 15min	Mud/rock/logs	set across outlet bay.
Sm. Exp 1	12:05	10:58	0.91→1.52m	94h 53min	Muck/rock	set off rock near point
Sm. Exp 2	12:20	10:50	1.21→1.52m	94h 30min	Muck	NE corner

Gear	Species	YOY	Juvenile	Adult
BMT2	tadpole		1	
NN1	Giant Water Bug			2
BMT1	Giant Diving Water Beetles			3
	tadpole		1	
	leech			2
	Dragonfly nymph		3	
BMT3	leech			2
	tadpole		2	
BMT4	Giant DIVING WATER BEETLES			1

Client: PGM
Project No. 09-1630
Investigators: KP VS

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 13 Station No.: L13 Location: MPGM
Datum: NAD 27 Pictures taken: 93 - 105
Date: Aug 5/09 Water Temperature: 15.85 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT 1	16:44	11:50	0.5	19	Muck	
MT 2	16:45	↓	↓	19	↓	
MT 3	16:49 KP	↓	↓	19	↓	

Gear	Species	YOY	Juvenile	Adult
3	leech			

Client: St. Hwater
Project No. 11-1837
Investigators: ST, MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L13 Station No.: L13 Location: Headwaters of stream 3 watershed
Datum: NAD 27 Pictures taken:
Date: June 12-16/11 Water Temperature: (°C)

Gear	Set Time June 12	Lift Time June 16	Depth	Effort/Area	Substrate	Comments
Baited MT1	10:45	10:00	0.6 m.	95h 15min	Mucky Bottom	Next to log pile.
Baited MT2	10:50	10:05	0.7m	95h 15min	Muck/macrophytes	Set in bay in bog next to macrophyte bed.
Baited MT3	10:50	10:00	0.65M	95h 10min	Boulders/logs	& shoreline
Baited MT4	11:05	10:05	1.0M	95h	Mucky	Near off bog
Nordic Net 1	11:10	10:10	0.8m	95h	Mucky/woody debris	across small inlet from bog

Gear	Species	YOY	Juvenile	Adult
BMT3	leeches			2
BMT4	leeches			2
	tadpoles		2	
NN	Leopard frog			1
	Giant water bug			2
BMT1	Giant water beatle			1
	dragonfly nymph		1	
BMT2	leeches			5
	dragonfly nymph		1	
	tadpoles		4	

Client: PGM
Project No. 09-1630
Investigators: KP VS

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 139 Station No.: L13A Location: Marathon PGM Project Site
Datum: NAD 27 Pictures taken:
Date: Aug 5/09 Water Temperature: 18 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT 4	18:32	11:58	0.5	16.5	Muck	
MT 5	18:34	↓	↓	16.5	↓	
MT 6	18:37	↓		16.5	↓	

Gear	Species	YOY	Juvenile	Adult
MT	Leech			

Client: St. Water
Project No. 11-1837
Investigators: ST, MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L13a Station No.: L13a Location: Headwaters of Stream 3 watershed
Datum: NAD27 Pictures taken:
Date: June 12-16/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
Baited MT1	10:15	9:40	0.5m	95h25min	Muck bottom near pile of sticks	Old beaver lodge
Baited MT2	10:15	9:32	0.30m	95h17min	Muck	IN AMONG ROOT WAD.
Baited MT3	10:20	9:26	0.30m	95h6min	Rocky bottom	Next to boulder pile in NW corner
Baited MT4	10:20	9:30	0.7m	95h10min	Mucky/detritus	Next to beaver dam
Nordic Net 1	10:25	9:35	1.0-1.2m	95h10min	Muck/woody debris	⊥ to beaver dam.

Gear	Species	YOY	Juvenile	Adult
BMT3	Caddis		many all over trap	
	Leopard Frog			1
	Dragonfly nymph		3	
BMT2	Giant Water Bug			1
BMT1	Eastern Newt			3
	Giant Water Bug			1
	Caddis		many	
	Dragonfly nymph		4	
BMT4	Giant Water Beetles			2
Nordic Net 1	Eastern Newt			5
BMT4	Caddis		many all over trap	

F

Client: Marathon PGM
Project No. 09-1600
Investigators: MMJT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream Catchment 2 Station No.: L14 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 3rd 09 Water Temperature: 15 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	17:15	10:05	.8	17.	soft mud rock and log	
MT2	17:20	10:20	.7	17	soft grass	
MT3	17:40	10:15	.8	17	soft in weed bed	moved -> stickle
NN	17:35	10:10	0.7 - 1	17	Soft algae	
GN	17:30	10:00	0.8 - 1.2 - 0.8	17	soft algae	Wash

Gear	Species	YOY	Juvenile	Adult
MT1	Brook Stickleback	—	—	10
NN	Lake Chub	—	—	1
	Brook Stickleback	—	—	1
MT3	"	—	—	49
MT2	"	saw	saw	50
		while walk around the Lake.		

Client: Marathon PGM
Project No. 09-1630
Investigators: MMJT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: STREAM CATCHMENT 2 Station No.: L15 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 6-7 09 Water Temperature: 15-12 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area (s)	Substrate	Comments
MT1	17:57	11:30	.6	17	clay, muck	Wash
MT2	17:50	11:32	.7	17	"	3
MT3	17:55	11:36	.6	17	"	Wash
MT4	18:05	11:40	1.0	17	rock + trees	1

Gear	Species	YOY	Juvenile	Adult
MT2	Brook stickleback			3
MT4	Brook stickleback			1

Client: Marathon PGM
Project No. 09-1630
Investigators: MH JT

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Two Ducks Watershed Station No.: L16 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 6-7 '09 Water Temperature: 17-14 (°C)

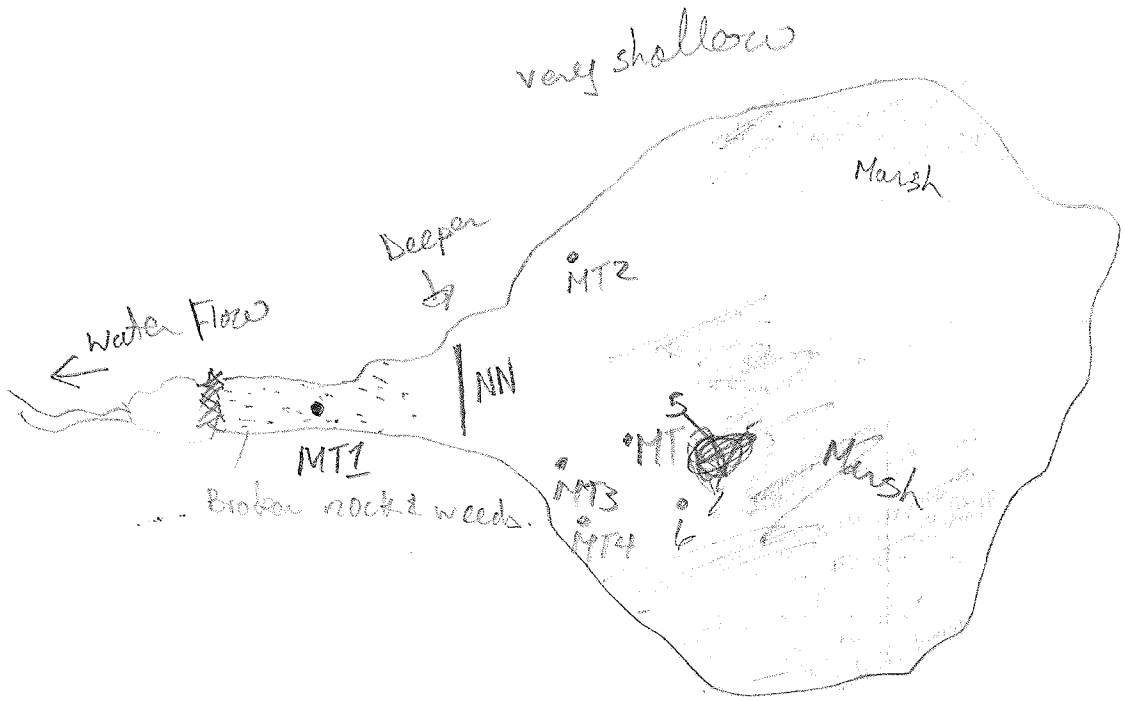
Gear	Set Time	Lift Time	Depth	Effort/Area (h)	Substrate	Comments
MT 1	19:00	12:34	.6	17.5	broken muck; boulder rock, weeds	Wash
NN	19:15	12:36	.4-.7-.4	6x40, 17.2	"	Wash
MT 2	19:25	12:50	.45	17	muck waterlily sedges	Wash
MT 3	19:24	12:46	.5	17	muck woody debris	Wash
MT 4	19:27	12:43	.2 oops	17	"	Wash
MT 5	19:36	12:39	.7	17	"	Wash
MT 6	19:36	12:30	.5	17	"	Wash

Gear	Species	YOY	Juvenile	Adult

Client: Marathon PGM
Project No. 99-L-30
Investigators: MMJT

Gear	Species	YOY	Juvenile	Adult
	TOTALS			

Comments:



Client: Stillwater
Project No. 11-1837
Investigators: ST, MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L16 Station No.: L16 Location: Headwaters of stream 3 watershed.
Datum: NAD 27 Pictures taken:
Date: Sun 12-16/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
Baited MT1	17:35	15:10	0.4 m	93h 35min	Muck/woody debris	off point in macrophytes
Baited MT2	17:40	15:05	0.6m	93h 25min	Muck	in patch of yellow pond lilies
Baited MT3	17:45	N/A	0.4m	N/A on shore destroyed by moose.	Muck/logs	west shoreline
Baited MT4	17:50	14:45	0.6m	92h 55min	Muck/Stick detritus	NE shoreline near old beaver lodge
Nordic Net 1	17:18	14:30	0.9 1 m	93h 12min	Muck, Macrophyte	lily pads
Nordic Net 2	17:20	14:50	0.6/-0.9/m	93h 30min	Muck, Boulder garden	perpendicular to Dam, in channel
5m. Exp.	17:25	14:45	0.61 - 1.22m	93h 20min	Muck, Macrophyte	at channel entrance

Gear	Species	YOY	Juvenile	Adult
NN1	Eastern Newt			1
	Giant Water Bug			2
	Giant Diving Beetle			1
5m Exp	Caddis		many x 10	
NN2	Caddis		many x 100	
	leech			21
BMT4	tadpoles			4
	caddis		2	
	damselfly nymph		1	
BMT2	EASTERN NEWT			1
	GIANT DIVING WATER Beetle			12
	GIANT WATER BUGS			5
	LEECH			1
BMT1	Tadpoles		3	

→over

Client: Stillwater ✓
Project No. 11-1837
Investigators: JT, MM

Gear	Species	YOY	Juvenile	Adult
BMT1	leech			1
	TOTALS			

Comments:

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Stream Catchment 3 Station No.: S21 → L17 Location: Marathon.
Datum: NAD27 Pictures taken: 372 - 376, 310 - 315
Date: AUG 12/09 Water Temperature: 19.1 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT 104	11:32	10:40	0.75m	23		
105	11:38		1m	23		
106	10:52		0.5m	23		
107	10:57		1m			
GNet 101	11:00	10:40	2m	24		5m exp

Gear	Species	YOY	Juvenile	Adult
MT 106	Brook SB			2
MT 107	"			1

Client: Marathon PGM
Project No. 09-1636
Investigators: MM & KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 17 Station No.: Lake 17 Location: Marathon
Datum: NAD27 Pictures taken: 478-503
Date: 16.06.10 Water Temperature: 19.2 (°C)

Gear	Set Time (June 16/10)	Lift Time (June 20/10)	Depth	Effort/Area	Substrate	Comments
MT1	9:10	8:54	.5m	4d	rocky Bog	
MT2	9:16	8:59	.6m	3d 23.7hrs	muck & sedge	
MT3	9:47	10:05	.25m	4d 0.2hr	bedrock & boulders.	lots of SB
N1	9:20	10:10	.5 - 1.5m	4d 0.8hr	muck + sedge.	2NN 1EN (sm)

Gear	Species	YOY	Juvenile	Adult
MT1	Tadpoles			6
MT2	Brook Stickleback			1
"	Leech			1
"	Beetles			6
MT3	Stickleback			2
"	2 Frogs leopard.			2
"	Clutch of frog eggs	Many.		
N1	Brook Stickleback			III
"	Frog			III
"	UFR No depth See photo →	Lake Chub.		1 Chub. in DN Panel.

N_1 = 2 Nordic + 1 sm Exp

Client: Marathon PGM
Project No. 09-1430
Investigators: MM JT

via 17.7

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Clay Lake Watershed Station No.: L18 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 10th 2009 Water Temperature: 17-13 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	13:35	13:10	1.0m	23.5	soft coontail	Wash
MT2	13:40	13:27	1.5m	23.5	rocky & steep	
MT3	14:00	13.27	.6m	24.5	weed gulf & weed patch	
5mExp	13:45	13:00	1.0-2.2m	23.5	rock, muck & trees	Wash
NN	13:50	13:20	1.4m-1.8m	23.5	rock, muck & trees	

-Slimy water on

Gear	Species	YOY	Juvenile	Adult
MT1	—	—	—	—
MT2	Fine Scale Dace	—	—	9
	Brook stickleback	—	2	5
MT3	Brook Stickleback	—	—	9
	Northern Redbelly Dace	=	—	16 12
	Fine scale Dace			
	Blacknose Shiners	=	=	3 6
	Fathead Minnows			
NN	Longnose Sucker	—	—	2
	Brook Stickleback	—	—	2
	Blacknose Shiners	—	—	3
	Fine scale Dace	—	—	12

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: stream Catchment 2 Station No.: Lake 20 Location: Marathon
Datum: Nad 27 Pictures taken: Yes
Date: Aug 12/09 Water Temperature: 17.4 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT 100	10:08	9:12	0.5m	23		
101	10:12		1 m	23		
102	10:39		0.5m	23		
103	10:42		0.25m	23		
GNS 100	10:22		3m	23		Nordic

Gear	Species	YOY	Juvenile	Adult

Client: Stillwater
Project No. 11-1837
Investigators: JT, MM, TM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L20 (Terra Lake) Station No.: L20 Location: Headwaters of Stream 2
Datum: NAD 27 Pictures taken: P6060018 – 19 (Joe)
Date: June 7-11/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1 Baited	13:30	9:20	0.91 m	91h 50min	rocky area	
MT2 Baited	13:20	9:11	0.46 m	91h 51min	woody debris & muck	
MT3 Baited	13:20	9:29	0.91m	92h 9min	Downed tree & muck	
MT4 Baited	13:15	9:35	1.52m	92h 20min	Dead fall	
Nordic Net 1	13:25	9:16	0.61 – 1.52m	91h 9min	Muck	
Nordic Net 2	13:15	9:32	1.83 – 0.91m	92h 17min	Muck	
Sm. Exp 1	13:20	9:25	5.79 – 0.30m	92h 5min	Muck	

Gear	Species	YOY	Juvenile	Adult
BMT2	tadpoles		2	
	Giant Water Beetle			1
NN1	leopard frog			1
	Giant Water Beetle			3
BMT4	tadpoles		26	
EXP	leech			1
BMT3	tadpoles		3	
	dragon fly nymph		2	
NN2	leech			1
MT4	tadpoles		7	

Client: St. Ilwater
Project No. 11-1837
Investigators: ST, MM, TM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L21 Station No.: L21 Location: Headwaters of Stream 4
Datum: NAD27 Pictures taken: P6060009-16 (JOE)
Date: June 7-11/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT Baited	11:25	13:10	0.46m	97h 45min	Muck weed bed	
MT2 Baited	11:38	12:58	0.9/m	97h 20min	Weed and Muck	Beaver dam
MT Baited	11:30	13:17	1.5m	97h 47min	Muck/Woody Debris	Next to floating Bog Island.
MT Baited	11:50	13:25	1.5m	97h 35min	Muck	Off bug island near beaver lodge
Nordic Net1	11:42	13:20	0.61-0.91m	97h 38min	Muck	
Nordic Net2	11:40	13:06	0.61-0.91m	97h 26min	Muck with woody debris	North bay in among logs.
Sm. Exp.	11:32	12:53	0.91-1.22m	97h 21min	Muck	

Gear	Species	YOY	Juvenile	Adult
Exp	dragonfly nymph		1	
	leech			3
NN2	leech			2
MT1	Giant Diving Beetle			11

Client: St. Water
Project No. 11-1837
Investigators: JT, MM, TM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L22 Station No.: L22 Location: Headwaters of Stream 4
Datum: NAD27 Pictures taken: P6060001-7 (JoE)
Date: JUNE 7-11/11 Water Temperature: ____ (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1 Baited	10:22	10:34	0.30m	96h 12min	Muck	manna grass
MT Baited	10:10	11:30	1.52m	97h 20min	Muck + rock	
MT Baited	10:15	N/A	1.8m	—	Muck	Float came undone unable to retrieve
MT4 Baited	10:20	11:58	1.22m	97h 38min	Muck	Next to Macrophyte bed.
Nordic Net1	10:15	10:42	0.91 → 1.22m	96h 27min	Muck	
Nordic Net2	10.25	11:55	0.91 → 2.44m	97h 30min	Muck	
SmExp	10:15	10:47	1.22 → 4.27m	96h 32min	Muck sticks	

Gear	Species	YOY	Juvenile	Adult
MT1	leeches			6
	Giant Water bugs			21
NN1	Tadpole		1	
	leech			1
	Eastern Newt			1
MT4	Eastern Newt			2
	Giant Water Bug			2
	dragonfly nymph		1	

Client: PGM
Project No. 09-1630
Investigators: VS, KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 23 Station No.: L23 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 12/09 Water Temperature: 17.4 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
GNet 103	13:13	~11:00	0.5 - 1.4m	22		Nordic
GNet 105	14:06		4.5 - 9.5m	21		Sm exp
MT 108	13:16		0.5m	22		

Gear	Species	YOY	Juvenile	Adult

Client: PGM
Project No. 09-1630
Investigators: KP, VS

___ of ___

Gear	Species	YOY	Juvenile	Adult
	TOTALS			

Comments:
Stickleback Seen in Water

Client: Marathon PGM
Project No. 09-1630
Investigators: MM + KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 25 Station No.: Lake 25 Location: Marathon
Datum: NAD27 Pictures taken: 522 - 542
Date: 16.06.10 Water Temperature: 19 (°C)

Gear	Set Time (Usual 16)	Lift Time (Usual 20)	Depth (cm)	Effort/Area	Substrate	Comments
MT 7	11:32	13:05	.5	4d 1.5hrs	rock & muck	
MT 8	11:36	13:10	1	4d 1.5hrs	clif bedrock	
MT 9	11:46	13:10	.5	4d 1.5hrs	logs	
MT 10	11:50	13:15	.3	4d 1.5hrs	stumps & weeds	
MT 11	11:52	13:15	.8	4d 1.5hrs	logs & weeds	
N# 3	11:44	13:10	1m - 1.2	4d 1.5hrs	rock & muck	
N# 4	11:56	13:10	.8 ~ 1.5	4d 1.7hrs	Woods & muck	
N# 5	11:58	13:10	.7 - 1	4d 1.7hrs	weeds, woods muck	

Net 3 + 5 were Nordic Nets
Net 4 was a small experimental.

Gear	Species	YOY	Juvenile	Adult
MT7	Tadpole	—	—	~~1~~ 2
11	Beetles	—	—	~~1~~ 2
MT8	Tadpole	—	—	20
11	Beetle	—	—	1
MT9	Tadpole	—	—	22
11	Beetle	—	—	1
MT10	Tadpole	—	—	10
MT11	Tadpole	—	—	5
11	Beetles	—	—	5
N4	MT	—	—	—
N5	MT	—	—	—
N6	~~1~~ Frogs	—	—	3

Client: Stillwater
Project No. 11-1837
Investigators: JT, KP, TM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L25 Station No.: L25 Location: Headwater of Stream 5
Datum: Nad 27 Pictures taken:
Date: June 7-11/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1 (Baited)	13:15	0855	0.40m	91h 40min	Bog	IN LOWER POND
MT2 (Baited)	13:15	0855	0.35 m	91h 40min	Bog	IN LOWER POND
MT3 (Baited)	13:10	0910	0.5	92h	Bog/Muck	Next to rock in middle pond
MT4 (Baited)	13:10	0905	0.50	91h 55min	Bog with Rocks.	Next to Log in upper pond
NN	13:00	0905.	1.5	92h 5min	Rocky	upper pond // to shore.
NN	13:10	0900	1.0	91h 50min	Bog	destroyed by Moose
SM EXP	13:00	0910	1.5	92h 10min	Boulders/Logs	at outlet end of middle pond
SM EXP	13:20	0900	1.0	91h 40mn	Rock/Muck Sticks.	IN lower pond

Gear	Species	YOY	Juvenile	Adult
MT4	giant water beetle	-	-	1
MT1	beatle larva	1	-	-
MT2	giant water beetle	-	-	2
MT2	tadpole	-	1	-
MT3	giant water beetle	-	-	5

Client: PGM
Project No. 09-1630
Investigators: KPVS

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Lake 26 Station No.: L26 Location: Marathon
Datum: NAD 27 Pictures taken: 220 - 226
Date: Aug 8/01 Water Temperature: 17.5 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
GNet 5	17:10	10:45	1.5m	16.5		gang set sm exp & nordic
MT 19	16:55	↓	0.75m	16.5		
MT 20	16:57	↓	0.5m	16.5		
MT 21	16:58	↓	1m	16.5		

Gear	Species	YOY	Juvenile	Adult

Client: RGM
Project No. 09-1630
Investigators: YP MM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L26 Station No.: L26 Location: Marathon
Datum: NAD 27 Pictures taken: 575 -
Date: 17-21/06/10 Water Temperature: 20 (°C)

Gear	Set Time (June 17)	Lift Time (June 21)	Depth (m)	Effort/Area	Substrate	Comments
MT 17	14:02	15:33	0.30	4d 1.5h	muck	
18	14:05	15:35	0.80	4d 1.5h	rock+muck	
19	14:06	15:35	0.6	4d 1.5h	muck log	
N 10	14:03	15:33	0.6-2.0	4d 1.5h	muck+log	

Gear	Species	YOY	Juvenile	Adult
MT17	Tadpoles			3
	water beetle			1
	Dragon fly			1
18	Inverts			-
	tadpoles			5
19	tadpoles			6
N10	MT			

F

Client: Marathon PGM
Project No. 09-1630
Investigators: MM, Ray, BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L27 (above Hare L.) Station No.: L27 Location: Marathon
Datum: NAD 27 Pictures taken: Yes
Date: Aug 12-13 '09 Water Temperature: 18-15 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT 1	11:30	10:40	0.8	23	Bog	Wash
MT 2	11:32	10:42	0.7	23	Rocky soft bottom	Wash
MT 3	11:45	10:55	1.0	23	Weeds soft	Wash
MT 4	11:47	10:57	0.6	23	Rock, weeds	Wash
NN	11:50	10:50	.8 X 1.1	23 x 40	Rock, weeds	Wash

Gear	Species	YOY	Juvenile	Adult

Client: Marathon PGM
Project No. 09-1630
Investigators: MM-Ray-BF

Gear	Species	YOY	Juvenile	Adult
	TOTALS			

Comments:

Some dabbler ducks.

Client: Marathon PGM
Project No. 09-1630
Investigators: MM & KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L 27 Station No.: Lake 27 Location: Marathon
Datum: NAD27 Pictures taken: 504 - XPXP 519
Date: 16.06.10 Water Temperature: 19 (°C)

Gear	Set Time (June 16)	Lift Time (June 20)	Depth	Effort/Area	Substrate	Comments
MT 4	10:17	11:04	1 m	½d 0.7 hr	Muck/Bog	
MT 5	10:24	11:06	1m	½d 0.5hr	Bedrock/Trees	
MT 6	10:30	11:30	0.8	½d 1hr	off weedbed + log	
N 2	10:35	11:30	3-4ft	½d 1hr	log + weedbed	

Gear	Species	YOY	Juvenile	Adult
MT4	Dragonfly Nymph			1
MT5	Empty			
MT6	Empty			
N2	No Fish			

N_2 = 1 Nordic + 1 Sm Exp

Client: Stillwater
Project No. 11-1837
Investigators: ST, KP, TM

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L27 Station No.: L27 Location: Headwaters of Stream 5
Datum: NAD 27 Pictures taken:
Date: June 7-11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1 (Baited)	14.15	0950	0.5m	9/h 35min	Mucky/bog	
MT2 (Baited)	14:15	0950	1.5m	9/h 35min	Rocks/logs.	
MT3 (Baited)	14:30	10:40	1.0m	92h 10min	Muck + Rocks	
MT4 (Baited)	14:45	10:35	1.0m	91h 50min	Muck and Logs	
Nordic Net 1	14:30	10.35	1.0 → 1.3m	92h 5min	Muck bottom. lg logs near by	
Nordic Net 2	14:20	10:30	1.0 → 1.5m	92h 10min	Muck with woody debris	
Sm. Exp	14.30	10:40	1.0m	92h 10min	Muck and woody debris	
Sm. Exp	14:45	10:20	0.91 → 1.21m	91h 35min	Rocky with muck and woody debris	Near inlet @ N end.

Gear	Species	YOY	Juvenile	Adult
MT3	dragonfly nymph	-	1	-
MT4	tadpoles	-	2	-
MT4	dragonfly nymph	-	1	-

Client: Stillwater
Project No. 11-1837
Investigators: ST, MM, KP

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: L29 Station No.: L29 Location: Stream | Watershed
Datum: NAD 27 Pictures taken: P6070019-24; P6110199-200 (JDE)
Date: June 7-11/11 Water Temperature: (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1 (Baited)	14:45	11:55	0.50m	93h 10min	woody debris / muck	IN AMONG LOGS.
MT2 (Baited)	15:00	12:00	0.70m	93h	Muck/woody debris	IN PILE OF STICKS
MT3 (Baited)	15:22	12:15	0.6m	92h 53min	gravel / boulder	Near old beaver dam.
MT4 (Baited)	15:25	12:20	1.2m	92h 55min	Muck	Next to bog island
Nordic Net	15:00	12:00	1.2→1.5m	93h	Muck/woody debris	off pile of stick N end
Nordic Net	15:30	12:25	1.2m	92h 55min	Muck/Veg	Near bog island
Sm. Exp.	15:10	12:05	1.2→1.8m	92h 55min	Muck/fallen logs	off W shore @ pt. at towards middle
Sm. Exp.	15:20	12:10	1.5→1.8m	92h 50min	Muck/sticks	Across outlet bay mouth

Gear	Species	YOY	Juvenile	Adult
MT1	beetle	-	-	1
MT3	dragonfly nymph	-	1	-
MT4	dragonfly nymph	-	1	-
MT4	leeches	-	-	2
MT4	giant water beetle	-	-	2

Client: Marathon P&M
Project No. 09-1630
Investigators: MM Ray, BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: Malpa Lake Station No.: Malpa Lake Location: Marathon
Datum: NAD27 Pictures taken: Yes
Date: Aug. 12-13'09 Water Temperature: 18-19 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	10:10	9:?10	.8	23.5	soft, log, wood	
MT2	10:20	9:50	.7	23.5	weed, soft, wood	
MT3	10:30	9:55	1.2	23.5	Rocky shore	
MT4	10:50	10:20	.8	23.5	soft, weeds, wood	
NN	10:40	10:10	1.2 - .8	23.5	soft, weeds, wood	

Gear	Species	YOY	Juvenile	Adult
MT3	Eastern Newt			
NN	Eastern Newt			

Client: MARATHON PGM
Project No. 09-1638
Investigators: BE/BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HART LAKE Station No.: HL Location: ENTIRE LAKE
Datum: NAD 27 Pictures taken: YES
Date: Aug 6/09 Water Temperature: 18 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT 1	16:35 Aug 6	16:05 Aug 7	3 ft		wild rice stand.	48 47.301 086 22828
MT 2	19:00	16:00	4 FT		MARGINATUS WATER LILY	48 49.314 86 23.624
MT 3	19.20	15:50	2 FT		ROCK BOULDERS	48° 46.994 86° 23.979
MT 4	19:25	15:45	2 FT		BOULDERS COBBLE	48° 46.910 86° 24.073
SEINE NET	15:15 AUG7	15:20 AUG7	0.2-1m	40m x 10m	SAND SILT GRAVEL	48°46.873 86° 24 110
MT 5	16:10 AUG 7	10.35 AUG8	0.5m		silt w/ macrophytes	4847.281 86 22.739
MT 6	16:20 Aug 7	10:40 Aug 8	0.5m		silt w/ bur reed	4847.327 86 22.900
MT 7	16:25 Aug 7	10:45 Aug 8	0.25m		rock	48 47.345 86 23.138
MT 8	16:[illegible]	10:50 Aug 8	[illegible]		mucky w/ some boulders	48 47.118 86 23.410

Gear	Species	YOY	Juvenile	Adult
SEINE	LOGPERCH		~~|||| |||| ||||~~ ~~|||| |||| |||~~	|||| ||
SEINE	SPOTTAIL SHINER			|||| |||| ||
SEINE	YELLOW PERCH		||	|
MT 4	SPOTTAIL SHINER			|

Client: MARATHON PGM
Project No. 09-1698
Investigators: RE / BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARE LAKE Station No.: HL1F Location: INLET
Coordinates: 48° 47.254 N 86° 22.927 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1-6"
Net Set Date: 06/08/09 Time: 17:00
Net Removed Date: 07/08/09 Time: 9:30
Total Fishing Time: 16.5 (hrs) Depth of Set: 1-8 (m)
Substrate Characteristics: SILT GRANICS MACROPHYTES BEDROCK SHORE

Fish Species	(Total) Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
NORTHERN PIKE	68.4	1950	(9lbs 10oz) released
NORTHERN PIKE	24.6	97	released.
NORTHERN PIKE	22.5	65	dead
NORTHERN PIKE	43.2	450	dead
NORTHERN PIKE	29.0	166	dead.
NORTHERN PIKE	46.5	610	HLNP-3M,3L FEMALE CISCO in stomach
Northern Pike	55.9	1280	HLNP-4M,4L Female Perch in stomach
Yellow Perch	15.7	44.	dead. HLYP-2
Yellow Perch	10.7	13	released
Yellow Perch	-	-	similar in size to above

Client: MARATHON PGM
Project No. 09-1658
Investigators: RG | BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARB LAKE Station No.: HL2F Location: SOUTH SHORE
Coordinates: 48° 47.026 N 86° 23.536 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1-6"
Net Set Date: 06/08/09 Time: 17:30
Net Removed Date: 07/08/09 Time: 10:05
Total Fishing Time: 17.3 (hrs) Depth of Set: 3-25 (m)
Substrate Characteristics: BEDROCK ?

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
Northern Pike	65.6	1650	dead #LNP-2m,2L FEMALE
Burbot	63.0	1410	@ 50ft of water ; released
Cisco	11.8	10.5	dead

Client: MARATHON PGP
Project No. 09-1658
Investigators: RE / BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARE LAKE Station No.: HL3F Location: NORTH SHORE WEST OF SPHERE
Coordinates: 48° 47.324 N 86° 23.306 W Datum: NAD 27
Gear Type: Gillnet ( ) Trapnet (X) Other ( ):
Net Size: (l x w x h): 4' Mesh Size (inch): 3/8"
Net Set Date: 06/08/09 Time: 18:30
Net Removed Date: 07/08/09 08/08/09 Time: 12:20 RBSG
Total Fishing Time: 17.8 (hrs) Depth of Set: 1-2 (m)
Substrate Characteristics: SILT DETRITUS

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
07/08/09 N. Pike	49.5	600	released
Y. Perch	16.2	35	HLYP-1
Y perch	—	—	Ad. 11 (2) Juv (11) Y o Y
Spottail Shiner	—	—	Ad (83) Juv (33) (18)
08/08/09 N. Pike	51.0	775	released (165)
Y. Perch	25.5	170	released
Y. Perch	12.1	60	HLYP.4 (113)
Y. Perch			Ad. 1 (11) Juv. Y o Y
Spottail Shiner			Ad (44) Juv (42)

Client: MARATHON PGA
Project No. 09-1658
Investigators: RR/RE

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HALF LOAF Station No.: HLYF Location: NEAR NORTH INLET
Coordinates: 48°47.197 N 86°23.675 W Datum: NAD 27
Gear Type: Gillnet ( ) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 75' x 6' Mesh Size (inch): 1½, 2, 2½
Net Set Date: 06/08/09 Time: 19:15
Net Removed Date: 07/08/09 Time: 10:25
Total Fishing Time: 15.2 (hrs) Depth of Set: 1-5 (m)
Substrate Characteristics: ORGANIC SILT

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
N. PIKE	73.0	2410	dead. HLNP-1M, IL. MALE

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE / BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HART LK Station No.: HLSF Location: SOUTH WEST END
Coordinates: 45° 46.853 N 86° 23.918 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 325' x 6 Mesh Size (inch): 1-6"
Net Set Date: 07/08/09 Time: 10:50
Net Removed Date: 08/08/09 Time: 9:35
Total Fishing Time: 22.7 (hrs) Depth of Set: 2-11 (m)
Substrate Characteristics: SILT

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
YELLOW PERCH	26.0	200	F CMAUS

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE / BC

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HART LAKE Station No.: HL6F Location: SOUTH SHORE
Coordinates: 48°47.136' N 86°23.204 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1-6"
Net Set Date: 07/08/09 Time: 11:05
Net Removed Date: 08/08/09 Time: 9:50
Total Fishing Time: 22.8 (hrs) Depth of Set: 3-22 (m)
Substrate Characteristics: ORGANIC SILT

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
NO FISH			

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARE LAKE Station No.: HL7F Location: EAST END
Coordinates: 48° 47.283 N 86° 22.791 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 25'x6' Mesh Size (inch): 1½-2, 2½
Net Set Date: 07/08/09 Time: 12.10
Net Removed Date: 08/08/09 Time: 10.00
Total Fishing Time: 21.8 (hrs) Depth of Set: 1 (m)
Substrate Characteristics: ORGANIC SILT

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
N. PIKE	67.0	1620	released
N. PIKE	47.0	575	released
N. PIKE	46.4	500	released
N. Pike	46.1	500	dead
N. Pike	44.6	500	dead
N. Pike	56.5	1000	(F) dead HL N1-SM, HL N1-SL
Y. Perch	20.7	95	dead HL YP-3
Y. Perch	16.0	47	dead HL YP-5

Client: MARATHON
Project No. 09-1658
Investigators: JE / BE

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: LITTLE LAKE Station No.: LL-8-1 Location: OUTLET
Coordinates: 45° 46.814 N 86° 24.040 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 75' X 6' Mesh Size (inch): 1½, 2, 2½
Net Set Date: 08/28/09 Time: 11:20
Net Removed Date: 09/10/09 Time: 9:30
Total Fishing Time: 22.2 (hrs) Depth of Set: 3-7 (m)
Substrate Characteristics: BEDROCK, BOULDER, SILT

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
N. PIKE	48.4	625	DEAD
PERCH	15.5	47	RELEASED
N. PIKE	47.2	590	DEAD

Client: MORRISON PBM
Project No. 09-1658
Investigators: RE IBF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARE LAKE Station No.: H19F Location: NORTH SHORE OFF MORSE CLIFF
Coordinates: 49° 47.007 N 86 23.921 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1" - 6"
Net Set Date: 08/08/09 Time: 11:40
Net Removed Date: 09/08/09 Time: 9:40
Total Fishing Time: 22 (hrs) Depth of Set: 6-12 (m)
Substrate Characteristics: BOULDER SILT

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
			NO FISH

Client: MARATHON PGM
Project No. 09-1558
Investigators: RE BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: HARE LAKE Station No.: HL10F Location: SOUTH SHORE NARROWS
Coordinates: 46 47.052 N 86° 23.684 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1-6"
Net Set Date: 08/08/09 Time: 12:00
Net Removed Date: 09/08/09 Time: 9:50
Total Fishing Time: 21.8 (hrs) Depth of Set: 3-20 (m)
Substrate Characteristics: BOULDER SILT

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
CISCO	—	—	

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY DETAILED CATCH RECORD

Client Name: Still Water
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare
Site/Station: HL-1

Lat/Long (ddmmss.ss): 48 46 54.3 86 23 53.6
UTM (NAD83):
Date/Time Set: Sept 7/11 13:46
Date/Time Lift: Sept 8/11 8:45

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: Depth 29 - 30 - 31 ft.

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
					FL (mm) TL (mm) Rwt (g)
NP	1		1		61.0 64.7 1515

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name
Project Number
Field Crew

Lake Name: Hare Lake
Site/Station: HL 2

Lat/Long (ddmmss.ss): 48 47 15.2 86 22 69.7
UTM (NAD83)
Date/Time Set: Sept 08/11 9:10
Date/Time Lift: Sept 07/2011 14:01

Method of Collection: Large 6.0 mesh
Gear Size (length,mesh)
Bottom Type
Other Habitat Features: 12 17 20

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL(mm)	TL(mm)	RWT(g)
YP	1			1	16.1	17.0	48
YP	1			1	17.0	17.9	61
YP	1			1	16.0	16.8	51
YP	1			1	16.0	16.9	49
YP	1		1		16.0	16.8	46
YP	1		1		17.0	17.9	53
YP	1		1		17.3	18.6	66
NP	1			1	15.0	15.6	38
NP	1			1	45.5	47.0	700
NP	1		1		66.0	70.0	980
					48.5	50.5	760

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater 11-1861
Project Number: 11-1861
Field Crew: C.T. M.P.

Lake Name: Rose Lake
Site/Station: RL-3

Lat/Long (ddmmss.ss): 48 47 21.9 86 23 13.4
UTM (NAD83):
Date/Time Set: Sept 07/2011 14:12
Date/Time Lift: Sept 8/11 9:46

Method of Collection: Small gill net
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 443

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWT
NP	1			1	59.0	62.5	1380
YP	1			1	13.8	14.5	29
YP	1			1	14.2	14.8	28
YP	1			1	13.5	14.2	28
YP	1			1	15.5	16.4	44
YP	1			1	9.8	10.2	10
YP	1			1	13.5	14.4	28
YP	1			1	12.2	12.8	19
YP	1			1	11.0	11.6	14
YP	1		1		16.8	17.6	53
YP	1		1		8.0	8.5	5
YP	1			1	8.8	9.4	7
YP	1		1	*	8.0	8.5	6
YP	1			1	8.5	9.0	7
YP	1			1	8.5	9.0	7
YP	1			1	8.5	9.4	7.5

Comments: Continued in Field Book all net 1

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still Water
Project Number: 11-1861
Field Crew: G.I. M.P.

Lake Name: Moore Lake
Site/Station: ML4

Lat/Long (ddmmss.ss): 45 46 55.9 86 24 00.7
UTM (NAD83):
Date/Time Set: Sept 7/2011 14:28
Date/Time Lift: Sept 8/11 11:05

Method of Collection: Small Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 26 28 30

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
					FL TL RWT
NP	1		1		65.0 68.0 1850

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still Water
Project Number: 11-186
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL5

Lat/Long (ddmmss.ss): 48 47 06.6 86 23 39.2
UTM (NAD83):
Date/Time Set: Sep. 07/2011 14:51
Date/Time Lift: Sept 8/11 11:51

Method of Collection: Lg. ~~Sm~~ Gill net
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: depth 66 - 74 - 77

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
LNS	1		1		18.6 19.7 76g

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-6

Lat/Long (ddmmss.ss): 48 47 14.0 86 23 08.2
UTM (NAD83):
Date/Time Set: Sept 8/11 13:26
Date/Time Lift: Sept 9/11 09:20

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 86 86 81

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
wash					

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still water
Project Number: 11-1861
Field Crew: KP GT

Lake Name: Hare Lake
Site/Station: HL-7

Lat/Long (ddmmss.ss): 48 47 180 86 23 35.9
UTM (NAD83):
Date/Time Set: Sept 8/11 13:38
Date/Time Lift: Sept 9/11 09:30

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 35 29 23

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL TL RWT
NP	1			1	68.8 70.7 2100
NP	1		1		63.8 66.2 1850

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-8

Lat/Long (ddmmss.ss): 48 46 49.4 86 24 01.8
UTM (NAD83):
Date/Time Set: Sept 8/11 13:51
Date/Time Lift: Sept 9/11 09:44

Method of Collection: 1" Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 19 20 21

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWT
YP	1		1		26.0	27.5	180
YP	1		1		16.3	17.0	52
YP	1		1		21.8	23.2	112
YP	1		1		21.7	22.8	100
YP	1		1		21.5	22.6	104
YP	1		1		20.8	21.8	98
YP	1		1		22.7	23.8	142
YP	1		1		18.7	20.0	74
YP	1			1	18.5	19.5	78
YP	1			1	14.5	15.4	32
YP	1			1	16.0	16.8	48
YP	1			1	15.2	16.1	38
YP	1		1		17.3	18.2	58
YP	1			1	16.4	17.2	50
YP	1			1	18.8	19.8	74

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare LK
Site/Station: HL-9

Lat/Long (ddmmss.ss): 48 47 01.1 86 23 51.2
UTM (NAD83):
Date/Time Set: Sept 8/11 14:00
Date/Time Lift: Sept 9/11 10:10

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 36 - 37 - 36

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

	Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWT
Net 1	Sm Cisco	1			1	11.6	13.1	17.0
	Sm Cisco	1			1	12.2	13.5	17.0
	?	1			1	10.4	11.5	12
Net 2	LNS	1				18.0	19.5	75
	Sm LNSCO	1			1	15.6	16.6	42
	Sm Cisco	1			1	13.5	15.2	25
	↓	1			1	14.8	16.4	32
		1			1	12.2	13.5	19
	YP	1		1		11.6	12.3	17
	YP	1		1		10.4	11	11

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP & GI

Lake Name: Hare Lake
Site/Station: HL-10

Lat/Long (ddmmss.ss): 48 47 12.0 86 23 40.3
UTM (NAD83):
Date/Time Set: Sept 8/11 14:09
Date/Time Lift: Sept 9/11 10:30

Method of Collection: Gillnet 8m
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 10 - 15 - 18

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
See Field Book for catch					

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still Water
Project Number: 11-1861
Field Crew: KP GF

Lake Name: Hare Lake
Site/Station: HL-11

Lat/Long (ddmmss.ss): 484653.3 8623 53.4
UTM (NAD83):
Date/Time Set: Sept 9/11 14:11
Date/Time Lift: Sept 10/11 9:45

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 29 - 30 - 30

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWT
YP	1		1		11.0	11.7	12
C	1		1		8.8	9.9	8
1 Sm Cisco	1			1	14.0	15.9	25
Sm Cisco	1			1	12.1	13.6	18
YP	1			1	8.5	9.0	7
YP	1		1		11.2	12.1	14
YP	1		1		11.2	11.9	14
YP	1		1		8.4	8.8	6
YP	1		1		11.8	12.6	15
2 YP	1		1		11.4	12.1	14
YP	1		1		10.9	11.5	13
YP	1			1	10.7	11.2	12
YP	1			1	8.1	8.5	6
YP	1			1	8.2	8.6	6
YP	1			1	8.8	9.2	7

Comments: C 1 1 9.0 10.1 9
C 1 1 6.2 6.9 3

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still Water
Project Number: 11-1861
Field Crew: KP GT

Lake Name: Hare Lake
Site/Station: HL-12

Lat/Long (ddmmss.ss): 48 47 18.9 86 22 53.3
UTM (NAD83):
Date/Time Set: Sept 9/11 14:20
Date/Time Lift: Sept 10/11 10:10

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 5-6-6

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
See Field Book for Catch					

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-13

Lat/Long (ddmmss.ss): 484715.3 8622589
UTM (NAD83):
Date/Time Set: Sept 9/11 14:25
Date/Time Lift: Sept 10/11 11:35

Method of Collection: 4g Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 56-61-69

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
					FL TL RWT
NP	1				641.0 67.7 1800

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Skillwater
Project Number: 11-1861
Field Crew: CP GE

Lake Name: Hare Lake
Site/Station: HL-184

Lat/Long (ddmmss.ss): 48 47 18.6 86 23 18.7
UTM (NAD83):
Date/Time Set: Sept 9/11 14:33
Date/Time Lift: Sept 10/11 12:00

Method of Collection: 4g Mesh Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 6-5-7

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	Wt
NP	1		1		68.3	72.2	2210
NP	1		1		47.5	51.0	720
NP	1		1		56.0	59.4	1200
~~NP~~	1		1		~~64.1~~	~~67.5~~	
NP	1		1		50.2	53.6	880
NP	1		1		41.6	44.7	500
YP	1		1		16.6	17.6	51
YP	1		1		15.3	16.1	40
YP	1		1		16.5	17.2	52
YP	1			1	20.8	22.0	104
YP	1			1	17.8	18.7	60
YP	1			1	23.5	24.7	148
YP	1			1	20.6	21.7	102
YP	1			1	19.9	20.7	80
YP	1			1	18.9	19.8	71
YP	1			1	17.6	18.5	58

Comments: More Fish in Field book

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GS

Lake Name: Hare Lake
Site/Station: HL-15

Lat/Long (ddmmss.ss): 48 46 52.8 86 24 03.2
UTM (NAD83):
Date/Time Set: Sept 9/11 14:46
Date/Time Lift: Sept 10/11 12:36

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 15-20-21

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWt
NP			1		65.4	69.4	2050
NP			1		63.4	67.0	1700
NP				1	52.4	56.7	1110
NP				1	62.8	65.3	1700
NP				1	68.3	72.0	2100
YP				1	15.0	15.8	41
YP				1	16.5	17.4	49
YP				1	16.3	16.9	49
YP				1	17.8	18.8	58
YP				1	15.8	16.6	39
				1	16.5	17.5	52

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stantec
Project Number: 11-1961
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-16

Lat/Long (ddmmss.ss): 48 47 11.6 86-23 37.9
UTM (NAD83):
Date/Time Set: Sept 10/11 14:24
Date/Time Lift: Sept 11/11 09:28

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 38 - 45 - 50

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
Wash					

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stantec
Project Number: 11-1861
Field Crew: KD GT

Lake Name: Hare Lake
Site/Station: HL-19

Lat/Long (ddmmss.ss): 48 47 20.4 86 23 33.8
UTM (NAD83):
Date/Time Set: Sept 10/11 14:38
Date/Time Lift: Sept 11/11 09:38

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 11-18-14

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
Wash					

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-18

Lat/Long (ddmmss.ss):
UTM (NAD83):
Date/Time Set: Sept 10/11 14:54
Date/Time Lift:

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 3-11-3

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWT	
NP	1		1		58.4	61.9	1400	
NP	1		1		50.6	53.7	890	
NP	1		1		44.6	47.8	600	
NP	1		1		40.9	44.0	440	
NP	1		1		36.2	35.9	320	
NP	1		1		38.5	41.0	360	
YP	1		1		19.7	20.6	90	
YP	1		1		20.1	21.1	94	
YP	1		1		20.4	21.3	99	
YP	1			1	21.8	22.9	122	
NP-1	1			1	73.3	77.1	3250	
NP-2	1			1	59.1	62.8	1440	
NP-3	1			1	58.8	61.0	1300	
NP-4	1			1	48.4	52.6	780	

F
F
F
F
F

Comments: NP-1 Lg Rib in Stomach

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GE

Lake Name: Hare Lake
Site/Station: HL-19

Lat/Long (ddmmss.ss): 48 47 17.6 86 28 06.6
UTM (NAD83):
Date/Time Set: Sept 10/11 15:03
Date/Time Lift: Sept 11/11 10:35

Method of Collection: SM Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 20-19-18

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RwH
YP	1		1		8.5	8.9	6
YP	1		1		11.6	12.2	16
YP	1		1		8.3	8.7	5
YP	1		1		8.6	9.1	7
YP	1			1	7.5	7.9	5
YP	1			1	11.7	12.3	16
YP	1			1	8.1	8.5	5
YP	1		1		8.3	8.7	6
YP	1			1	8.2	8.7	6
YP	1			1	8.0	8.5	6
YP	1			1	10.4	11.0	11
C	1			1	10.6	11.8	17

Net 1

Comments: Net 2 in Field Book

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still water
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-20

Lat/Long (ddmmss.ss): 48 47 00.8 96 23 50.0
UTM (NAD83):
Date/Time Set: Sept 10/11 15:11
Date/Time Lift: Sept 11/11 11:30

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 40-39-37

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	Rwt
YP	1		1		11.6	12.3	15
Sm Cisco	1			1	12.6	13.9	18
Sculpin	1	1			-	6.8	3
?	1			1	7.5	8.2	5
Sm Cisco	1			1	14.2	16.0	25
YP	1		1		11.8	12.5	15
YP	1		1		11.2	11.9	13
YP	1		1		11.8	12.5	16
Sm Cisco	1			1	14.6	16.4	29
YP	1		1		12.2	12.9	17
YP	1		1		11.0	11.6	13
C	1			1	8.6	9.5	7.5

Comments:

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI
Lake Name: Hare Lake
Site/Station: HL 21

Lat/Long (ddmmss.ss): 48 46 57.0 86 23 53.9
UTM (NAD83):
Date/Time Set: Sept 11/11 13:15
Date/Time Lift: Sept 12/11 09:12
Method of Collection: 5m Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 31-32-33

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWT
YP	1		1		11.2	11.9	13.5
YP	1		1		11.0	11.6	12.5
YP	1		1		11.7	12.4	15.0
YP	1		1		12.0	12.7	16
YP	1		1		11.5	12.1	15
YP	1		1		12.3	13.0	18
YP	1		1		11.1	11.7	13
YP	1		1		10.9	11.6	13
YP	1		1		11.0	11.7	14
YP	1		1		10.9	11.6	12
YP	1		1		10.8	11.4	13
YP	1		1		10.6	11.1	12
YP	1		1		11.8	12.6	16
YP	1			1	11.2	11.9	15
YP	1			1	12.8	13.5	20
YP	1			1	11.9	12.6	18

Comments: cont. in Field book

Nest 2

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL 22

Lat/Long (ddmmss.ss): 48 47 19.7 86 28 17.4
UTM (NAD83):
Date/Time Set: Sept 11/11 1826
Date/Time Lift: Sept 12/11 09:44

Method of Collection: SM Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 5-7-9

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations

Comments: See FB for Catch

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-23

Lat/Long (ddmmss.ss): 48 47 02.8 86 23 30.4
UTM (NAD83):
Date/Time Set: Sept 11/11 13:37
Date/Time Lift: Sept 12/11 11:08

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 68-79-82

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
WRSH					

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still water
Project Number: 11-1861
Field Crew: KP GL

Lake Name: Hare Lake
Site/Station: HL-24

Lat/Long (ddmmss.ss): 48 47 09.6 86 03 12.2
UTM (NAD83):
Date/Time Set: Sept 11/11 13:48
Date/Time Lift: Sept 12/11 11:26

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 36-60-42

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations			
					FL	TL	RWT	
LNS	1		1		31.5	33.4	480	
NP-S	1			1	67.4	71.0	2040	F

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-25

Lat/Long (ddmmss.ss): 18 477171 8622589
UTM (NAD83):
Date/Time Set: Sept 11/11 13:58
Date/Time Lift: Sept 12/11 11:54

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 3G-3G-3O

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations			
					FL	TL	Rwt	
NP	1			1	64.4	68.0	1880	M
NP	1			1	69.2	72.9	2470	F

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GL

Lake Name: Hare Lake
Site/Station: ML. 06

Lat/Long (ddmmss.ss): 48 46 50.9 86 23 51.3
UTM (NAD83):
Date/Time Set: Sept 12/11 13:05
Date/Time Lift: Sept 13/11 09:18

Method of Collection: 4g Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features:
10-14-12

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	Wt	
NP	1			1	60.4	64.3	1540	F
NP	1			1	47.4	50.6	780	M
YP	1			1	14.4	15.2	35	

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-27

Lat/Long (ddmmss.ss):
UTM (NAD83):
Date/Time Set: Sept 12/11 13:12
Date/Time Lift: Sept 13/11 9:50

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 8-11-7

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations			
					FL	TL	Wt	
NP				1	416.2	449.3	720	M
YP			1		16.6	17.4	45	
YP			1		16.1	16.9	44	
YP			1		17.0	18.1	50	

Comments:

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still water
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-28

Lat/Long (ddmmss.ss): 48 46 59.6 86 23 55.7
UTM (NAD83):
Date/Time Set: Sept 12/11 13:17
Date/Time Lift: Sept 13/11 10:05

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 31-32-34

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
WHSN					

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still water
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-29

Lat/Long (ddmmss.ss): 48 47 19.7 86 23 09.2
UTM (NAD83):
Date/Time Set: Sept 12/11 13:32
Date/Time Lift: Sept 13/11 10:21

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features:
12-14-16

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

	Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL TL Rwt	
Net 1	NP	1		1		escaped from board	
	YP				1	8.9 9.4 7	
	YP				1	12.2 12.8 12	
	YP				1	~~8.~~ 7.9 8.5 6	
	YP				1	7.4 7.9 5	
	YP				1	8.2 8.6 6	
	YP				1	8.4 8.8 6	
	C				1	6.1 7.0 3	
	C				1	5.8 6.6 3	
	C				1	6.3 7.2 3	No guts
	YP				1	7.6 8.1 5	"
	LP				1	6.4 6.6 2.5	
	LP				1	6.5 6.6 2	
	LP				1	6.3 6.5 2.5	

Comments: 1 sm NP escape from Net 2
3 Headless Shiners Net 1
Net 2 in FB

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-30

Lat/Long (ddmmss.ss): 48 47 16.3 086 23 38.3
UTM (NAD83):
Date/Time Set: Sept 12/11 13:40
Date/Time Lift: Sept 13/11 11:00

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 7-5-10

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	RWt
YP	1		1		14.1	15.0	25
YP	1		1		13.8	14.8	23 Parasites on Fin
YP	1		1		17.5	15.6	59
YP	1		1		12.2	13.0	20
YP	1		1		8.3	8.9	6.5
YP	1		1		12.8	13.6	23
YP	1			1	16.1	17.0	42
YP	1			1	15.3	16.2	40
YP	1			1	15.6	16.4	39
YP	1			1	15.0	15.9	37
YP	1			1	9.8	10.4	9.5
YP	1			1	7.4	7.7	5
YP	1			1	8.5	9.0	6.5
YP	1			1	9.7	10.4	8
YP	1			1	8.8	9.3	7
YP	1			1	8.5	9.1	6

Net 2

Comments: See FB for more Fish from Net 1 & 2

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stantec
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-31

Lat/Long (ddmmss.ss): 48 47 17.9 082 23 16.1
UTM (NAD83):
Date/Time Set: Sept 12/11 18:48
Date/Time Lift: Sept 13/11 11:49

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 45-42-42

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

	Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	Rwt
Net 1	LNS	1		1		23.3	24.3	160
	Sm Cisco	1			1	13.0	14.5	20
	Sm Cisco	1			1	8.3	9.2	6.5
Net 2	Cisco Sm	1			1	14.0	15.4	23
		1			1	12.1	13.4	19
		1			1	13.0	14.7	21
		1			1	13.6	15.3	24.5
		1			1	13.0	14.6	23
		1			1	12.9	14.3	19
		1			1	12.0	13.4	17
		1			1	8.6	9.3	6

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-32

Lat/Long (ddmmss.ss): 48 47 16.1 68 22 54.8
UTM (NAD83):
Date/Time Set: Sept 13/11 13:08
Date/Time Lift: Sept 14/11 8:34

Method of Collection: Sm Mesh
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 49-46-46

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations			
					FL	TL	Rwt	
(isco)	1			1	13.5	14.9	20	Sprawled
↓	1		1		13.4	15.2	24	
↓	1			1	13.4	15.0	22	
TP	1		1		7.9	9.1	6	

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Still water
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: ML-33

Lat/Long (ddmmss.ss): 48 47 15.8 86 22 48.7
UTM (NAD83):
Date/Time Set: Sept 13/11 13:14
Date/Time Lift: Sept 14/11

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 12-16-21

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL TL Rwt
NP	1		1		20.4 21.5 89
			1		14.9 15.7 36
			1		16.6 17.5 51
			1		17.2 18.5 58
			1		22.5 23.6 118
			1		14.4 15.3 32
			1		14.4 15.2 32
			1		8.6 9.2 6.5
			1		14.8 15.5 37
			1		14.4 15.2 31
			1		24.0 25.5 164
			1		13.2 14.0 27
			1		16.6 17.5 57
			1		12.1 12.8 18
			1		15.1 15.9 42
			1		16.0 16.9 47

Nil

Comments: Mal Net 1 in FB

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KD GT

Lake Name: Hare Lake
Site/Station: HL 34

Lat/Long (ddmmss.ss): 48 47 19.8 86 23 34.2
UTM (NAD83):
Date/Time Set: Sept 13/11 13:24
Date/Time Lift: Sept 14/11

Method of Collection: Sm Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 23 - 23 - 22

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL	TL	Rust
NP	1		1		44.3	66.5	1750
YP	1		1		10.6	11.3	12
YP	1		1		12.4	13.1	21
YP	1		1		15.3	14.2	23
YP	1		1		13.3	14.0	26
YP	1		1	1	14.8	15.6	36
YP	1			1	12.3	13.0	18
YP	1			1	11.3	11.9	15
YP	1			1	7.7	8.1	5
NP	1			1	44.6	47.8	620
YP	1			1	8.5	9.1	7
YP	1			1	8.5	8.9	7
YP	1			1	8.4	8.9	7
YP	1			1	7.7	8.1	5
C	1			1	8.5	9.4	7
C	1			1	8.9	10.0	9
C	1			1	8.9	9.5	7

NCH

Comments: 2 C Bodies in Net 1
Net 2 in FB

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stantec
Project Number: 11-1861
Field Crew: KP GI

Lake Name: Hare Lake
Site/Station: HL-35

Lat/Long (ddmmss.ss): 484711.5 862337.7
UTM (NAD83):
Date/Time Set: Sept 13/11 13:36
Date/Time Lift: Sept 14/11 11:45

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 39-45-48

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations
					FL TL RWt #
LT					620 662 3050 F LP

Comments

EcoMetrix INCORPORATED
6800 Campobello Road,
Mississauga, Ontario L5N 2L8
telephone: (905) 794-2325
facsimile: (905) 794-2338

ADULT FISH SURVEY
DETAILED CATCH RECORD

Client Name: Stillwater
Project Number: 11-1861
Field Crew: KP GT

Lake Name: Hare Lake
Site/Station: HL-36

Lat/Long (ddmmss.ss): 48 46 53.8 86 23 50.3
UTM (NAD83):
Date/Time Set: Sept 13/11 13:43
Date/Time Lift: Sept 14/11 12:10

Method of Collection: Lg Gillnet
Gear Size (length,mesh):
Bottom Type:
Other Habitat Features: 3-12-6

Supporting Water Chemistry

Water Column	Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity /Salinity (µS/cm)/ (ppt)	Other Observations
Surface						
Middle						
Bottom						

Catch Data

Species	Number Caught	Number Retained	Number Released	Number Dead	Other Observations FL TL RW
NP	1		1		495 583.2 800
NP	1		1		666.2 705 1980
NP	1			1	620 661 1620

Comments

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
L	HL-1	13:46	8:45	3	NP	61.0	64.7	1575	1	
L	HL-2	9:10	14:01	2	YP	16.1	17.0	48		1
L	HL-2			2	NP	15.0	15.6	38		1
L	HL-2			2	NP	44.5	47.0	700		1
L	HL-2			2	NP	48.5	50.5	760		1
L	HL-2			2	NP	66.0	70.0	980	1	
L	HL-2			2	YP	16.0	16.8	48	1	
L	HL-2			2	YP	16.0	16.8	51		1
L	HL-2			2	YP	16.0	16.9	49		1
L	HL-2			2	YP	17.0	17.9	53	1	
L	HL-2			2	YP	17.0	17.9	81		1
L	HL-2			2	YP	17.8	18.6	66	1	
S	HL-3 Net 1	14:12	9:40	1	NP	59.0	62.5	1380		1
S	HL-3 Net 1			1	2 MORE HEADLESS C FISH					
S	HL-3 Net 1			1	C	8.4	8.8	6		1
S	HL-3 Net 1			1	C	8.5	9.4	7		1
S	HL-3 Net 1			1	C	9.0	9.8	9		1
S	HL-3 Net 1			1	C	9.0	9.8	9.5		1
S	HL-3 Net 1			1	C	9.0	10.0	9		1
S	HL-3 Net 1			1	C	9.0	9.9	8		1
S	HL-3 Net 1			1	C	9.0	9.8	9		1
S	HL-3 Net 1			1	LP	6.3	6.5	2		1
S	HL-3 Net 1			1	LP	6.6	6.8	3		1
S	HL-3 Net 1			1	LP	6.7	6.9	3		1
S	HL-3 Net 1			1	LP	7.4	7.7	4		1
S	HL-3 Net 1			1	YP	8.0	8.5	5	1	
S	HL-3 Net 1			1	YP	8.0	8.5	6	1	
S	HL-3 Net 1			1	YP	8.0	8.5	7		1
S	HL-3 Net 1			1	YP	8.0	8.6	7		1
S	HL-3 Net 1			1	YP	8.0	8.5	6		1
S	HL-3 Net 1			1	YP	8.5	9.0	7		1
S	HL-3 Net 1			1	YP	8.5	9.0	7		1
S	HL-3 Net 1			1	YP	8.5	9.4	7.5		1
S	HL-3 Net 1			1	YP	8.8	9.4	7		1
S	HL-3 Net 1			1	YP	9.4	10.0	8	1	
S	HL-3 Net 1			1	YP	9.8	10.2	10		1
S	HL-3 Net 1			1	YP	11.0	11.6	14		1
S	HL-3 Net 1			1	YP	12.2	12.8	19		1
S	HL-3 Net 1			1	YP	13.5	14.2	28		1
S	HL-3 Net 1			1	YP	13.5	14.4	28		1
S	HL-3 Net 1			1	YP	13.8	14.5	29		1
S	HL-3 Net 1			1	YP	14.2	14.8	28		1
S	HL-3 Net 1			1	YP	15.5	16.4	44		1
S	HL-3 Net 1			1	YP	16.8	17.6	53	1	
S	HL-3 Net 2	14:12	9:40	1	YP	14.0	14.5	28	1	
S	HL-3 Net 2			1	2 MORE HEADLESS LP					
S	HL-3 Net 2			1	4 MORE HEADLESS C					
S	HL-3 Net 2			1	C	7.9	8.6	6		1
S	HL-3 Net 2			1	C	8.8	9.5	8		1
S	HL-3 Net 2			1	C	8.9	10.0	9		1
S	HL-3 Net 2			1	C	9.0	10.0	10		1
S	HL-3 Net 2			1	C	9.1	10.1	10		1
S	HL-3 Net 2			1	C	9.2	10.1	9		1
S	HL-3 Net 2			1	LP	6.8	7.0	4		1
S	HL-3 Net 2			1	LP	6.8	7.0	4		1
S	HL-3 Net 2			1	LP	7.0	7.1	3		1
S	HL-3 Net 2			1	YP	8.0	8.4	7		1
S	HL-3 Net 2			1	YP	8.0	8.5	7		1
S	HL-3 Net 2			1	YP	8.0	8.4	6		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-3 Net 2			1	YP	8.0	8.4	7		1
S	HL-3 Net 2			1	YP	8.4	8.8	7		1
S	HL-3 Net 2			1	YP	8.5	9.0	7		1
S	HL-3 Net 2			1	YP	10.0	10.4	12		1
S	HL-3 Net 2			1	YP	10.5	11.2	12	1	
S	HL-3 Net 2			1	YP	11.0	11.8	13	1	
S	HL-3 Net 2			1	YP	16.5	17.4	47		1
S	HL-4 Net 1	14:28	11:05	3	YP	11.0	11.5	12	1	
S	HL-4 Net 1			3	YP	7.8	8.2	5		1
S	HL-4 Net 1			3	YP	8.0	8.6	6		1
S	HL-4 Net 1			3	YP	8.0	8.4	6		1
S	HL-4 Net 1			3	YP	8.0	8.4	6		1
S	HL-4 Net 1			3	YP	8.0	8.5	6.5		1
S	HL-4 Net 1			3	YP	8.0	8.5	6		1
S	HL-4 Net 1			3	YP	8.0	8.5	6		1
S	HL-4 Net 1			3	YP	8.0	8.4	7		1
S	HL-4 Net 1			3	YP	8.2	8.6	6		1
S	HL-4 Net 1			3	YP	8.4	8.6	7		1
S	HL-4 Net 1			3	YP	8.4	9.0	8		1
S	HL-4 Net 1			3	YP	8.5	9.0	7		1
S	HL-4 Net 1			3	YP	8.6	9.0	7		1
S	HL-4 Net 1			3	YP	8.8	9.2	8		1
S	HL-4 Net 1			3	YP	9.3	9.8	8		1
S	HL-4 Net 1			3	YP	9.3	9.6	8		1
S	HL-4 Net 1			3	YP	9.5	9.8	8		1
S	HL-4 Net 1			3	YP	9.5	10.3	8.5		1
S	HL-4 Net 1			3	YP	9.5	10.0	9		1
S	HL-4 Net 1			3	YP	9.5	10.0	10		1
S	HL-4 Net 1			3	YP	9.8	10.4	9		1
S	HL-4 Net 1			3	YP	9.8	10.1	9		1
S	HL-4 Net 1			3	YP	9.9	10.4	9		1
S	HL-4 Net 1			3	YP	10.0	10.5	9		1
S	HL-4 Net 1			3	YP	10.0	10.6	11		1
S	HL-4 Net 1			3	YP	10.0	10.5	10		1
S	HL-4 Net 1			3	YP	10.0	10.4	10		1
S	HL-4 Net 1			3	YP	10.0	10.4	10		1
S	HL-4 Net 1			3	YP	10.0	10.5	10		1
S	HL-4 Net 1			3	YP	10.4	10.9	13		1
S	HL-4 Net 1			3	YP	10.8	11.4	13	1	
S	HL-4 Net 1			3	YP	10.8	11.4	13		1
S	HL-4 Net 1			3	YP	11.0	11.8	14		1
S	HL-4 Net 1			3	YP	11.0	11.4	12		1
S	HL-4 Net 1			3	YP	11.0	11.8	16		1
S	HL-4 Net 1			3	YP	11.2	12.0	15		1
S	HL-4 Net 1			3	YP	11.3	11.9	14		1
S	HL-4 Net 1			3	YP	11.5	12.3	14		1
S	HL-4 Net 1			3	YP	11.5	12.2	16		1
S	HL-4 Net 1			3	YP	11.5	12.1	15		1
S	HL-4 Net 1			3	YP	11.8	12.5	16		1
S	HL-4 Net 1			3	YP	12.0	12.6	14	1	
S	HL-4 Net 1			3	YP	12.0	12.6	17		1
S	HL-4 Net 1			3	YP	12.3	13.0	19		1
S	HL-4 Net 1			3	YP	12.5	13.0	19		1
S	HL-4 Net 1			3	YP	12.5	13.0	20		1
S	HL-4 Net 1			3	YP	12.5	13.1	19		1
S	HL-4 Net 1			3	YP	13.5	14.0	24		1
S	HL-4 Net 1			3	YP	13.8	14.5	25	1	
S	HL-4 Net 1			3	YP	13.8	14.5	28		1
S	HL-4 Net 1			3	YP	14.5	15.2	33	1	

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-4 Net 1			3	YP	15.5	16.3	39		1
S	HL-4 Net 2	14:28	11:05	3	NP	65.0	68.0	1850	1	
S	HL-4 Net 2			3	C	8.5	9.5	8		1
S	HL-4 Net 2			3	YP	8.0	8.4	6		1
S	HL-4 Net 2			3	YP	8.0	8.5	6.5		1
S	HL-4 Net 2			3	YP	8.2	8.6	6		1
S	HL-4 Net 2			3	YP	8.4	8.8	6		1
S	HL-4 Net 2			3	YP	8.4	8.8	6		1
S	HL-4 Net 2			3	YP	8.4	8.9	7		1
S	HL-4 Net 2			3	YP	8.4	8.8	6		1
S	HL-4 Net 2			3	YP	8.5	9.1	7		1
S	HL-4 Net 2			3	YP	9.0	9.5	7		1
S	HL-4 Net 2			3	YP	9.8	10.2	9		1
S	HL-4 Net 2			3	YP	10.0	10.3	9		1
S	HL-4 Net 2			3	YP	10.5	11.2	12		1
S	HL-4 Net 2			3	YP	10.5	11.0	11		1
S	HL-4 Net 2			3	YP	10.5	11.0	12		1
S	HL-4 Net 2			3	YP	11.0	11.6	14		1
S	HL-4 Net 2			3	YP	11.0	11.6	15		1
S	HL-4 Net 2			3	YP	11.2	11.8	15		1
S	HL-4 Net 2			3	YP	11.5	12.0	17		1
S	HL-4 Net 2			3	YP	11.8	12.4	15		1
S	HL-4 Net 2			3	YP	12.1	12.5	17		1
S	HL-4 Net 2			3	YP	12.2	12.9	18	1	
S	HL-4 Net 2			3	YP	12.8	13.4	21	1	
L	HL-5	14:51	11:51	5	LNS	18.6	19.7	76	1	
L	HL-6	13:26	9:20	5	WASH					
L	HL-7	13:35	9:30	3	NP	66.8	70.7	2100		1
L	HL-7			3	NP	62.8	66.2	1850	1	
L	HL-8	13:51	9:44	3	YP	26.0	27.5	180	1	
L	HL-8			3	YP	14.5	15.4	32		1
L	HL-8			3	YP	15.2	16.1	38		1
L	HL-8			3	YP	16.0	16.8	48		1
L	HL-8			3	YP	16.3	17.0	52	1	
L	HL-8			3	YP	16.4	17.2	50		1
L	HL-8			3	YP	17.3	18.2	58	1	
L	HL-8			3	YP	18.5	19.5	78		1
L	HL-8			3	YP	18.7	20.0	74	1	
L	HL-8			3	YP	18.8	19.8	74		1
L	HL-8			3	YP	20.8	21.8	98	1	
L	HL-8			3	YP	21.5	22.6	104	1	
L	HL-8			3	YP	21.7	22.8	100	1	
L	HL-8			3	YP	21.8	23.2	112	1	
L	HL-8			3	YP	22.7	23.8	142	1	
S	HL-9 Net 1	14:00	10:10	4	SM CISCO	11.6	13.1	17		1
S	HL-9 Net 1			4	SM CISCO	12.2	13.5	17		1
S	HL-9 Net 1			4	TP	10.4	11.5	12		1
S	HL-9 Net 2	14:00	10:10	4	LNS	15.6	16.6	42		1
S	HL-9 Net 2			4	LNS	18.0	19.5	75		1
S	HL-9 Net 2			4	SM CISCO	12.2	13.5	19		1
S	HL-9 Net 2			4	SM CISCO	13.5	15.2	25		1
S	HL-9 Net 2			4	SM CISCO	14.8	16.4	32		1
S	HL-9 Net 2			4	YP	10.4	11.0	11	1	
S	HL-9 Net 2			4	YP	11.6	12.3	17	1	
S	HL-10 Net 1	14:09	10:30	2	YP	10.6	11.4	11	1	
S	HL-10 Net 1			2	1 HEADLESS C					
S	HL-10 Net 1			2	C	5.9	6.6	3		1
S	HL-10 Net 1			2	C	8.2	9.2	7		1
S	HL-10 Net 1			2	C	8.4	9.4	7		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-10 Net 1			2	C	8.8	9.6	8		1
S	HL-10 Net 1			2	C	8.9	9.8	8		1
S	HL-10 Net 1			2	C	9.0	10.2	9		1
S	HL-10 Net 1			2	C	9.0	10.1	8		1
S	HL-10 Net 1			2	NP	63.0	66.5	1750		1
S	HL-10 Net 1			2	YP	7.4	11.1	11		1
S	HL-10 Net 1			2	YP	7.9	8.2	5.5		1
S	HL-10 Net 1			2	YP	8.0	8.6	6		1
S	HL-10 Net 1			2	YP	8.2	8.6	6		1
S	HL-10 Net 1			2	YP	8.2	8.8	6		1
S	HL-10 Net 1			2	YP	8.3	8.8	6	1	
S	HL-10 Net 1			2	YP	8.3	9.0	7		1
S	HL-10 Net 1			2	YP	8.3	8.8	6		1
S	HL-10 Net 1			2	YP	8.4	9.2	6	1	
S	HL-10 Net 1			2	YP	8.4	9.1	7		1
S	HL-10 Net 1			2	YP	8.4	8.9	7		1
S	HL-10 Net 1			2	YP	8.5	8.9	6	1	
S	HL-10 Net 1			2	YP	8.5	8.9	7		1
S	HL-10 Net 1			2	YP	8.5	9.0	7		1
S	HL-10 Net 1			2	YP	8.5	9.0	7		1
S	HL-10 Net 1			2	YP	8.7	9.1	7		1
S	HL-10 Net 1			2	YP	8.8	9.3	7		1
S	HL-10 Net 1			2	YP	8.8	9.1	7		1
S	HL-10 Net 1			2	YP	8.8	9.3	7		1
S	HL-10 Net 1			2	YP	9.0	9.5	8		1
S	HL-10 Net 1			2	YP	9.2	9.9	7		1
S	HL-10 Net 1			2	YP	9.4	10.1	9		1
S	HL-10 Net 1			2	YP	9.9	10.6	11		1
S	HL-10 Net 1			2	YP	10.0	10.8	10		1
S	HL-10 Net 1			2	YP	12.6	13.2	22		1
S	HL-10 Net 2	14:09	10:30	2	YP	7.5	8.0	5	1	
S	HL-10 Net 2			2	C	7.5	9.6	8		1
S	HL-10 Net 2			2	C	7.9	8.8	6		1
S	HL-10 Net 2			2	C	8.5	9.4	7		1
S	HL-10 Net 2			2	C	8.6	9.8	8		1
S	HL-10 Net 2			2	C	8.8	9.9	10		1
S	HL-10 Net 2			2	YP	7.8	8.1	5		1
S	HL-10 Net 2			2	YP	7.9	8.3	6		1
S	HL-10 Net 2			2	YP	8.0	8.4	6		1
S	HL-10 Net 2			2	YP	8.1	8.6	5	1	
S	HL-10 Net 2			2	YP	8.2	8.6	5		1
S	HL-10 Net 2			2	YP	8.3	8.8	7		1
S	HL-10 Net 2			2	YP	8.4	8.9	6		1
S	HL-10 Net 2			2	YP	8.4	8.8	7		1
S	HL-10 Net 2			2	YP	8.4	8.6	6		1
S	HL-10 Net 2			2	YP	8.4	8.9	7		1
S	HL-10 Net 2			2	YP	8.5	8.9	7		1
S	HL-10 Net 2			2	YP	8.5	9.0	7		1
S	HL-10 Net 2			2	YP	8.5	8.9	6		1
S	HL-10 Net 2			2	YP	8.7	9.3	7	1	
S	HL-10 Net 2			2	YP	8.7	9.1	6		1
S	HL-10 Net 2			2	YP	8.8	9.2	7		1
S	HL-10 Net 2			2	YP	9.0	9.6	7		1
S	HL-10 Net 2			2	YP	10.0	10.6	10	1	
S	HL-10 Net 2			2	YP	10.0	10.8	10		1
S	HL-10 Net 2			2	YP	10.4	11.0	10		1
S	HL-10 Net 2			2	YP	10.9	11.5	13		1
S	HL-10 Net 2			2	YP	12.0	12.8	16		1
S	HL-10 Net 2			2	YP	12.5	13.1	18	1	

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-11 Net 1	14:11	9:45	3	YP	11.0	11.7	12	1	
S	HL-11 Net 1			3	C	8.8	9.9	8	1	
S	HL-11 Net 1			3	SM CISCO	12.1	13.6	18		1
S	HL-11 Net 1			3	SM CISCO	14.0	15.9	25		1
S	HL-11 Net 1			3	YP	8.5	9.0	7		1
S	HL-11 Net 2	14:11	9:45	3	YP	11.2	12.1	14	1	
S	HL-11 Net 2			3	C	6.2	6.9	3		1
S	HL-11 Net 2			3	C	9.0	10.1	9		1
S	HL-11 Net 2			3	YP	8.1	8.5	6		1
S	HL-11 Net 2			3	YP	8.2	8.6	6		1
S	HL-11 Net 2			3	YP	8.4	8.8	6	1	
S	HL-11 Net 2			3	YP	8.8	9.2	7		1
S	HL-11 Net 2			3	YP	10.7	11.2	12		1
S	HL-11 Net 2			3	YP	10.9	11.5	13	1	
S	HL-11 Net 2			3	YP	11.2	11.9	14	1	
S	HL-11 Net 2			3	YP	11.4	12.1	14	1	
S	HL-11 Net 2			3	YP	11.8	12.6	15	1	
S	HL-12 Net 1	14:20	10:10	1	YP	15.9	16.5	43	1	
S	HL-12 Net 1			1	3 HEADLESS SHINERS					
S	HL-12 Net 1			1	C	5.7	6.3	2.5		1
S	HL-12 Net 1			1	C	5.8	6.5	2.5		1
S	HL-12 Net 1			1	C	5.8	6.5	3		1
S	HL-12 Net 1			1	C	5.8	6.5	3		1
S	HL-12 Net 1			1	C	6.3	6.6	2.5		1
S	HL-12 Net 1			1	C	6.3	7.0	3		1
S	HL-12 Net 1			1	C	8.1	9.0	6		1
S	HL-12 Net 1			1	C	8.4	9.2	7		1
S	HL-12 Net 1			1	C	8.5	9.6	7	1	
S	HL-12 Net 1			1	C	8.5	9.5	8		1
S	HL-12 Net 1			1	C	8.6	9.7	8	1	
S	HL-12 Net 1			1	C	8.6	9.5	7		1
S	HL-12 Net 1			1	C	8.8	9.7	7		1
S	HL-12 Net 1			1	C	9.0	10.1	9		1
S	HL-12 Net 1			1	C	10.3	11.5	18	1	
S	HL-12 Net 1			1	LP	6.7	6.9	3		1
S	HL-12 Net 1			1	YP	7.9	8.4	5		1
S	HL-12 Net 1			1	YP	8.1	8.6	5	1	
S	HL-12 Net 1			1	YP	8.1	8.6	6		1
S	HL-12 Net 1			1	YP	8.2	8.6	6	1	
S	HL-12 Net 1			1	YP	8.2	8.5	6		1
S	HL-12 Net 1			1	YP	8.2	8.6	7		1
S	HL-12 Net 1			1	YP	8.3	8.9	6	1	
S	HL-12 Net 1			1	YP	8.4	8.9	6		1
S	HL-12 Net 1			1	YP	8.8	9.4	7		1
S	HL-12 Net 1			1	YP	10.3	10.9	12	1	
S	HL-12 Net 1			1	YP	10.6	11.4	13		1
S	HL-12 Net 1			1	YP	10.9	11.6	15		1
S	HL-12 Net 1			1	YP	11.1	11.6	9	1	
S	HL-12 Net 1			1	YP	11.2	11.9	16		1
S	HL-12 Net 1			1	YP	12.9	13.8	25		1
S	HL-12 Net 1			1	YP	13.2	14.0	28		1
S	HL-12 Net 1			1	YP	16.4	17.2	46	1	
S	HL-12 Net 1			1	YP	17.1	17.9	53	1	
S	HL-12 Net 2	14:20	10:10	1	YP	13.1	13.9	23	1	
S	HL-12 Net 2			1	2 MORE C BODIES					
S	HL-12 Net 2			1	C	5.3	5.9	1.5		1
S	HL-12 Net 2			1	C	8.5	9.6	7		1
S	HL-12 Net 2			1	C	9.0	10.1	9		1
S	HL-12 Net 2			1	C	10.2	11.4	13		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-12 Net 2			1	YP	5.9	6.2	2		1
S	HL-12 Net 2			1	YP	7.9	8.4	5	1	
S	HL-12 Net 2			1	YP	7.9	8.3	6		1
S	HL-12 Net 2			1	YP	8.0	8.5	5.5		1
S	HL-12 Net 2			1	YP	8.1	8.5	5	1	
S	HL-12 Net 2			1	YP	8.1	8.6	6		1
S	HL-12 Net 2			1	YP	8.1	8.6	6		1
S	HL-12 Net 2			1	YP	8.3	8.8	6		1
S	HL-12 Net 2			1	YP	8.4	8.8	7		1
S	HL-12 Net 2			1	YP	8.5	8.9	6		1
S	HL-12 Net 2			1	YP	8.8	9.2	7		1
S	HL-12 Net 2			1	YP	9.0	9.5	9		1
S	HL-12 Net 2			1	YP	10.1	10.7	12		1
S	HL-12 Net 2			1	YP	10.8	11.2	13	1	
S	HL-12 Net 2			1	YP	12.0	13.1	18	1	
S	HL-12 Net 2			1	YP	12.3	12.9	19	1	
S	HL-12 Net 2			1	YP	13.4	14.0	29		1
S	HL-12 Net 2			1	YP	15.0	15.9	40		1
S	HL-12 Net 2			1	YP	15.7	16.5	44		1
L	HL-13	14:25	11:35	5	NP	64.0	67.7	1800		
L	HL-14	14:33	12:00	1	NP	68.3	72.2	2210	1	
L	HL-14			1	NP	41.6	44.7	500	1	
L	HL-14			1	NP	43.5	46.4	600		1
L	HL-14			1	NP	46.9	50.3	690		1
L	HL-14			1	NP	47.5	51.0	720	1	
L	HL-14			1	NP	50.2	53.6	880	1	
L	HL-14			1	NP	51.8	55.0	1000		1
L	HL-14			1	NP	54.3	57.5	1150		1
L	HL-14			1	NP	56.0	59.4	1200	1	
L	HL-14			1	NP	61.0	64.2	1640		1
L	HL-14			1	NP	61.5	65.4	1680		1
L	HL-14			1	YP	15.3	16.1	40	1	
L	HL-14			1	YP	16.5	17.2	52	1	
L	HL-14			1	YP	16.6	17.6	51	1	
L	HL-14			1	YP	16.6	17.3	45		1
L	HL-14			1	YP	17.1	17.9	52		1
L	HL-14			1	YP	17.2	18.1	56		1
L	HL-14			1	YP	17.3	18.1	55		1
L	HL-14			1	YP	17.6	18.5	58		1
L	HL-14			1	YP	17.8	18.7	60		1
L	HL-14			1	YP	18.9	19.8	71		1
L	HL-14			1	YP	19.2	20.1	89		1
L	HL-14			1	YP	19.9	20.7	80		1
L	HL-14			1	YP	20.6	21.7	102		1
L	HL-14			1	YP	20.8	22.0	104		1
L	HL-14			1	YP	23.5	24.7	148		1
L	HL-15	14:46	12:36	2	NP	65.4	69.4	2050	1	
L	HL-15			2	NP	52.4	56.7	1100		1
L	HL-15			2	NP	62.2	65.3	1700		1
L	HL-15			2	NP	63.4	67.0	1700	1	
L	HL-15			2	NP	68.3	72.0	2100		1
L	HL-15			2	YP	15.0	15.8	41		1
L	HL-15			2	YP	15.8	16.6	39		1
L	HL-15			2	YP	16.3	16.9	49		1
L	HL-15			2	YP	16.5	17.4	49		1
L	HL-15			2	YP	16.5	17.5	52		1
L	HL-15			2	YP	17.8	18.8	58		1
I	HL-16	14:24	9:28	4	WASH					
L	HL-17	14:38	9:38	2	WASH					

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
L	HL-18	14:54	9:45	1	NP	58.4	61.9	1400	1	
L	HL-18			1	NP	36.2	38.9	320	1	
L	HL-18			1	NP	38.5	41.0	360	1	
L	HL-18			1	NP	40.9	44.0	440	1	
L	HL-18			1	NP	44.6	47.8	600	1	
L	HL-18			1	NP	48.4	52.6	780		1
L	HL-18			1	NP	50.6	53.7	890	1	
L	HL-18			1	NP	57.8	61.0	1380		1
L	HL-18			1	NP	59.1	62.8	1440		1
L	HL-18			1	NP	73.3	77.4	3250		1
L	HL-18			1	YP	19.7	20.6	90	1	
L	HL-18			1	YP	20.1	21.1	94	1	
L	HL-18			1	YP	20.4	21.3	99	1	
L	HL-18			1	YP	21.8	22.9	122		1
S	HL-19 Net 1	15:03	10:35	2	YP	8.5	8.9	6	1	
S	HL-19 Net 1			2	C	10.6	11.8	17		1
S	HL-19 Net 1			2	YP	7.5	7.9	5		1
S	HL-19 Net 1			2	YP	8.0	8.5	6		1
S	HL-19 Net 1			2	YP	8.1	8.5	5		1
S	HL-19 Net 1			2	YP	8.2	8.7	6		1
S	HL-19 Net 1			2	YP	8.3	8.7	5	1	
S	HL-19 Net 1			2	YP	8.3	8.7	6	1	
S	HL-19 Net 1			2	YP	8.6	9.1	7	1	
S	HL-19 Net 1			2	YP	10.4	11.0	11		1
S	HL-19 Net 1			2	YP	11.6	12.2	16	1	
S	HL-19 Net 1			2	YP	11.7	12.3	16		1
S	HL-19 Net 2	15:03	10:35	2	YP	8.2	8.6	6		1
S	HL-19 Net 2			2	1 HEADLESS PERCH AND 1 SHINER					
S	HL-19 Net 2			2	C	8.6	9.5	10.5		1
S	HL-19 Net 2			2	C	8.9	9.9	8		1
S	HL-19 Net 2			2	C	9.2	10.1	9		1
S	HL-19 Net 2			2	C	9.4	10.5	10		1
S	HL-19 Net 2			2	C	9.9	11.0	12	1	
S	HL-19 Net 2			2	LP	7.1	7.2	3		1
S	HL-19 Net 2			2	YP	7.3	7.6	4		1
S	HL-19 Net 2			2	YP	7.5	8.0	5		1
S	HL-19 Net 2			2	YP	7.8	8.2	5	1	
S	HL-19 Net 2			2	YP	7.9	8.4	5		1
S	HL-19 Net 2			2	YP	8.0	8.5	6		1
S	HL-19 Net 2			2	YP	8.2	8.6	6		1
S	HL-19 Net 2			2	YP	8.2	8.7	6		1
S	HL-19 Net 2			2	YP	8.2	8.8	7		1
S	HL-19 Net 2			2	YP	8.2	8.5	6		1
S	HL-19 Net 2			2	YP	8.2	8.6	7		1
S	HL-19 Net 2			2	YP	8.2	8.7	6		1
S	HL-19 Net 2			2	YP	8.2	8.6	6		1
S	HL-19 Net 2			2	YP	8.2	8.6	6		1
S	HL-19 Net 2			2	YP	8.3	8.9	7		1
S	HL-19 Net 2			2	YP	8.3	8.9	7		1
S	HL-19 Net 2			2	YP	8.3	8.7	6		1
S	HL-19 Net 2			2	YP	8.5	8.9	7		1
S	HL-19 Net 2			2	YP	8.7	9.2	7		1
S	HL-19 Net 2			2	YP	8.8	9.2	7.5		1
S	HL-19 Net 2			2	YP	9.0	9.6	9		1
S	HL-19 Net 2			2	YP	9.0	9.4	9		1
S	HL-19 Net 2			2	YP	9.0	9.4	7		1
S	HL-19 Net 2			2	YP	9.1	9.7	8		1
S	HL-19 Net 2			2	YP	9.2	9.8	8		1
S	HL-19 Net 2			2	YP	9.4	9.9	9		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-19 Net 2			2	YP	9.4	10.1	9		1
S	HL-19 Net 2			2	YP	9.7	10.1	9		1
S	HL-19 Net 2			2	YP	10.3	10.8	10	1	
S	HL-19 Net 2			2	YP	13.0	13.8	23		1
S	HL-19 Net 2			2	YP	13.2	13.9	25		1
S	HL-20 Net 1	15:11	11:30	4	YP	11.6	12.3	15	1	
S	HL-20 Net 1			4	SCULPIN		6.8	3		
S	HL-20 Net 1			4	SM CISCO	12.6	13.9	18		1
S	HL-20 Net 2	15:11	11:30	4	TP	7.3	8.2	5		1
S	HL-20 Net 2			4	C	8.6	9.5	7.5		1
S	HL-20 Net 2			4	SM CISCO	14.2	16.0	25		1
S	HL-20 Net 2			4	SM CISCO	14.6	16.4	29		1
S	HL-20 Net 2			4	YP	11.0	11.6	13	1	
S	HL-20 Net 2			4	YP	11.2	11.9	13	1	
S	HL-20 Net 2			4	YP	11.8	12.5	15	1	
S	HL-20 Net 2			4	YP	11.8	12.5	16	1	
S	HL-20 Net 2			4	YP	12.2	12.9	17	1	
S	HL-21 Net 1	13:15	9:12	3	YP	11.3	11.9	13	1	
S	HL-21 Net 1			3	SM CISCO	8.1	8.9	5		1
S	HL-21 Net 1			3	SM CISCO	11.6	13.1	16		1
S	HL-21 Net 1			3	SM CISCO	14.3	16.1	26		1
S	HL-21 Net 1			3	YP	11.1	11.8	13	1	
S	HL-21 Net 1			3	YP	11.3	12.0	15	1	
S	HL-21 Net 2	13:15	9:12	3	YP	11.2	11.9	13.5	1	
S	HL-21 Net 2			3	SM CISCO	8.8	9.6	6		1
S	HL-21 Net 2			3	SM CISCO	13.1	14.5	19		1
S	HL-21 Net 2			3	SM CISCO	14.1	15.8	27		1
S	HL-21 Net 2			3	YP	10.6	11.1	12	1	
S	HL-21 Net 2			3	YP	10.8	11.4	13	1	
S	HL-21 Net 2			3	YP	10.9	11.6	13	1	
S	HL-21 Net 2			3	YP	10.9	11.6	12	1	
S	HL-21 Net 2			3	YP	11.0	11.6	12.5	1	
S	HL-21 Net 2			3	YP	11.0	11.7	14	1	
S	HL-21 Net 2			3	YP	11.0	11.6	13.5		1
S	HL-21 Net 2			3	YP	11.1	11.7	13	1	
S	HL-21 Net 2			3	YP	11.2	11.9	15		1
S	HL-21 Net 2			3	YP	11.5	12.1	15	1	
S	HL-21 Net 2			3	YP	11.7	12.4	15	1	
S	HL-21 Net 2			3	YP	11.8	12.6	16	1	
S	HL-21 Net 2			3	YP	11.9	12.6	18		1
S	HL-21 Net 2			3	YP	12.0	12.7	16	1	
S	HL-21 Net 2			3	YP	12.3	13.0	18	1	
S	HL-21 Net 2			3	YP	12.8	13.5	20		1
S	HL-22 Net 1	13:26	9:44	1	YP	8.6	9.1	7	1	
S	HL-22 Net 1			1	2 YP BODES					
S	HL-22 Net 1			1	3 C BODIES					
S	HL-22 Net 1			1	C	5.6	6.4	3	1	
S	HL-22 Net 1			1	C	5.6	6.4	3	1	
S	HL-22 Net 1			1	C	5.6	6.4	2.5		1
S	HL-22 Net 1			1	C	6.0	6.6	3		1
S	HL-22 Net 1			1	C	6.1	6.6	3		1
S	HL-22 Net 1			1	C	8.3	9.1	7.5		1
S	HL-22 Net 1			1	C	8.5	9.4	8		1
S	HL-22 Net 1			1	C	8.5	9.4	8		1
S	HL-22 Net 1			1	C	8.9	9.6	8		1
S	HL-22 Net 1			1	YP	7.7	8.1	5.5		1
S	HL-22 Net 1			1	YP	7.8	8.3	6		1
S	HL-22 Net 1			1	YP	7.8	8.2	6		1
S	HL-22 Net 1			1	YP	7.9	8.4	6		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-22 Net 1			1	YP	7.9	8.4	6		1
S	HL-22 Net 1			1	YP	7.9	8.4	6		1
S	HL-22 Net 1			1	YP	7.9	8.4	6		1
S	HL-22 Net 1			1	YP	7.9	8.2	6		1
S	HL-22 Net 1			1	YP	8.0	8.5	6		1
S	HL-22 Net 1			1	YP	8.0	8.5	6.5		1
S	HL-22 Net 1			1	YP	8.1	8.6	5.5	1	
S	HL-22 Net 1			1	YP	8.1	8.5	6		1
S	HL-22 Net 1			1	YP	8.1	8.6	6		1
S	HL-22 Net 1			1	YP	8.2	8.6	6.5		1
S	HL-22 Net 1			1	YP	8.3	8.8	6		1
S	HL-22 Net 1			1	YP	8.3	8.7	7		1
S	HL-22 Net 1			1	YP	8.3	8.6	7		1
S	HL-22 Net 1			1	YP	8.6	9.1	7.5	1	
S	HL-22 Net 1			1	YP	8.6	9.1	7		1
S	HL-22 Net 1			1	YP	8.8	9.2	8		1
S	HL-22 Net 2	13:26	9:44	1	YP	15.4	16.3	42	1	
S	HL-22 Net 2			1	1 C BODY					
S	HL-22 Net 2			1	2 YP BODIES					
S	HL-22 Net 2			1	C	8.2	9.1	7		1
S	HL-22 Net 2			1	C	8.7	9.6	8	1	
S	HL-22 Net 2			1	C	8.8	9.7	8		1
S	HL-22 Net 2			1	C	8.8	9.6	8		1
S	HL-22 Net 2			1	C	8.8	9.8	8		1
S	HL-22 Net 2			1	C	8.8	9.7	8		1
S	HL-22 Net 2			1	C	8.9	9.7	8		1
S	HL-22 Net 2			1	C	8.9	10.1	8		1
S	HL-22 Net 2			1	C	9.1	10.2	12		1
S	HL-22 Net 2			1	C	9.2	10.1	9		1
S	HL-22 Net 2			1	C	9.4	10.4	11		1
S	HL-22 Net 2			1	C	9.5	10.2	10		1
S	HL-22 Net 2			1	YP	6.8	7.1	4	1	
S	HL-22 Net 2			1	YP	7.4	7.8	5		1
S	HL-22 Net 2			1	YP	7.5	7.9	5		1
S	HL-22 Net 2			1	YP	7.6	8.2	6		1
S	HL-22 Net 2			1	YP	7.6	8.1	6		1
S	HL-22 Net 2			1	YP	7.8	8.3	5.5	1	
S	HL-22 Net 2			1	YP	7.8	8.2	5		1
S	HL-22 Net 2			1	YP	7.8	8.2	6		1
S	HL-22 Net 2			1	YP	7.8	8.2	6		1
S	HL-22 Net 2			1	YP	7.9	8.4	5	1	
S	HL-22 Net 2			1	YP	7.9	8.5	6		1
S	HL-22 Net 2			1	YP	7.9	8.3	5		1
S	HL-22 Net 2			1	YP	7.9	8.4	6		1
S	HL-22 Net 2			1	YP	8.0	8.5	6.5		1
S	HL-22 Net 2			1	YP	8.1	8.7	6		1
S	HL-22 Net 2			1	YP	8.1	8.5	6		1
S	HL-22 Net 2			1	YP	8.1	8.5	6		1
S	HL-22 Net 2			1	YP	8.1	8.5	6		1
S	HL-22 Net 2			1	YP	8.2	8.7	5	1	
S	HL-22 Net 2			1	YP	8.2	8.8	6		1
S	HL-22 Net 2			1	YP	8.2	8.6	6		1
S	HL-22 Net 2			1	YP	8.2	8.5	6		1
S	HL-22 Net 2			1	YP	8.3	8.7	6		1
S	HL-22 Net 2			1	YP	8.4	8.9	6		1
S	HL-22 Net 2			1	YP	8.4	8.9	6.5		1
S	HL-22 Net 2			1	YP	8.4	8.7	7		1
S	HL-22 Net 2			1	YP	8.5	9.0	7.5		1
S	HL-22 Net 2			1	YP	8.6	9.1	8		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-22 Net 2			1	YP	9.2	9.9	8		1
S	HL-22 Net 2			1	YP	9.3	9.8	8		1
S	HL-22 Net 2			1	YP	9.4	9.9	8		1
S	HL-22 Net 2			1	YP	9.6	10.1	8		1
S	HL-22 Net 2			1	YP	10.6	11.1	12		1
S	HL-22 Net 2			1	YP	11.8	12.4	18		1
S	HL-22 Net 2			1	YP	12.4	13.0	16	1	
S	HL-22 Net 2			1	YP	13.9	14.8	28		1
L	HL-23	13:37	11:08	5	WASH					
L	HL-24	13:48	11:26	4	LNS	31.5	33.4	480	1	
L	HL-24			4	NP-5	67.4	71.0	2040		1
L	HL-25	13:58	11:54	4	NP	64.4	68.0	1880		1
L	HL-25			4	NP	69.2	72.9	2470		1
L	HL-26	13:05	9:18	2	NP	60.4	64.3	1540		1
L	HL-26			2	NP	47.4	50.6	780		1
L	HL-26			2	YP	14.4	15.2	35		1
L	HL-27	13:12	9:50	1	NP	46.2	49.3	720		1
L	HL-27			1	YP	16.1	16.9	44	1	
L	HL-27			1	YP	16.6	17.4	45	1	
L	HL-27			1	YP	17.0	18.1	50	1	
L	HL-28	13:17	10:05	3	WASH					
S	HL-29 Net 1	13:32	10:21	2	NP	62.0		1600	1	
S	HL-29 Net 1			2	3 HEADLESS SHINERS NET 1					
S	HL-29 Net 1			2	C	5.8	6.6	3		1
S	HL-29 Net 1			2	C	6.1	7.0	3		1
S	HL-29 Net 1			2	C	6.3	7.2	3		1
S	HL-29 Net 1			2	LP	6.3	6.5	2.5		1
S	HL-29 Net 1			2	LP	6.4	6.6	2.5		1
S	HL-29 Net 1			2	LP	6.5	6.6	2.5		1
S	HL-29 Net 1			2	YP	7.4	7.9	5		1
S	HL-29 Net 1			2	YP	7.6	8.1	5		1
S	HL-29 Net 1			2	YP	7.9	8.5	6		1
S	HL-29 Net 1			2	YP	8.2	8.6	6		1
S	HL-29 Net 1			2	YP	8.4	8.8	6		1
S	HL-29 Net 1			2	YP	8.9	9.4	7	1	
S	HL-29 Net 1			2	YP	12.2	12.8	12		1
S	HL-29 Net 2	13:32	10:21	2	YP	11.8	12.6	15	1	
S	HL-29 Net 2			2	1 HEADLESS YP AND 3 C BODIES					
S	HL-29 Net 2			2	NP	20.0		120		
S	HL-29 Net 2			2	YP	7.8	8.5	5	1	
S	HL-29 Net 2			2	YP	7.8	8.3	5		1
S	HL-29 Net 2			2	YP	7.9	8.4	6	1	
S	HL-29 Net 2			2	YP	7.9	8.4	6		1
S	HL-29 Net 2			2	YP	8.0	8.4	6		1
S	HL-29 Net 2			2	YP	8.0	8.5	6		1
S	HL-29 Net 2			2	YP	8.1	8.5	5.5		1
S	HL-29 Net 2			2	YP	8.2	8.6	6		1
S	HL-29 Net 2			2	YP	8.3	8.9	6		1
S	HL-29 Net 2			2	YP	8.5	9.0	7		1
S	HL-29 Net 2			2	YP	8.6	9.0	7		1
S	HL-29 Net 2			2	YP	12.3	13.0	22		1
S	HL-30 Net 1	13:40	11:00	1	NP	58.8	62.5	1500	1	
S	HL-30 Net 1			1	2 YP BODIES 3 BODIES OF C					
S	HL-30 Net 1			1	C	5.8	6.5	2.5		1
S	HL-30 Net 1			1	C	6.2	7.1	3		1
S	HL-30 Net 1			1	C	7.7	8.6	6.5		1
S	HL-30 Net 1			1	C	8.7	9.4	6		1
S	HL-30 Net 1			1	C	8.7	9.5	8		1
S	HL-30 Net 1			1	LP	6.6	6.8	3		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-30 Net 1			1	LP	6.9	7.1	3		1
S	HL-30 Net 1			1	LP	7.2	7.4	3		1
S	HL-30 Net 1			1	YP	7.6	8.2	5.5		1
S	HL-30 Net 1			1	YP	7.9	8.4	6		1
S	HL-30 Net 1			1	YP	8.5	8.9	6		1
S	HL-30 Net 1			1	YP	8.5	8.9	7		1
S	HL-30 Net 1			1	YP	12.9	13.8	22	1	
S	HL-30 Net 1			1	YP	13.0	13.6	23		1
S	HL-30 Net 2	13:40	11:00	1	YP	14.1	15.0	25	1	
S	HL-30 Net 2			1	7 headless C bodies					
S	HL-30 Net 2			1	C	5.9	6.6	3		1
S	HL-30 Net 2			1	C	7.2	8.1	5		1
S	HL-30 Net 2			1	C	8.0	8.9	8		1
S	HL-30 Net 2			1	C	8.4	9.5	7		1
S	HL-30 Net 2			1	C	8.5	9.2	7		1
S	HL-30 Net 2			1	C	8.6	9.7	8		1
S	HL-30 Net 2			1	C	8.6	9.6	7.5		1
S	HL-30 Net 2			1	C	8.8	9.7	8.5		1
S	HL-30 Net 2			1	C	10.2	11.5	9		1
S	HL-30 Net 2			1	C		6.6	3		1
S	HL-30 Net 2			1	YP	6.4	6.9	3		1
S	HL-30 Net 2			1	YP	7.4	7.7	5		1
S	HL-30 Net 2			1	YP	7.4	8.0	5		1
S	HL-30 Net 2			1	YP	8.3	8.9	6.5	1	
S	HL-30 Net 2			1	YP	8.5	9.0	6.5		1
S	HL-30 Net 2			1	YP	8.5	9.1	6		1
S	HL-30 Net 2			1	YP	8.8	9.3	7		1
S	HL-30 Net 2			1	YP	9.7	10.4	8		1
S	HL-30 Net 2			1	YP	9.8	10.4	9.5		1
S	HL-30 Net 2			1	YP	12.2	13.0	20	1	
S	HL-30 Net 2			1	YP	12.8	13.6	23	1	
S	HL-30 Net 2			1	YP	13.8	14.8	23	1	
S	HL-30 Net 2			1	YP	15.0	15.9	37		1
S	HL-30 Net 2			1	YP	15.3	16.2	40		1
S	HL-30 Net 2			1	YP	15.6	16.4	39		1
S	HL-30 Net 2			1	YP	16.1	17.0	42		1
S	HL-30 Net 2			1	YP	17.5	18.6	59	1	
S	HL-31 Net 1	13:48	11:49	4	LNS	23.3	24.3	160	1	
S	HL-31 Net 1			4	SM CISCO	8.3	9.2	6.5		1
S	HL-31 Net 1			4	SM CISCO	13.0	14.5	20		1
S	HL-31 Net 2	13:48	11:49	4	SM CISCO	14.0	15.4	23		1
S	HL-31 Net 2			4	SM CISCO	8.6	9.3	6		1
S	HL-31 Net 2			4	SM CISCO	12.0	13.4	17		1
S	HL-31 Net 2			4	SM CISCO	12.1	13.4	19		1
S	HL-31 Net 2			4	SM CISCO	12.9	14.3	19		1
S	HL-31 Net 2			4	SM CISCO	13.0	14.7	21		1
S	HL-31 Net 2			4	SM CISCO	13.0	14.6	23		1
S	HL-31 Net 2			4	SM CISCO	13.6	15.3	24.5		1
S	HL-32 Net 1	13:08	8:34	4	SM CISCO	13.5	14.9	20		1
S	HL-32 Net 1			4	SM CISCO	13.4	15.2	24	1	
S	HL-32 Net 1			4	SM CISCO	13.4	15.0	22		1
S	HL-32 Net 1			4	TP	7.9	9.1	6	1	
S	HL-32 Net 2	13:08	8:34							
S	HL-33 Net 1	13:14	10:35	2	NP	20.4	21.5	89	1	
S	HL-33 Net 1			2	3 SHINER BODIES					
S	HL-33 Net 1			2	C	8.0	9.1	7		1
S	HL-33 Net 1			2	C	8.4	9.6	7		1
S	HL-33 Net 1			2	C	8.5	9.6	8		1
S	HL-33 Net 1			2	C	8.6	9.6	8		1

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-33 Net 1			2	C	8.9	9.9	8		1
S	HL-33 Net 1			2	NP	8.6	9.2	6.5	1	
S	HL-33 Net 1			2	NP	12.1	12.8	18	1	
S	HL-33 Net 1			2	NP	13.2	14.0	27	1	
S	HL-33 Net 1			2	NP	14.4	15.3	32	1	
S	HL-33 Net 1			2	NP	14.4	15.2	32	1	
S	HL-33 Net 1			2	NP	14.4	15.2	31	1	
S	HL-33 Net 1			2	NP	14.8	15.5	37	1	
S	HL-33 Net 1			2	NP	14.9	15.7	36	1	
S	HL-33 Net 1			2	NP	15.1	15.9	42	1	
S	HL-33 Net 1			2	NP	16.0	16.9	47	1	
S	HL-33 Net 1			2	NP	16.6	17.5	51	1	
S	HL-33 Net 1			2	NP	16.6	17.5	57	1	
S	HL-33 Net 1			2	NP	17.2	18.5	58	1	
S	HL-33 Net 1			2	NP	22.5	23.6	110	1	
S	HL-33 Net 1			2	NP	24.0	25.5	164	1	
S	HL-33 Net 1			2	YP	10.9	11.5	14		1
S	HL-33 Net 1			2	YP	11.1	11.7	16		1
S	HL-33 Net 1			2	YP	11.4	12.0	16		1
S	HL-33 Net 1			2	YP	11.5	12.3	16		1
S	HL-33 Net 1			2	YP	11.5	12.1	16		1
S	HL-33 Net 1			2	YP	12.0	12.6	20		1
S	HL-33 Net 1			2	YP	12.2	12.9	20		1
S	HL-33 Net 1			2	YP	12.4	13.1	20		1
S	HL-33 Net 1			2	YP	12.4	13.1	19		1
S	HL-33 Net 1			2	YP	12.5	13.2	21		1
S	HL-33 Net 1			2	YP	13.0	13.7	23		1
S	HL-33 Net 1			2	YP	13.5	14.4	28		1
S	HL-33 Net 1			2	YP	13.8	14.5	31		1
S	HL-33 Net 1			2	YP	13.8	14.5	32		1
S	HL-33 Net 1			2	YP	14.0	14.9	29		1
S	HL-33 Net 1			2	YP	14.1	14.9	31		1
S	HL-33 Net 1			2	YP	14.4	15.0	33		1
S	HL-33 Net 1			2	YP	14.9	15.9	40		1
S	HL-33 Net 1			2	YP	15.0	15.8	42		1
S	HL-33 Net 1			2	YP	15.0	15.9	38		1
S	HL-33 Net 1			2	YP	16.0	16.9	48		1
S	HL-33 Net 1			2	YP	16.5	17.6	48		1
S	HL-33 Net 1			2	YP	17.6	18.5	63		1
S	HL-33 Net 1			2	YP	18.2	19.4	71		1
S	HL-33 Net 1			2	YP	18.3	19.4	69		1
S	HL-33 Net 1			2	YP	18.9	20.0	72		1
S	HL-33 Net 1			2	YP	19.1	20.0	84		1
S	HL-33 Net 2	13:14	10:35	2	YP	16.4	17.4	57	1	
S	HL-33 Net 2			2	1 HEADLESS C AND 1 LP					
S	HL-33 Net 2			2	C	7.9	8.9	6		1
S	HL-33 Net 2			2	C	8.0	9.1	6	1	
S	HL-33 Net 2			2	C	8.4	9.3	7		1
S	HL-33 Net 2			2	C	8.5	9.7	8	1	
S	HL-33 Net 2			2	C	8.5	9.6	7		1
S	HL-33 Net 2			2	C	8.8	9.7	8		1
S	HL-33 Net 2			2	C	9.0	10.1	10		1
S	HL-33 Net 2			2	C	9.0	10.1	8		1
S	HL-33 Net 2			2	C	9.2	10.5	9		1
S	HL-33 Net 2			2	YP	8.0	8.5	5	1	
S	HL-33 Net 2			2	YP	8.0	8.5	7		1
S	HL-33 Net 2			2	YP	8.3	8.8	5	1	
S	HL-33 Net 2			2	YP	8.5	9.1	7		1
S	HL-33 Net 2			2	YP	11.0	11.6	15	1	

TABLE A2.1: CATCHES AND MERSITICS ASSOCIATED WITH THE HARE LAKE NETTING SURVEY IN SEPTEMBER 2011

Size	Site Location	Set	Lift	Depth Strata	Species	FL	TL	RWT	Released	Dead
S	HL-33 Net 2			2	YP	11.0	11.7	14		1
S	HL-33 Net 2			2	YP	11.9	12.6	17		1
S	HL-33 Net 2			2	YP	11.9	12.6	17		1
S	HL-33 Net 2			2	YP	12.6	13.3	26		1
S	HL-33 Net 2			2	YP	12.7	13.5	20	1	
S	HL-33 Net 2			2	YP	13.0	13.8	24	1	
S	HL-33 Net 2			2	YP	14.0	14.9	28	1	
S	HL-33 Net 2			2	YP	14.3	15.1	32		1
S	HL-33 Net 2			2	YP	14.5	15.3	36		1
S	HL-33 Net 2			2	YP	14.9	15.9	44		1
S	HL-33 Net 2			2	YP	17.4	18.2	57		1
S	HL-34 Net 1	13:24	11:00	3	NP	64.3	66.5	1750	1	
S	HL-34 Net 1			3	2 C BODIES IN NET 1					
S	HL-34 Net 1			3	C	8.5	9.4	7		1
S	HL-34 Net 1			3	C	8.9	10.0	9		1
S	HL-34 Net 1			3	C	8.9	9.5	7		1
S	HL-34 Net 1			3	NP	44.6	47.8	620		1
S	HL-34 Net 1			3	YP	7.7	8.1	5		1
S	HL-34 Net 1			3	YP	7.7	8.1	5		1
S	HL-34 Net 1			3	YP	8.4	8.9	7		1
S	HL-34 Net 1			3	YP	8.5	9.1	7		1
S	HL-34 Net 1			3	YP	8.5	8.9	7		1
S	HL-34 Net 1			3	YP	10.6	11.3	12	1	
S	HL-34 Net 1			3	YP	11.3	11.9	15		1
S	HL-34 Net 1			3	YP	12.3	13.0	18		1
S	HL-34 Net 1			3	YP	12.4	13.1	21	1	
S	HL-34 Net 1			3	YP	13.3	14.0	26	1	
S	HL-34 Net 1			3	YP	14.8	15.6	36		1
S	HL-34 Net 1			3	YP	15.3	14.2	23	1	
S	HL-34 Net 2	13:24	11:00	3	NP	67.3	70.6	2020	1	
S	HL-34 Net 2			3	2 LP, 6 C, 2 YP bodies					
S	HL-34 Net 2			3	LP	6.2	6.4	2		1
S	HL-34 Net 2			3	YP	7.7	8.2	5		1
S	HL-34 Net 2			3	YP	8.2	8.6	6	1	
S	HL-34 Net 2			3	YP	8.2	8.7	6		1
S	HL-34 Net 2			3	YP	8.4	8.9	7		1
S	HL-34 Net 2			3	YP	8.6	9.1	7		1
S	HL-34 Net 2			3	YP	8.9	9.4	8		1
S	HL-34 Net 2			3	YP	9.8	10.4	9		1
S	HL-34 Net 2			3	YP	10.6	11.3	13		1
S	HL-34 Net 2			3	YP	11.2	11.9	13		1
S	HL-34 Net 2			3	YP	11.6	12.4	18		1
S	HL-34 Net 2			3	YP	11.9	12.6	17		1
S	HL-34 Net 2			3	YP	12.4	13.2	18	1	
S	HL-34 Net 2			3	YP	12.4	13.2	18	1	
S	HL-34 Net 2			3	YP	12.9	13.7	24	1	
S	HL-34 Net 2			3	YP	13.2	14.0	23	1	
S	HL-34 Net 2			3	YP	14.8	15.4	29	1	
S	HL-34 Net 2			3	YP	15.1	15.9	35	1	
S	HL-34 Net 2			3	YP	15.8	16.6	50		1
L	HL-35	13:30	11:45	4	LT	62.0	66.2	3050		
L	HL-36	13:43	12:10	1	NP	49.5	53.2	800	1	
L	HL-36			1	NP	62.0	66.1	1620		1
L	HL-36			1	NP	66.2	70.5	1980	1	

NOTE: C= SPOTTAIL SHINER; L IS LARGE MESH GILLNET, S IS SMALL MESH GILLNET; FL = FORK LENGTH (mm), TL = TOTAL LENGTH (mm), WEIGHT IS IN GRAMS

Client: MARATHON PGM
Project No. 09-1630
Investigators: RF/RR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BAMOOSE LAKE Station No.: BC Location: LAKESIDE
Datum: NAD 27 Pictures taken: YES
Date: 27/08/09 Water Temperature: 61-62°F (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
MT1	15:30	10:05/11:40	0.5		Cobble sand detritus	48° 48.919 86° 19.637
MT2	16:50	17:30/15:35	0.5		COBBLE/GRAVEL	48°48.331 86° 22.597
MT3	17:00	16.35/1435	0.75		GRAVEL SAND BOULDER	48° 48.577 86° 22.597
MT4	17:15	14:15/13:40	1.0		BOULDER	48° 48.815 86° 22.299
MT5	17:25	13:20/13:00	0.75		SILT COBBLE SAND	48° 49.152 86° 21.225
MT6	17:55	11:45/12:00	0.75		SAND SILT PEBBLES	48° 49.568 86° 20.110
MT7	18:10	10:10/11:50	1.0		SILT	48° 49.042 86° 19.788

LOCATION
ACCESS
OUTLET
NW ENDMARSH
NO NAME
NW INLET
NE INLET
BEAVER LODGE

IF NOT LISTED BELOW NO CATCH

Gear	Species	YOY	Juvenile	Adult
MT1	LAKE CHUB			1
MT7	LAKE CHUB		THL	THH
MT2	Brook stickleback			111
MT7	Finescale Dace & NRED HYBRIDS		11	11
MT6	TROUT PERCH			1
MT5	LAKE CHUB		11	
MT4	LAKE CHUB			111
MT4	SLIMY SCULPIN		1	
MT1	Finescale Dace			1
MT1	Brookstickleback			1
MT1	fathead minnow			1
MT1	Lake chub		11	1111
MT7	LAKE CHUB		THH THH 111	THH
MT7	BROOK STICKLEBACK			1

MT 7 FATHEAD MINNOW 1

48 48.

Client: Marathon PGM
Project No. 09-1658
Investigators: RK/RR

Gear	Species	YOY	Juvenile	Adult
MT4	LAKE CHUB		III	II
	TOTALS			

Comments:

Client: Marathon PGM
Project No. 09-1630
Investigators: RR+RE

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BAMOOS LAKE Station No.: BLS1 Location: West Beach.
Coordinates: 48° 48.365' N 86° 22.862' W Datum: NAD 27.
Date: Aug 31/09 Time: 12.30 Water Temperature: 62°F (°C)
~~Electrofishing Effort~~: 400 (seconds) Length of ~~Stream~~ Sampled: 40 (m) Mean Width: 10 (m)
SEINE NET 59.M Beach.

Species	YOY	Juvenile	Adult
Ninespine stickleback.	//////	////	////
Slimy sculpin.	////		
Lake Chub	/		
TOTALS			

Comments: 50'x4' BAG SEINE 3/4" MESH

Client: MARATHON PGA
Project No. 09-1630
Investigators: RE/AR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BAMOOS LAKE Station No.: BL1N Location: NORTHWEST EMBAYMENT
Coordinates: 48° 48.593 N 86° 22.583' W Datum: NAD 22
Gear Type: Gillnet ( ) Trapnet ( ) Other (X): NORDIC NO1
Net Size: (l x w x h): 50' x 4' Mesh Size (inch): [illegible]
Net Set Date: 27/08/09 Time: 12.05
Net Removed Date: 28/08/09. Time: 16.40
Total Fishing Time: 22.6 (hrs) Depth of Set: 1-1.5 (m)
Substrate Characteristics: SILT SAND GRAVEL LARGE ORGANIC

Fish Species	Adult Length (cm)	Juv Weight (g)	YOY, Notes (sex, stomach contents, parasites, etc.)
BT	31.1	11	
BT	23.3		
WS		1	
LNS		11	
LC	IIII	IIII	

Client: MARATHON PGM
Project No. 09-1658
Investigators: R&IRR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: RAMOUS LAKE Station No.: BL2N Location: NORTHEAST IN LAKE
Coordinates: 45° 49.551' N 86° 20.099' W Datum: NAD 27
Gear Type: Gillnet ( ) Trapnet ( ) Other (X): NORDIC NETS
Net Size: (l x w x h): 50' x 4' Mesh Size (inch): _____
Net Set Date: 27/08/09 Time: 18:05
Net Removed Date: 28/08/09 Time: 11:30
Total Fishing Time: 17.4 (hrs) Depth of Set: 1-1.5 (m)
Substrate Characteristics: SAND SILT

Fish Species	Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)
WS	"	"	"
LNS	"	"	"
LAKE CHUB	"	"	
Trout Perch	"		

Client: MANAHOA PCM
Project No. 09-1630
Investigators: RE IAR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: RAMOOS LAKE Station No.: BL1F Location: DOWNSTREAM EMBAYMENT
Coordinates: 48 49.539 N 86 20.071 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 75' x 6' Mesh Size (inch): 1½ - 2½
Net Set Date: Aug 27/09 Time: 13:20
Net Removed Date: 28/08/09 Time: 10:30
Total Fishing Time: 17.2 (hrs) Depth of Set: 3-10 (m)
Substrate Characteristics: Bedrock & Sand, Boulders. 62°F

Fish Species	Total Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)						
LONGNOSE SUCKER	31.2	280	Total Length	Wgt.	SP	SP	FL	WT	
1	28.6a	223	26.3	180	WS	LNS	23.5	135	Dead
	33.2	345	27.2	200	"	"	26.5	175	"
	29.8	250	23.2	110	LNS	"	24.2	135	"
	31.5	295	23.8	125	"	WS	25.6	160	"
	31.3	310	23.8	135	"	LNS	29.3	250	"
	31.0	275	23.2	135	"	BT	26.0	205	"
	35.6	420	31.2	285	"	LT	36.2	369	"
	34.2	395	24.7	150	WS	LT	37.2	440	"
	28.2	225	32.5	325	"	LT(a)	49.1	825	M!! BLT1M,
	27.0	190	32.1	305	LNS	LT(a)	43.5	665	M!! BLT2M,
	36.2	505	29.8	260	"				
	24.4	145	17.4	45	"				
	27.2	195	17.7	52	"				
	29.3	260	17.3	40	"				
	29.0	235	25.4	155	WS				
	25.5	175	28.5	226	LNS				
	30.0	—	27.6	205	WS				
	29.9	290	26.5	175	LNS				
	27.7	235	25.0	145	"				
	28.7	240	24.5	135	"				
	26.2	170	16.2	40	"				
23 ↓	28.5	235							

Client: Marathon PGM
Project No. 09-1630
Investigators: RE/RR.

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BAMOOS LAKE Station No.: BL2F Location: SOUTH SHORE BAY
Coordinates: 48° 49.009' N 86° 20.901 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 225 Mesh Size (inch): 1-6"
Net Set Date: 27/08/09 Time: 13:40
Net Removed Date: 28/08/09 Time: 12:00
Total Fishing Time: 22.3 (hrs) Depth of Set: 3-10 (m)
Substrate Characteristics: SILT WOODY DEBRIS 62°F

Fish Species	Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)
WS	32.0	300	
"	26.5	195	
LT	36.5	380	
LT	43.2	665	BLT3M, L Male
BT	33.9	405	Female
WS	25.1	155	
LT	32.9	290	
BT	18.5	60.0	
Cisco	13.0	8.0	
LT	30.0	190	
LT	36.0	350	I
LT	40.8	575	M

Client: MARATHON PGM
Project No. 09-1630
Investigators: RB/RR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Lake elevation 285m

Waterbody: BAMOS LAKE Station No.: BL3F Location: NORTH SHORE MID LAKE
Coordinates: 48° 49.128 N 86 21.732 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 75'x6' Mesh Size (inch): 1½, 2, 2½
Net Set Date: Aug 27/08 Time: 14:00
Net Removed Date: Aug 28/08 Time: 13:25 61°F
Total Fishing Time: 23.4 (hrs) Depth of Set: 2-7 (m)
Substrate Characteristics: Sand silt cobble woody Debris.

Fish Species	Total Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)
BT	22.3	110	
"	20.3	85	
WS	33.2	350	
LNS	29.7	235	
"	28.0	230	
WS	26.4	180	
LNS	29.6	235	
"	30.3	295	
"	33.7	380	
"	32.5	335	
"	32.8	370	
"	31.7	320	
BT	28.1	176	
WS	24.7	155	
LT	36.2	390	FI

Client: MARATHON PGM
Project No. 09-1630
Investigators: REIER

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BAMOOS LAKE Station No.: BLUF Location: OFF SOUTHWEST ISLAND
Coordinates: 88° 18.694 N 86° 22.261 W Datum: NAD27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 225 x 6 Mesh Size (inch): 1-6 IN
Net Set Date: 27/08/09 Time: 14:40
Net Removed Date: 28/08/09 Time: 14:45
Total Fishing Time: 24.1 (hrs) Depth of Set: 3-14 (m)
Substrate Characteristics: ORGANIC SILT BEDROCK

61°F

Fish Species	Total Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)						
LNS	29.2	235	Sp	Lgt	Wgt	SP	Lgt	Wgt	
WS	47.2	1060	BT	35.0	410	Cisco	12.7	15.0 F	D
LNS	33.5	345	LNS	28.4	235	"	13.4	11.0	D
"	33.6	385	"	22.2	105	"	13.4	11.0	D
"	38.3	600	"	28.7	225	"	12.9	10.0	D
"	42.7	750	"	29.2	250	"	12.9	9.0 F	D
"	30.2	285	"	27.6	200	"	13.4	10.6 M	D
"	32.8	375	"	27.0	215	"	13.0	— M	D
"	32.6	385	WS	32.2	330	"	13.8	— M	D
"	34.3	425	"	33.2	365	"	12.9	— F	D
	33.3	345	LNS	28.7	230	"	12.7	— F	D
	29.6	245	"	28.7	225	"	13.0	— F	D
	34.2	435	"	21.8	96	LT	46.9	820	D
	34.0	370	"	29.8	260	LT	33.3	285 I	D
	29.7	255	WS	25.0	160	LT	40.4	450 F	D
	38.1	530	LNS	25.0	150	LT	44.8	705	D
	37.7	515	"	21.7	105	LT	49.1	1095 F	BLT4M, L
	22.9	210	" D	28.5	215	LT	48.7	1000 M	BLT5M, L
	35.3	450	" D	31.1	285				
D	30.0	300	BT D	22.0	115 F				
D	37.4	540	LT D	29.5	205				
V	28.8	240	LNS D	17.8	50				
	31.2	310							

Client: MARATHON PGM
Project No. 09-1630
Investigators: RSIRR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BAMOOSE LAKE Station No.: BL5F Location: EAST BAY NW
Coordinates: 48° 49 . 139 N 86° 20 . 306' W Datum: NAD 27
Gear Type: Gillnet (x) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1-6"
Net Set Date: 28/08/09 Time: 13:00
Net Removed Date: 29/08/09 Time: 12:10
Total Fishing Time: 23.2 (hrs) Depth of Set: 7-23 (m)
Substrate Characteristics: BIG ROCK SILT 60°F

Fish Species	Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)
Laketrout	55.2	1250	Released
"	45.3	890	Released
CISCO	37.4	420	"
LT	43.4	595	Dead.
LNS	35.5	410	Released
CISCO	36.2	405	"
LNS	28.0	220	"
LT	45.0	655	"
LT	34.6	270	"
LNS	27.0	205	"
"	28.3	210	"
LT	33.2	270	"
LNS	18.3	70	"
LT	32.7	325	dead

Client: MADISON P&G
Project No. 08-1678
Investigators: RK JCR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BADGER LAKE Station No.: BLGF Location: WEST BASIN
Coordinates: 43° 48.955 N 89° 32.577 W Datum: NAD27
Gear Type: Gillnet (x) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1-6
Net Set Date: 28/08/08 Time: 14:30
Net Removed Date: 29/08/08 Time: 15:40
Total Fishing Time: 23.2 (hrs) Depth of Set: 29-31 (m)
Substrate Characteristics: BEDROCK SILT

Fish Species	Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)		
LT	42.1	575	SP	Lgt	WGt
LNS	34.1	290	LT	36.0	295
LNS	36.0	450	LT	36.6	380 FI
"	33.9	380	LT	39.4	465 M
LT	43.0	530	Cisco	33.5	365
LNS	28.2	230	"	28.5	177
"	35.2	360			
"	28.0	230			
"	31.8	250			
"	26.6	165			
LT	49.8	890			
Cisco F	32.3	275			
" F	26.3	170			
" I	21.7	60.0			
" I	18.5	40.0			
" FI	27.3	155.0			
" M	28.0	150			
" I	25.5	115			
" F	34.0	365			
" M	33.4	360			
" FI	18.8	55.0			
LT I	32.5	250			
LT I	33.3	265			

Long gill rakers

Client: Marathon PGM
Project No. 09-1630
Investigators: KS/RR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: RAMSEY LAKE Station No.: BL7F Location: North side Island West basin
Coordinates: 46° 48.804 N 86° 22.138 W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ):
Net Size: (l x w x h): 75' Mesh Size (inch): 1½, 2¼
Net Set Date: 28/08/09 Time: 14:00
Net Removed Date: Aug 29/09 Time: 13:50
Total Fishing Time: 23.8 (hrs) Depth of Set: 7-12 (m)
Substrate Characteristics: Rocky S. 15 60°F

	Fish Species	Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)			
	LT	48.3	800	sex	Lgt	Wgt	
	LNS	26.9	185	LNS	31.7	295	
	"	26.6	175	WS	25.0	165	D
D	WS	25.5	175	LNS	29.1	235	
	LNS	29.1	190	LT	50.6	1000	Female
	"	24.9	150	LT	58.2	1595	Female.
	"	28.0	215				
D	WS	28.1	245				
D	LNS	27.7	195				
	"	28.9	240				
D	"	28.5	220				
	"	30.4	265				
	"	29.0	245				
	"	22.3	115				
D	WS	26.9	195				
	LNS	30.0	250				
	"	25.0	155				
	"	30.6	280				
D	"	22.2	115				
D	"	33.4	365				
	"	29.1	245				
	"	24.4	145				
D	WS	18.0	65				

Client: MARATHON PGM
Project No. 09-1630
Investigators: RS / RR

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: BANNOS LAKE Station No.: BL T1 Location: WEST END BEACH
Coordinates: 48° 48.369' N 86° 22.823' W Datum: NAD 27
Gear Type: Gillnet ( ) Trapnet (X) Other ( ):
Net Size: (l x w x h): 100' LEAD 4' HOUSE Mesh Size (inch): 3/8"
Net Set Date: 28/08/09 Time: 16:30
Net Removed Date: 28/08/09 / 29/08/09 Time: 17:20 / 14:50
Total Fishing Time: 24.8 / 21.3 (hrs) Depth of Set: 0.5 - 3 (m)
Substrate Characteristics: SAND SILT

Fish Species	Length (cm)	Weight (g)	Notes (sex, stomach contents, parasites, etc.)
28/08/09 WS	11	1	
LC	44 44 44 44	44 44	
TP	44 44 44	44 44	
LNS		11	
LNS		11	
29/08/09 LC	44 44 44	44	
TP	44	111	
9spinestickleback	9 spinestickleback	11	
Brookstickleback			

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE BE

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: LAKE SUPERIOR Station No.: LS Location: PORT MUNROE
Datum: NAD 27 Pictures taken: YES
Date: 06/08/09 Water Temperature: 15 (°C)

Gear	Set Time	Lift Time	Depth	Effort/Area	Substrate	Comments
100' SEINE	10:35	10:50	0.5	20M x 80M	SAND	
100'	10:55	11:05	0.5	20M x 50M	SAND + ROCKS	

Gear	Species	YOY	Juvenile	Adult
SEINE	MOTTLED SCULPIN		1	
SEINE	ROUND WHITEFISH	1		

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE / BF

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: LAKE SUPERIOR Station No.: LS1F Location: PORT MUNROE
Coordinates: 48° 46.921' N 86° 25.909' W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 225' x 6' Mesh Size (inch): 1"-6"
Net Set Date: 05/08/09 Time: 15:25
Net Removed Date: 06/08/09 Time: 9:30
Total Fishing Time: 18.1 (hrs) Depth of Set: 3-6 m (m)
Substrate Characteristics: SANDY SILT

Fish Species	TL Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
WHITE SUCKER	48.2	1050	FEMALE RELEASED
WHITE SUCKER	43.6	800	FEMALE RELEASED
WHITE SUCKER	49.5	1260	MALE RELEASED
WHITE SUCKER	39.0	530	MALE RELEASED - LAMPREY SCAR
WHITE SUCKER	41.2	650	FEMALE - RELEASED
WHITE SUCKER	39.8	580	MALE - RELEASED
WHITE SUCKER	39.4	310	MALE - RELEASED
WHITE SUCKER	39.5	510	MALE - RELEASED
WHITE SUCKER	40.1	640	MALE - RELEASED
WHITE SUCKER	29.6	175	IMMATURE - RELEASED
WHITE SUCKER	37.9	515	FEMALE - RELEASED
ROUND WHITEFISH	46.5	720	DEAD
ROUND WHITEFISH	42.1	425	DEAD
LAKE CHUB	12.4	—	ADULT

Client: MARATHON PGM
Project No. 09-1658
Investigators: RE / BE

ECOMETRIX INCORPORATED
FISH COLLECTION FORM

Waterbody: LAKE SUPERIOR Station No.: LS2F Location: PORT MUNROE
Coordinates: 48° 46.212' N 86° 26.073' W Datum: NAD 27
Gear Type: Gillnet (X) Trapnet ( ) Other ( ): _____
Net Size: (l x w x h): 225' X 6' Mesh Size (inch): 1" - 6"
Net Set Date: 05/08/09 Time: 15:45
Net Removed Date: 06/08/09 Time: 9:55
Total Fishing Time: 18.2 (hrs) Depth of Set: 5 - 12 m (m)
Substrate Characteristics: COBBLE

Fish Species	Length (cm)	Weight (gm)	Notes (sex, stomach contents, parasites, etc.)
WHITE SUCKER			
ROUND WHITEFISH	38.2	350	RELEASED
LONG NOSED SUCKER	36.0	410	MALE - RELEASED
WHITE SUCKER	46.4	890	MALE - RELEASED
WHITE SUCKER	42.2	695	MALE - RELEASED
ROUND WHITEFISH	32.8	190	IMMATURE - RELEASED
ROUND WHITEFISH	34.7	225	
WHITE SUCKER	24.3	25.0	IMMATURE - RELEASED
ROUND WHITEFISH	37.5	360	RELEASED

APPENDIX 3: Laboratory Reports for Sediment, Fish and Plant Tissue Analyses

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Certificate of Analysis

ECOMETRIX INC
ATTN: BRIAN FRASER
6800 CAMPOBELLO ROAD
MISSISSAUGA ON L5N 2L8

Report Date: 09-OCT-09 14:49 (MT)
Version: FINAL

Lab Work Order #: **L808918** **Date Received:** **21-AUG-09**

Project P.O. #:
Job Reference: 09-1630
Legal Site Desc:
CofC Numbers: 65835, 74527, 74528, 74529

Other Information:

Comments:

Wayne Smith, C.CHEM., C.E.T.
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS Canada Ltd.
Part of the **ALS Laboratory Group**
5730 Coopers Avenue, Unit #26 , Mississauga, ON L4Z 2E9
Phone: +1 905 507 6910 Fax: +1 905 507 6927 www.alsglobal.com
A Campbell Brothers Limited Company

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L808918-1	L808918-2	L808918-3	L808918-4	L808918-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09
	Sampled Time					
	Client ID	HL-P1	HL-P2	HL-P3	HL-P4	HL-P5
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	84.6	89.8	84.9	91.0	90.0
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	15500	8450	5180	10800	13500
Organic / Inorganic Carbon	Fraction Organic Carbon	0.119	0.115	0.102	0.152	0.109
	Total Organic Carbon (%)	11.9	11.5	10.2	15.2	10.9
Metals	Aluminum (Al) (mg/kg)	18400	25800	15900	23200	26000
	Antimony (Sb) (mg/kg)	<1.0	1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	6.5	18.0	10.1	16.8	17.2
	Barium (Ba) (mg/kg)	117	324	115	202	293
	Beryllium (Be) (mg/kg)	1.07	1.76	1.06	1.80	1.96
	Bismuth (Bi) (mg/kg)	<1.0	2.3	<1.0	1.6	2.4
	Boron (B) (mg/kg)	8.7	10.4	8.3	10.1	8.4
	Cadmium (Cd) (mg/kg)	0.89	4.46	2.70	4.51	4.89
	Calcium (Ca) (mg/kg)	4630	4500	3880	4530	4170
	Chromium (Cr) (mg/kg)	24.1	28.1	28.9	24.8	25.9
	Cobalt (Co) (mg/kg)	11.4	23.7	14.8	23.0	21.5
	Copper (Cu) (mg/kg)	22.2	38.2	23.1	35.7	38.6
	Iron (Fe) (mg/kg)	29900	65400	24300	52400	65500
	Lead (Pb) (mg/kg)	32.8	84.6	47.9	84.9	75.6
	Magnesium (Mg) (mg/kg)	2700	2600	2140	2110	2040
	Manganese (Mn) (mg/kg)	658	5840	964	2520	5400
	Mercury (Hg) (mg/kg)	0.169	0.268	0.177	0.318	0.293
	Molybdenum (Mo) (mg/kg)	1.8	1.7	1.1	1.8	2.2
	Nickel (Ni) (mg/kg)	13.6	20.3	14.6	18.8	18.5
	Phosphorus (P) (mg/kg)	1440	1330	931	1210	1370
	Potassium (K) (mg/kg)	650	799	571	698	668
	Selenium (Se) (mg/kg)	1.9	2.8	1.7	3.0	3.0
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	314	340	232	418	288
	Strontium (Sr) (mg/kg)	18.2	19.1	19.8	19.4	19.0
	Thallium (Tl) (mg/kg)	<1.0	7.2	<1.0	2.6	6.2
	Tin (Sn) (mg/kg)	4.9	6.7	5.5	6.7	6.7
	Titanium (Ti) (mg/kg)	609	542	577	469	504
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	30.6	40.4	26.1	38.4	37.6
	Zinc (Zn) (mg/kg)	164	407	302	397	422
	Zirconium (Zr) (mg/kg)	7.9	16.6	7.4	13.1	16.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L808918-6 SOIL 21-AUG-09 HL-L1	L808918-7 SOIL 21-AUG-09 HL-L2	L808918-8 SOIL 21-AUG-09 HL-L3	L808918-9 SOIL 21-AUG-09 HL-L4	L808918-10 SOIL 21-AUG-09 HL-L5
	Sample ID / **Description** / **Sampled Date** / **Sampled Time** / **Client ID**					
SOIL						
Physical Tests	% Moisture (%)	67.7	81.3	77.3	65.1	82.4
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	2860	9000	4400	3610	8240
Organic / Inorganic Carbon	Fraction Organic Carbon	0.0190	0.0972	0.0804	0.0342	0.0788
	Total Organic Carbon (%)	1.90	9.72	8.04	3.42	7.88
Metals	Aluminum (Al) (mg/kg)	15300	18200	10400	10800	16900
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	4.2	4.4	4.7	2.5	3.8
	Barium (Ba) (mg/kg)	74.7	106	91.8	74.4	80.8
	Beryllium (Be) (mg/kg)	1.03	1.13	0.75	0.63	0.94
	Bismuth (Bi) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B) (mg/kg)	6.9	9.6	7.5	8.2	9.1
	Cadmium (Cd) (mg/kg)	0.91	1.72	1.94	0.71	1.54
	Calcium (Ca) (mg/kg)	2560	4190	3950	2740	4390
	Chromium (Cr) (mg/kg)	21.1	26.8	17.4	20.6	20.5
	Cobalt (Co) (mg/kg)	12.3	12.1	8.1	8.2	8.4
	Copper (Cu) (mg/kg)	17.2	24.6	17.2	10.1	35.3
	Iron (Fe) (mg/kg)	27300	26700	13100	16500	16100
	Lead (Pb) (mg/kg)	13.6	27.0	24.9	13.0	12.5
	Magnesium (Mg) (mg/kg)	1980	3370	1920	2570	2160
	Manganese (Mn) (mg/kg)	1390	384	407	594	730
	Mercury (Hg) (mg/kg)	0.062	0.145	0.090	0.061	0.124
	Molybdenum (Mo) (mg/kg)	<1.0	1.1	<1.0	<1.0	1.1
	Nickel (Ni) (mg/kg)	16.4	17.6	13.7	12.7	15.2
	Phosphorus (P) (mg/kg)	734	1130	552	585	931
	Potassium (K) (mg/kg)	529	749	509	527	594
	Selenium (Se) (mg/kg)	<1.0	1.6	1.2	<1.0	1.3
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	321	317	328	463	514
	Strontium (Sr) (mg/kg)	9.7	17.3	15.0	10.9	15.3
	Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Tin (Sn) (mg/kg)	4.2	4.3	4.4	4.1	4.4
	Titanium (Ti) (mg/kg)	526	760	554	676	554
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	26.7	32.5	20.7	22.8	23.1
	Zinc (Zn) (mg/kg)	212	209	213	168	238
	Zirconium (Zr) (mg/kg)	7.3	8.0	6.8	7.3	6.5

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	Sample ID / Description / Sampled Date / Sampled Time / Client ID				
		L808918-11 SOIL 21-AUG-09 LS1	L808918-12 SOIL 21-AUG-09 LS2	L808918-13 SOIL 21-AUG-09 LS3	L808918-14 SOIL 21-AUG-09 LS4	L808918-15 SOIL 21-AUG-09 LS5
SOIL						
Physical Tests	% Moisture (%)	35.7	51.6	43.4	63.5	63.4
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	2110	2010	1240	3070	4240
Organic / Inorganic Carbon	Fraction Organic Carbon	0.0066	0.0208	0.0135	0.0297	0.0327
	Total Organic Carbon (%)	0.66	2.08	1.35	2.97	3.27
Metals	Aluminum (Al) (mg/kg)	4360	7660	6440	9390	8710
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	1.5	3.2	2.3	4.6	3.7
	Barium (Ba) (mg/kg)	26.4	41.6	38.2	52.4	45.7
	Beryllium (Be) (mg/kg)	<0.50	<0.50	<0.50	0.51	<0.50
	Bismuth (Bi) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B) (mg/kg)	6.9	9.2	8.4	10.8	9.9
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	0.65	0.58
	Calcium (Ca) (mg/kg)	8590	11800	18900	12000	9350
	Chromium (Cr) (mg/kg)	15.0	25.1	21.7	30.6	29.9
	Cobalt (Co) (mg/kg)	4.9	7.7	6.7	9.1	8.6
	Copper (Cu) (mg/kg)	7.9	20.8	14.8	30.8	29.8
	Iron (Fe) (mg/kg)	13300	17500	16000	20300	18700
	Lead (Pb) (mg/kg)	3.4	7.7	5.6	11.2	9.4
	Magnesium (Mg) (mg/kg)	5730	8610	12000	9420	7590
	Manganese (Mn) (mg/kg)	203	232	287	290	236
	Mercury (Hg) (mg/kg)	<0.050	0.060	<0.050	0.128	0.110
	Molybdenum (Mo) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Nickel (Ni) (mg/kg)	8.1	14.3	11.7	17.7	17.2
	Phosphorus (P) (mg/kg)	455	666	604	731	701
	Potassium (K) (mg/kg)	512	776	679	980	957
	Selenium (Se) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	229	364	261	547	357
	Strontium (Sr) (mg/kg)	9.4	14.3	15.0	16.5	15.4
	Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Tin (Sn) (mg/kg)	4.1	4.2	3.9	4.3	4.7
	Titanium (Ti) (mg/kg)	599	811	714	883	905
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	19.0	29.6	24.6	35.1	34.0
	Zinc (Zn) (mg/kg)	42.5	84.6	65.8	102	83.1
	Zirconium (Zr) (mg/kg)	9.3	14.3	12.3	16.9	17.3

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L808918-16 SOIL 21-AUG-09 LAKE2	L808918-17 SOIL 21-AUG-09 L9	L808918-18 SOIL 21-AUG-09 LAKE13A	L808918-19 SOIL 21-AUG-09 LAKE13	L808918-20 SOIL 21-AUG-09 L16
	Sample ID	L808918-16	L808918-17	L808918-18	L808918-19	L808918-20
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09
	Sampled Time					
	Client ID	LAKE2	L9	LAKE13A	LAKE13	L16
SOIL						
Physical Tests	% Moisture (%)	91.5	68.8	54.1	77.7	83.8
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	14100	3520	2300	8200	9100
Organic / Inorganic Carbon	Fraction Organic Carbon	0.158	0.0858	0.0484	0.115	0.134
	Total Organic Carbon (%)	15.8	8.58	4.84	11.5	13.4
Metals	Aluminum (Al) (mg/kg)	5560	8140	23500	17700	6260
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	3.0	1.5	1.9	3.3	1.7
	Barium (Ba) (mg/kg)	66.7	68.3	69.7	85.1	98.6
	Beryllium (Be) (mg/kg)	<0.50	<0.50	0.66	<0.50	<0.50
	Bismuth (Bi) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B) (mg/kg)	7.9	6.6	10.6	10.3	6.6
	Cadmium (Cd) (mg/kg)	0.89	<0.50	<0.50	<0.50	<0.50
	Calcium (Ca) (mg/kg)	1690	3210	5780	5030	74000
	Chromium (Cr) (mg/kg)	5.4	22.2	42.3	35.6	8.6
	Cobalt (Co) (mg/kg)	1.9	6.3	16.8	17.7	24.8
	Copper (Cu) (mg/kg)	9.3	66.5	185	140	475
	Iron (Fe) (mg/kg)	7110	9780	18700	18600	33400
	Lead (Pb) (mg/kg)	32.5	23.5	6.7	21.3	16.6
	Magnesium (Mg) (mg/kg)	324	1250	4710	4180	6750
	Manganese (Mn) (mg/kg)	78.4	89.5	190	391	389
	Mercury (Hg) (mg/kg)	0.166	0.082	0.091	0.097	0.084
	Molybdenum (Mo) (mg/kg)	1.4	<1.0	<1.0	1.1	<1.0
	Nickel (Ni) (mg/kg)	4.3	14.0	62.5	39.7	26.0
	Phosphorus (P) (mg/kg)	561	374	871	952	28100
	Potassium (K) (mg/kg)	310	367	740	831	528
	Selenium (Se) (mg/kg)	1.5	<1.0	<1.0	<1.0	2.4
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	469	257	392	318	431
	Strontium (Sr) (mg/kg)	9.9	23.8	24.0	26.5	172
	Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Tin (Sn) (mg/kg)	5.5	4.9	3.8	4.2	3.5
	Titanium (Ti) (mg/kg)	267	959	748	728	1210
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	9.9	44.7	34.6	35.9	105
	Zinc (Zn) (mg/kg)	81.2	55.0	57.8	84.8	82.3
	Zirconium (Zr) (mg/kg)	4.5	4.2	4.9	5.5	8.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L808918-21	L808918-22	L808918-23	L808918-24	L808918-25
	Description	TISSUE	TISSUE	TISSUE	TISSUE	TISSUE
	Sampled Date	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09
	Sampled Time					
	Client ID	HLSS-1	HLSS-2	HLSS-3	HLSS-4	HLSS-5
Grouping	**Analyte**					
TISSUE						
Metals	Aluminum (Al)-Total (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Arsenic (As)-Total (mg/kg)	0.065	0.078	0.071	0.057	0.055
	Barium (Ba)-Total (mg/kg)	5.48	7.11	9.37	7.70	6.88
	Beryllium (Be)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Bismuth (Bi)-Total (mg/kg)	<0.060	<0.060	<0.060	<0.060	<0.060
	Cadmium (Cd)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Calcium (Ca)-Total (mg/kg)	9030	10100	10700	8820	11500
	Chromium (Cr)-Total (mg/kg)	0.19	0.19	0.13	0.26	0.14
	Cobalt (Co)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Total (mg/kg)	0.85	0.79	0.97	0.77	0.74
	Iron (Fe)-Total (mg/kg)	27.5	13.0	14.0	13.2	11.1
	Lead (Pb)-Total (mg/kg)	0.051	0.023	0.033	0.026	0.045
	Lithium (Li)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	404	405	410	386	400
	Manganese (Mn)-Total (mg/kg)	4.79	5.20	5.79	4.89	4.41
	Mercury (Hg)-Total (mg/kg)	0.159	0.183	0.215	0.174	0.177
	Molybdenum (Mo)-Total (mg/kg)	0.033	0.036	0.034	0.043	0.030
	Nickel (Ni)-Total (mg/kg)	0.26	0.29	0.28	0.34	0.29
	Phosphorus (P)-Total (mg/kg)	5760	6380	6400	6190	6250
	Potassium (K)-Total (mg/kg)	3480	3830	3760	3360	4070
	Selenium (Se)-Total (mg/kg)	0.77	0.89	0.99	0.88	0.92
	Sodium (Na)-Total (mg/kg)	694	712	773	583	671
	Strontium (Sr)-Total (mg/kg)	9.51	10.4	10.6	9.78	10.3
	Thallium (Tl)-Total (mg/kg)	0.012	<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Total (mg/kg)	0.054	<0.050	<0.050	<0.050	<0.050
	Titanium (Ti)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Uranium (U)-Total (mg/kg)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Vanadium (V)-Total (mg/kg)	<0.10	<0.10	0.10	0.12	0.10
	Zinc (Zn)-Total (mg/kg)	48.2	58.0	67.2	53.5	47.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L808918-26	L808918-27	L808918-28	L808918-29	L808918-30
	Description	TISSUE	TISSUE	TISSUE	TISSUE	TISSUE
	Sampled Date	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09
	Sampled Time					
	Client ID	HLNP-1M	HLNP-2M	HLNP-3M	HLNP-4M	HLNP-5M
Grouping	**Analyte**					
TISSUE						
Metals	Aluminum (Al)-Total (mg/kg)	<2.0	<2.0	<2.0	<2.0	<2.0
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Arsenic (As)-Total (mg/kg)	0.274	0.283	0.170	0.237	0.218
	Barium (Ba)-Total (mg/kg)	0.104	0.117	0.100	0.100	0.094
	Beryllium (Be)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Bismuth (Bi)-Total (mg/kg)	<0.060	<0.060	<0.060	<0.060	<0.060
	Cadmium (Cd)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Calcium (Ca)-Total (mg/kg)	530	805	508	544	418
	Chromium (Cr)-Total (mg/kg)	0.15	0.13	0.21	0.27	0.17
	Cobalt (Co)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Total (mg/kg)	0.25	0.20	0.19	0.17	0.15
	Iron (Fe)-Total (mg/kg)	4.5	2.4	3.0	2.9	2.3
	Lead (Pb)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Lithium (Li)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	310	308	340	282	334
	Manganese (Mn)-Total (mg/kg)	0.374	0.644	0.441	0.584	0.353
	Mercury (Hg)-Total (mg/kg)	2.25	4.44	0.988	1.32	1.42
	Molybdenum (Mo)-Total (mg/kg)	0.019	0.016	0.024	0.031	0.022
	Nickel (Ni)-Total (mg/kg)	0.11	0.10	0.14	0.18	0.13
	Phosphorus (P)-Total (mg/kg)	2990	2850	3010	2720	2440
	Potassium (K)-Total (mg/kg)	5260	5010	5610	4820	4340
	Selenium (Se)-Total (mg/kg)	1.05	0.97	0.81	0.78	0.80
	Sodium (Na)-Total (mg/kg)	293	303	371	485	302
	Strontium (Sr)-Total (mg/kg)	0.312	0.490	0.269	0.334	0.214
	Thallium (Tl)-Total (mg/kg)	0.013	0.013	0.012	0.013	0.015
	Tin (Sn)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Titanium (Ti)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Uranium (U)-Total (mg/kg)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Vanadium (V)-Total (mg/kg)	0.14	0.15	0.16	0.16	0.15
	Zinc (Zn)-Total (mg/kg)	3.74	3.69	4.05	3.60	3.46

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L808918-31	L808918-32	L808918-33	L808918-34	L808918-35
		Description	TISSUE	TISSUE	TISSUE	TISSUE	TISSUE
		Sampled Date	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09	21-AUG-09
		Sampled Time					
		Client ID	HLNP-1L	HLNP-2L	HLNP-3L	HLNP-4L	HLNP-5L
Grouping	**Analyte**						
TISSUE							
Metals	Aluminum (Al)-Total (mg/kg)		3.4	3.3	<2.0	<2.0	3.4
	Antimony (Sb)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010	<0.010
	Arsenic (As)-Total (mg/kg)		0.078	0.069	0.084	0.063	0.079
	Barium (Ba)-Total (mg/kg)		0.047	0.023	<0.020	<0.020	<0.020
	Beryllium (Be)-Total (mg/kg)		<0.050	<0.050	<0.050	<0.050	<0.050
	Bismuth (Bi)-Total (mg/kg)		<0.060	<0.060	<0.060	<0.060	<0.060
	Cadmium (Cd)-Total (mg/kg)		0.46	0.39	0.17	0.14	0.30
	Calcium (Ca)-Total (mg/kg)		64.1	36.3	55.7	28.7	56.3
	Chromium (Cr)-Total (mg/kg)		0.29	<0.10	<0.10	<0.10	0.57
	Cobalt (Co)-Total (mg/kg)		<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Total (mg/kg)		20.2	7.41	12.8	5.59	12.8
	Iron (Fe)-Total (mg/kg)		267	87.8	174	137	175
	Lead (Pb)-Total (mg/kg)		<0.020	<0.020	<0.020	<0.020	<0.020
	Lithium (Li)-Total (mg/kg)		<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)		104	114	155	108	130
	Manganese (Mn)-Total (mg/kg)		0.836	0.671	1.07	0.800	1.05
	Mercury (Hg)-Total (mg/kg)		2.53	2.29	0.825 *	0.784	1.12 *
	Molybdenum (Mo)-Total (mg/kg)		0.135	0.093	0.152	0.081	0.185
	Nickel (Ni)-Total (mg/kg)		0.16	<0.10	<0.10	<0.10	0.30
	Phosphorus (P)-Total (mg/kg)		1780	2230	3340	2020	2450
	Potassium (K)-Total (mg/kg)		2370	2920	3540	2840	2870
	Selenium (Se)-Total (mg/kg)		4.82	2.73	3.34	1.89	2.77
	Sodium (Na)-Total (mg/kg)		999	663	635	661	937
	Strontium (Sr)-Total (mg/kg)		0.063	<0.050	<0.050	<0.050	<0.050
	Thallium (Tl)-Total (mg/kg)		0.011	0.011	0.015	<0.010	0.015
	Tin (Sn)-Total (mg/kg)		<0.050	<0.050	<0.050	<0.050	<0.050
	Titanium (Ti)-Total (mg/kg)		<0.10	<0.10	<0.10	<0.10	<0.10
	Uranium (U)-Total (mg/kg)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Vanadium (V)-Total (mg/kg)		<0.10	0.12	0.17	0.13	0.18
	Zinc (Zn)-Total (mg/kg)		39.1	41.0	53.5	25.7	48.7

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L808918-36 /EGETATION CC 21-AUG-09 HL	L808918-37 /EGETATION CC 21-AUG-09 SC2	L808918-38 /EGETATION CC 21-AUG-09 SC3		
	Sample ID					
	Description					
	Sampled Date					
	Sampled Time					
	Client ID					
TISSUE						
Metals	Aluminum (Al)-Total (mg/kg)	139 *	471 *	608 *		
	Antimony (Sb)-Total (mg/kg)	<0.25 *	<0.25 *	<0.25 *		
	Arsenic (As)-Total (mg/kg)	<0.25 *	0.33 *	0.39 *		
	Barium (Ba)-Total (mg/kg)	88.6 *	104 *	86.8 *		
	Beryllium (Be)-Total (mg/kg)	<1.0 *	<1.0 *	<1.0 *		
	Bismuth (Bi)-Total (mg/kg)	<1.5 *	<1.5 *	<1.5 *		
	Cadmium (Cd)-Total (mg/kg)	<2.5 *	<2.5 *	<2.5 *		
	Calcium (Ca)-Total (mg/kg)	8890 *	9750 *	8820 *		
	Chromium (Cr)-Total (mg/kg)	<2.5 *	<2.5 *	2.5 *		
	Cobalt (Co)-Total (mg/kg)	<2.5 *	2.7 *	6.1 *		
	Copper (Cu)-Total (mg/kg)	6.0 *	9.3 *	28.9 *		
	Iron (Fe)-Total (mg/kg)	435 *	2530 *	2930 *		
	Lead (Pb)-Total (mg/kg)	0.57 *	1.99 *	2.40 *		
	Lithium (Li)-Total (mg/kg)	<2.5 *	<2.5 *	<2.5 *		
	Magnesium (Mg)-Total (mg/kg)	2440 *	2340 *	2500 *		
	Manganese (Mn)-Total (mg/kg)	522 *	591 *	498 *		
	Mercury (Hg)-Total (mg/kg)	0.022	0.019	0.026		
	Molybdenum (Mo)-Total (mg/kg)	0.88 *	0.31 *	0.28 *		
	Nickel (Ni)-Total (mg/kg)	<2.5 *	2.5 *	4.2 *		
	Phosphorus (P)-Total (mg/kg)	2220 *	2310	2280 *		
	Potassium (K)-Total (mg/kg)	19300	13700	13300		
	Selenium (Se)-Total (mg/kg)	<5.0 *	<5.0 *	<5.0 *		
	Sodium (Na)-Total (mg/kg)	1920 *	4230 *	3190 *		
	Strontium (Sr)-Total (mg/kg)	21.1 *	38.3 *	57.0 *		
	Thallium (Tl)-Total (mg/kg)	<0.15 *	0.21 *	<0.15 *		
	Tin (Sn)-Total (mg/kg)	<1.0 *	<1.0 *	2.5 *		
	Titanium (Ti)-Total (mg/kg)	<2.5 *	17.7 *	22.0 *		
	Uranium (U)-Total (mg/kg)	<0.050 *	<0.050 *	<0.050 *		
	Vanadium (V)-Total (mg/kg)	<2.5 *	<2.5 *	2.5 *		
	Zinc (Zn)-Total (mg/kg)	58.4 *	74.6 *	60.2 *		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLIS	Detection Limit Adjusted: Insufficient Sample

Samples with Qualifiers for Individual Parameters as listed above:

Sample Number	Client Sample ID	Parameters	Qualifier
L808918-33	HLNP-3L	Mercury (Hg)-Total	DLIS
L808918-35	HLNP-5L	Mercury (Hg)-Total	DLIS
L808918-36	HL	Strontium (Sr)-Total Bismuth (Bi)-Total Thallium (Tl)-Total Manganese (Mn)-Total Barium (Ba)-Total Chromium (Cr)-Total Cadmium (Cd)-Total Aluminum (Al)-Total Selenium (Se)-Total Zinc (Zn)-Total Sodium (Na)-Total Vanadium (V)-Total Antimony (Sb)-Total Lithium (Li)-Total Titanium (Ti)-Total Iron (Fe)-Total Copper (Cu)-Total Calcium (Ca)-Total Lead (Pb)-Total Arsenic (As)-Total Phosphorus (P)-Total Cobalt (Co)-Total Beryllium (Be)-Total Uranium (U)-Total Tin (Sn)-Total Molybdenum (Mo)-Total Magnesium (Mg)-Total Nickel (Ni)-Total	DLIS
L808918-37	SC2	Cobalt (Co)-Total Lead (Pb)-Total Vanadium (V)-Total Barium (Ba)-Total Zinc (Zn)-Total Copper (Cu)-Total Uranium (U)-Total Antimony (Sb)-Total Titanium (Ti)-Total Thallium (Tl)-Total Iron (Fe)-Total Manganese (Mn)-Total Chromium (Cr)-Total Lithium (Li)-Total Aluminum (Al)-Total Strontium (Sr)-Total Calcium (Ca)-Total Molybdenum (Mo)-Total Selenium (Se)-Total Bismuth (Bi)-Total Arsenic (As)-Total Nickel (Ni)-Total Magnesium (Mg)-Total	DLIS

Reference Information

L808918-38	SC3	Beryllium (Be)-Total Sodium (Na)-Total Tin (Sn)-Total Cadmium (Cd)-Total Aluminum (Al)-Total Barium (Ba)-Total Nickel (Ni)-Total Vanadium (V)-Total Chromium (Cr)-Total Copper (Cu)-Total Manganese (Mn)-Total Zinc (Zn)-Total Antimony (Sb)-Total Beryllium (Be)-Total Phosphorus (P)-Total Titanium (Ti)-Total Tin (Sn)-Total Cobalt (Co)-Total Iron (Fe)-Total Magnesium (Mg)-Total Sodium (Na)-Total Lithium (Li)-Total Arsenic (As)-Total Lead (Pb)-Total Uranium (U)-Total Bismuth (Bi)-Total Molybdenum (Mo)-Total Cadmium (Cd)-Total Strontium (Sr)-Total Selenium (Se)-Total Thallium (Tl)-Total Calcium (Ca)-Total	DLIS

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
AS,SB,SE-3050-MS-WT	Soil	As, Sb and Se by ICP/MS	SW846 3050B/6020A
HG-DRY-CVAA-ED	Tissue	Mercury in Tissue by CVAA	EPA 200.3 / EPA 245.1
HG-WET-CVAA-ED	Tissue	Mercury in Tissue by CVAA	EPA 200.3 / EPA 245.1
HG-WT	Soil	Mercury by CVAA	SW846 7470A
MET-DRY-ICP-ED	Tissue	Metals in Tissue by ICPOES	EPA 200.7
MET-DRY-MS-ED	Tissue	Metals in Tissue by ICPMS	EPA 6020
MET-WET-ICP-ED	Tissue	Metals in Tissue by ICPOES	EPA 200.7
MET-WET-MS-ED	Tissue	Metals in Tissue by ICPMS	EPA 6020
MET-WT	Soil	Metal Scan (ICP)	EPA 3050/6010B
Sample is vigorously digested with nitric acid and hydrogen peroxide. Analysis is conducted by ICP/OES.			
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
TKN-WT	Soil	Total Kjeldahl Nitrogen	APHA 4500-N
TOC-WT	Soil	TOC in Solids	ASTM F-1647

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
WT	ALS LABORATORY GROUP - WATERLOO, ONTARIO, CANADA	ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
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.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group Quality Control Report

Workorder: L808918 Report Date: 09-OCT-09

Client: ECOMETRIX INC
6800 CAMPOBELLO ROAD
MISSISSAUGA ON L5N 2L8
Contact: BRIAN FRASER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AS,SB,SE-3050-MS-WT	**Soil**							
Batch R923532								
WG994805-2 CVS								
Antimony (Sb)			93		%		63-138	27-AUG-09
Arsenic (As)			119		%		63-138	27-AUG-09
Selenium (Se)			101		%		63-138	27-AUG-09
WG994115-4 DUP		**WG994115-3**						
Antimony (Sb)		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	27-AUG-09
Arsenic (As)		3.3	3.4	J	mg/kg	0.1	4	27-AUG-09
Selenium (Se)		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	27-AUG-09
WG994131-3 DUP		**L808918-11**						
Antimony (Sb)		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	27-AUG-09
Arsenic (As)		1.5	1.1	J	mg/kg	0.4	4	27-AUG-09
Selenium (Se)		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	27-AUG-09
WG994115-2 LCS								
Arsenic (As)			103		%		63-138	27-AUG-09
Selenium (Se)			103		%		63-138	27-AUG-09
WG994131-2 LCS								
Arsenic (As)			103		%		63-138	27-AUG-09
Selenium (Se)			103		%		63-138	27-AUG-09
WG994115-1 MB								
Antimony (Sb)			<1.0		mg/kg		1	27-AUG-09
Arsenic (As)			<1.0		mg/kg		1	27-AUG-09
Selenium (Se)			<1.0		mg/kg		1	27-AUG-09
WG994131-1 MB								
Antimony (Sb)			<1.0		mg/kg		1	27-AUG-09
Arsenic (As)			<1.0		mg/kg		1	27-AUG-09
Selenium (Se)			<1.0		mg/kg		1	27-AUG-09
HG-WT	**Soil**							
Batch R922825								
WG994024-3 DUP		**L808918-13**						
Mercury (Hg)		<0.050	<0.050	RPD-NA	mg/kg	N/A	20	26-AUG-09
WG994024-2 LCS								
Mercury (Hg)			115		%		70-130	26-AUG-09
WG994024-1 MB								
Mercury (Hg)			<0.050		mg/kg		0.05	26-AUG-09
MET-WT	**Soil**							

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R924129								
WG994717-2 CVS								
Aluminum (Al)			108		%		70-130	26-AUG-09
Barium (Ba)			104		%		60-140	26-AUG-09
Beryllium (Be)			97		%		80-120	26-AUG-09
Bismuth (Bi)			95		%		80-120	26-AUG-09
Boron (B)			102		%		80-120	26-AUG-09
Cadmium (Cd)			83		%		80-120	26-AUG-09
Calcium (Ca)			109		%		80-120	26-AUG-09
Chromium (Cr)			104		%		80-120	26-AUG-09
Cobalt (Co)			104		%		80-120	26-AUG-09
Copper (Cu)			104		%		80-120	26-AUG-09
Iron (Fe)			106		%		80-120	26-AUG-09
Lead (Pb)			105		%		80-120	26-AUG-09
Magnesium (Mg)			106		%		80-120	26-AUG-09
Manganese (Mn)			99		%		80-120	26-AUG-09
Molybdenum (Mo)			97		%		80-120	26-AUG-09
Nickel (Ni)			104		%		80-120	26-AUG-09
Phosphorus (P)			96		%		80-120	26-AUG-09
Potassium (K)			94		%		60-140	26-AUG-09
Silver (Ag)			101		%		80-120	26-AUG-09
Sodium (Na)			110		%		60-140	26-AUG-09
Strontium (Sr)			102		%		63-138	26-AUG-09
Thallium (Tl)			104		%		80-120	26-AUG-09
Uranium (U)			97		%		80-120	26-AUG-09
Vanadium (V)			96		%		80-120	26-AUG-09
Zinc (Zn)			110		%		80-120	26-AUG-09
WG994717-3 CVS								
Tin (Sn)			114		%		80-120	26-AUG-09
Titanium (Ti)			107		%		60-140	26-AUG-09
Zirconium (Zr)			108		%		80-120	26-AUG-09
WG994131-3 DUP		**L808918-11**						
Aluminum (Al)		4360	4300		mg/kg	1.4	50	26-AUG-09
Barium (Ba)		26.4	25.2		mg/kg	4.5	50	26-AUG-09
Beryllium (Be)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	26-AUG-09

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R924129								
WG994131-3 DUP		**L808918-11**						
Bismuth (Bi)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	26-AUG-09
Boron (B)		6.9	7.2	J	mg/kg	0.3	20	26-AUG-09
Cadmium (Cd)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	26-AUG-09
Calcium (Ca)		8590	8800		mg/kg	2.5	30	26-AUG-09
Chromium (Cr)		15.0	15.1		mg/kg	0.50	30	26-AUG-09
Cobalt (Co)		4.9	4.9	J	mg/kg	0.0	4	26-AUG-09
Copper (Cu)		7.9	7.3	J	mg/kg	0.6	4	26-AUG-09
Iron (Fe)		13300	13200		mg/kg	0.32	30	26-AUG-09
Lead (Pb)		3.4	3.4	J	mg/kg	0.0	4	26-AUG-09
Magnesium (Mg)		5730	5850		mg/kg	2.1	30	26-AUG-09
Manganese (Mn)		203	197		mg/kg	3.0	30	26-AUG-09
Molybdenum (Mo)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	26-AUG-09
Nickel (Ni)		8.1	8.1	J	mg/kg	0.0	4	26-AUG-09
Phosphorus (P)		455	448		mg/kg	1.5	30	26-AUG-09
Potassium (K)		512	507		mg/kg	1.1	50	26-AUG-09
Silver (Ag)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	26-AUG-09
Sodium (Na)		229	376		mg/kg	48	50	26-AUG-09
Strontium (Sr)		9.4	9.5	J	mg/kg	0.1	4	26-AUG-09
Thallium (Tl)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	26-AUG-09
Tin (Sn)		4.1	3.9	J	mg/kg	0.2	4	26-AUG-09
Titanium (Ti)		599	599		mg/kg	0.083	50	26-AUG-09
Uranium (U)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	26-AUG-09
Vanadium (V)		19.0	19.7		mg/kg	3.4	30	26-AUG-09
Zinc (Zn)		42.5	41.0		mg/kg	3.7	30	26-AUG-09
Zirconium (Zr)		9.3	9.1	J	mg/kg	0.2	4	26-AUG-09
WG994131-2 LCS								
Aluminum (Al)			83		%		70-130	26-AUG-09
Barium (Ba)			105		%		80-120	26-AUG-09
Beryllium (Be)			103		%		80-120	26-AUG-09
Bismuth (Bi)			85		%		80-120	26-AUG-09
Cadmium (Cd)			100		%		80-120	26-AUG-09
Calcium (Ca)			106		%		80-120	26-AUG-09
Chromium (Cr)			105		%		80-120	26-AUG-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R924129								
WG994131-2 LCS								
Cobalt (Co)			106		%		80-120	26-AUG-09
Copper (Cu)			103		%		80-120	26-AUG-09
Iron (Fe)			106		%		80-120	26-AUG-09
Lead (Pb)			107		%		80-120	26-AUG-09
Magnesium (Mg)			112		%		80-120	26-AUG-09
Manganese (Mn)			107		%		80-120	26-AUG-09
Nickel (Ni)			106		%		80-120	26-AUG-09
Phosphorus (P)			101		%		80-120	26-AUG-09
Potassium (K)			98		%		60-140	26-AUG-09
Sodium (Na)			111		%		60-140	26-AUG-09
Strontium (Sr)			104		%		63-138	26-AUG-09
Thallium (Tl)			103		%		80-120	26-AUG-09
Uranium (U)			105		%		80-120	26-AUG-09
Vanadium (V)			103		%		80-120	26-AUG-09
Zinc (Zn)			105		%		80-120	26-AUG-09
MOISTURE-WT	**Soil**							
Batch R919090								
WG992547-3 DUP		**L808764-10**						
% Moisture		8.75	8.80		%	0.55	26	24-AUG-09
WG992547-2 LCS								
% Moisture			105		%		79-120	24-AUG-09
WG992547-1 MB								
% Moisture			<0.10		%		0.1	24-AUG-09
TKN-WT	**Soil**							
Batch R922537								
WG993402-2 CVS								
Total Kjeldahl Nitrogen			93		%		80-120	25-AUG-09
WG993183-2 DUP		**L808918-1**						
Total Kjeldahl Nitrogen		15500	14400		mg/kg	7.5	20	25-AUG-09
WG993183-3 DUP		**L808918-20**						
Total Kjeldahl Nitrogen		9100	8050		mg/kg	12	20	25-AUG-09
WG993183-4 LCS								
Total Kjeldahl Nitrogen			84		%		70-130	25-AUG-09
WG993183-1 MB								
							200	

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-WT	**Soil**							
Batch R922537								
WG993183-1 MB								
Total Kjeldahl Nitrogen			<200		mg/kg		200	25-AUG-09
TOC-WT	**Soil**							
Batch R922749								
WG994091-3 DUP		**L808918-1**						
Total Organic Carbon		11.9	12.3		%	3.2	30	26-AUG-09
WG994091-2 LCS								
Total Organic Carbon			100		%		80-120	26-AUG-09
WG994091-1 MB								
Fraction Organic Carbon			<0.0010				0.001	26-AUG-09
Total Organic Carbon			<0.10		%		0.1	26-AUG-09
Batch R923538								
WG995038-3 DUP		**L808918-4**						
Total Organic Carbon		15.2	15.1		%	0.36	30	27-AUG-09
WG995038-2 LCS								
Total Organic Carbon			98		%		80-120	27-AUG-09
WG995038-1 MB								
Fraction Organic Carbon			<0.0010				0.001	27-AUG-09
Total Organic Carbon			<0.10		%		0.1	27-AUG-09
HG-DRY-CVAA-ED	**Tissue**							
Batch R977965								
WG1008376-5 DUP		**L815297-11**						
Mercury (Hg)-Total		0.032	0.032	J	mg/kg	0.000	0.04	03-OCT-09
WG1008376-1 MB								
Mercury (Hg)-Total			<0.010		mg/kg		0.01	03-OCT-09
WG1008376-6 MS		**L815297-11**						
Mercury (Hg)-Total			101		%		50-150	03-OCT-09
HG-WET-CVAA-ED	**Tissue**							
Batch R977899								
WG1005647-2 CRM		**DOLT-4_LIVER**						
Mercury (Hg)-Total			91		%		70-130	07-OCT-09
WG1005647-3 DUP		**L808918-30**						
Mercury (Hg)-Total		1.42	1.40		mg/kg	1.6	35	07-OCT-09
WG1005647-1 MB								
Mercury (Hg)-Total			<0.0020		mg/kg		0.002	01-OCT-09
MET-DRY-ICP-ED	**Tissue**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-ICP-ED	**Tissue**							
Batch R963750								
WG1008376-2 CRM		**7602_BUSHES**						
WG1008376-3 DUP		**L809050-5**						
Aluminum (Al)-Total		<50	<50	RPD-NA	mg/kg	N/A	26	01-OCT-09
Beryllium (Be)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	01-OCT-09
Cadmium (Cd)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Calcium (Ca)-Total		272	242	J	mg/kg	31	200	01-OCT-09
Chromium (Cr)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Cobalt (Co)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Copper (Cu)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Iron (Fe)-Total		<25	<25	RPD-NA	mg/kg	N/A	26	01-OCT-09
Magnesium (Mg)-Total		114	102	J	mg/kg	13	100	01-OCT-09
Manganese (Mn)-Total		59.2	54.1		mg/kg	9.0	26	01-OCT-09
Phosphorus (P)-Total		270	230	J	mg/kg	40	400	01-OCT-09
Potassium (K)-Total		920	910	J	mg/kg	10	2000	01-OCT-09
Sodium (Na)-Total		<500	<500	RPD-NA	mg/kg	N/A	26	01-OCT-09
Strontium (Sr)-Total		<1.5	<1.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Titanium (Ti)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Zinc (Zn)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
WG1008376-5 DUP		**L815297-11**						
Aluminum (Al)-Total		178	177	J	mg/kg	1	200	01-OCT-09
Beryllium (Be)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	01-OCT-09
Cadmium (Cd)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Calcium (Ca)-Total		10500	10700		mg/kg	1.4	26	01-OCT-09
Chromium (Cr)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Cobalt (Co)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Copper (Cu)-Total		5.6	5.7	J	mg/kg	0.1	10	01-OCT-09
Iron (Fe)-Total		458	453		mg/kg	1.0	26	01-OCT-09
Magnesium (Mg)-Total		4260	4210		mg/kg	1.2	26	01-OCT-09
Manganese (Mn)-Total		298	295		mg/kg	1.0	26	01-OCT-09
Sodium (Na)-Total		<500	<500	RPD-NA	mg/kg	N/A	26	01-OCT-09
Strontium (Sr)-Total		37.9	38.6		mg/kg	1.7	26	01-OCT-09
Titanium (Ti)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Zinc (Zn)-Total		117	116		mg/kg	0.55	26	01-OCT-09
WG1008376-1 MB								

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-ICP-ED	**Tissue**							
Batch R963750								
WG1008376-1 MB								
Aluminum (Al)-Total			<10		mg/kg		10	01-OCT-09
Beryllium (Be)-Total			<0.20		mg/kg		0.2	01-OCT-09
Cadmium (Cd)-Total			<0.50		mg/kg		0.5	01-OCT-09
Calcium (Ca)-Total			<10		mg/kg		10	01-OCT-09
Chromium (Cr)-Total			<0.50		mg/kg		0.5	01-OCT-09
Cobalt (Co)-Total			<0.50		mg/kg		0.5	01-OCT-09
Copper (Cu)-Total			<0.50		mg/kg		0.5	01-OCT-09
Iron (Fe)-Total			<5.0		mg/kg		5	01-OCT-09
Magnesium (Mg)-Total			<5.0		mg/kg		5	01-OCT-09
Manganese (Mn)-Total			<0.20		mg/kg		0.2	01-OCT-09
Phosphorus (P)-Total			<20		mg/kg		20	01-OCT-09
Potassium (K)-Total			<100		mg/kg		100	01-OCT-09
Sodium (Na)-Total			<100		mg/kg		100	01-OCT-09
Strontium (Sr)-Total			<0.30		mg/kg		0.3	01-OCT-09
Titanium (Ti)-Total			<0.50		mg/kg		0.5	01-OCT-09
Zinc (Zn)-Total			<0.50		mg/kg		0.5	01-OCT-09
WG1008376-4 MS		**L809050-5**						
Aluminum (Al)-Total			107		%		63-138	01-OCT-09
Beryllium (Be)-Total			108		%		63-138	01-OCT-09
Cadmium (Cd)-Total			109		%		63-138	01-OCT-09
Calcium (Ca)-Total			112		%		63-138	01-OCT-09
Chromium (Cr)-Total			114		%		63-138	01-OCT-09
Cobalt (Co)-Total			113		%		63-138	01-OCT-09
Copper (Cu)-Total			124		%		63-138	01-OCT-09
Iron (Fe)-Total			117		%		63-138	01-OCT-09
Magnesium (Mg)-Total			113		%		63-138	01-OCT-09
Manganese (Mn)-Total			106		%		63-138	01-OCT-09
Phosphorus (P)-Total			105		%		63-138	01-OCT-09
Potassium (K)-Total			88		%		63-138	01-OCT-09
Sodium (Na)-Total			111		%		63-138	01-OCT-09
Strontium (Sr)-Total			112		%		63-138	01-OCT-09
Titanium (Ti)-Total			116		%		63-138	01-OCT-09
Zinc (Zn)-Total			106		%		63-138	01-OCT-09

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-ICP-ED	**Tissue**							
Batch R963750								
WG1008376-6 MS		**L815297-11**						
Aluminum (Al)-Total			94		%		63-138	01-OCT-09
Beryllium (Be)-Total			102		%		63-138	01-OCT-09
Cadmium (Cd)-Total			100		%		63-138	01-OCT-09
Calcium (Ca)-Total			56	E	%		63-138	01-OCT-09
Chromium (Cr)-Total			105		%		63-138	01-OCT-09
Cobalt (Co)-Total			102		%		63-138	01-OCT-09
Copper (Cu)-Total			113		%		63-138	01-OCT-09
Iron (Fe)-Total			100		%		63-138	01-OCT-09
Magnesium (Mg)-Total			89		%		63-138	01-OCT-09
Manganese (Mn)-Total			81	E	%		63-138	01-OCT-09
Phosphorus (P)-Total			92		%		63-138	01-OCT-09
Sodium (Na)-Total			104		%		63-138	01-OCT-09
Strontium (Sr)-Total			93		%		63-138	01-OCT-09
Titanium (Ti)-Total			107		%		63-138	01-OCT-09
Zinc (Zn)-Total			96		%		63-138	01-OCT-09
MET-DRY-MS-ED	**Tissue**							
Batch R963118								
WG1008376-3 DUP		**L809050-5**						
Antimony (Sb)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	30-SEP-09
Arsenic (As)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	30-SEP-09
Barium (Ba)-Total		2.62	2.47		mg/kg	6.1	26	30-SEP-09
Bismuth (Bi)-Total		<0.30	<0.30	RPD-NA	mg/kg	N/A	26	30-SEP-09
Lead (Pb)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	30-SEP-09
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	26	30-SEP-09
Molybdenum (Mo)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	30-SEP-09
Nickel (Ni)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	26	30-SEP-09
Selenium (Se)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	30-SEP-09
Thallium (Tl)-Total		<0.030	<0.030	RPD-NA	mg/kg	N/A	26	30-SEP-09
Tin (Sn)-Total		0.60	0.63	J	mg/kg	0.03	0.8	30-SEP-09
Uranium (U)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	30-SEP-09
Vanadium (V)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	26	30-SEP-09
WG1008376-5 DUP		**L815297-11**						
Antimony (Sb)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	30-SEP-09

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-MS-ED	**Tissue**							
Batch R963118								
WG1008376-5 DUP		**L815297-11**						
Arsenic (As)-Total		0.097	0.095	J	mg/kg	0.002	0.2	30-SEP-09
Barium (Ba)-Total		49.9	52.2		mg/kg	4.6	26	30-SEP-09
Bismuth (Bi)-Total		<0.30	<0.30	RPD-NA	mg/kg	N/A	26	30-SEP-09
Lead (Pb)-Total		1.15	1.24		mg/kg	6.9	26	30-SEP-09
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	26	30-SEP-09
Molybdenum (Mo)-Total		0.382	0.381	J	mg/kg	0.002	0.2	30-SEP-09
Nickel (Ni)-Total		1.34	1.32	J	mg/kg	0.02	2	30-SEP-09
Selenium (Se)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	30-SEP-09
Thallium (Tl)-Total		0.182	0.167	J	mg/kg	0.016	0.12	30-SEP-09
Tin (Sn)-Total		0.61	0.62	J	mg/kg	0.01	0.8	30-SEP-09
Uranium (U)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	30-SEP-09
Vanadium (V)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	26	30-SEP-09
WG1008376-1 MB								
Antimony (Sb)-Total			<0.050		mg/kg		0.05	30-SEP-09
Arsenic (As)-Total			<0.050		mg/kg		0.05	30-SEP-09
Barium (Ba)-Total			<0.10		mg/kg		0.1	30-SEP-09
Bismuth (Bi)-Total			<0.30		mg/kg		0.3	30-SEP-09
Lead (Pb)-Total			<0.10		mg/kg		0.1	30-SEP-09
Lithium (Li)-Total			<0.50		mg/kg		0.5	30-SEP-09
Molybdenum (Mo)-Total			<0.050		mg/kg		0.05	30-SEP-09
Nickel (Ni)-Total			<0.50		mg/kg		0.5	30-SEP-09
Selenium (Se)-Total			<1.0		mg/kg		1	30-SEP-09
Thallium (Tl)-Total			<0.030		mg/kg		0.03	30-SEP-09
Uranium (U)-Total			<0.010		mg/kg		0.01	30-SEP-09
Vanadium (V)-Total			<0.50		mg/kg		0.5	30-SEP-09
Tin (Sn)-Total			<0.20		mg/kg		0.2	03-OCT-09
WG1008376-4 MS		**L809050-5**						
Antimony (Sb)-Total			109		%		63-138	30-SEP-09
Arsenic (As)-Total			100		%		63-138	30-SEP-09
Barium (Ba)-Total			104		%		63-138	30-SEP-09
Bismuth (Bi)-Total			109		%		63-138	30-SEP-09
Lead (Pb)-Total			107		%		63-138	30-SEP-09
Lithium (Li)-Total			98		%		63-138	30-SEP-09

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-MS-ED	**Tissue**							
Batch R963118								
WG1008376-4 MS		**L809050-5**						
Molybdenum (Mo)-Total			106		%		63-138	30-SEP-09
Nickel (Ni)-Total			100		%		63-138	30-SEP-09
Selenium (Se)-Total			98		%		63-138	30-SEP-09
Thallium (Tl)-Total			111		%		63-138	30-SEP-09
Tin (Sn)-Total			104		%		63-138	30-SEP-09
Uranium (U)-Total			99		%		63-138	30-SEP-09
Vanadium (V)-Total			106		%		63-138	30-SEP-09
WG1008376-6 MS		**L815297-11**						
Antimony (Sb)-Total			110		%		63-138	30-SEP-09
Arsenic (As)-Total			103		%		63-138	30-SEP-09
Bismuth (Bi)-Total			105		%		63-138	30-SEP-09
Lead (Pb)-Total			103		%		63-138	30-SEP-09
Lithium (Li)-Total			98		%		63-138	30-SEP-09
Molybdenum (Mo)-Total			106		%		63-138	30-SEP-09
Nickel (Ni)-Total			99		%		63-138	30-SEP-09
Selenium (Se)-Total			105		%		63-138	30-SEP-09
Thallium (Tl)-Total			107		%		63-138	30-SEP-09
Tin (Sn)-Total			107		%		63-138	30-SEP-09
Uranium (U)-Total			98		%		63-138	30-SEP-09
Vanadium (V)-Total			100		%		63-138	30-SEP-09
Barium (Ba)-Total			105		%		63-138	30-SEP-09
MET-WET-ICP-ED	**Tissue**							
Batch R961426								
WG1005647-2 CRM		**DOLT-4_LIVER**						
WG1005647-3 DUP		**L808918-30**						
Aluminum (Al)-Total		<2.0	<2.0	RPD-NA	mg/kg	N/A	26	21-SEP-09
Beryllium (Be)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	21-SEP-09
Cadmium (Cd)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Calcium (Ca)-Total		418	403		mg/kg	3.7	26	21-SEP-09
Chromium (Cr)-Total		0.17	0.15	J	mg/kg	0.03	0.4	21-SEP-09
Cobalt (Co)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Copper (Cu)-Total		0.15	0.16	J	mg/kg	0.01	0.4	21-SEP-09
Iron (Fe)-Total		2.3	2.4	J	mg/kg	0.1	4	21-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-ICP-ED	**Tissue**							
Batch R961426								
WG1005647-3 DUP		**L808918-30**						
Magnesium (Mg)-Total		334	343		mg/kg	2.6	26	21-SEP-09
Manganese (Mn)-Total		0.353	0.333	J	mg/kg	0.021	0.2	21-SEP-09
Sodium (Na)-Total		302	313		mg/kg	3.4	26	21-SEP-09
Strontium (Sr)-Total		0.214	0.204	J	mg/kg	0.011	0.2	21-SEP-09
Titanium (Ti)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Zinc (Zn)-Total		3.46	3.56		mg/kg	3.0	26	21-SEP-09
WG1005647-5 DUP		**L810144-10**						
Aluminum (Al)-Total		<2.0	<2.0	RPD-NA	mg/kg	N/A	26	21-SEP-09
Beryllium (Be)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	21-SEP-09
Cadmium (Cd)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Calcium (Ca)-Total		142	157		mg/kg	9.9	26	21-SEP-09
Chromium (Cr)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Cobalt (Co)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Copper (Cu)-Total		0.48	0.48	J	mg/kg	0.01	0.4	21-SEP-09
Iron (Fe)-Total		12.3	12.7		mg/kg	3.3	26	21-SEP-09
Magnesium (Mg)-Total		325	330		mg/kg	1.5	26	21-SEP-09
Manganese (Mn)-Total		0.080	0.082	J	mg/kg	0.002	0.2	21-SEP-09
Sodium (Na)-Total		475	462		mg/kg	2.8	26	21-SEP-09
Strontium (Sr)-Total		0.634	0.716		mg/kg	12	26	21-SEP-09
Titanium (Ti)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Zinc (Zn)-Total		2.98	2.96		mg/kg	0.76	26	21-SEP-09
WG1005647-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	21-SEP-09
Beryllium (Be)-Total			<0.050		mg/kg		0.05	21-SEP-09
Cadmium (Cd)-Total			<0.10		mg/kg		0.1	21-SEP-09
Chromium (Cr)-Total			<0.10		mg/kg		0.1	21-SEP-09
Cobalt (Co)-Total			0.10		mg/kg		0.1	21-SEP-09
Copper (Cu)-Total			<0.10		mg/kg		0.1	21-SEP-09
Iron (Fe)-Total			<1.0		mg/kg		1	21-SEP-09
Magnesium (Mg)-Total			<1.0		mg/kg		1	21-SEP-09
Manganese (Mn)-Total			<0.050		mg/kg		0.05	21-SEP-09
Phosphorus (P)-Total			<5.0		mg/kg		5	21-SEP-09
Potassium (K)-Total			<20		mg/kg		20	21-SEP-09

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-ICP-ED	**Tissue**							
Batch R961426								
WG1005647-1 MB								
Sodium (Na)-Total			<20		mg/kg		20	21-SEP-09
Strontium (Sr)-Total			<0.050		mg/kg		0.05	21-SEP-09
Titanium (Ti)-Total			<0.10		mg/kg		0.1	21-SEP-09
Zinc (Zn)-Total			<0.10		mg/kg		0.1	21-SEP-09
Calcium (Ca)-Total			2.7	B	mg/kg		2	21-SEP-09
WG1005647-4 MS		**L808918-30**						
Aluminum (Al)-Total			107		%		63-138	21-SEP-09
Beryllium (Be)-Total			103		%		63-138	21-SEP-09
Cadmium (Cd)-Total			101		%		63-138	21-SEP-09
Calcium (Ca)-Total			106		%		63-138	21-SEP-09
Chromium (Cr)-Total			109		%		63-138	21-SEP-09
Cobalt (Co)-Total			106		%		63-138	21-SEP-09
Copper (Cu)-Total			119		%		63-138	21-SEP-09
Iron (Fe)-Total			108		%		63-138	21-SEP-09
Magnesium (Mg)-Total			106		%		63-138	21-SEP-09
Manganese (Mn)-Total			105		%		63-138	21-SEP-09
Phosphorus (P)-Total			92		%		63-138	21-SEP-09
Potassium (K)-Total			105		%		63-138	21-SEP-09
Sodium (Na)-Total			106		%		63-138	21-SEP-09
Strontium (Sr)-Total			105		%		63-138	21-SEP-09
Titanium (Ti)-Total			91		%		63-138	21-SEP-09
Zinc (Zn)-Total			103		%		63-138	21-SEP-09
WG1005647-6 MS		**L810144-10**						
Aluminum (Al)-Total			106		%		63-138	21-SEP-09
Beryllium (Be)-Total			102		%		63-138	21-SEP-09
Cadmium (Cd)-Total			102		%		63-138	21-SEP-09
Calcium (Ca)-Total			106		%		63-138	21-SEP-09
Chromium (Cr)-Total			108		%		63-138	21-SEP-09
Cobalt (Co)-Total			105		%		63-138	21-SEP-09
Copper (Cu)-Total			116		%		63-138	21-SEP-09
Iron (Fe)-Total			107		%		63-138	21-SEP-09
Magnesium (Mg)-Total			106		%		63-138	21-SEP-09
Manganese (Mn)-Total			104		%		63-138	21-SEP-09

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-ICP-ED	**Tissue**							
Batch R961426								
WG1005647-6 MS		**L810144-10**						
Phosphorus (P)-Total			106		%		63-138	21-SEP-09
Sodium (Na)-Total			105		%		63-138	21-SEP-09
Strontium (Sr)-Total			104		%		63-138	21-SEP-09
Titanium (Ti)-Total			106		%		63-138	21-SEP-09
Zinc (Zn)-Total			103		%		63-138	21-SEP-09
MET-WET-MS-ED	**Tissue**							
Batch R953054								
WG1005647-2 CRM		**DOLT-4_LIVER**						
WG1005647-3 DUP		**L808918-30**						
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	21-SEP-09
Arsenic (As)-Total		0.218	0.209		mg/kg	4.2	26	21-SEP-09
Barium (Ba)-Total		0.094	0.070	J	mg/kg	0.024	0.08	21-SEP-09
Bismuth (Bi)-Total		<0.060	<0.060	RPD-NA	mg/kg	N/A	26	21-SEP-09
Lead (Pb)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	26	21-SEP-09
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Molybdenum (Mo)-Total		0.022	0.018	J	mg/kg	0.004	0.04	21-SEP-09
Nickel (Ni)-Total		0.13	0.10	J	mg/kg	0.03	0.4	21-SEP-09
Selenium (Se)-Total		0.80	0.80	J	mg/kg	0.00	0.8	21-SEP-09
Thallium (Tl)-Total		0.015	0.013	J	mg/kg	0.002	0.04	21-SEP-09
Tin (Sn)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	21-SEP-09
Uranium (U)-Total		<0.0020	<0.0020	RPD-NA	mg/kg	N/A	26	21-SEP-09
Vanadium (V)-Total		0.15	0.15	J	mg/kg	0.00	0.4	21-SEP-09
WG1005647-5 DUP		**L810144-10**						
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	21-SEP-09
Arsenic (As)-Total		0.653	0.662		mg/kg	1.4	26	21-SEP-09
Barium (Ba)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	26	21-SEP-09
Bismuth (Bi)-Total		<0.060	<0.060	RPD-NA	mg/kg	N/A	26	21-SEP-09
Lead (Pb)-Total		<0.020	<0.020	RPD-NA	mg/kg	N/A	26	21-SEP-09
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Molybdenum (Mo)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	21-SEP-09
Nickel (Ni)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	21-SEP-09
Selenium (Se)-Total		0.43	0.44	J	mg/kg	0.02	0.8	21-SEP-09
Thallium (Tl)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	21-SEP-09

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-ED	**Tissue**							
Batch R953054								
WG1005647-5 DUP		**L810144-10**						
Tin (Sn)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	21-SEP-09
Uranium (U)-Total		<0.0020	<0.0020	RPD-NA	mg/kg	N/A	26	21-SEP-09
Vanadium (V)-Total		<0.10	0.11	RPD-NA	mg/kg	N/A	26	21-SEP-09
WG1005647-1 MB								
Antimony (Sb)-Total			<0.010		mg/kg		0.01	21-SEP-09
Arsenic (As)-Total			<0.010		mg/kg		0.01	21-SEP-09
Barium (Ba)-Total			<0.020		mg/kg		0.02	21-SEP-09
Bismuth (Bi)-Total			<0.060		mg/kg		0.06	21-SEP-09
Lead (Pb)-Total			<0.020		mg/kg		0.02	21-SEP-09
Lithium (Li)-Total			<0.10		mg/kg		0.1	21-SEP-09
Molybdenum (Mo)-Total			<0.010		mg/kg		0.01	21-SEP-09
Nickel (Ni)-Total			<0.10		mg/kg		0.1	21-SEP-09
Selenium (Se)-Total			<0.20		mg/kg		0.2	21-SEP-09
Thallium (Tl)-Total			<0.010		mg/kg		0.01	21-SEP-09
Tin (Sn)-Total			<0.050		mg/kg		0.05	21-SEP-09
Uranium (U)-Total			<0.0020		mg/kg		0.002	21-SEP-09
Vanadium (V)-Total			<0.10		mg/kg		0.1	21-SEP-09
WG1005647-4 MS		**L808918-30**						
Antimony (Sb)-Total			102		%		63-138	21-SEP-09
Arsenic (As)-Total			109		%		63-138	21-SEP-09
Barium (Ba)-Total			104		%		63-138	21-SEP-09
Bismuth (Bi)-Total			100		%		63-138	21-SEP-09
Lead (Pb)-Total			100		%		63-138	21-SEP-09
Lithium (Li)-Total			104		%		63-138	21-SEP-09
Molybdenum (Mo)-Total			102		%		63-138	21-SEP-09
Nickel (Ni)-Total			105		%		63-138	21-SEP-09
Selenium (Se)-Total			120		%		63-138	21-SEP-09
Thallium (Tl)-Total			108		%		63-138	21-SEP-09
Tin (Sn)-Total			103		%		63-138	21-SEP-09
Uranium (U)-Total			101		%		63-138	21-SEP-09
Vanadium (V)-Total			98		%		63-138	21-SEP-09
WG1005647-6 MS		**L810144-10**						
Antimony (Sb)-Total			105		%		63-138	21-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-ED	**Tissue**							
Batch R953054								
WG1005647-6 MS		**L810144-10**						
Arsenic (As)-Total			106		%		63-138	21-SEP-09
Barium (Ba)-Total			104		%		63-138	21-SEP-09
Bismuth (Bi)-Total			98		%		63-138	21-SEP-09
Lead (Pb)-Total			99		%		63-138	21-SEP-09
Lithium (Li)-Total			102		%		63-138	21-SEP-09
Molybdenum (Mo)-Total			103		%		63-138	21-SEP-09
Nickel (Ni)-Total			103		%		63-138	21-SEP-09
Selenium (Se)-Total			114		%		63-138	21-SEP-09
Thallium (Tl)-Total			108		%		63-138	21-SEP-09
Tin (Sn)-Total			105		%		63-138	21-SEP-09
Uranium (U)-Total			100		%		63-138	21-SEP-09
Vanadium (V)-Total			100		%		63-138	21-SEP-09

ALS Laboratory Group Quality Control Report

Legend:

Limit	99% Confidence Interval (Laboratory Control Limits)
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. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
E	Matrix Spike recovery outside ALS DQO due to analyte background in sample.
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

ALS Laboratory Group Quality Control Report

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.

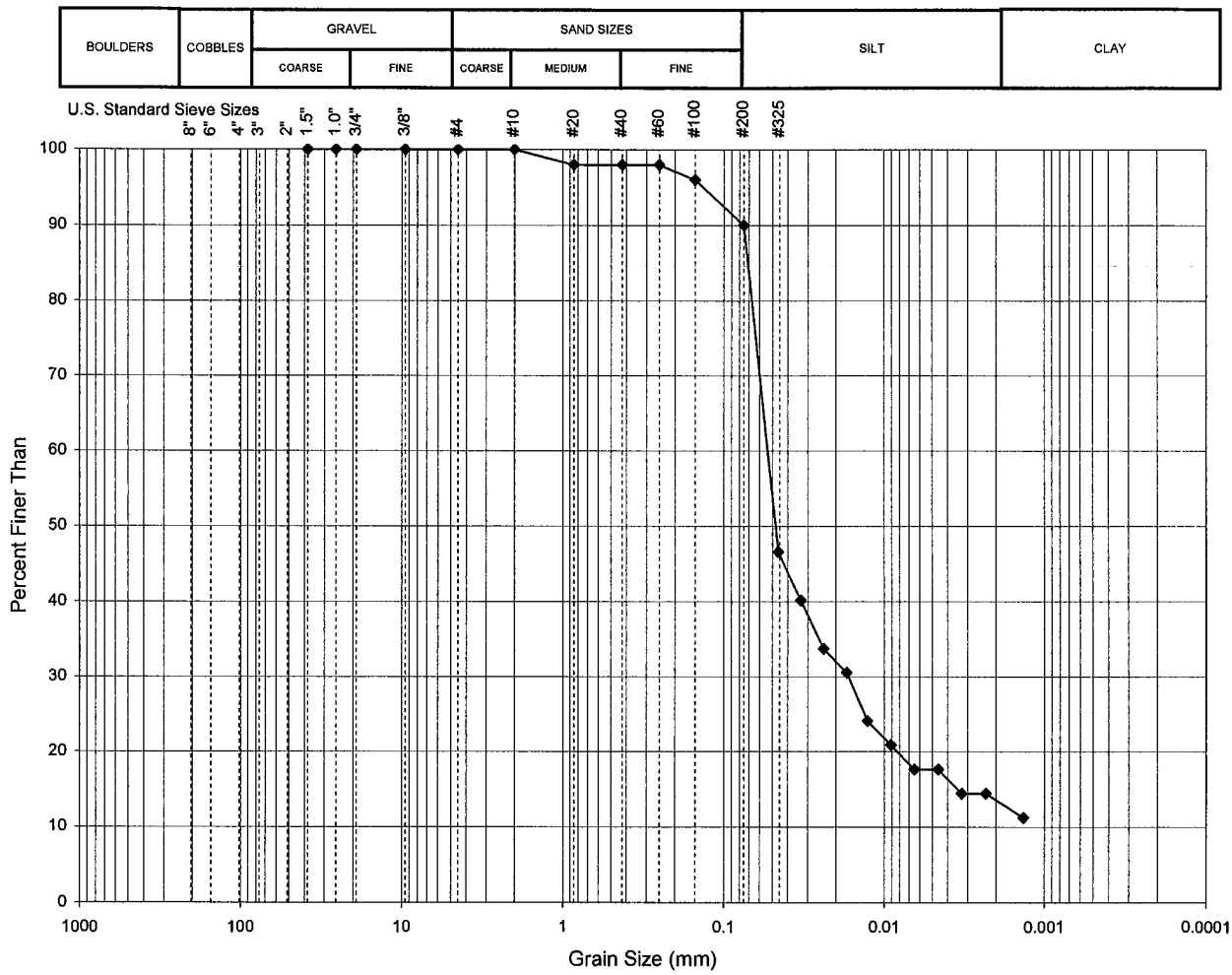
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-P1
Sample Depth:	
Lab ID Number:	L808918-1
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH CLAY, TRACE SAND	AND	36 - 50 %	GRAVEL 0	%
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND 10	%
ESTIMATED HAZEN NUMBER: 1.21E-06 cm/s	WITH	11 - 20 %	SILT + CLAY 90	%
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-P1
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-1	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	0.000	0.000	0.425	2.000	98.000
NO. 60 SIEVE :	0.000	0.000	0.250	2.000	98.000
NO. 100 SIEVE:	1.000	2.000	0.150	4.000	96.000
NO. 200 SIEVE:	3.000	6.000	0.075	10.000	90.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	17.0	22.0	0.046	46.544	46.544
2.00	15.0	22.0	0.033	40.119	40.119
4.00	13.0	22.0	0.024	33.695	33.695
8.00	12.0	22.0	0.017	30.483	30.483
15.00	10.0	22.0	0.013	24.059	24.059
30.00	9.0	22.0	0.009	20.847	20.847
60.00	8.0	22.0	0.006	17.635	17.635
120.00	8.0	22.0	0.005	17.635	17.635
240.00	7.0	22.0	0.003	14.422	14.422
480.00	7.0	22.0	0.002	14.422	14.422
1440.00	6.0	22.0	0.001	11.210	11.210

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	2.00	0.425 - 2.0
% FINE SAND :	8.00	0.075 - 0.425
% SILT :	76.44	0.075 - 0.002
% CLAY :	13.56	< 0.002
% CLAY :	17.63	< 0.005

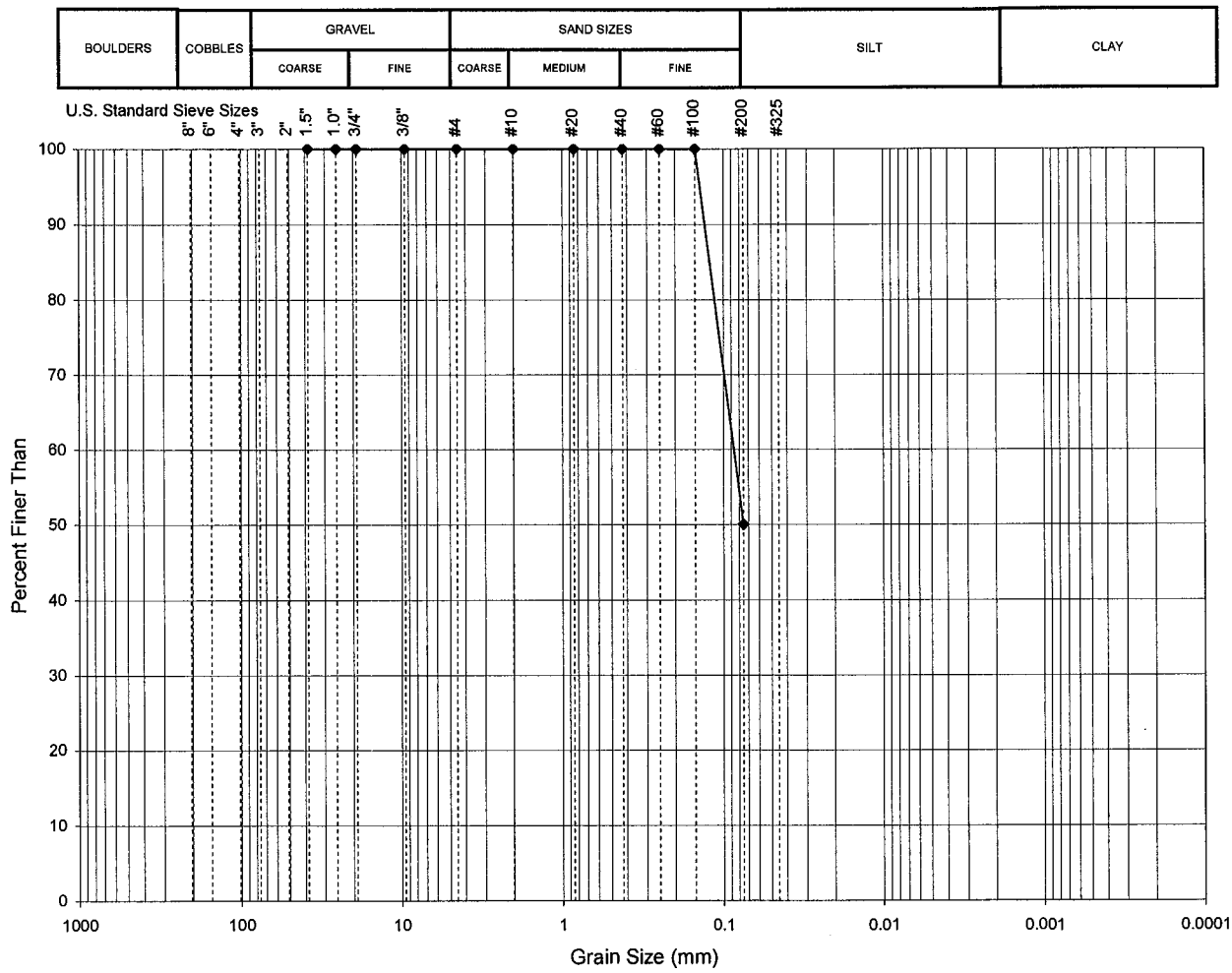
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-L2
Sample Depth:	
Lab ID Number:	L808918-2
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, AND SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	50 %
ESTIMATED HAZEN NUMBER: 1.86E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	50 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-L2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-2	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	40 grams	Specific Gravity:	2.650
Hydro. Sample Weight	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	0.000	0.000	0.150	0.000	100.000
NO. 200 SIEVE:	20.000	50.000	0.075	50.000	50.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

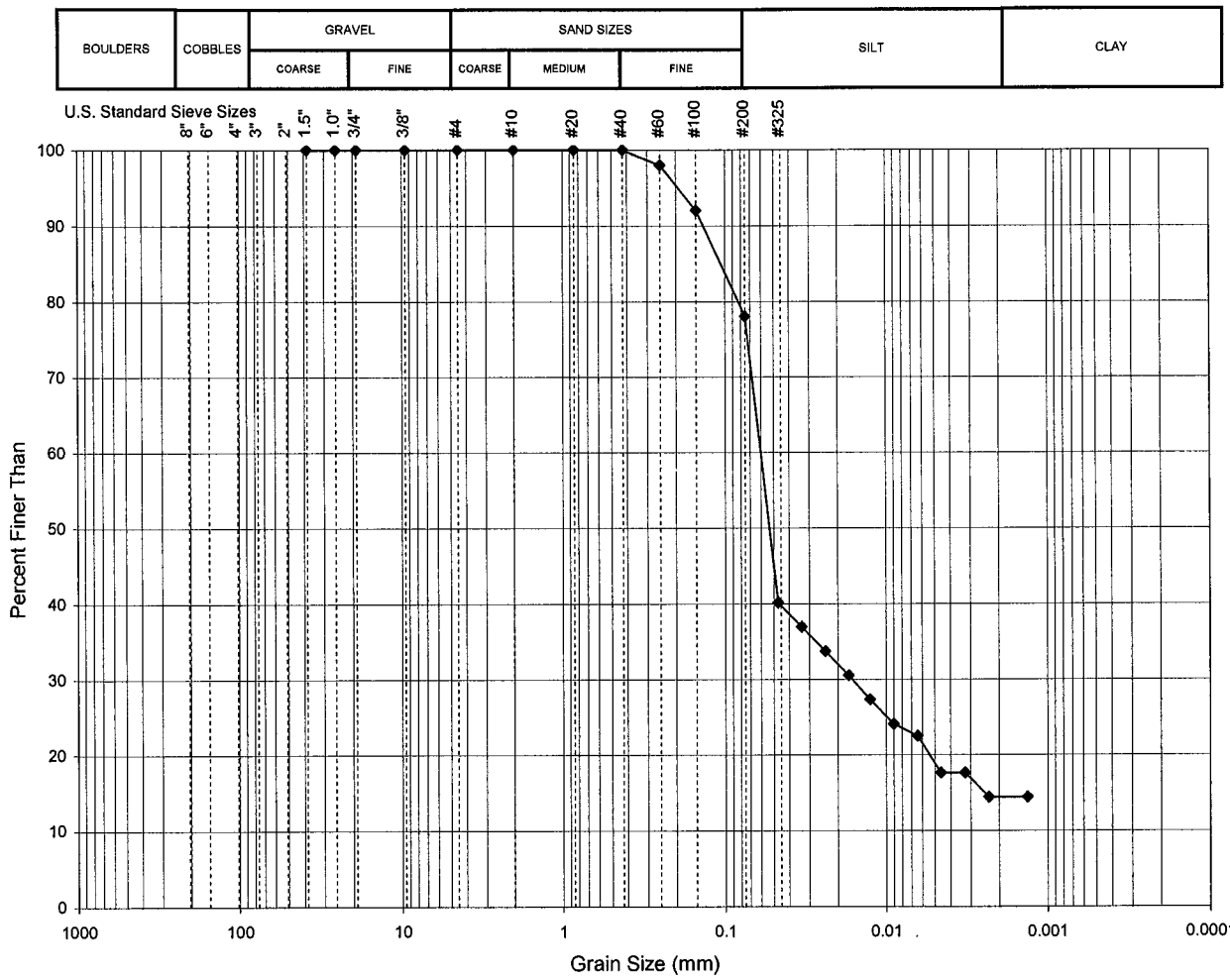
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	50.00	0.075 - 0.425
% SILT & CLAY :	50.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-P3
Sample Depth:	
Lab ID Number:	L808918-3
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SANDY SILT WITH CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	22 %
ESTIMATED HAZEN NUMBER: 2.11E-06 cm/s	WITH	11 - 20 %	SILT + CLAY	78 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-P3
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-3	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	1.000	2.000	0.250	2.000	98.000
NO. 100 SIEVE:	3.000	6.000	0.150	8.000	92.000
NO. 200 SIEVE:	7.000	14.000	0.075	22.000	78.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	15.0	22.0	0.047	40.119	40.119
2.00	14.0	22.0	0.033	36.907	36.907
4.00	13.0	22.0	0.024	33.695	33.695
8.00	12.0	22.0	0.017	30.483	30.483
15.00	11.0	22.0	0.013	27.271	27.271
30.00	10.0	22.0	0.009	24.059	24.059
60.00	9.5	22.0	0.006	22.453	22.453
120.00	8.0	22.0	0.005	17.635	17.635
240.00	8.0	22.0	0.003	17.635	17.635
480.00	7.0	22.0	0.002	14.422	14.422
1440.00	7.0	22.0	0.001	14.422	14.422

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	22.00	0.075 - 0.425
% SILT :	63.58	0.075 - 0.002
% CLAY :	14.42	< 0.002
% CLAY :	18.89	< 0.005

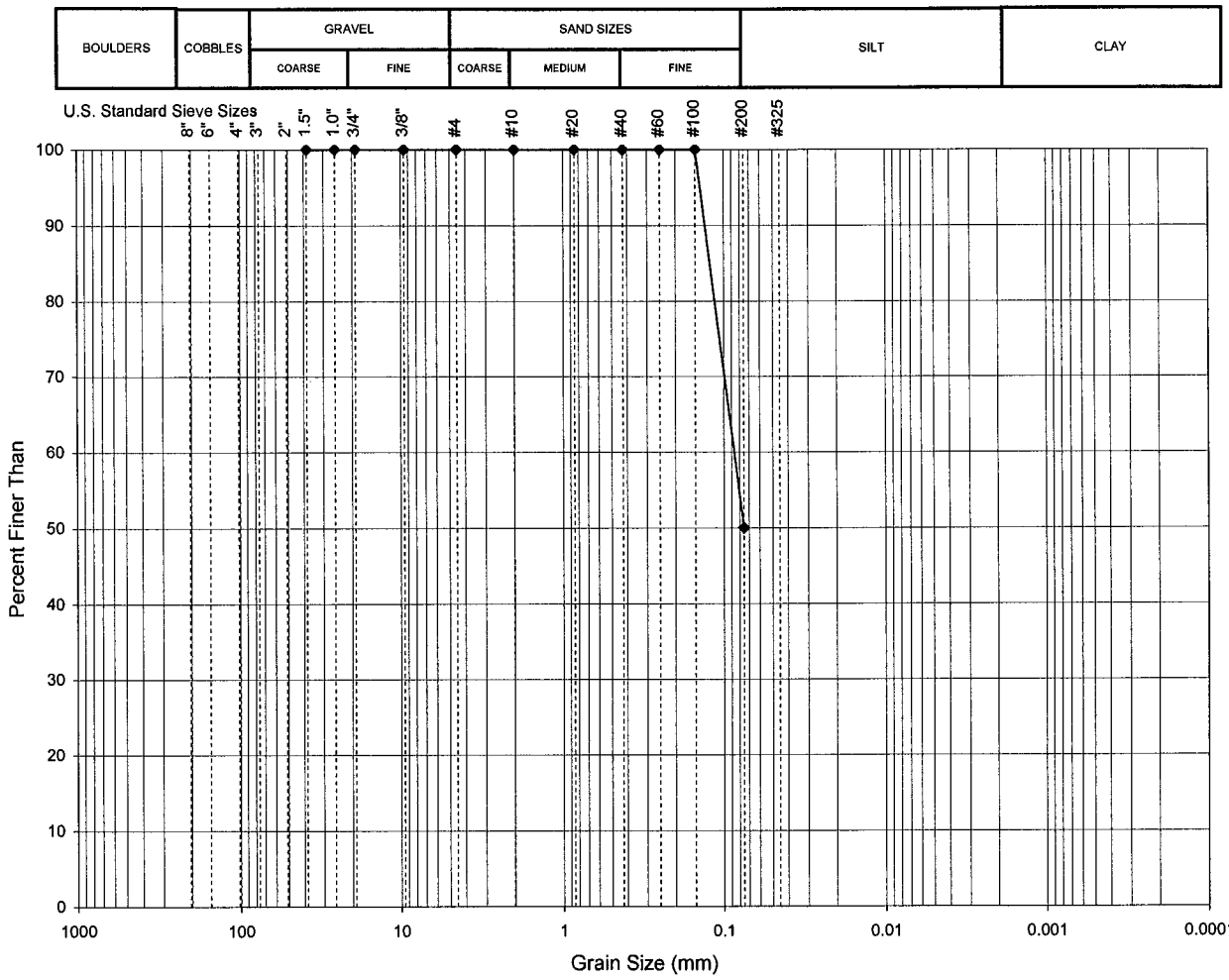
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-P4
Sample Depth:	
Lab ID Number:	L808918-4
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND AND SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	50 %
ESTIMATED HAZEN NUMBER: 1.86E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	50 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-P4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-4	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	20	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	0.000	0.000	0.150	0.000	100.000
NO. 200 SIEVE:	10.000	50.000	0.075	50.000	50.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	50.00	0.075 - 0.425
% SILT & CLAY :	50.00	< 0.075

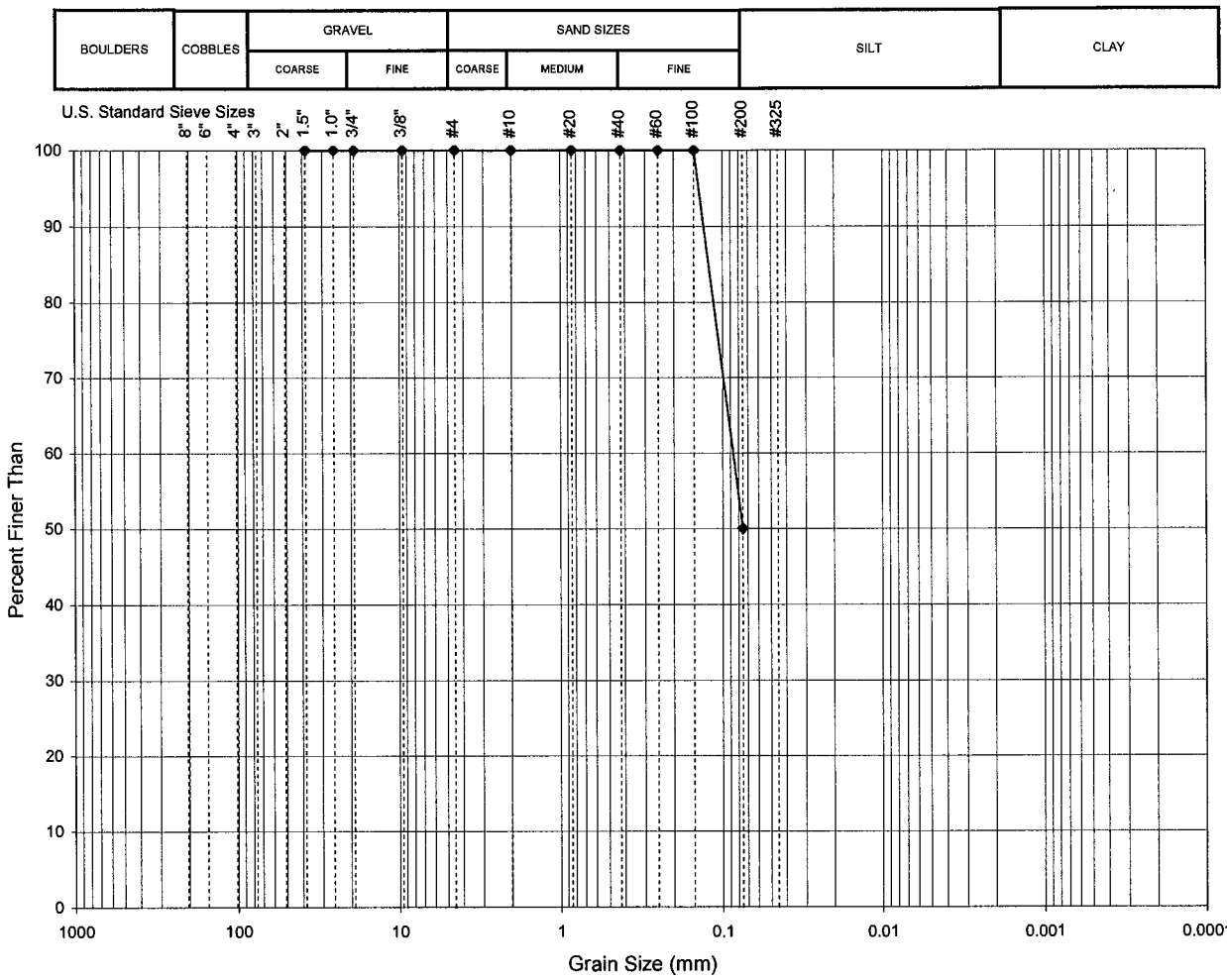
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-P5
Sample Depth:	
Lab ID Number:	L808918-5
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND AND SILT+CLAY	AND	36 - 50 %	GRAVEL 0	%
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND 50	%
ESTIMATED HAZEN NUMBER: 1.86E-03 cm/s	WITH	11 - 20 %	SILT + CLAY 50	%
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-P5
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-5	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	20 grams	Specific Gravity:	2.650
Hydro. Sample Weight	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	0.000	0.000	0.150	0.000	100.000
NO. 200 SIEVE:	10.000	50.000	0.075	50.000	50.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	50.00	0.075 - 0.425
% SILT & CLAY :	50.00	< 0.075

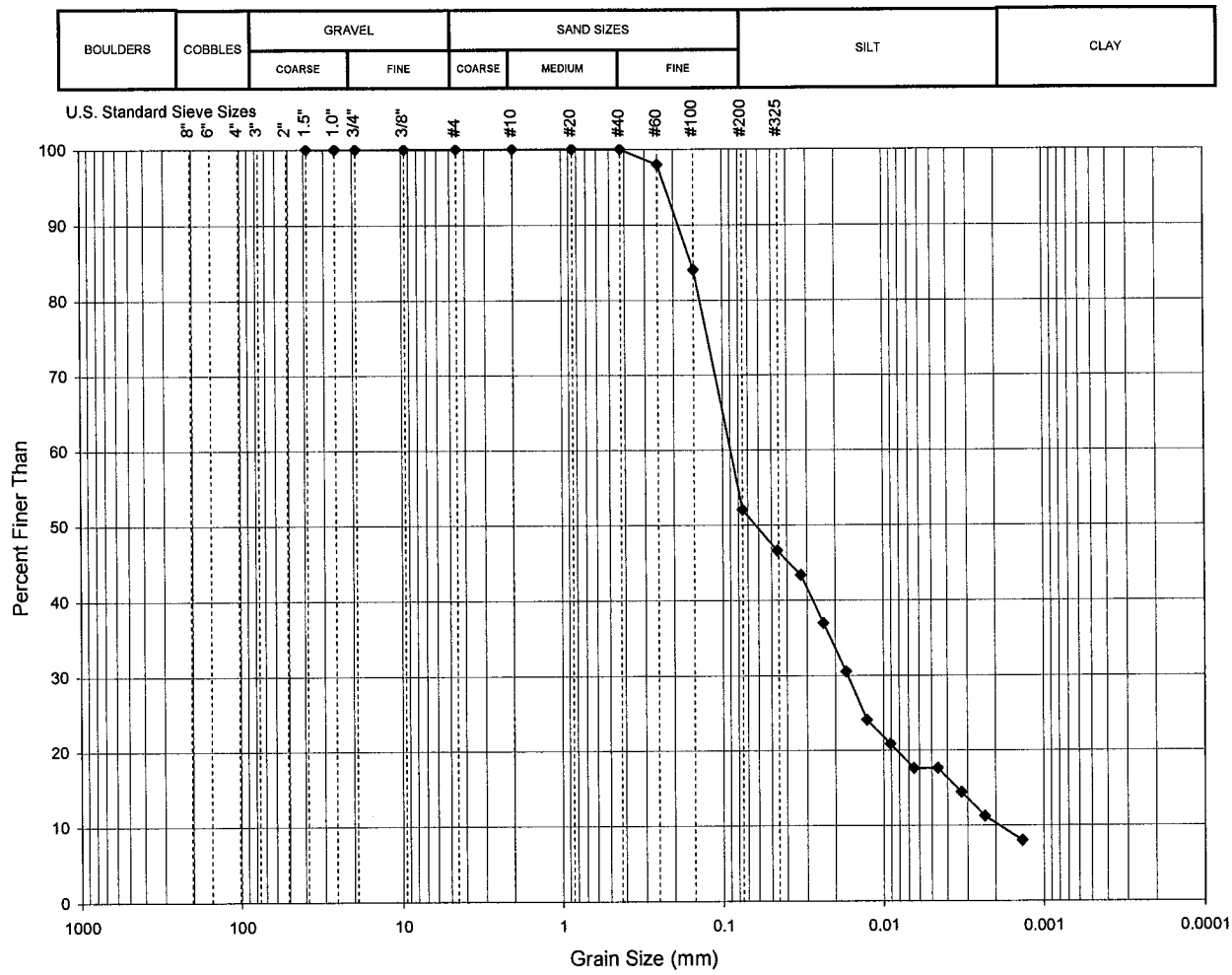
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-L1
Sample Depth:	
Lab ID Number:	L808918-6
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND AND SILT, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	48 %
ESTIMATED HAZEN NUMBER: 4.23E-06 cm/s	WITH	11 - 20 %	SILT + CLAY	52 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-L1
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-6	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	1.000	2.000	0.250	2.000	98.000
NO. 100 SIEVE:	7.000	14.000	0.150	16.000	84.000
NO. 200 SIEVE:	16.000	32.000	0.075	48.000	52.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	17.0	22.0	0.046	46.544	46.544
2.00	16.0	22.0	0.033	43.331	43.331
4.00	14.0	22.0	0.024	36.907	36.907
8.00	12.0	22.0	0.017	30.483	30.483
15.00	10.0	22.0	0.013	24.059	24.059
30.00	9.0	22.0	0.009	20.847	20.847
60.00	8.0	22.0	0.006	17.635	17.635
120.00	8.0	22.0	0.005	17.635	17.635
240.00	7.0	22.0	0.003	14.422	14.422
480.00	6.0	22.0	0.002	11.210	11.210
1440.00	5.0	22.0	0.001	7.998	7.998

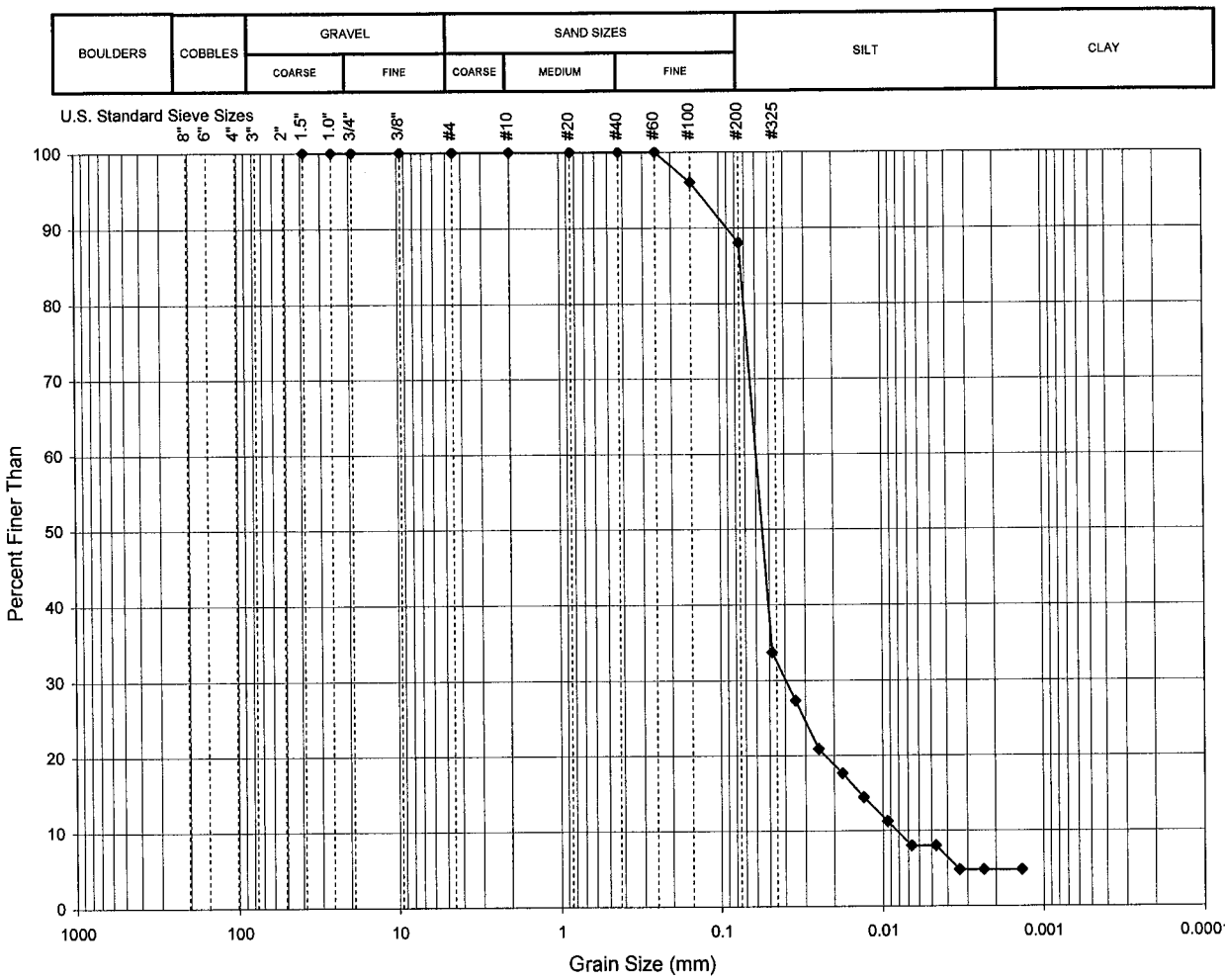
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	48.00	0.075 - 0.425
% SILT :	41.71	0.075 - 0.002
% CLAY :	10.29	< 0.002
% CLAY :	17.63	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-L2
Sample Depth:	
Lab ID Number:	L808918-7
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	12 %
ESTIMATED HAZEN NUMBER: 6.76E-05 cm/s	WITH	11 - 20 %	SILT + CLAY	88 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-L2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-7	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	2.000	4.000	0.150	4.000	96.000
NO. 200 SIEVE:	4.000	8.000	0.075	12.000	88.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	13.0	22.0	0.048	33.695	33.695
2.00	11.0	22.0	0.035	27.271	27.271
4.00	9.0	22.0	0.025	20.847	20.847
8.00	8.0	22.0	0.018	17.635	17.635
15.00	7.0	22.0	0.013	14.422	14.422
30.00	6.0	22.0	0.009	11.210	11.210
60.00	5.0	22.0	0.007	7.998	7.998
120.00	5.0	22.0	0.005	7.998	7.998
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	4.0	22.0	0.001	4.786	4.786

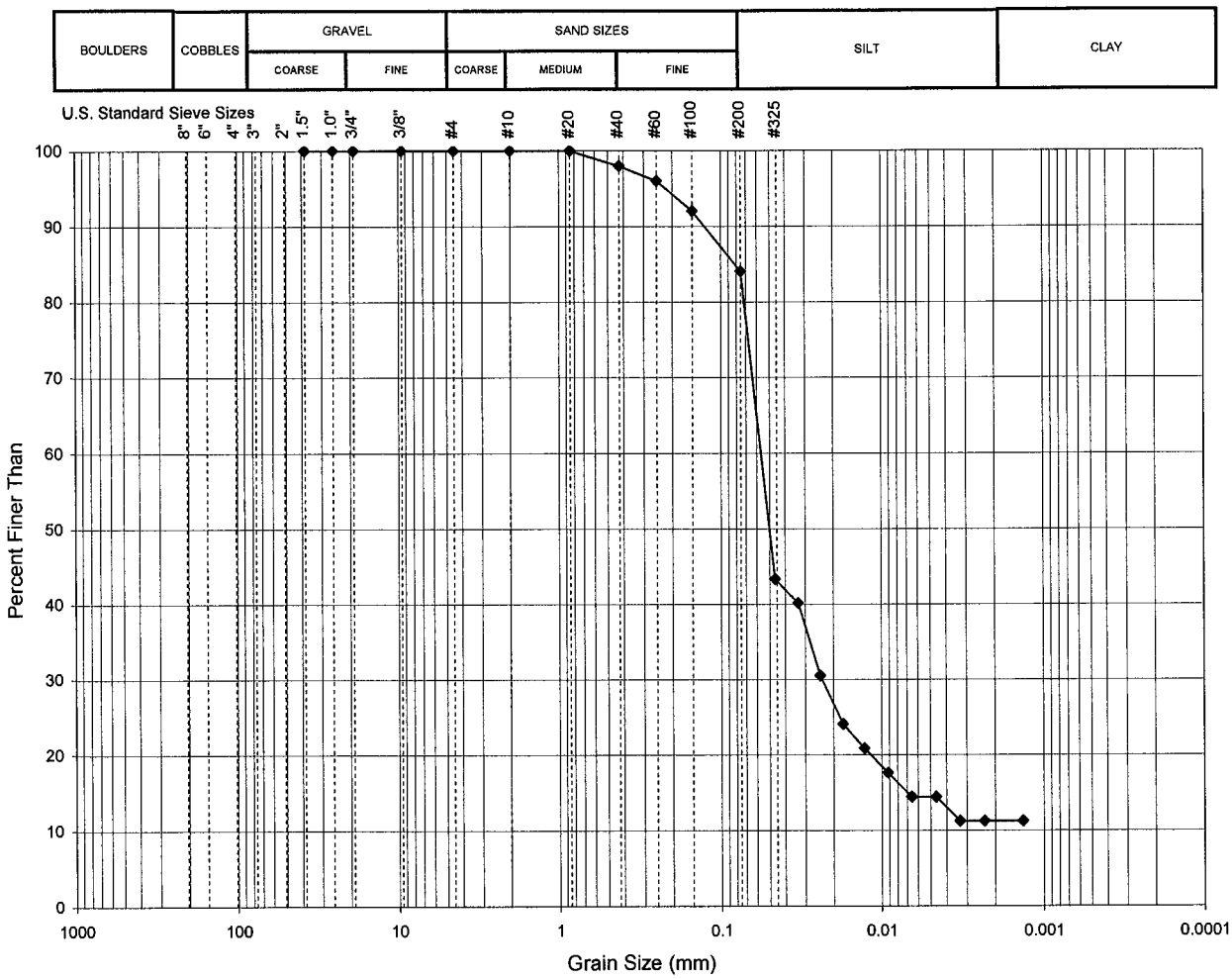
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	12.00	0.075 - 0.425
% SILT :	83.21	0.075 - 0.002
% CLAY :	4.79	< 0.002
% CLAY :	8.00	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-L3
Sample Depth:	
Lab ID Number:	L808918-8
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	16 %
ESTIMATED HAZEN NUMBER: 8.46E-06 cm/s	WITH	11 - 20 %	SILT + CLAY	84 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-L3
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-8	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	1.000	2.000	0.425	2.000	98.000
NO. 60 SIEVE :	1.000	2.000	0.250	4.000	96.000
NO. 100 SIEVE:	2.000	4.000	0.150	8.000	92.000
NO. 200 SIEVE:	4.000	8.000	0.075	16.000	84.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	16.0	22.0	0.046	43.331	43.331
2.00	15.0	22.0	0.033	40.119	40.119
4.00	12.0	22.0	0.024	30.483	30.483
8.00	10.0	22.0	0.017	24.059	24.059
15.00	9.0	22.0	0.013	20.847	20.847
30.00	8.0	22.0	0.009	17.635	17.635
60.00	7.0	22.0	0.007	14.422	14.422
120.00	7.0	22.0	0.005	14.422	14.422
240.00	6.0	22.0	0.003	11.210	11.210
480.00	6.0	22.0	0.002	11.210	11.210
1440.00	6.0	22.0	0.001	11.210	11.210

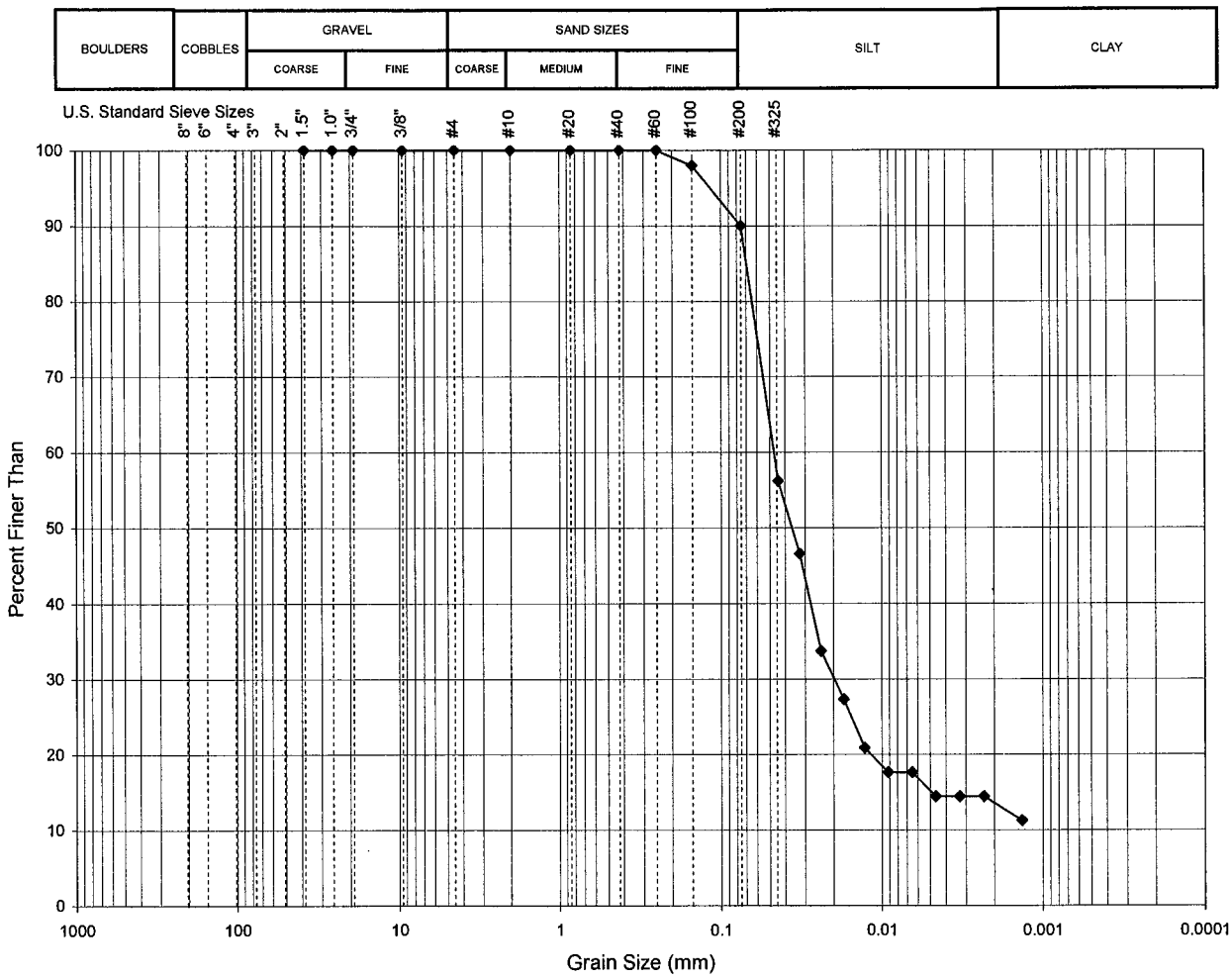
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	2.00	0.425 - 2.0
% FINE SAND :	14.00	0.075 - 0.425
% SILT :	72.79	0.075 - 0.002
% CLAY :	11.21	< 0.002
% CLAY :	14.42	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-L4
Sample Depth:	
Lab ID Number:	L808918-9
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH CLAY TRACE SAND	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	10 %
ESTIMATED HAZEN NUMBER: 1.21E-06 cm/s	WITH	11 - 20 %	SILT + CLAY	90 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-L4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-9	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	1.000	2.000	0.150	2.000	98.000
NO. 200 SIEVE:	4.000	8.000	0.075	10.000	90.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	20.0	22.0	0.044	56.180	56.180
2.00	17.0	22.0	0.032	46.544	46.544
4.00	13.0	22.0	0.024	33.695	33.695
8.00	11.0	22.0	0.017	27.271	27.271
15.00	9.0	22.0	0.013	20.847	20.847
30.00	8.0	22.0	0.009	17.635	17.635
60.00	8.0	22.0	0.006	17.635	17.635
120.00	7.0	22.0	0.005	14.422	14.422
240.00	7.0	22.0	0.003	14.422	14.422
480.00	7.0	22.0	0.002	14.422	14.422
1440.00	6.0	22.0	0.001	11.210	11.210

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	10.00	0.075 - 0.425
% SILT :	76.44	0.075 - 0.002
% CLAY :	13.56	< 0.002
% CLAY :	15.16	< 0.005

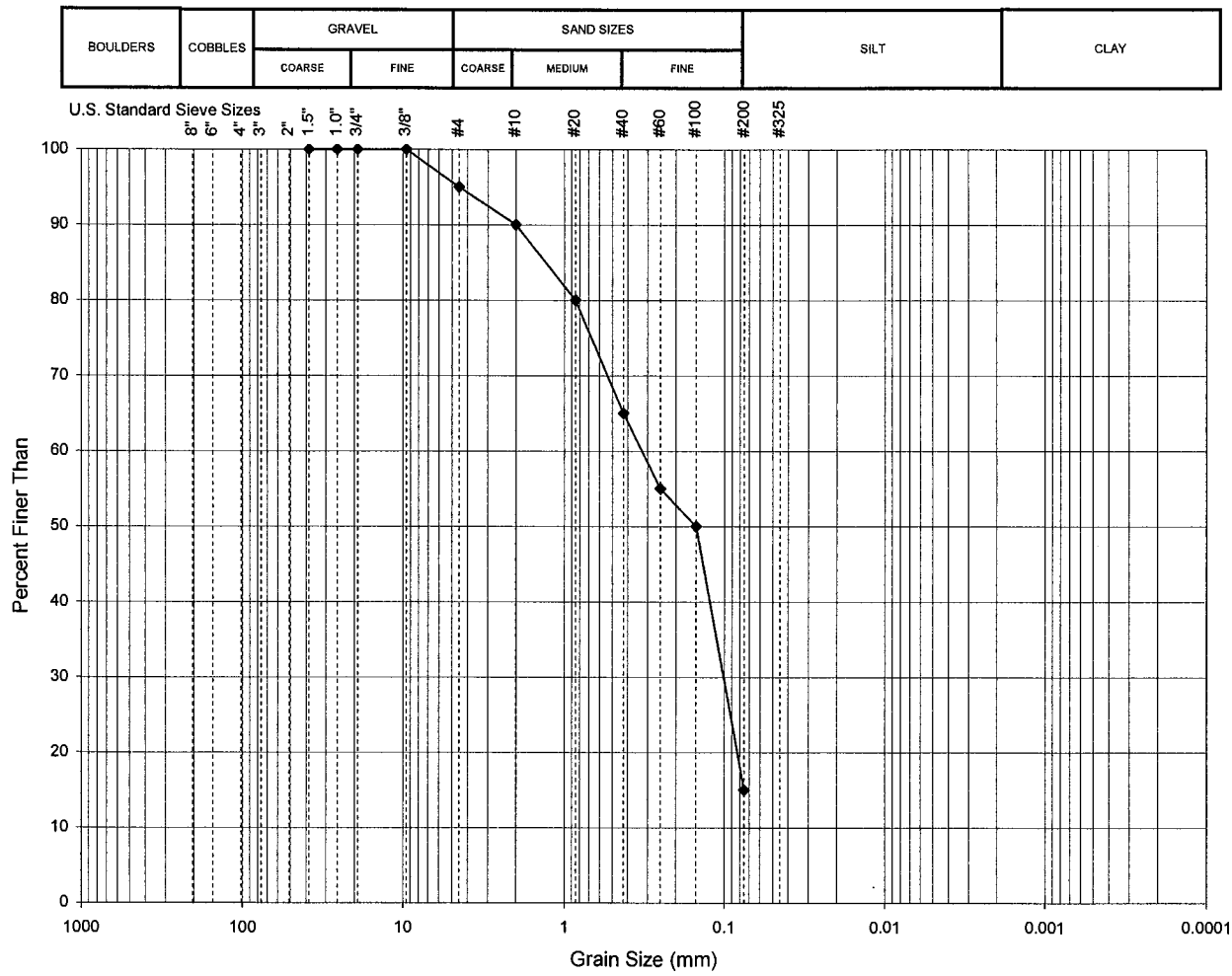
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	HL-L5
Sample Depth:	
Lab ID Number:	L808918-10
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND WITH SILT+CLAY, TRACE CLAY	AND	36 - 50 %	GRAVEL	5 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	80 %
ESTIMATED HAZEN NUMBER: 4.61E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	15 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	HL-L5
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-10	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	20	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.900	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	1.000	5.000	4.500	5.000	95.000
NO. 10 SIEVE :	1.000	5.000	2.000	10.000	90.000
NO. 20 SIEVE :	2.000	10.000	0.850	20.000	80.000
NO. 40 SIEVE :	3.000	15.000	0.425	35.000	65.000
NO. 60 SIEVE :	2.000	10.000	0.250	45.000	55.000
NO. 100 SIEVE:	1.000	5.000	0.150	50.000	50.000
NO. 200 SIEVE:	7.000	35.000	0.075	85.000	15.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	5.00	> 4.5
% COARSE SAND :	5.00	2.0 - 4.5
% MEDIUM SAND :	25.00	0.425 - 2.0
% FINE SAND :	50.00	0.075 - 0.425
% SILT & CLAY :	15.00	< 0.075

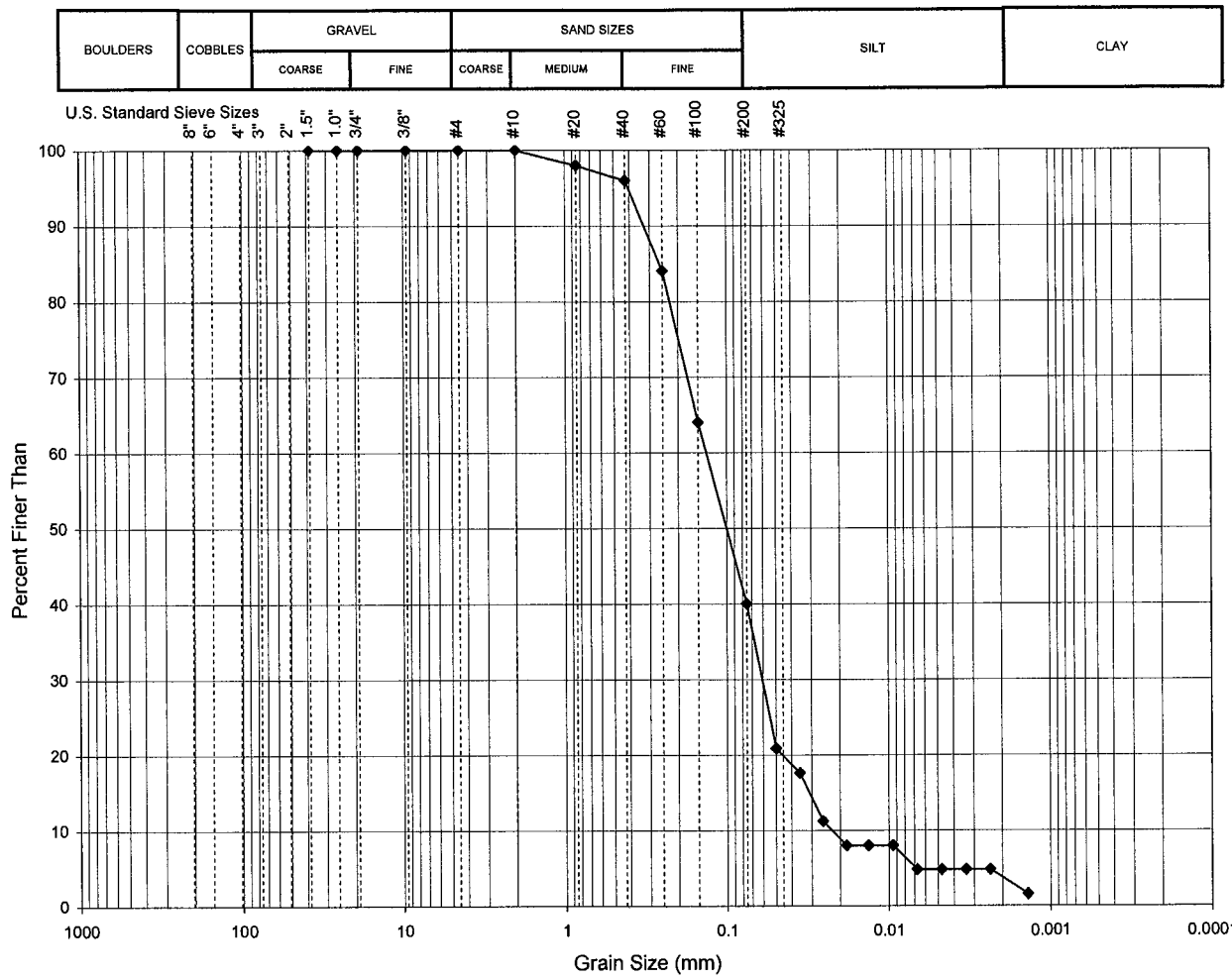
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LS1
Sample Depth:	
Lab ID Number:	L808918-11
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND AND SILT, TRACE CLAY	AND	36 - 50 %	GRAVEL 0	%
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND 60	%
ESTIMATED HAZEN NUMBER: 5.78E-04 cm/s	WITH	11 - 20 %	SILT + CLAY 40	%
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LS1
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-11	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	1.000	2.000	0.425	4.000	96.000
NO. 60 SIEVE :	6.000	12.000	0.250	16.000	84.000
NO. 100 SIEVE:	10.000	20.000	0.150	36.000	64.000
NO. 200 SIEVE:	12.000	24.000	0.075	60.000	40.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	9.0	22.0	0.050	20.847	20.847
2.00	8.0	22.0	0.036	17.635	17.635
4.00	6.0	22.0	0.026	11.210	11.210
8.00	5.0	22.0	0.018	7.998	7.998
15.00	5.0	22.0	0.013	7.998	7.998
30.00	5.0	22.0	0.009	7.998	7.998
60.00	4.0	22.0	0.007	4.786	4.786
120.00	4.0	22.0	0.005	4.786	4.786
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	3.0	22.0	0.001	1.574	1.574

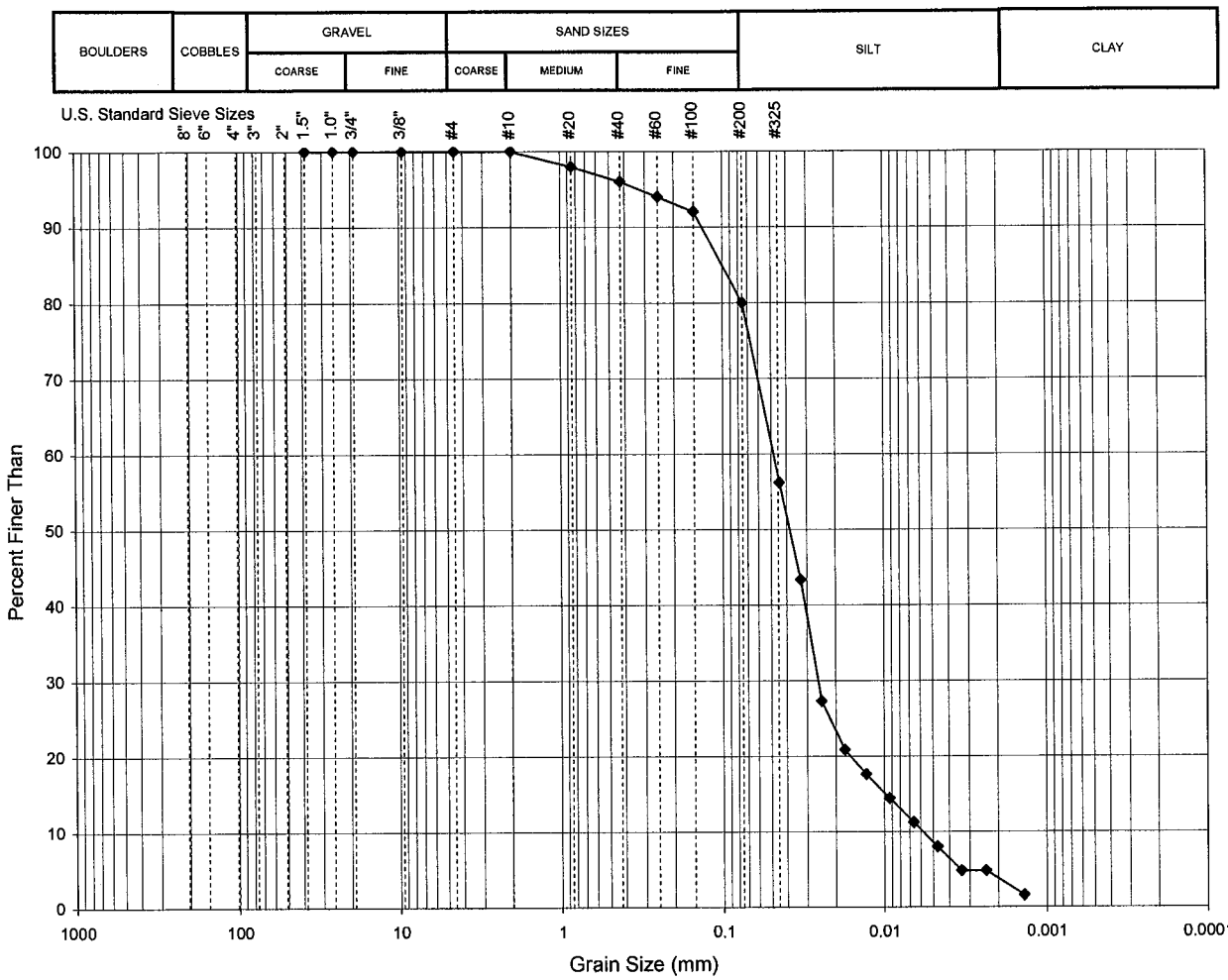
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	4.00	0.425 - 2.0
% FINE SAND :	56.00	0.075 - 0.425
% SILT :	36.24	0.075 - 0.002
% CLAY :	3.76	< 0.002
% CLAY :	4.79	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LS2
Sample Depth:	
Lab ID Number:	L808918-12
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH SAND TRACE CLAY	AND	36 - 50 %	GRAVEL 0	%
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND 20	%
ESTIMATED HAZEN NUMBER: 3.38E-05 cm/s	WITH	11 - 20 %	SILT + CLAY 80	%
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LS2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-12	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	1.000	2.000	0.425	4.000	96.000
NO. 60 SIEVE :	1.000	2.000	0.250	6.000	94.000
NO. 100 SIEVE:	1.000	2.000	0.150	8.000	92.000
NO. 200 SIEVE:	6.000	12.000	0.075	20.000	80.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	20.0	22.0	0.044	56.180	56.180
2.00	16.0	22.0	0.033	43.331	43.331
4.00	11.0	22.0	0.024	27.271	27.271
8.00	9.0	22.0	0.018	20.847	20.847
15.00	8.0	22.0	0.013	17.635	17.635
30.00	7.0	22.0	0.009	14.422	14.422
60.00	6.0	22.0	0.007	11.210	11.210
120.00	5.0	22.0	0.005	7.998	7.998
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	3.0	22.0	0.001	1.574	1.574

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	4.00	0.425 - 2.0
% FINE SAND :	16.00	0.075 - 0.425
% SILT :	76.24	0.075 - 0.002
% CLAY :	3.76	< 0.002
% CLAY :	8.56	< 0.005

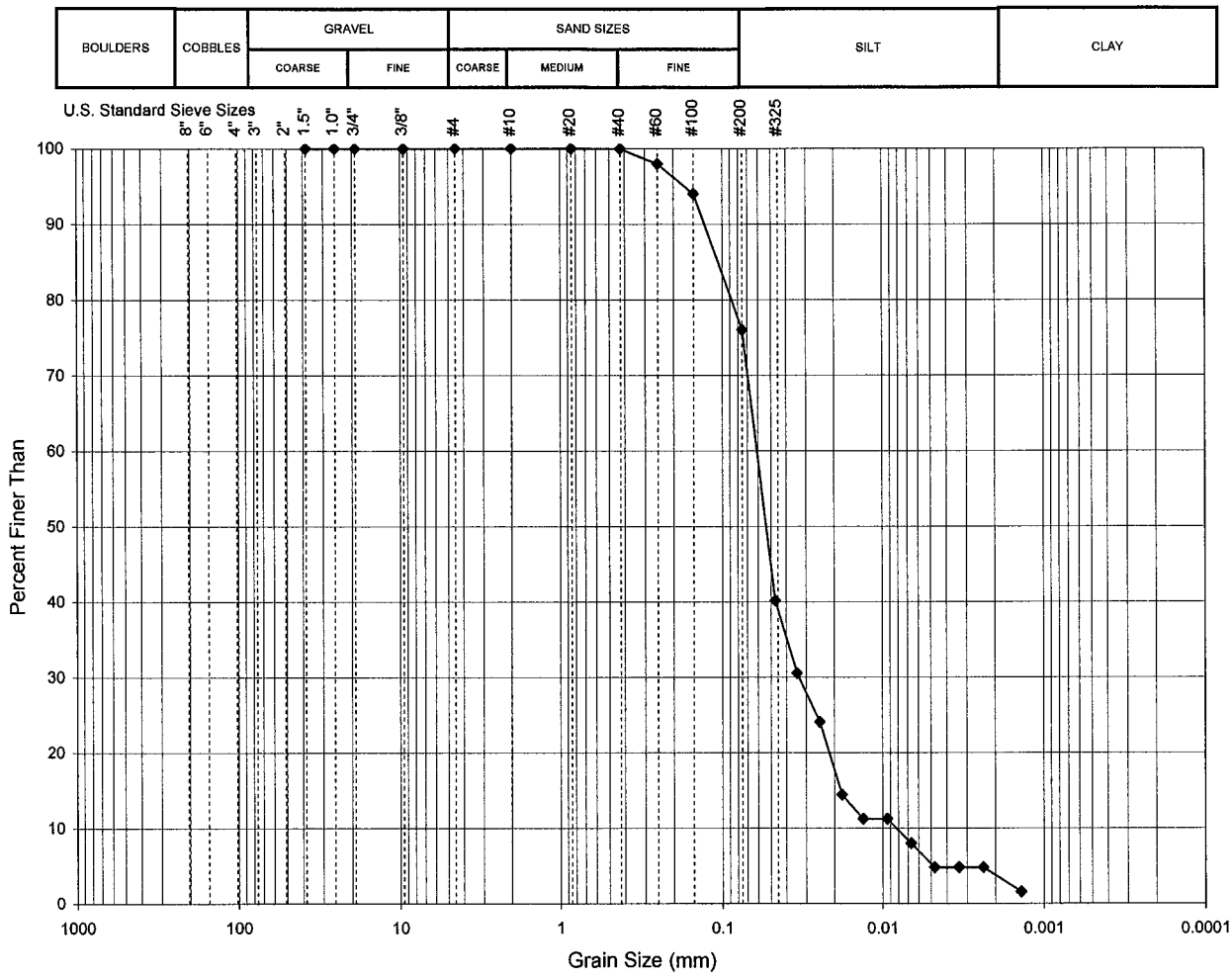
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LS3
Sample Depth:	
Lab ID Number:	L808918-13
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SANDY SILT, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	24 %
ESTIMATED HAZEN NUMBER: 1.39E-04 cm/s	WITH	11 - 20 %	SILT + CLAY	76 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LS3
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-13	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	1.000	2.000	0.250	2.000	98.000
NO. 100 SIEVE:	2.000	4.000	0.150	6.000	94.000
NO. 200 SIEVE:	9.000	18.000	0.075	24.000	76.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	15.0	22.0	0.047	40.119	40.119
2.00	12.0	22.0	0.034	30.483	30.483
4.00	10.0	22.0	0.025	24.059	24.059
8.00	7.0	22.0	0.018	14.422	14.422
15.00	6.0	22.0	0.013	11.210	11.210
30.00	6.0	22.0	0.009	11.210	11.210
60.00	5.0	22.0	0.007	7.998	7.998
120.00	4.0	22.0	0.005	4.786	4.786
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	3.0	22.0	0.001	1.574	1.574

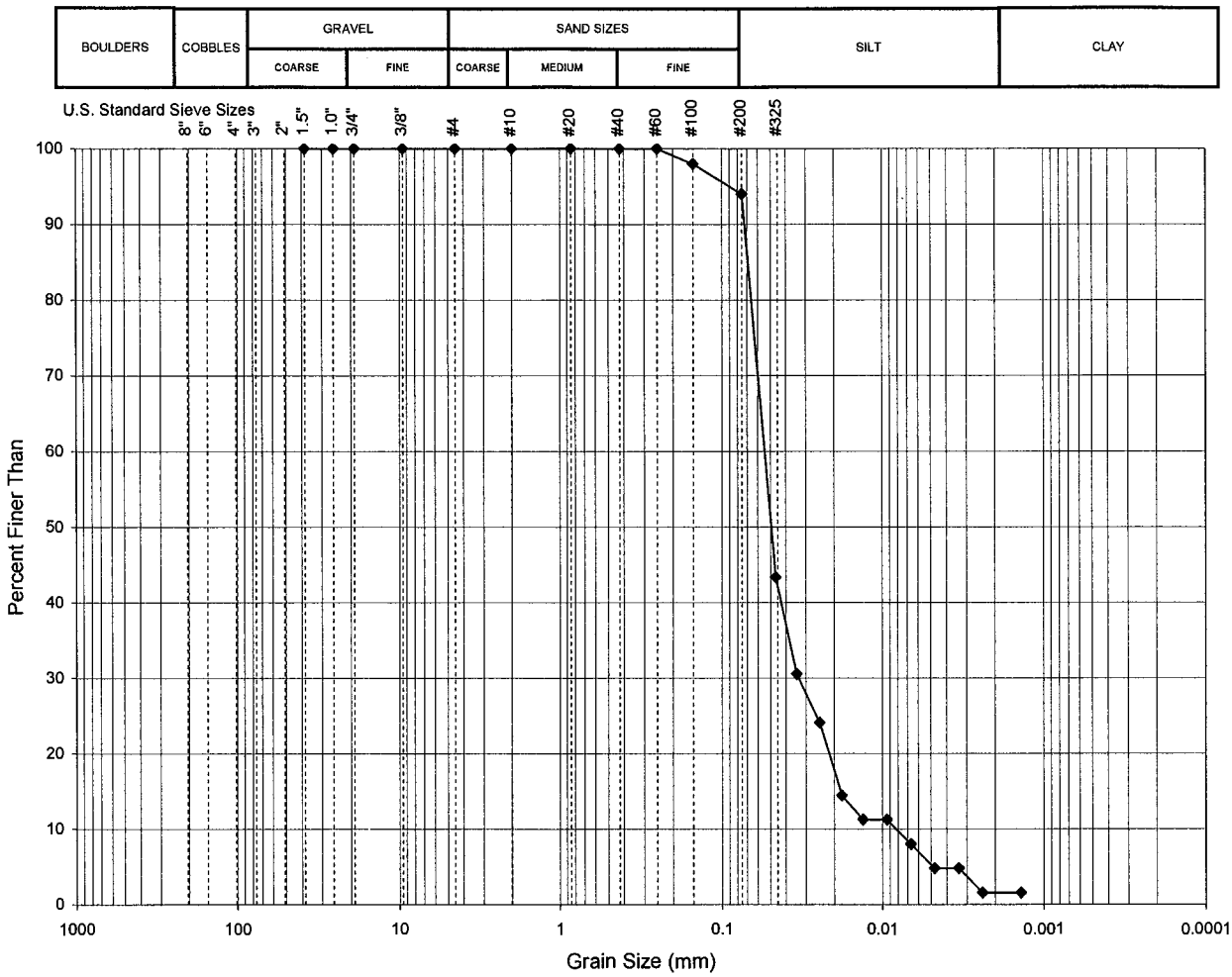
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	24.00	0.075 - 0.425
% SILT :	72.24	0.075 - 0.002
% CLAY :	3.76	< 0.002
% CLAY :	5.27	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LS4
Sample Depth:	
Lab ID Number:	L808918-14
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT TRACE SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	6 %
ESTIMATED HAZEN NUMBER: 1.39E-04 cm/s	WITH	11 - 20 %	SILT + CLAY	94 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LS4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-14	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	1.000	2.000	0.150	2.000	98.000
NO. 200 SIEVE:	2.000	4.000	0.075	6.000	94.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	16.0	22.0	0.046	43.331	43.331
2.00	12.0	22.0	0.034	30.483	30.483
4.00	10.0	22.0	0.025	24.059	24.059
8.00	7.0	22.0	0.018	14.422	14.422
15.00	6.0	22.0	0.013	11.210	11.210
30.00	6.0	22.0	0.009	11.210	11.210
60.00	5.0	22.0	0.007	7.998	7.998
120.00	4.0	22.0	0.005	4.786	4.786
240.00	4.0	22.0	0.003	4.786	4.786
480.00	3.0	22.0	0.002	1.574	1.574
1440.00	3.0	22.0	0.001	1.574	1.574

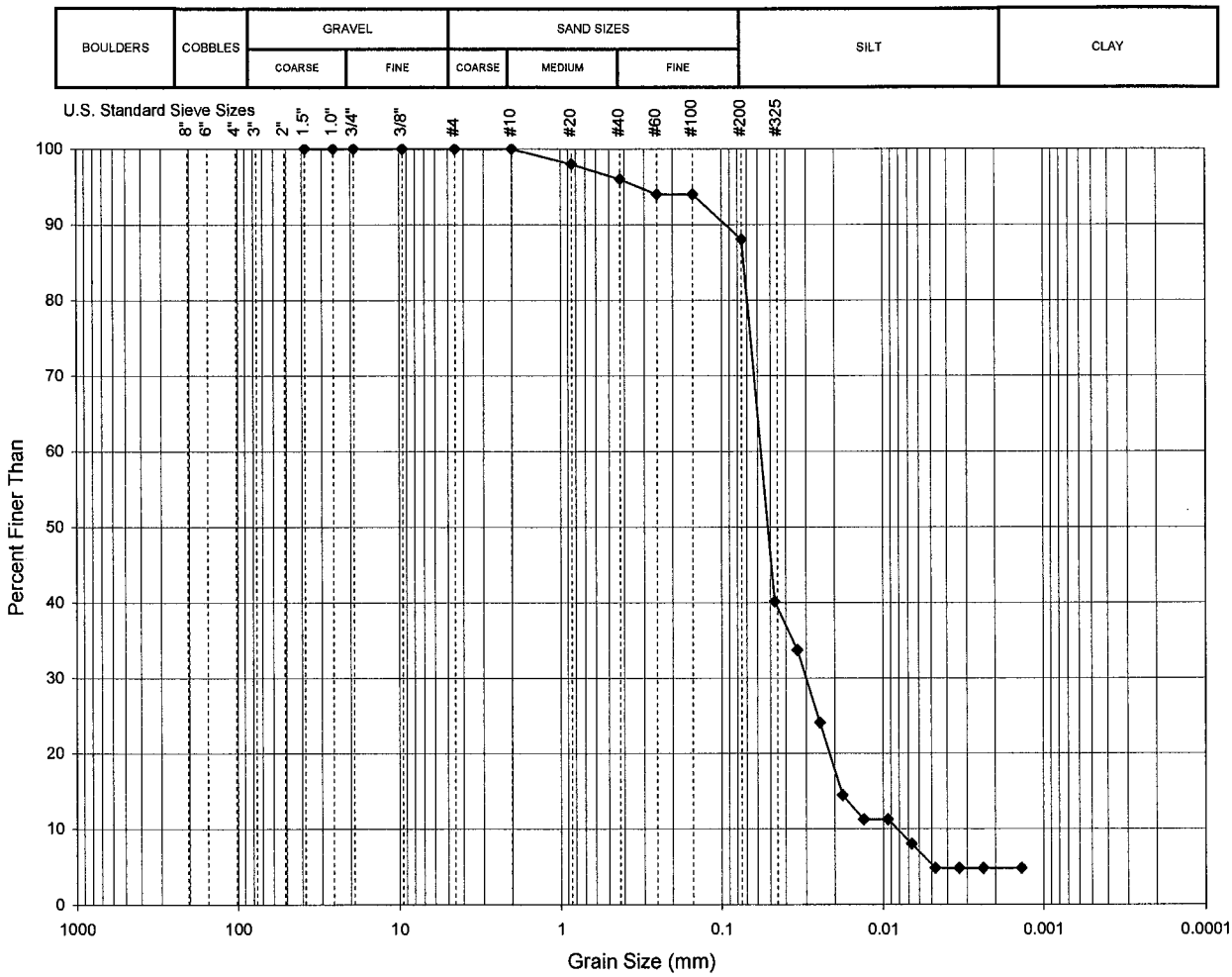
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	6.00	0.075 - 0.425
% SILT :	92.43	0.075 - 0.002
% CLAY :	1.57	< 0.002
% CLAY :	5.27	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LS5
Sample Depth:	
Lab ID Number:	L808918-15
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL 0	%
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND 12	%
ESTIMATED HAZEN NUMBER: 1.39E-04 cm/s	WITH	11 - 20 %	SILT + CLAY 88	%
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LS5
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-15	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	1.000	2.000	0.425	4.000	96.000
NO. 60 SIEVE :	1.000	2.000	0.250	6.000	94.000
NO. 100 SIEVE:	0.000	0.000	0.150	6.000	94.000
NO. 200 SIEVE:	3.000	6.000	0.075	12.000	88.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	15.0	22.0	0.047	40.119	40.119
2.00	13.0	22.0	0.034	33.695	33.695
4.00	10.0	22.0	0.025	24.059	24.059
8.00	7.0	22.0	0.018	14.422	14.422
15.00	6.0	22.0	0.013	11.210	11.210
30.00	6.0	22.0	0.009	11.210	11.210
60.00	5.0	22.0	0.007	7.998	7.998
120.00	4.0	22.0	0.005	4.786	4.786
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	4.0	22.0	0.001	4.786	4.786

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	4.00	0.425 - 2.0
% FINE SAND :	8.00	0.075 - 0.425
% SILT :	83.21	0.075 - 0.002
% CLAY :	4.79	< 0.002
% CLAY :	5.27	< 0.005

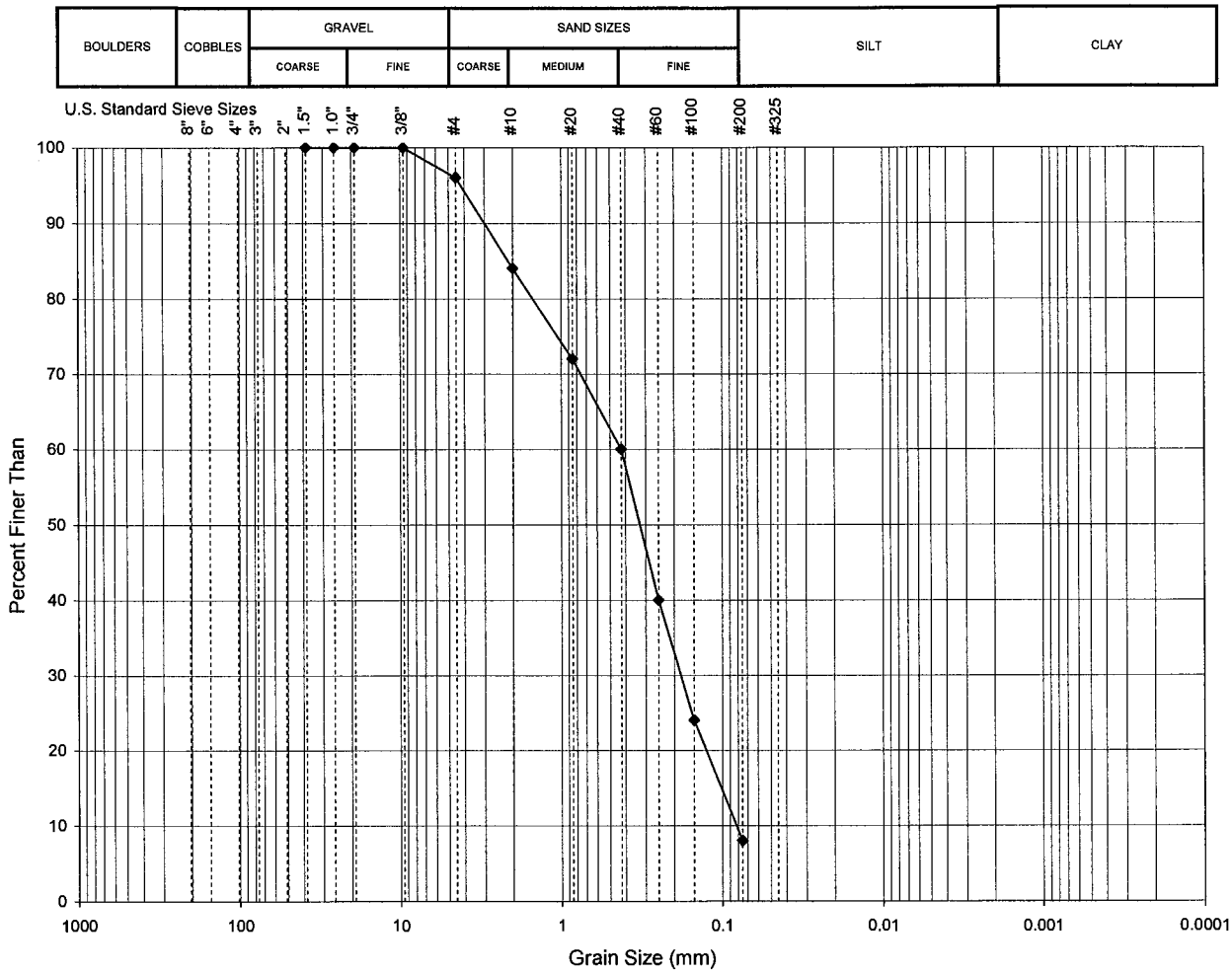
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LAKE 2
Sample Depth:	
Lab ID Number:	L808918-16
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY, TRACE GRAVEL	AND	36 - 50 %	GRAVEL	4 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	88 %
ESTIMATED HAZEN NUMBER: 6.69E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	8 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LAKE 2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-16	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	25	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.840	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	1.000	4.000	4.500	4.000	96.000
NO. 10 SIEVE :	3.000	12.000	2.000	16.000	84.000
NO. 20 SIEVE :	3.000	12.000	0.850	28.000	72.000
NO. 40 SIEVE :	3.000	12.000	0.425	40.000	60.000
NO. 60 SIEVE :	5.000	20.000	0.250	60.000	40.000
NO. 100 SIEVE:	4.000	16.000	0.150	76.000	24.000
NO. 200 SIEVE:	4.000	16.000	0.075	92.000	8.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	4.00	> 4.5
% COARSE SAND :	12.00	2.0 - 4.5
% MEDIUM SAND :	24.00	0.425 - 2.0
% FINE SAND :	52.00	0.075 - 0.425
% SILT & CLAY :	8.00	< 0.075

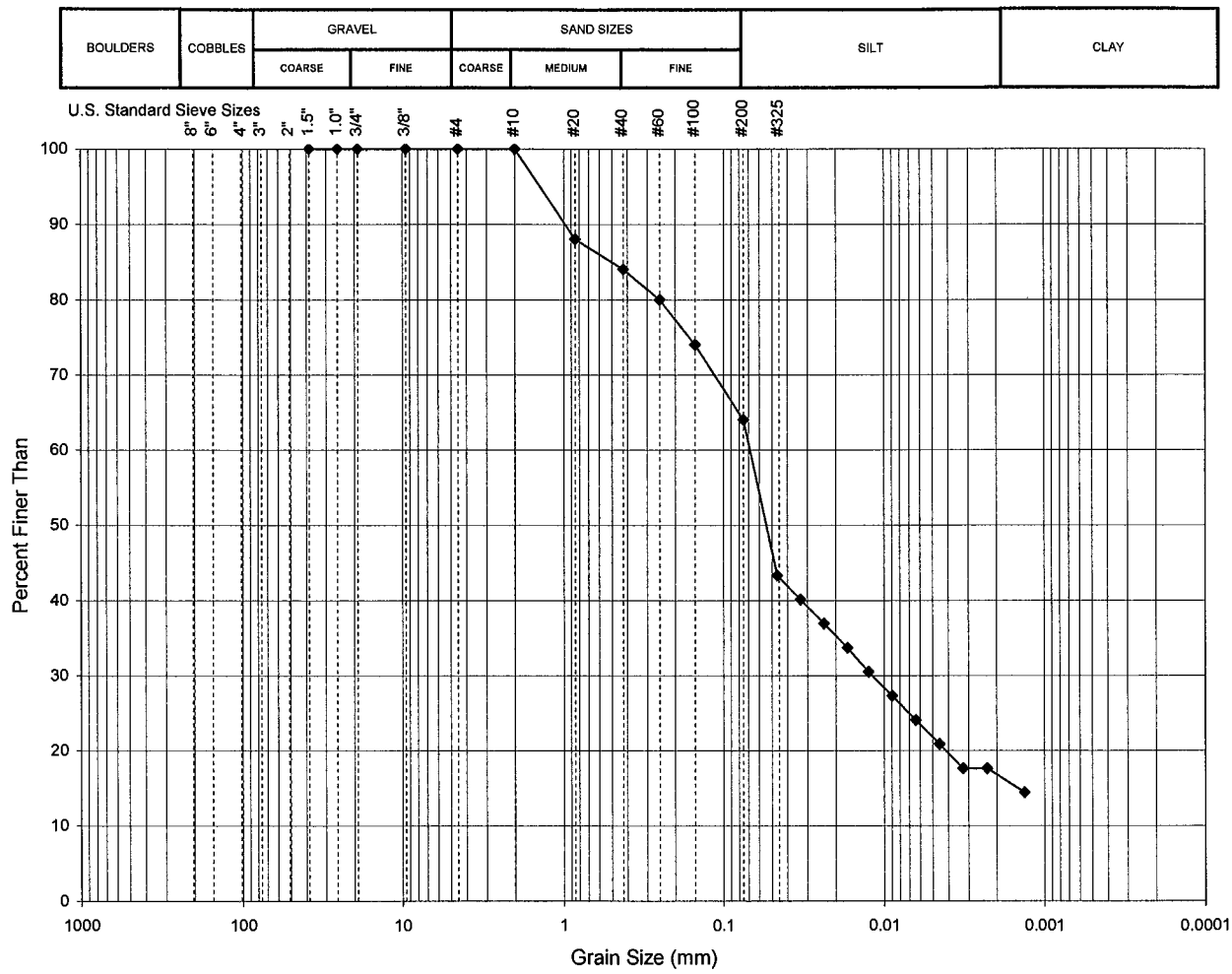
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	L9
Sample Depth:	
Lab ID Number:	L808918-17
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT AND SAND, WITH CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	36 %
ESTIMATED HAZEN NUMBER: 4.03E-07 cm/s	WITH	11 - 20 %	SILT + CLAY	64 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	L9
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-17	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	6.000	12.000	0.850	12.000	88.000
NO. 40 SIEVE :	2.000	4.000	0.425	16.000	84.000
NO. 60 SIEVE :	2.000	4.000	0.250	20.000	80.000
NO. 100 SIEVE:	3.000	6.000	0.150	26.000	74.000
NO. 200 SIEVE:	5.000	10.000	0.075	36.000	64.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	16.0	22.0	0.046	43.331	43.331
2.00	15.0	22.0	0.033	40.119	40.119
4.00	14.0	22.0	0.024	36.907	36.907
8.00	13.0	22.0	0.017	33.695	33.695
15.00	12.0	22.0	0.012	30.483	30.483
30.00	11.0	22.0	0.009	27.271	27.271
60.00	10.0	22.0	0.006	24.059	24.059
120.00	9.0	22.0	0.005	20.847	20.847
240.00	8.0	22.0	0.003	17.635	17.635
480.00	8.0	22.0	0.002	17.635	17.635
1440.00	7.0	22.0	0.001	14.422	14.422

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	16.00	0.425 - 2.0
% FINE SAND :	20.00	0.075 - 0.425
% SILT :	47.18	0.075 - 0.002
% CLAY :	16.82	< 0.002
% CLAY :	21.76	< 0.005

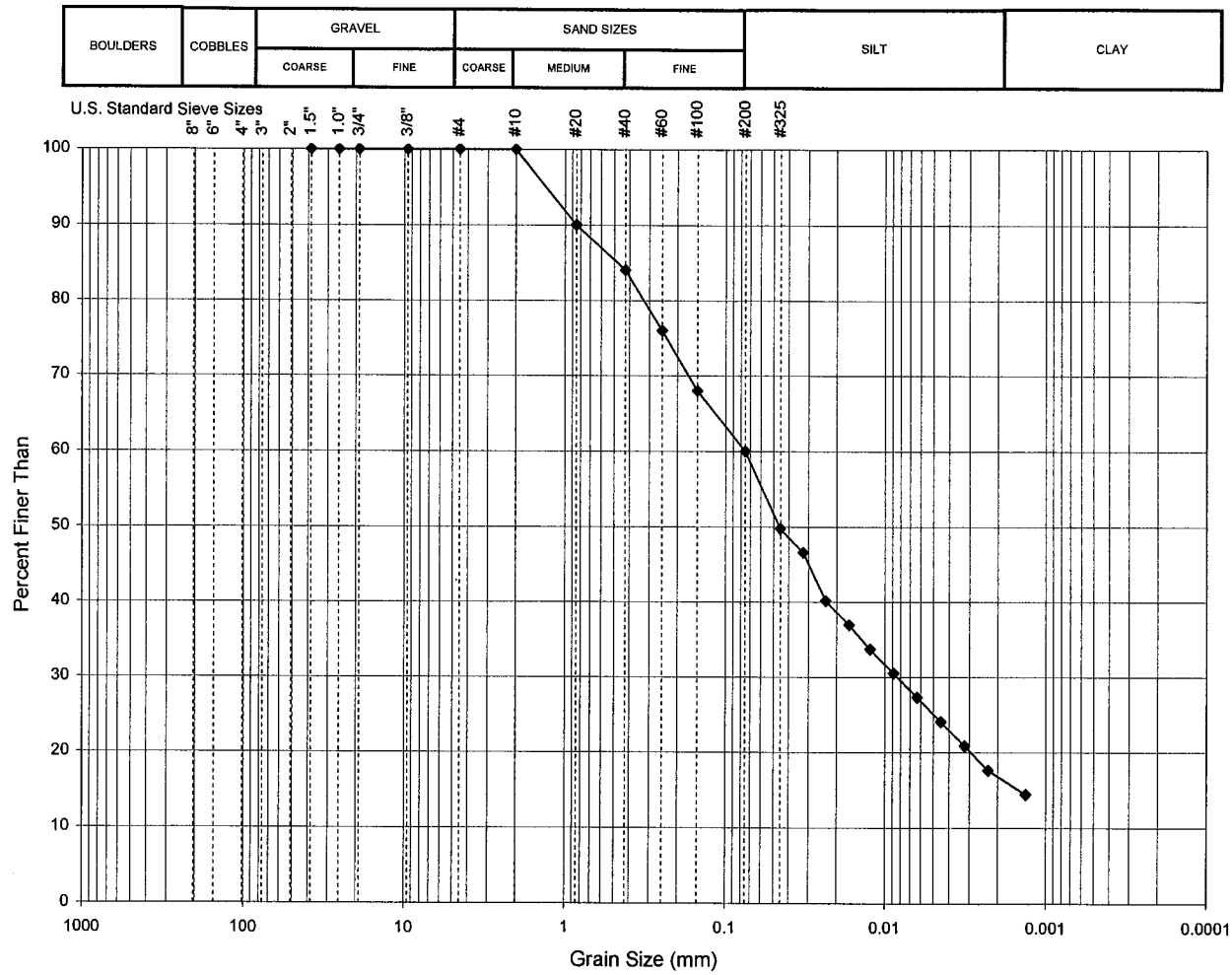
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LAKE 13A
Sample Depth:	
Lab ID Number:	L808918-18
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT AND SAND WITH CLAY	AND	36 - 50 %	GRAVEL 0	%
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND 40	%
ESTIMATED HAZEN NUMBER: 4.03E-07 cm/s	WITH	11 - 20 %	SILT + CLAY 60	%
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LAKE 13A
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-18	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	5.000	10.000	0.850	10.000	90.000
NO. 40 SIEVE :	3.000	6.000	0.425	16.000	84.000
NO. 60 SIEVE :	4.000	8.000	0.250	24.000	76.000
NO. 100 SIEVE:	4.000	8.000	0.150	32.000	68.000
NO. 200 SIEVE:	4.000	8.000	0.075	40.000	60.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	18.0	22.0	0.045	49.756	49.756
2.00	17.0	22.0	0.032	46.544	46.544
4.00	15.0	22.0	0.023	40.119	40.119
8.00	14.0	22.0	0.017	36.907	36.907
15.00	13.0	22.0	0.012	33.695	33.695
30.00	12.0	22.0	0.009	30.483	30.483
60.00	11.0	22.0	0.006	27.271	27.271
120.00	10.0	22.0	0.004	24.059	24.059
240.00	9.0	22.0	0.003	20.847	20.847
480.00	8.0	22.0	0.002	17.635	17.635
1440.00	7.0	22.0	0.001	14.422	14.422

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	16.00	0.425 - 2.0
% FINE SAND :	24.00	0.075 - 0.425
% SILT :	43.18	0.075 - 0.002
% CLAY :	16.82	< 0.002
% CLAY :	25.07	< 0.005

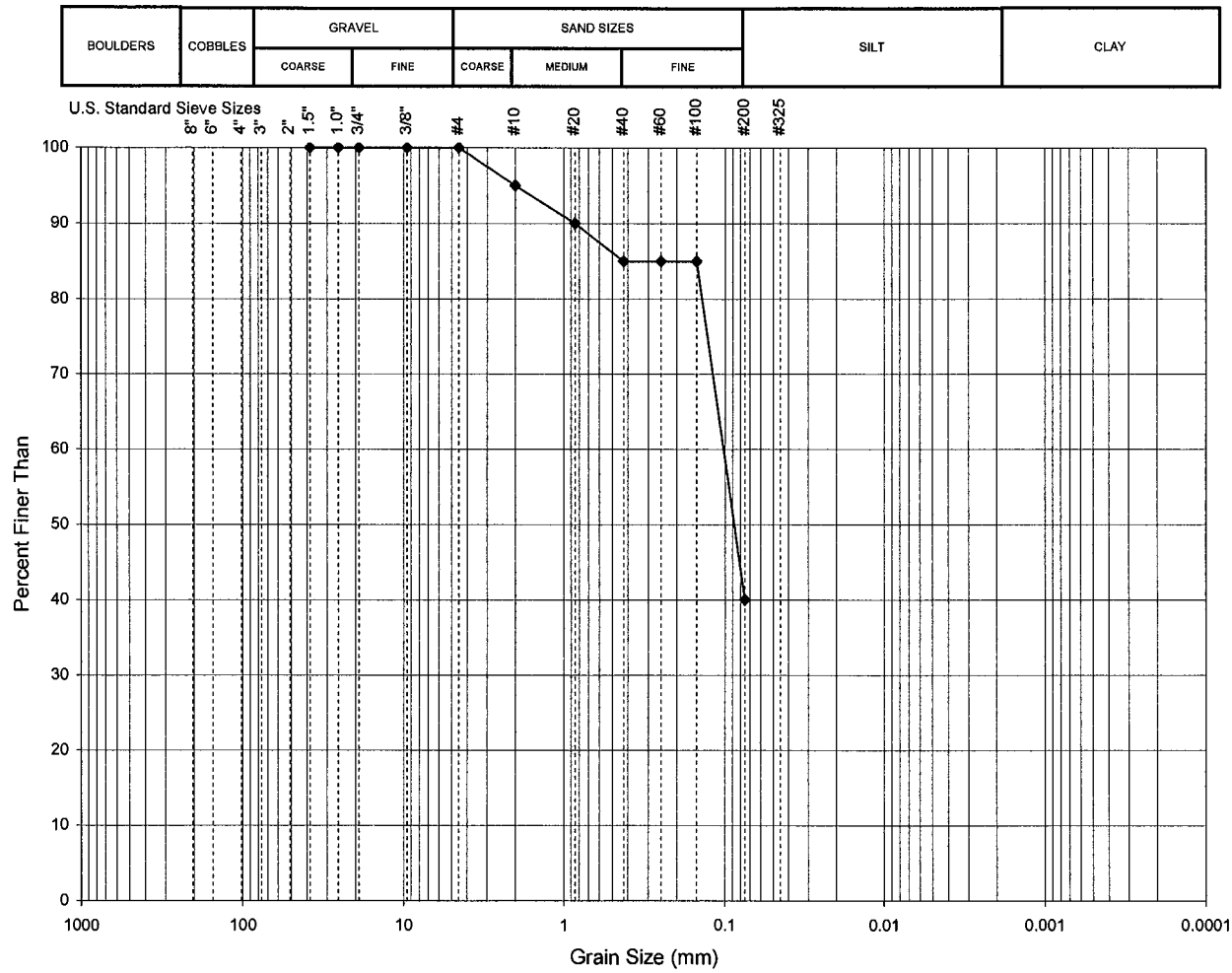
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	LAKE 13
Sample Depth:	
Lab ID Number:	L808918-19
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND AND SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	60 %
ESTIMATED HAZEN NUMBER: 2.23E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	40 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	LAKE 13
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-19	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	20	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.950	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	1.000	5.000	2.000	5.000	95.000
NO. 20 SIEVE :	1.000	5.000	0.850	10.000	90.000
NO. 40 SIEVE :	1.000	5.000	0.425	15.000	85.000
NO. 60 SIEVE :	0.000	0.000	0.250	15.000	85.000
NO. 100 SIEVE:	0.000	0.000	0.150	15.000	85.000
NO. 200 SIEVE:	9.000	45.000	0.075	60.000	40.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	5.00	2.0 - 4.5
% MEDIUM SAND :	10.00	0.425 - 2.0
% FINE SAND :	45.00	0.075 - 0.425
% SILT & CLAY :	40.00	< 0.075

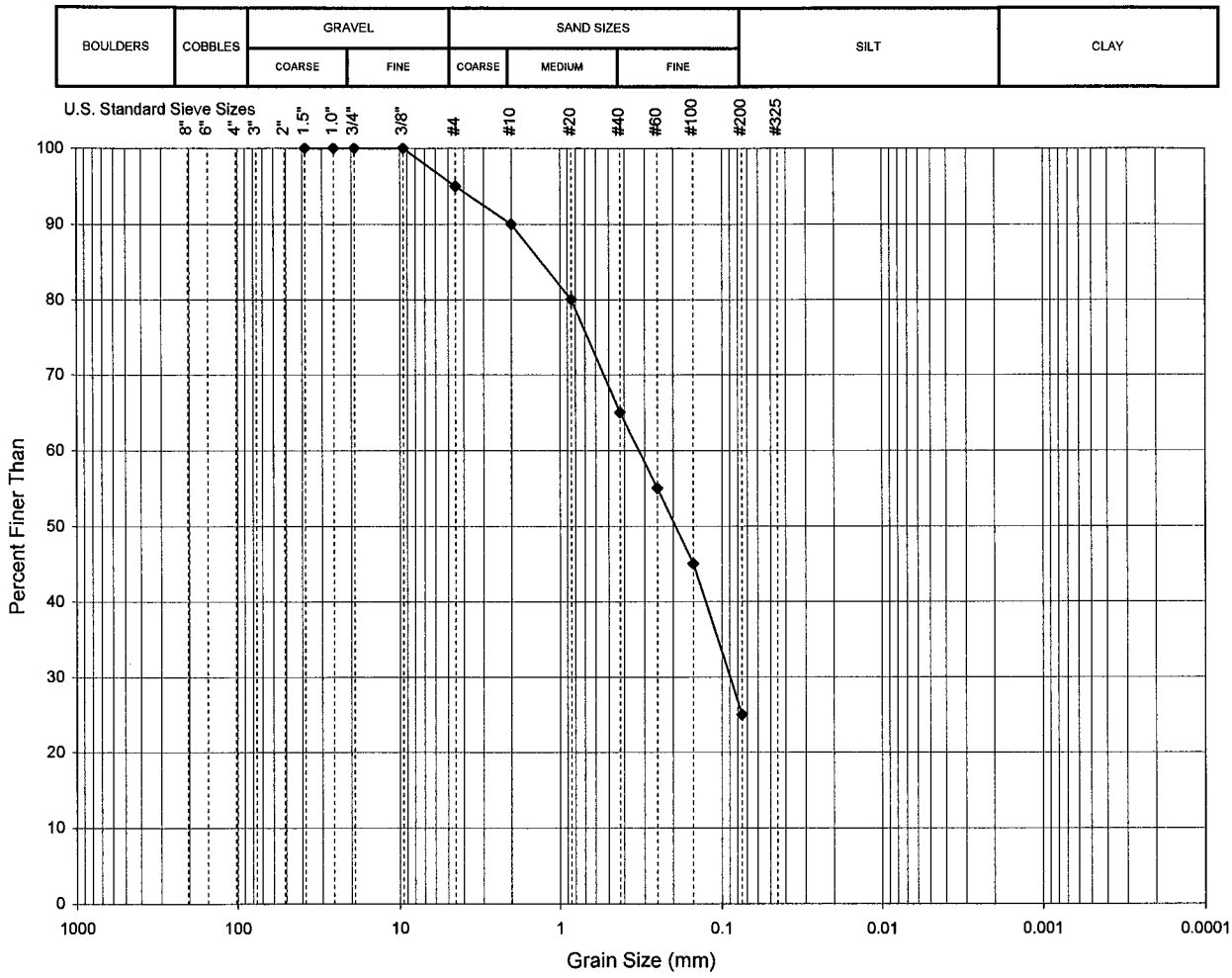
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	L16
Sample Depth:	
Lab ID Number:	L808918-20
Technician:	SM1
Sampler:	
Dates:	
Collected On:	8/21/2009
Analyzed:	9/3/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILTY,CLAYEY SAND, TRACE GRAVEL	AND	36 - 50 %	GRAVEL	5 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	70 %
ESTIMATED HAZEN NUMBER: 1.99E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	25 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	L16
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	08/21/09
Lab ID Number:	L808918-20	Date Submitted:	08/21/09
		Date Completed:	09/03/09

Total Sample Weight	20 grams	Specific Gravity:	2.650
Hydro. Sample Weight	grams	Liquid Specific Gravity:	1.000
% Past #10	0.900 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	1.000	5.000	4.500	5.000	95.000
NO. 10 SIEVE :	1.000	5.000	2.000	10.000	90.000
NO. 20 SIEVE :	2.000	10.000	0.850	20.000	80.000
NO. 40 SIEVE :	3.000	15.000	0.425	35.000	65.000
NO. 60 SIEVE :	2.000	10.000	0.250	45.000	55.000
NO. 100 SIEVE:	2.000	10.000	0.150	55.000	45.000
NO. 200 SIEVE:	4.000	20.000	0.075	75.000	25.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	5.00	> 4.5
% COARSE SAND :	5.00	2.0 - 4.5
% MEDIUM SAND :	25.00	0.425 - 2.0
% FINE SAND :	40.00	0.075 - 0.425
% SILT & CLAY :	25.00	< 0.075

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

COC # 74527-4
PAGE 1 OF ___

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends. TAT samples received past 3:00pm or Saturday/Sunday begin the next day.

Date requested	Service requested		
	2 day TAT (50%)		
	5 day (Regular)	✓	Next day TAT (100%)
	3-4 day TAT (25%)		Same day TAT (200%)

COMPANY NAME: EcoMetrix
ALS ACCOUNT #:
PROJECT MANAGER: Brian Fraser
PROJECT #: 09-1630
PHONE: (905) 794-2325 ex 246
FAX: (905) 794-2338
QUOTATION #: PO#

CRITERIA: Criteria on report (y/n) ___
Reg 153/04
Table 1 2 3
TCLP ___ MISA ___ PWQO ___
OTHER

REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE MAILED
EMAIL ___ FAX ___ BOTH ___
EMAIL 1
EMAIL 2
SELECT: pdf ___ digital ___ both ___

SAMPLING INFORMATION

Sample Date/Time: Date (yy/mm/dd)	Time (24 hr)	TYPE: COMP	GRAB	MATRIX: WATER	SOIL	OTHER	SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	Metals (as TCLP-MS)	Mercury (as CVAA)	Total Organic Carbon	TKN	Grain Size	COMMENTS	LAB ID
					X		HL-P1	2	✓	✓	✓	✓	✓		-1
					X		HL-P2	2	✓	✓	✓	✓	✓		-2
					X		HL-P3	2	✓	✓	✓	✓	✓		-3
					X		HL-P4	2	✓	✓	✓	✓	✓		-4
					X		HL-P5	2	✓	✓	✓	✓	✓		-5
					X		HL-L1	2	✓	✓	✓	✓	✓		-6
					X		HL-L2	2	✓	✓	✓	✓	✓		-7
					X		HL-L3	2	✓	✓	✓	✓	✓		-8
					X		HL-L4	2	✓	✓	✓	✓	✓		-9
					X		HL-L5	2	✓	✓	✓	✓	✓		-10
					X		LS1	2	✓	✓	✓	✓	✓		-11
					X		LS2	2	✓	✓	✓	✓	✓		-12

ANALYSIS REQUEST

INDICATE BOTTLES FIELD FILTERED
PRESERVED (FP)

SUBMISSION #: L808918
ENTERED BY: PBQ
DATE/TIME ENTERED: 21-Aug-09
BIN #: B247

SPECIAL INSTRUCTIONS/COMMENTS

SAMPLE CONDITION

		LEAD TEMP
FROZEN	Tissue & Veggies	
COLD	Soil	4°C
AMBIENT		

CONDITION ACCEPTABLE UPON RECEIPT (Y/N): Y
INIT: EP

SAMPLED BY / RELINQUISHED BY	DATE & TIME	RECEIVED BY / RECEIVED AT LAB	DATE & TIME
[signature]	15:00 Aug 21 '09	[signature]	Aug 21/09 15:30
	DATE & TIME		DATE & TIME: 21-AUG-09 15:30

NOTES AND CONDITIONS:
1. Quote number must be provided to ensure proper pricing.
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

White - report copy YELLOW - File copy PINK - Customer Copy Reg COC Rev#3 Jul06

21 Aug 2009 5:01PM ALS Laboratory Group 19055076927 P.1

C of C # 74528
PAGE 2 OF 4

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

ALS Environmental

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends. TAT samples received past 3:00pm or Saturday/Sunday begin the next day.

Date requested	Service requested	
	5 day (Regular)	✓
	3-4 day TAT (25%)	
	2 day TAT (50%)	
	Next day TAT (100%)	
	Same day TAT (200%)	

COMPANY NAME: EcoMetrix
ALS ACCOUNT#:
PROJECT MANAGER: Brian Fraser
PROJECT #: 09-1630
PHONE: (905) 794-2325 ex 246
FAX: (905) 794-2338
QUOTATION #: PO#:

CRITERIA: Criteria on report (y/n) ____
Reg 153/04
Table 1 2 3
TCLP ____ MISA ____ PWQO ____
OTHER ____
REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE MAILED
EMAIL ____ FAX ____ BOTH ____
EMAIL1 ____
EMAIL2 ____
SELECT: pdf ____ digital ____ both ____

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX			SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	ANALYSIS REQUEST: Metals via ICP MS	Mercury via CVAA	Total Organic Carbon	TKN	Grain Size	COMMENTS	LAB ID
Date (y/m/m/d)	Time (24 hr)	COMP	GRAB	WATER	SOIL	OTHER									
					X		LS3	2	✓	✓	✓	✓	✓		13
					X		LS4	2	✓	✓	✓	✓	✓		-14
					X		LS5	2	✓	✓	✓	✓	✓		-15
					X		Lake 2	2	✓	✓	✓	✓	✓	= L26	-16
					X		L9	2	✓	✓	✓	✓	✓		-17
					X		Lake 13A	2	✓	✓	✓	✓	✓		-18
					X		Lake 13	2	✓	✓	✓	✓	✓		-19
					X		L16	2	✓	✓	✓	✓	✓		-20
						X	HLSS-1	1	✓	✓				Tissue	-21
						X	HLSS-2	1	✓	✓				Tissue	-22
						X	HLSS-3	1	✓	✓				Tissue	-23
						X	HLSS-4	1	✓	✓				Tissue	-24

INDICATE BOTTLES FIELD FILTERED/PRESERVED (FP)

SUBMISSION #: 1808918
ENTERED BY: PBO
DATE/TIME ENTERED: 21-Aug-09
SIF #: B247

SPECIAL INSTRUCTIONS/COMMENTS

SAMPLE CONDITION

FROZEN	MEAN TEMP
GOLD	
AMBIENT	
CONDITION ACCEPTABLE UPON RECEIPT (Y/N)	INIT

SAMPLED BY: M McKinley
DATE & TIME: 15:00 Aug 21
RECEIVED BY: Vontant
DATE & TIME: Aug 21/09 15:00
RELINQUISHED BY:
DATE & TIME:
RECEIVED AT LAB BY:
DATE & TIME:

NOTES AND CONDITIONS:
1. Quote number must be provided to ensure proper pricing.
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

White - report copy YELLOW - File copy PINK - Customer Copy Reg COC Rev#3 Jul06

21 Aug 2009 5:01PM ALS Laboratory Group 19055076927 P.2

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

COC# 74529 PAGE 3 OF ___

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends. TAT samples received past 2:00pm or Saturday/Sunday begin the next day.

Date requested	Service requested		
	5 day (Regular)	✓	2 day TAT (50%)
	3-4 day TAT (25%)		Next day TAT (100%)
			Same day TAT (200%)

COMPANY NAME: EcoMetrix
ALS ACCOUNT#:
PROJECT MANAGER: Brian Fraser
PROJECT #: 09-1630
PHONE: (905) 794-2325 ex 246
FAX: (905) 794-2338
QUOTATION #: PO#

CRITERIA: Criteria on report (y/n) ___
Reg 153/04
Table 1 2 3
TCLP ___ MISA ___ PWQO ___
OTHER
REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE MAILED
EMAIL ___ FAX ___ BOTH ___
EMAIL1
EMAIL2
SELECT: pdf digital both

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX			SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	ANALYSIS REQUEST: Metals: mi ICP MS	Mercury mi CVAA	Total Organic Carbon	PFCs	Grain Size	COMMENTS	LAB ID
Date (yy/mm/dd)	Time (24 hr)	COMP	GRAB	WATER	SOIL	OTHER									
						X	HLSS-5	1	✓	✓				Tissue	-25
						X	HLNP-1M	1	✓	✓				Tissue	-26
						X	HLNP-2M	1	✓	✓				Tissue	-27
						X	HLNP-3M	1	✓	✓				Tissue	-28
						X	HLNP-4M	1	✓	✓				Tissue	-29
						X	HLNP-5M	1	✓	✓				Tissue	-30
						X	HLNP-1L	1	✓	✓				Tissue	-31
						X	HLNP-2L	1	✓	✓				Tissue	-32
						X	HLNP-3L	1	✓	✓				Tissue	-33
						X	HLNP-4L	1	✓	✓				Tissue	-34
						X	HLNP-5L	1	✓	✓				Tissue	-35
						X	HL	1	✓	✓				Vegetation – composite of all	-36

SUBMISSION #: L2089718
ENTERED BY: PBQ
DATE/TIME ENTERED: 21-Aug-09
BIN #: B247

SPECIAL INSTRUCTIONS/COMMENTS
Note: HL = HL-1, HL-2, HL-3 & 3S

SAMPLE CONDITION: FROZEN / COLD / AMBIENT / CONDITION ACCEPTABLE UPON RECEIPT (Y/N) ___ — MEAN TEMP / INIT

SAMPLED BY: [signature] DATE & TIME: 15:00 Aug 21
RELINQUISHED BY: RECEIVED BY: DATE & TIME: Aug 21/09 15:20

NOTES AND CONDITIONS:
1. Quote number must be provided to ensure proper pricing.
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

White - report copy YELLOW - File copy PINK - Customer Copy Reg COC Rev#3 Jul06

21 Aug 2009 5:01PM ALS Laboratory Group 19055076927 P.3

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

ALS Environmental

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

C of C # 65835 PAGE 4 OF 4

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends. TAT samples received past 3:00pm or Saturday/Sunday begin the next day.

Date requested	Service requested	
	5 day (Regular)	✓
	3-4 day TAT (25%)	
	2 day TAT (50%)	
	Next day TAT (100%)	
	Same day TAT (200%)	

INDICATE BOTTLES FIELD FILTERED (FF) ⇦ PRESERVED (FP)

COMPANY NAME	Eco Metrix
ALS ACCOUNT#	
PROJECT MANAGER	Brian Fraser
PROJECT #	09-1630
PHONE	(905) 794-2325 ex 246
FAX	(905) 794-2338
QUOTATION #	PO#

CRITERIA: Criteria on report (y/n) ____
Reg 153/04
Table 1 2 3
TCLP ____ MISA ____ PWQO ____
OTHER

REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE MAILED
EMAIL ____ FAX ____ BOTH ____
EMAIL
EMAIL2
SELECT: pdf digital both

SUBMISSION # L828918
ENTERED BY: PBQ
DATE/TIME ENTERED: 21-Aug-09
DIN # B247

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX			SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	ANALYSIS REQUEST: Metals: via ICP MS	Mercury: via CVAA	Total Organic Carbon TKN	Grain Size	COMMENTS	LAB ID
Date (yy/mm/dd)	Time (24 hr)	COMP	GRAB	WATER	SOIL	OTHER								
						X	SC2	1	1	1			Vegetation composite of all	37
						X	SC3	1	1	1			Vegetation composite of all	38

SPECIAL INSTRUCTIONS/COMMENTS

Note: SC2 = Lake 3, L5, L6, L7, L8, L14, L15, L4, L1, L2, L26
SC3 = L9, L10/11, Lake 12, Lake 13, Lake 13a, L16, L18

SAMPLE CONDITION: FROZEN / COLD / AMBIENT — MEAN TEMP — CONDITION ACCEPTABLE UPON RECEIPT (Y/N) ____ — INIT

SAMPLED BY	DATE & TIME	RECEIVED BY	DATE & TIME
RELINQUISHED BY	13:00 Aug 21st	RECEIVED AT LAB BY	Aug 21/09 15:40

NOTES AND CONDITIONS:
1. Quote number must be provided to ensure proper pricing.
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

White - report copy YELLOW - File copy PINK - Customer Copy Reg COC Rev#3 Jul06

21 Aug 2009 5:02PM ALS Laboratory Group 19055076927 P.4

Certificate of Analysis

ECOMETRIX INC
ATTN: BRIAN FRASER
6800 CAMPOBELLO ROAD
MISSISSAUGA ON L5N 2L8

Report Date: 12-JAN-10 13:15 (MT)
Version: FINAL REV. 2

Lab Work Order #: L815297 **Date Received:** 04-SEP-09

Project P.O. #: NOT SUBMITTED
Job Reference: 09-1630
Legal Site Desc:
CofC Numbers: 53145, 53146, 53147

Other Information:

Comments:
12-JAN-10: Sending to Karen Peterson

Emerson Perez
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L815297-1	L815297-2	L815297-3	L815297-4	L815297-5
	Description	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampled Date	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09
	Sampled Time					
	Client ID	BLP1	BLP2	BLP3	BLP4	BLP5
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	88.8	89.2	83.4	86.3	88.1
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	8600	15700	7860	11100	14200
Organic / Inorganic Carbon	Fraction Organic Carbon	0.156	0.114	0.0849	0.125	0.0962
	Total Organic Carbon (%)	15.6	11.4	8.49	12.5	9.62
Metals	Aluminum (Al) (mg/kg)	20500	34000	26800	18600	34300
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	10.5	7.8	7.7	10.5	13.8
	Barium (Ba) (mg/kg)	202	159	91.5	122	137
	Beryllium (Be) (mg/kg)	0.83	1.14	0.96	0.85	1.31
	Bismuth (Bi) (mg/kg)	1.3	1.5	<1.0	1.2	5.0
	Boron (B) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	2.15	2.44	1.72	2.49	3.02
	Calcium (Ca) (mg/kg)	10000	5460	4050	4910	4440
	Chromium (Cr) (mg/kg)	22.5	31.4	26.0	23.3	29.4
	Cobalt (Co) (mg/kg)	23.4	21.7	14.9	14.0	22.5
	Copper (Cu) (mg/kg)	111	155	73.9	62.7	97.1
	Iron (Fe) (mg/kg)	33800	39000	27500	32300	52100
	Lead (Pb) (mg/kg)	58.0	27.2	29.0	52.0	65.9
	Magnesium (Mg) (mg/kg)	4630	3670	2350	2120	2710
	Manganese (Mn) (mg/kg)	882	1580	1040	1240	2240
	Mercury (Hg) (mg/kg)	0.209	0.205	0.141	0.196	0.267
	Molybdenum (Mo) (mg/kg)	1.0	1.9	1.5	1.2	1.8
	Nickel (Ni) (mg/kg)	23.5	34.9	22.1	19.9	27.5
	Phosphorus (P) (mg/kg)	3770	2350	1820	1420	1940
	Potassium (K) (mg/kg)	830	896	651	550	716
	Selenium (Se) (mg/kg)	3.2	2.9	2.1	2.5	3.0
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	124	118	90	130	88
	Strontium (Sr) (mg/kg)	39.1	23.3	16.3	20.2	19.0
	Thallium (Tl) (mg/kg)	<1.0	1.7	1.0	1.4	2.6
	Tin (Sn) (mg/kg)	4.1	3.5	3.7	4.5	5.1
	Titanium (Ti) (mg/kg)	848	738	572	569	543
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	37.0	40.0	32.4	29.2	41.5
	Zinc (Zn) (mg/kg)	187	259	214	207	289
	Zirconium (Zr) (mg/kg)	9.7	13.4	9.1	8.7	14.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	L815297-6 SOIL 04-SEP-09 BLL1	L815297-7 SOIL 04-SEP-09 BLL2	L815297-8 SOIL 04-SEP-09 BLL3	L815297-9 SOIL 04-SEP-09 BLL4	L815297-10 SOIL 04-SEP-09 BLL5
Sample ID / Description / Sampled Date / Sampled Time / Client ID						
SOIL						
Physical Tests	% Moisture (%)	64.4	37.1	85.6	48.1	78.7
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	4250	1150	10700	750	5560
Organic / Inorganic Carbon	Fraction Organic Carbon	0.0490	0.0107	0.164	0.0021	0.0958
	Total Organic Carbon (%)	4.90	1.07	16.4	0.21	9.58
Metals	Aluminum (Al) (mg/kg)	14300	6200	11200	4220	9400
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	2.0	1.4	2.8	<1.0	2.4
	Barium (Ba) (mg/kg)	195	63.3	100	28.3	84.0
	Beryllium (Be) (mg/kg)	<0.50	<0.50	0.56	<0.50	<0.50
	Bismuth (Bi) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B) (mg/kg)	<5.0	<5.0	<5.0	<5.0	<5.0
	Cadmium (Cd) (mg/kg)	0.66	<0.50	0.99	<0.50	0.63
	Calcium (Ca) (mg/kg)	24700	9150	5380	2410	5220
	Chromium (Cr) (mg/kg)	15.9	21.9	15.4	8.7	19.1
	Cobalt (Co) (mg/kg)	16.0	6.9	10.0	3.6	7.0
	Copper (Cu) (mg/kg)	20.3	7.7	29.5	6.2	27.7
	Iron (Fe) (mg/kg)	21500	10800	19400	6870	13800
	Lead (Pb) (mg/kg)	18.6	9.2	24.7	7.5	18.6
	Magnesium (Mg) (mg/kg)	4570	2440	2350	1360	2480
	Manganese (Mn) (mg/kg)	304	162	233	99.9	190
	Mercury (Hg) (mg/kg)	0.069	<0.050	0.109	<0.050	0.074
	Molybdenum (Mo) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Nickel (Ni) (mg/kg)	14.7	11.7	13.4	6.3	13.4
	Phosphorus (P) (mg/kg)	8770	3300	1270	682	1350
	Potassium (K) (mg/kg)	526	313	544	184	389
	Selenium (Se) (mg/kg)	1.1	<1.0	1.3	<1.0	<1.0
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	117	70	75	59	85
	Strontium (Sr) (mg/kg)	73.0	27.2	17.1	8.0	17.9
	Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Tin (Sn) (mg/kg)	2.9	2.3	4.0	4.1	3.8
	Titanium (Ti) (mg/kg)	2820	1150	737	428	739
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	33.6	20.0	18.9	8.9	18.0
	Zinc (Zn) (mg/kg)	174	87.0	139	45.9	123
	Zirconium (Zr) (mg/kg)	7.5	5.6	9.0	4.4	6.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L815297-11	L815297-12	L815297-13	L815297-14	L815297-15
	Description	VEGETATION	TISSUE	TISSUE	TISSUE	TISSUE
	Sampled Date	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09
	Sampled Time					
	Client ID	BAMOOS LAKE	BLLC-1	BLLC-2	BLLC-3	BLLC-4
Grouping	**Analyte**					
TISSUE						
Metals	Aluminum (Al)-Total (mg/kg)	178 *	<2.0	<2.0	2.4	<2.0
	Antimony (Sb)-Total (mg/kg)	<0.050	<0.010	<0.010	<0.010	<0.010
	Arsenic (As)-Total (mg/kg)	0.097	0.049	0.041	0.041	0.049
	Barium (Ba)-Total (mg/kg)	49.9	6.50	6.75	6.65	6.63
	Beryllium (Be)-Total (mg/kg)	<1.0 *	<0.050	<0.050	<0.050	<0.050
	Bismuth (Bi)-Total (mg/kg)	<0.30	<0.060	<0.060	<0.060	<0.060
	Cadmium (Cd)-Total (mg/kg)	<2.5 *	<0.10	<0.10	<0.10	<0.10
	Calcium (Ca)-Total (mg/kg)	10500 *	8590	9190	8190	8510
	Chromium (Cr)-Total (mg/kg)	<2.5 *	<0.10	<0.10	<0.10	0.49
	Cobalt (Co)-Total (mg/kg)	<2.5 *	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Total (mg/kg)	5.6 *	0.78	0.79	0.72	0.81
	Iron (Fe)-Total (mg/kg)	458 *	14.8	13.8	20.7	19.1
	Lead (Pb)-Total (mg/kg)	1.15	0.020	<0.020	<0.020	<0.020
	Lithium (Li)-Total (mg/kg)	<0.50	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	4260 *	285	284	275	276
	Manganese (Mn)-Total (mg/kg)	298 *	3.65	2.40	2.88	2.49
	Mercury (Hg)-Total (mg/kg)	0.032	0.0603	0.0807	0.0897	0.101
	Molybdenum (Mo)-Total (mg/kg)	0.382	0.025	0.022	0.025	0.077
	Nickel (Ni)-Total (mg/kg)	1.34	0.18	0.18	0.19	0.48
	Phosphorus (P)-Total (mg/kg)	2350	5430	5630	5560	5650
	Potassium (K)-Total (mg/kg)	27800	3390	3280	3090	3190
	Selenium (Se)-Total (mg/kg)	<1.0	0.88	0.94	1.06	0.87
	Sodium (Na)-Total (mg/kg)	<500 *	752	718	705	687
	Strontium (Sr)-Total (mg/kg)	37.9 *	11.6	12.2	11.7	11.1
	Thallium (Tl)-Total (mg/kg)	0.182	<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Total (mg/kg)	0.61	<0.050	<0.050	<0.050	<0.050
	Titanium (Ti)-Total (mg/kg)	<2.5 *	<0.10	<0.10	0.11	<0.10
	Uranium (U)-Total (mg/kg)	<0.010	<0.0020	<0.0020	<0.0020	<0.0020
	Vanadium (V)-Total (mg/kg)	<0.50	<0.10	<0.10	<0.10	<0.10
	Zinc (Zn)-Total (mg/kg)	117 *	64.7	63.4	63.2	55.8

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L815297-16	L815297-17	L815297-18	L815297-19	L815297-20
Description	TISSUE	TISSUE	TISSUE	TISSUE	TISSUE
Sampled Date	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09
Sampled Time					
Client ID	BLLC-5	BLT-1L	BLT-2L	BLT-3L	BLT-4L
Grouping / **Analyte**					
TISSUE					
Metals Aluminum (Al)-Total (mg/kg)	<2.0	2.9	<4.0 *	<2.0	<2.0
Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.020 *	<0.010	<0.010
Arsenic (As)-Total (mg/kg)	0.045	0.115	0.191 *	0.117	0.071
Barium (Ba)-Total (mg/kg)	7.38	0.058	<0.040 *	<0.020	0.025
Beryllium (Be)-Total (mg/kg)	<0.050	<0.050	<0.10 *	<0.050	<0.050
Bismuth (Bi)-Total (mg/kg)	<0.060	<0.060	<0.12 *	<0.060	<0.060
Cadmium (Cd)-Total (mg/kg)	<0.10	1.23	0.85 *	0.77	0.52
Calcium (Ca)-Total (mg/kg)	8120	139	51.6 *	68.7	109
Chromium (Cr)-Total (mg/kg)	<0.10	<0.10	<0.20 *	<0.10	<0.10
Cobalt (Co)-Total (mg/kg)	<0.10	<0.10	<0.20 *	<0.10	<0.10
Copper (Cu)-Total (mg/kg)	0.89	29.5	28.7 *	19.3	9.20
Iron (Fe)-Total (mg/kg)	16.6	316	123 *	73.2	53.8
Lead (Pb)-Total (mg/kg)	<0.020	<0.020	<0.040 *	<0.020	<0.020
Lithium (Li)-Total (mg/kg)	<0.10	<0.10	<0.20 *	<0.10	<0.10
Magnesium (Mg)-Total (mg/kg)	311	136	153 *	129	153
Manganese (Mn)-Total (mg/kg)	3.48	1.44	1.83 *	1.33	1.68
Mercury (Hg)-Total (mg/kg)	0.0637	0.606	0.294 *	0.473 *	0.611
Molybdenum (Mo)-Total (mg/kg)	0.034	0.191	0.215 *	0.168	0.137
Nickel (Ni)-Total (mg/kg)	0.20	<0.10	<0.20 *	<0.10	<0.10
Phosphorus (P)-Total (mg/kg)	5520	3340	3850	3390	3530
Potassium (K)-Total (mg/kg)	2940	2740	2160 *	2600	2680
Selenium (Se)-Total (mg/kg)	0.92	10.9	13.6 *	7.72	4.21
Sodium (Na)-Total (mg/kg)	723	1360	1150 *	1370	1420
Strontium (Sr)-Total (mg/kg)	12.7	0.161	<0.10 *	0.096	0.129
Thallium (Tl)-Total (mg/kg)	<0.010	0.046	0.081 *	0.100	0.075
Tin (Sn)-Total (mg/kg)	<0.050	<0.050	<0.10 *	<0.050	<0.050
Titanium (Ti)-Total (mg/kg)	0.14	<0.10	<0.20 *	<0.10	<0.10
Uranium (U)-Total (mg/kg)	<0.0020	<0.0020	<0.0040 *	<0.0020	<0.0020
Vanadium (V)-Total (mg/kg)	0.11	<0.10	<0.20 *	<0.10	<0.10
Zinc (Zn)-Total (mg/kg)	59.6	38.9	36.2 *	30.9	24.7

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L815297-21	L815297-22	L815297-23	L815297-24	L815297-25
	Description	TISSUE	TISSUE	TISSUE	TISSUE	TISSUE
	Sampled Date	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09	04-SEP-09
	Sampled Time					
	Client ID	BLT-5L	BLT-1M	BLT-2M	BLT-3M	BLT-4M
Grouping	**Analyte**					
TISSUE						
Metals	Aluminum (Al)-Total (mg/kg)	3.0	<2.0	<2.0	<2.0	<2.0
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010
	Arsenic (As)-Total (mg/kg)	0.154	0.123	0.113	0.098	0.077
	Barium (Ba)-Total (mg/kg)	<0.020	0.029	0.029	0.035	0.021
	Beryllium (Be)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Bismuth (Bi)-Total (mg/kg)	<0.060	<0.060	<0.060	<0.060	<0.060
	Cadmium (Cd)-Total (mg/kg)	0.87	<0.10	<0.10	<0.10	<0.10
	Calcium (Ca)-Total (mg/kg)	111	225	184	197	82.2
	Chromium (Cr)-Total (mg/kg)	<0.10	<0.10	<0.10	0.19	<0.10
	Cobalt (Co)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Copper (Cu)-Total (mg/kg)	37.4	0.26	0.34	0.30	0.27
	Iron (Fe)-Total (mg/kg)	180	3.8	3.5	3.7	2.8
	Lead (Pb)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020
	Lithium (Li)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)	128	254	276	244	244
	Manganese (Mn)-Total (mg/kg)	1.76	0.093	0.117	0.131	0.098
	Mercury (Hg)-Total (mg/kg)	0.647	0.680	0.431	0.474	0.601
	Molybdenum (Mo)-Total (mg/kg)	0.262	<0.010	<0.010	0.024	0.010
	Nickel (Ni)-Total (mg/kg)	<0.10	<0.10	<0.10	0.14	<0.10
	Phosphorus (P)-Total (mg/kg)	3280	2510	2640	2320	2380
	Potassium (K)-Total (mg/kg)	2380	4420	4560	3990	4130
	Selenium (Se)-Total (mg/kg)	12.8	0.71	0.68	0.82	0.71
	Sodium (Na)-Total (mg/kg)	1360	278	215	213	246
	Strontium (Sr)-Total (mg/kg)	0.106	0.189	0.172	0.170	<0.050
	Thallium (Tl)-Total (mg/kg)	0.042	<0.010	0.010	<0.010	<0.010
	Tin (Sn)-Total (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Titanium (Ti)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Uranium (U)-Total (mg/kg)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Vanadium (V)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10
	Zinc (Zn)-Total (mg/kg)	38.4	2.90	2.84	3.35	2.81

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L815297-26				
	Description	TISSUE				
	Sampled Date	04-SEP-09				
	Sampled Time					
	Client ID	BLT-5M				
Grouping	**Analyte**					
TISSUE						
Metals	Aluminum (Al)-Total (mg/kg)	<2.0				
	Antimony (Sb)-Total (mg/kg)	<0.010				
	Arsenic (As)-Total (mg/kg)	0.118				
	Barium (Ba)-Total (mg/kg)	0.025				
	Beryllium (Be)-Total (mg/kg)	<0.050				
	Bismuth (Bi)-Total (mg/kg)	<0.060				
	Cadmium (Cd)-Total (mg/kg)	<0.10				
	Calcium (Ca)-Total (mg/kg)	112				
	Chromium (Cr)-Total (mg/kg)	<0.10				
	Cobalt (Co)-Total (mg/kg)	<0.10				
	Copper (Cu)-Total (mg/kg)	0.26				
	Iron (Fe)-Total (mg/kg)	3.3				
	Lead (Pb)-Total (mg/kg)	<0.020				
	Lithium (Li)-Total (mg/kg)	<0.10				
	Magnesium (Mg)-Total (mg/kg)	262				
	Manganese (Mn)-Total (mg/kg)	0.127				
	Mercury (Hg)-Total (mg/kg)	0.511				
	Molybdenum (Mo)-Total (mg/kg)	0.013				
	Nickel (Ni)-Total (mg/kg)	<0.10				
	Phosphorus (P)-Total (mg/kg)	2270				
	Potassium (K)-Total (mg/kg)	3830				
	Selenium (Se)-Total (mg/kg)	0.79				
	Sodium (Na)-Total (mg/kg)	197				
	Strontium (Sr)-Total (mg/kg)	0.059				
	Thallium (Tl)-Total (mg/kg)	<0.010				
	Tin (Sn)-Total (mg/kg)	<0.050				
	Titanium (Ti)-Total (mg/kg)	<0.10				
	Uranium (U)-Total (mg/kg)	<0.0020				
	Vanadium (V)-Total (mg/kg)	<0.10				
	Zinc (Zn)-Total (mg/kg)	3.11				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLIS	Detection Limit Adjusted: Insufficient Sample

Samples with Qualifiers for Individual Parameters as listed above:

Sample Number	Client Sample ID	Parameters	Qualifier
L815297-11	BAMOOS LAKE	Aluminum (Al)-Total Iron (Fe)-Total Cobalt (Co)-Total Manganese (Mn)-Total Cadmium (Cd)-Total Copper (Cu)-Total Beryllium (Be)-Total Strontium (Sr)-Total Chromium (Cr)-Total Zinc (Zn)-Total Titanium (Ti)-Total Sodium (Na)-Total Calcium (Ca)-Total Magnesium (Mg)-Total	DLIS
L815297-18	BLT-2L	Thallium (Tl)-Total Magnesium (Mg)-Total Sodium (Na)-Total Barium (Ba)-Total Vanadium (V)-Total Zinc (Zn)-Total Cobalt (Co)-Total Iron (Fe)-Total Nickel (Ni)-Total Selenium (Se)-Total Copper (Cu)-Total Potassium (K)-Total Tin (Sn)-Total Beryllium (Be)-Total Uranium (U)-Total Arsenic (As)-Total Antimony (Sb)-Total Lithium (Li)-Total Strontium (Sr)-Total Lead (Pb)-Total Mercury (Hg)-Total Cadmium (Cd)-Total Calcium (Ca)-Total Aluminum (Al)-Total Manganese (Mn)-Total Bismuth (Bi)-Total Titanium (Ti)-Total Molybdenum (Mo)-Total Chromium (Cr)-Total	DLIS
L815297-19	BLT-3L	Mercury (Hg)-Total	DLIS

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
AS,SB,SE-3050-MS-WT	Soil	As, Sb and Se by ICP/MS	SW846 3050B/6020A
HG-DRY-CVAA-ED	Tissue	Mercury in Tissue by CVAA	EPA 200.3 / EPA 245.1
HG-WET-CVAA-ED	Tissue	Mercury in Tissue by CVAA	EPA 200.3 / EPA 245.1

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
HG-WT	Soil	Mercury by CVAA	EPA 7471
MET-DRY-ICP-ED	Tissue	Metals in Tissue by ICPOES	EPA 200.7
MET-DRY-MS-ED	Tissue	Metals in Tissue by ICPMS	EPA 6020
MET-WET-ICP-ED	Tissue	Metals in Tissue by ICPOES	EPA 200.7
MET-WET-MS-ED	Tissue	Metals in Tissue by ICPMS	EPA 6020
MET-WT	Soil	Metal Scan (ICP)	EPA 3050/6010B
Sample is vigorously digested with nitric acid and hydrogen peroxide. Analysis is conducted by ICP/OES.			
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
TKN-WT	Soil	Total Kjeldahl Nitrogen	APHA 4500-N
TOC-WT	Soil	TOC in Solids	CARTER 21.2

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
WT	ALS LABORATORY GROUP - WATERLOO, ONTARIO, CANADA	ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
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.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group Quality Control Report

Workorder: L815297 Report Date: 12-JAN-10 Page 1 of 13

Client: ECOMETRIX INC
6800 CAMPOBELLO ROAD
MISSISSAUGA ON L5N 2L8
Contact: BRIAN FRASER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AS,SB,SE-3050-MS-WT	**Soil**							
Batch R941325								
WG1002813-2 CVS								
Antimony (Sb)			81		%		63-138	14-SEP-09
Arsenic (As)			100		%		63-138	14-SEP-09
Selenium (Se)			103		%		63-138	14-SEP-09
WG1001892-2 LCS								
Arsenic (As)			96		%		63-138	14-SEP-09
Selenium (Se)			91		%		63-138	14-SEP-09
WG1001892-1 MB								
Antimony (Sb)			<1.0		mg/kg		1	14-SEP-09
Arsenic (As)			<1.0		mg/kg		1	14-SEP-09
Selenium (Se)			<1.0		mg/kg		1	14-SEP-09
HG-WT	**Soil**							
Batch R940790								
WG1001226-2 LCS								
Mercury (Hg)			108		%		70-130	11-SEP-09
WG1001226-1 MB								
Mercury (Hg)			<0.050		mg/kg		0.05	11-SEP-09
Batch R941032								
WG1001888-2 LCS								
Mercury (Hg)			126		%		70-130	12-SEP-09
WG1001888-1 MB								
Mercury (Hg)			<0.050		mg/kg		0.05	12-SEP-09
MET-WT	**Soil**							
Batch R941220								
WG1002560-2 CVS								
Aluminum (Al)			105		%		70-130	12-SEP-09
Barium (Ba)			102		%		60-140	12-SEP-09
Beryllium (Be)			98		%		80-120	12-SEP-09
Bismuth (Bi)			89		%		80-120	12-SEP-09
Boron (B)			100		%		80-120	12-SEP-09
Cadmium (Cd)			97		%		80-120	12-SEP-09
Calcium (Ca)			104		%		80-120	12-SEP-09
Chromium (Cr)			102		%		80-120	12-SEP-09
Cobalt (Co)			101		%		80-120	12-SEP-09
Copper (Cu)			103		%		80-120	12-SEP-09
Iron (Fe)			107		%		80-120	12-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R941220								
WG1002560-2 CVS								
Lead (Pb)			92		%		80-120	12-SEP-09
Magnesium (Mg)			103		%		80-120	12-SEP-09
Manganese (Mn)			108		%		80-120	12-SEP-09
Molybdenum (Mo)			95		%		80-120	12-SEP-09
Nickel (Ni)			100		%		80-120	12-SEP-09
Phosphorus (P)			93		%		80-120	12-SEP-09
Potassium (K)			95		%		60-140	12-SEP-09
Silver (Ag)			96		%		80-120	12-SEP-09
Sodium (Na)			107		%		60-140	12-SEP-09
Strontium (Sr)			97		%		63-138	12-SEP-09
Thallium (Tl)			103		%		80-120	12-SEP-09
Uranium (U)			101		%		80-120	12-SEP-09
Vanadium (V)			93		%		80-120	12-SEP-09
Zinc (Zn)			104		%		80-120	12-SEP-09
WG1002560-3 CVS								
Tin (Sn)			111		%		80-120	12-SEP-09
Titanium (Ti)			101		%		60-140	12-SEP-09
Zirconium (Zr)			103		%		80-120	12-SEP-09
WG1001892-2 LCS								
Aluminum (Al)			103		%		70-130	12-SEP-09
Barium (Ba)			104		%		80-120	12-SEP-09
Beryllium (Be)			100		%		80-120	12-SEP-09
Bismuth (Bi)			82		%		80-120	12-SEP-09
Cadmium (Cd)			103		%		80-120	12-SEP-09
Calcium (Ca)			103		%		80-120	12-SEP-09
Chromium (Cr)			102		%		80-120	12-SEP-09
Cobalt (Co)			102		%		80-120	12-SEP-09
Copper (Cu)			102		%		80-120	12-SEP-09
Iron (Fe)			103		%		80-120	12-SEP-09
Lead (Pb)			105		%		80-120	12-SEP-09
Magnesium (Mg)			109		%		80-120	12-SEP-09
Manganese (Mn)			103		%		80-120	12-SEP-09
Nickel (Ni)			102		%		80-120	12-SEP-09
Phosphorus (P)			99		%		80-120	12-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R941220								
WG1001892-2 LCS								
Potassium (K)			95		%		60-140	12-SEP-09
Sodium (Na)			108		%		60-140	12-SEP-09
Strontium (Sr)			99		%		63-138	12-SEP-09
Thallium (Tl)			106		%		80-120	12-SEP-09
Uranium (U)			113		%		80-120	12-SEP-09
Vanadium (V)			102		%		80-120	12-SEP-09
Zinc (Zn)			101		%		80-120	12-SEP-09
WG1001892-1 MB								
Aluminum (Al)			<5.0		mg/kg		5	12-SEP-09
Barium (Ba)			<1.0		mg/kg		1	12-SEP-09
Beryllium (Be)			<0.50		mg/kg		0.5	12-SEP-09
Bismuth (Bi)			<1.0		mg/kg		1	12-SEP-09
Boron (B)			<5.0		mg/kg		5	12-SEP-09
Cadmium (Cd)			<0.50		mg/kg		0.5	12-SEP-09
Calcium (Ca)			<20		mg/kg		20	12-SEP-09
Chromium (Cr)			<1.0		mg/kg		1	12-SEP-09
Cobalt (Co)			<1.0		mg/kg		1	12-SEP-09
Copper (Cu)			<1.0		mg/kg		1	12-SEP-09
Iron (Fe)			<5.0		mg/kg		5	12-SEP-09
Lead (Pb)			<1.0		mg/kg		1	12-SEP-09
Magnesium (Mg)			<20		mg/kg		20	12-SEP-09
Manganese (Mn)			<1.0		mg/kg		1	12-SEP-09
Molybdenum (Mo)			<1.0		mg/kg		1	12-SEP-09
Nickel (Ni)			<1.0		mg/kg		1	12-SEP-09
Phosphorus (P)			<10		mg/kg		10	12-SEP-09
Potassium (K)			<10		mg/kg		10	12-SEP-09
Silver (Ag)			<0.20		mg/kg		0.2	12-SEP-09
Sodium (Na)			<20		mg/kg		20	12-SEP-09
Strontium (Sr)			<1.0		mg/kg		1	12-SEP-09
Thallium (Tl)			<1.0		mg/kg		1	12-SEP-09
Tin (Sn)			<1.0		mg/kg		1	12-SEP-09
Titanium (Ti)			<5.0		mg/kg		5	12-SEP-09
Uranium (U)			<1.0		mg/kg		1	12-SEP-09
Vanadium (V)			<1.0		mg/kg		1	12-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R941220								
WG1001892-1 MB								
Zinc (Zn)			<1.0		mg/kg		1	12-SEP-09
Zirconium (Zr)			<1.0		mg/kg		1	12-SEP-09
MOISTURE-WT	**Soil**							
Batch R939128								
WG1000552-2 LCS								
% Moisture			97		%		79-120	09-SEP-09
WG1000552-1 MB								
% Moisture			<0.10		%		0.1	09-SEP-09
TKN-WT	**Soil**							
Batch R940903								
WG1002452-2 CVS								
Total Kjeldahl Nitrogen			111		%		80-120	11-SEP-09
WG1001789-3 DUP		**L815297-2**						
Total Kjeldahl Nitrogen		15700	13000		mg/kg	19	20	11-SEP-09
WG1001789-2 LCS								
Total Kjeldahl Nitrogen			87		%		70-130	11-SEP-09
WG1001789-1 MB								
Total Kjeldahl Nitrogen			<200		mg/kg		200	11-SEP-09
TOC-WT	**Soil**							
Batch R941038								
WG1002580-3 DUP		**L815297-3**						
Total Organic Carbon		8.49	8.55		%	0.75	30	12-SEP-09
WG1002580-2 LCS								
Total Organic Carbon			98		%		80-120	12-SEP-09
WG1002580-1 MB								
Total Organic Carbon			<0.10		%		0.1	12-SEP-09
Fraction Organic Carbon			<0.0010				0.001	12-SEP-09
HG-DRY-CVAA-ED	**Tissue**							
Batch R977965								
WG1008376-5 DUP		**L815297-11**						
Mercury (Hg)-Total		0.032	0.032	J	mg/kg	0.000	0.04	03-OCT-09
WG1008376-1 MB								
Mercury (Hg)-Total			<0.010		mg/kg		0.01	03-OCT-09
WG1008376-6 MS		**L815297-11**						
Mercury (Hg)-Total			101		%		50-150	03-OCT-09
HG-WET-CVAA-ED	**Tissue**							

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-WET-CVAA-ED	**Tissue**							
Batch R977965								
WG1007182-2 CRM		**DOLT-4_LIVER**						
Mercury (Hg)-Total			94		%		70-130	03-OCT-09
WG1007182-5 DUP		**L815297-12**						
Mercury (Hg)-Total		0.0603	0.0758		mg/kg	23	35	03-OCT-09
WG1007182-1 MB								
Mercury (Hg)-Total			0.0079	B	mg/kg		0.002	03-OCT-09
MET-DRY-ICP-ED	**Tissue**							
Batch R963750								
WG1008376-2 CRM		**7602_BUSHES**						
WG1008376-5 DUP		**L815297-11**						
Aluminum (Al)-Total		178	177	J	mg/kg	1	200	01-OCT-09
Beryllium (Be)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	01-OCT-09
Cadmium (Cd)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Calcium (Ca)-Total		10500	10700		mg/kg	1.4	26	01-OCT-09
Chromium (Cr)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Cobalt (Co)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Copper (Cu)-Total		5.6	5.7	J	mg/kg	0.1	10	01-OCT-09
Iron (Fe)-Total		458	453		mg/kg	1.0	26	01-OCT-09
Magnesium (Mg)-Total		4260	4210		mg/kg	1.2	26	01-OCT-09
Manganese (Mn)-Total		298	295		mg/kg	1.0	26	01-OCT-09
Sodium (Na)-Total		<500	<500	RPD-NA	mg/kg	N/A	26	01-OCT-09
Strontium (Sr)-Total		37.9	38.6		mg/kg	1.7	26	01-OCT-09
Titanium (Ti)-Total		<2.5	<2.5	RPD-NA	mg/kg	N/A	26	01-OCT-09
Zinc (Zn)-Total		117	116		mg/kg	0.55	26	01-OCT-09
WG1008376-1 MB								
Aluminum (Al)-Total			<10		mg/kg		10	01-OCT-09
Beryllium (Be)-Total			<0.20		mg/kg		0.2	01-OCT-09
Cadmium (Cd)-Total			<0.50		mg/kg		0.5	01-OCT-09
Calcium (Ca)-Total			<10		mg/kg		10	01-OCT-09
Chromium (Cr)-Total			<0.50		mg/kg		0.5	01-OCT-09
Cobalt (Co)-Total			<0.50		mg/kg		0.5	01-OCT-09
Copper (Cu)-Total			<0.50		mg/kg		0.5	01-OCT-09
Iron (Fe)-Total			<5.0		mg/kg		5	01-OCT-09
Magnesium (Mg)-Total			<5.0		mg/kg		5	01-OCT-09
Manganese (Mn)-Total			<0.20		mg/kg		0.2	01-OCT-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-ICP-ED	**Tissue**							
Batch R963750								
WG1008376-1 MB								
Phosphorus (P)-Total			<20		mg/kg		20	01-OCT-09
Potassium (K)-Total			<100		mg/kg		100	01-OCT-09
Sodium (Na)-Total			<100		mg/kg		100	01-OCT-09
Strontium (Sr)-Total			<0.30		mg/kg		0.3	01-OCT-09
Titanium (Ti)-Total			<0.50		mg/kg		0.5	01-OCT-09
Zinc (Zn)-Total			<0.50		mg/kg		0.5	01-OCT-09
WG1008376-4 MS		**L809050-5**						
Aluminum (Al)-Total			107		%		63-138	01-OCT-09
Beryllium (Be)-Total			108		%		63-138	01-OCT-09
Cadmium (Cd)-Total			109		%		63-138	01-OCT-09
Calcium (Ca)-Total			112		%		63-138	01-OCT-09
Chromium (Cr)-Total			114		%		63-138	01-OCT-09
Cobalt (Co)-Total			113		%		63-138	01-OCT-09
Copper (Cu)-Total			124		%		63-138	01-OCT-09
Iron (Fe)-Total			117		%		63-138	01-OCT-09
Magnesium (Mg)-Total			113		%		63-138	01-OCT-09
Manganese (Mn)-Total			106		%		63-138	01-OCT-09
Phosphorus (P)-Total			105		%		63-138	01-OCT-09
Potassium (K)-Total			88		%		63-138	01-OCT-09
Sodium (Na)-Total			111		%		63-138	01-OCT-09
Strontium (Sr)-Total			112		%		63-138	01-OCT-09
Titanium (Ti)-Total			116		%		63-138	01-OCT-09
Zinc (Zn)-Total			106		%		63-138	01-OCT-09
WG1008376-6 MS		**L815297-11**						
Aluminum (Al)-Total			94		%		63-138	01-OCT-09
Beryllium (Be)-Total			102		%		63-138	01-OCT-09
Cadmium (Cd)-Total			100		%		63-138	01-OCT-09
Calcium (Ca)-Total			56	E	%		63-138	01-OCT-09
Chromium (Cr)-Total			105		%		63-138	01-OCT-09
Cobalt (Co)-Total			102		%		63-138	01-OCT-09
Copper (Cu)-Total			113		%		63-138	01-OCT-09
Iron (Fe)-Total			100		%		63-138	01-OCT-09
Magnesium (Mg)-Total			89		%		63-138	01-OCT-09
Manganese (Mn)-Total			81	E	%		63-138	01-OCT-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-ICP-ED	**Tissue**							
Batch R963750								
WG1008376-6 MS		**L815297-11**						
Phosphorus (P)-Total			92		%		63-138	01-OCT-09
Sodium (Na)-Total			104		%		63-138	01-OCT-09
Strontium (Sr)-Total			93		%		63-138	01-OCT-09
Titanium (Ti)-Total			107		%		63-138	01-OCT-09
Zinc (Zn)-Total			96		%		63-138	01-OCT-09
MET-DRY-MS-ED	**Tissue**							
Batch R963118								
WG1008376-5 DUP		**L815297-11**						
Antimony (Sb)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	30-SEP-09
Arsenic (As)-Total		0.097	0.095	J	mg/kg	0.002	0.2	30-SEP-09
Barium (Ba)-Total		49.9	52.2		mg/kg	4.6	26	30-SEP-09
Bismuth (Bi)-Total		<0.30	<0.30	RPD-NA	mg/kg	N/A	26	30-SEP-09
Lead (Pb)-Total		1.15	1.24		mg/kg	6.9	26	30-SEP-09
Lithium (Li)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	26	30-SEP-09
Molybdenum (Mo)-Total		0.382	0.381	J	mg/kg	0.002	0.2	30-SEP-09
Nickel (Ni)-Total		1.34	1.32	J	mg/kg	0.02	2	30-SEP-09
Selenium (Se)-Total		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	30-SEP-09
Thallium (Tl)-Total		0.182	0.167	J	mg/kg	0.016	0.12	30-SEP-09
Tin (Sn)-Total		0.61	0.62	J	mg/kg	0.01	0.8	30-SEP-09
Uranium (U)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	30-SEP-09
Vanadium (V)-Total		<0.50	<0.50	RPD-NA	mg/kg	N/A	26	30-SEP-09
WG1008376-1 MB								
Antimony (Sb)-Total			<0.050		mg/kg		0.05	30-SEP-09
Arsenic (As)-Total			<0.050		mg/kg		0.05	30-SEP-09
Barium (Ba)-Total			<0.10		mg/kg		0.1	30-SEP-09
Bismuth (Bi)-Total			<0.30		mg/kg		0.3	30-SEP-09
Lead (Pb)-Total			<0.10		mg/kg		0.1	30-SEP-09
Lithium (Li)-Total			<0.50		mg/kg		0.5	30-SEP-09
Molybdenum (Mo)-Total			<0.050		mg/kg		0.05	30-SEP-09
Nickel (Ni)-Total			<0.50		mg/kg		0.5	30-SEP-09
Selenium (Se)-Total			<1.0		mg/kg		1	30-SEP-09
Thallium (Tl)-Total			<0.030		mg/kg		0.03	30-SEP-09
Tin (Sn)-Total			<0.20		mg/kg		0.2	03-OCT-09
Uranium (U)-Total			<0.010		mg/kg		0.01	30-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DRY-MS-ED	**Tissue**							
Batch R963118								
WG1008376-1 MB								
Vanadium (V)-Total			<0.50		mg/kg		0.5	30-SEP-09
WG1008376-4 MS		**L809050-5**						
Antimony (Sb)-Total			109		%		63-138	30-SEP-09
Arsenic (As)-Total			100		%		63-138	30-SEP-09
Barium (Ba)-Total			104		%		63-138	30-SEP-09
Bismuth (Bi)-Total			109		%		63-138	30-SEP-09
Lead (Pb)-Total			107		%		63-138	30-SEP-09
Lithium (Li)-Total			98		%		63-138	30-SEP-09
Molybdenum (Mo)-Total			106		%		63-138	30-SEP-09
Nickel (Ni)-Total			100		%		63-138	30-SEP-09
Selenium (Se)-Total			98		%		63-138	30-SEP-09
Thallium (Tl)-Total			111		%		63-138	30-SEP-09
Tin (Sn)-Total			104		%		63-138	30-SEP-09
Uranium (U)-Total			99		%		63-138	30-SEP-09
Vanadium (V)-Total			106		%		63-138	30-SEP-09
WG1008376-6 MS		**L815297-11**						
Antimony (Sb)-Total			110		%		63-138	30-SEP-09
Arsenic (As)-Total			103		%		63-138	30-SEP-09
Barium (Ba)-Total			105		%		63-138	30-SEP-09
Bismuth (Bi)-Total			105		%		63-138	30-SEP-09
Lead (Pb)-Total			103		%		63-138	30-SEP-09
Lithium (Li)-Total			98		%		63-138	30-SEP-09
Molybdenum (Mo)-Total			106		%		63-138	30-SEP-09
Nickel (Ni)-Total			99		%		63-138	30-SEP-09
Selenium (Se)-Total			105		%		63-138	30-SEP-09
Thallium (Tl)-Total			107		%		63-138	30-SEP-09
Tin (Sn)-Total			107		%		63-138	30-SEP-09
Uranium (U)-Total			98		%		63-138	30-SEP-09
Vanadium (V)-Total			100		%		63-138	30-SEP-09
MET-WET-ICP-ED	**Tissue**							
Batch R964079								
WG1007182-2 CRM		**DOLT-4_LIVER**						
Cadmium (Cd)-Total			84		%		70-130	23-SEP-09
Copper (Cu)-Total			93		%		70-130	23-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-ICP-ED	**Tissue**							
Batch R964079								
WG1007182-2 CRM		**DOLT-4_LIVER**						
Iron (Fe)-Total			87		%		70-130	23-SEP-09
Zinc (Zn)-Total			88		%		70-130	23-SEP-09
WG1007182-5 DUP		**L815297-12**						
Aluminum (Al)-Total		<2.0	<2.0	RPD-NA	mg/kg	N/A	26	23-SEP-09
Beryllium (Be)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	23-SEP-09
Cadmium (Cd)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	23-SEP-09
Chromium (Cr)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	23-SEP-09
Cobalt (Co)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	23-SEP-09
Copper (Cu)-Total		0.78	0.76	J	mg/kg	0.02	0.4	23-SEP-09
Iron (Fe)-Total		14.8	14.1		mg/kg	4.8	26	23-SEP-09
Magnesium (Mg)-Total		285	282		mg/kg	1.2	26	23-SEP-09
Manganese (Mn)-Total		3.65	3.71		mg/kg	1.7	26	23-SEP-09
Sodium (Na)-Total		752	735		mg/kg	2.2	26	23-SEP-09
Strontium (Sr)-Total		11.6	12.1		mg/kg	3.9	26	23-SEP-09
Titanium (Ti)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	23-SEP-09
Zinc (Zn)-Total		64.7	64.1		mg/kg	0.94	26	23-SEP-09
WG1007182-1 MB								
Aluminum (Al)-Total			<2.0		mg/kg		2	23-SEP-09
Beryllium (Be)-Total			<0.050		mg/kg		0.05	23-SEP-09
Cadmium (Cd)-Total			<0.10		mg/kg		0.1	23-SEP-09
Calcium (Ca)-Total			<2.0		mg/kg		2	23-SEP-09
Chromium (Cr)-Total			<0.10		mg/kg		0.1	23-SEP-09
Cobalt (Co)-Total			<0.10		mg/kg		0.1	23-SEP-09
Copper (Cu)-Total			<0.10		mg/kg		0.1	23-SEP-09
Iron (Fe)-Total			<1.0		mg/kg		1	23-SEP-09
Magnesium (Mg)-Total			<1.0		mg/kg		1	23-SEP-09
Manganese (Mn)-Total			<0.050		mg/kg		0.05	23-SEP-09
Phosphorus (P)-Total			<5.0		mg/kg		5	23-SEP-09
Potassium (K)-Total			<20		mg/kg		20	23-SEP-09
Sodium (Na)-Total			<20		mg/kg		20	23-SEP-09
Strontium (Sr)-Total			<0.050		mg/kg		0.05	23-SEP-09
Titanium (Ti)-Total			<0.10		mg/kg		0.1	23-SEP-09
Zinc (Zn)-Total			<0.10		mg/kg		0.1	23-SEP-09
WG1007182-6 MS		**L815297-12**						

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-ICP-ED	**Tissue**							
Batch R964079								
WG1007182-6 MS		**L815297-12**						
Aluminum (Al)-Total			91		%		63-138	23-SEP-09
Beryllium (Be)-Total			100		%		63-138	23-SEP-09
Cadmium (Cd)-Total			93		%		63-138	23-SEP-09
Chromium (Cr)-Total			98		%		63-138	23-SEP-09
Cobalt (Co)-Total			94		%		63-138	23-SEP-09
Copper (Cu)-Total			106		%		63-138	23-SEP-09
Iron (Fe)-Total			102		%		63-138	23-SEP-09
Magnesium (Mg)-Total			101		%		63-138	23-SEP-09
Manganese (Mn)-Total			97		%		63-138	23-SEP-09
Sodium (Na)-Total			101		%		63-138	23-SEP-09
Strontium (Sr)-Total			121		%		63-138	23-SEP-09
Titanium (Ti)-Total			99		%		63-138	23-SEP-09
Zinc (Zn)-Total			111		%		63-138	23-SEP-09
MET-WET-MS-ED	**Tissue**							
Batch R962256								
WG1007182-2 CRM		**DOLT-4_LIVER**						
WG1007182-5 DUP		**L815297-12**						
Antimony (Sb)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	26-SEP-09
Arsenic (As)-Total		0.049	0.056	J	mg/kg	0.007	0.04	26-SEP-09
Barium (Ba)-Total		6.50	6.96		mg/kg	6.9	26	26-SEP-09
Bismuth (Bi)-Total		<0.060	<0.060	RPD-NA	mg/kg	N/A	26	26-SEP-09
Lead (Pb)-Total		0.020	0.021	J	mg/kg	0.001	0.08	26-SEP-09
Lithium (Li)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	26-SEP-09
Molybdenum (Mo)-Total		0.025	0.025	J	mg/kg	0.000	0.04	26-SEP-09
Nickel (Ni)-Total		0.18	0.20	J	mg/kg	0.02	0.4	26-SEP-09
Selenium (Se)-Total		0.88	0.92	J	mg/kg	0.03	0.8	26-SEP-09
Thallium (Tl)-Total		<0.010	<0.010	RPD-NA	mg/kg	N/A	26	26-SEP-09
Tin (Sn)-Total		<0.050	<0.050	RPD-NA	mg/kg	N/A	26	26-SEP-09
Uranium (U)-Total		<0.0020	<0.0020	RPD-NA	mg/kg	N/A	26	26-SEP-09
Vanadium (V)-Total		<0.10	<0.10	RPD-NA	mg/kg	N/A	26	26-SEP-09
WG1007182-1 MB								
Antimony (Sb)-Total			<0.010		mg/kg		0.01	25-SEP-09
Arsenic (As)-Total			<0.010		mg/kg		0.01	25-SEP-09
Barium (Ba)-Total			<0.020		mg/kg		0.02	25-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-ED	**Tissue**							
Batch R962256								
WG1007182-1 MB								
Bismuth (Bi)-Total			<0.060		mg/kg		0.06	25-SEP-09
Lead (Pb)-Total			<0.020		mg/kg		0.02	25-SEP-09
Lithium (Li)-Total			<0.10		mg/kg		0.1	25-SEP-09
Molybdenum (Mo)-Total			<0.010		mg/kg		0.01	25-SEP-09
Nickel (Ni)-Total			<0.10		mg/kg		0.1	25-SEP-09
Selenium (Se)-Total			<0.20		mg/kg		0.2	25-SEP-09
Thallium (Tl)-Total			<0.010		mg/kg		0.01	25-SEP-09
Tin (Sn)-Total			<0.050		mg/kg		0.05	25-SEP-09
Uranium (U)-Total			<0.0020		mg/kg		0.002	25-SEP-09
Vanadium (V)-Total			<0.10		mg/kg		0.1	25-SEP-09
WG1007182-4 MS		**L810260-4**						
Antimony (Sb)-Total			92		%		63-138	25-SEP-09
Arsenic (As)-Total			90		%		63-138	25-SEP-09
Barium (Ba)-Total			87		%		63-138	25-SEP-09
Bismuth (Bi)-Total			94		%		63-138	25-SEP-09
Lead (Pb)-Total			94		%		63-138	25-SEP-09
Lithium (Li)-Total			80		%		63-138	25-SEP-09
Molybdenum (Mo)-Total			89		%		63-138	25-SEP-09
Nickel (Ni)-Total			80		%		63-138	25-SEP-09
Selenium (Se)-Total			96		%		63-138	25-SEP-09
Thallium (Tl)-Total			100		%		63-138	25-SEP-09
Tin (Sn)-Total			92		%		63-138	25-SEP-09
Uranium (U)-Total			89		%		63-138	25-SEP-09
Vanadium (V)-Total			90		%		63-138	25-SEP-09
WG1007182-6 MS		**L815297-12**						
Antimony (Sb)-Total			84		%		63-138	26-SEP-09
Arsenic (As)-Total			85		%		63-138	26-SEP-09
Barium (Ba)-Total			91		%		63-138	26-SEP-09
Bismuth (Bi)-Total			78		%		63-138	26-SEP-09
Lead (Pb)-Total			78		%		63-138	26-SEP-09
Lithium (Li)-Total			75		%		63-138	26-SEP-09
Molybdenum (Mo)-Total			82		%		63-138	26-SEP-09
Nickel (Ni)-Total			75		%		63-138	26-SEP-09
Selenium (Se)-Total			94		%		63-138	26-SEP-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WET-MS-ED	**Tissue**							
Batch R962256								
WG1007182-6 MS		**L815297-12**						
Thallium (Tl)-Total			85		%		63-138	26-SEP-09
Tin (Sn)-Total			84		%		63-138	26-SEP-09
Uranium (U)-Total			81		%		63-138	26-SEP-09
Vanadium (V)-Total			82		%		63-138	26-SEP-09

Legend:

Limit	99% Confidence Interval (Laboratory Control Limits)
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. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
E	Matrix Spike recovery outside ALS DQO due to analyte background in sample.
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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.

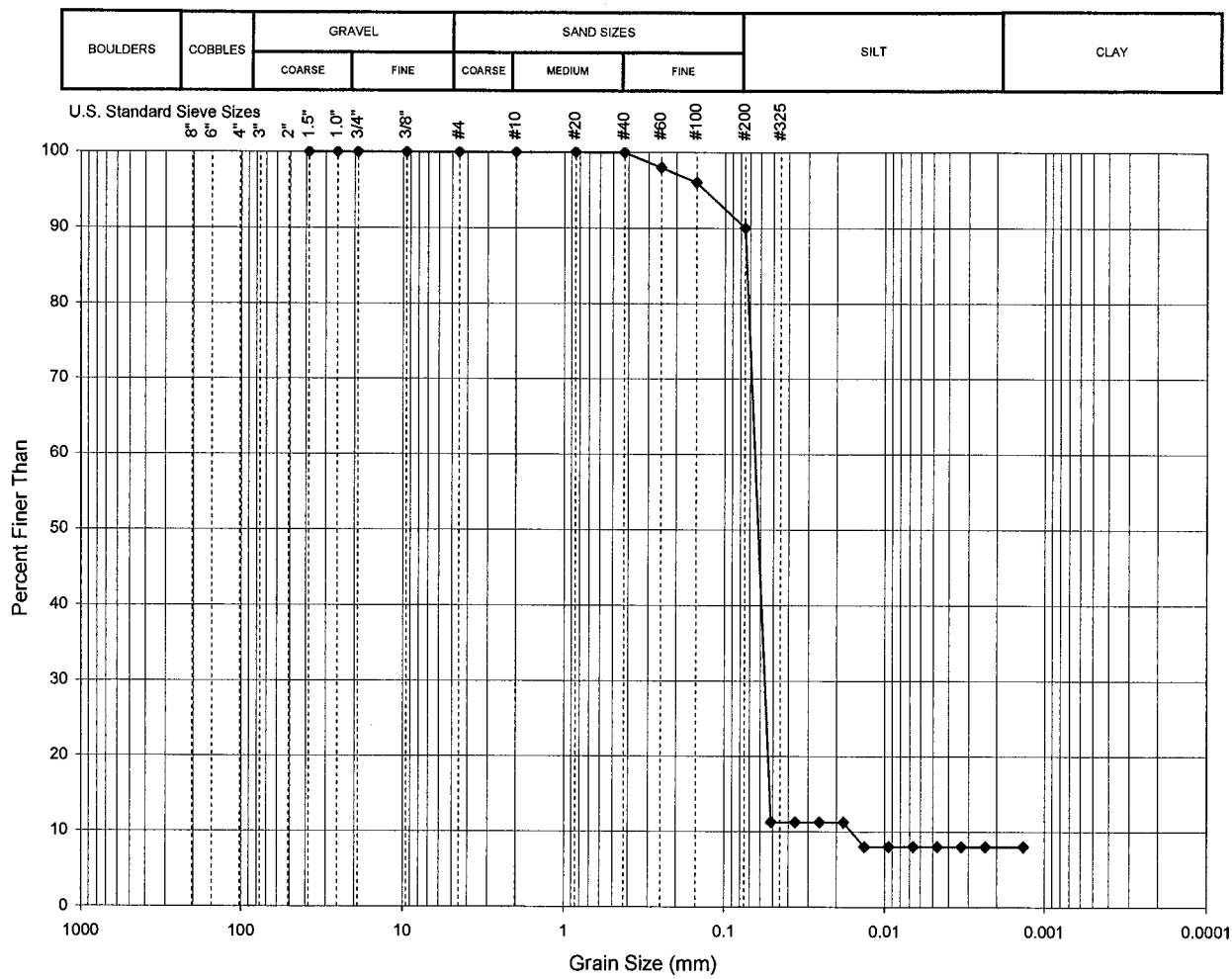
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLP1
Sample Depth:	
Lab ID Number:	L815297-1
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT TRACE SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	10 %
ESTIMATED HAZEN NUMBER: 2.59E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	90 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLP1
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-1	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	1.000	2.000	0.250	2.000	98.000
NO. 100 SIEVE:	1.000	2.000	0.150	4.000	96.000
NO. 200 SIEVE:	3.000	6.000	0.075	10.000	90.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	6.0	22.0	0.051	11.210	11.210
2.00	6.0	22.0	0.036	11.210	11.210
4.00	6.0	22.0	0.026	11.210	11.210
8.00	6.0	22.0	0.018	11.210	11.210
15.00	5.0	22.0	0.013	7.998	7.998
30.00	5.0	22.0	0.009	7.998	7.998
60.00	5.0	22.0	0.007	7.998	7.998
120.00	5.0	22.0	0.005	7.998	7.998
240.00	5.0	22.0	0.003	7.998	7.998
480.00	5.0	22.0	0.002	7.998	7.998
1440.00	5.0	22.0	0.001	7.998	7.998

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	10.00	0.075 - 0.425
% SILT :	82.00	0.075 - 0.002
% CLAY :	8.00	< 0.002
% CLAY :	8.00	< 0.005

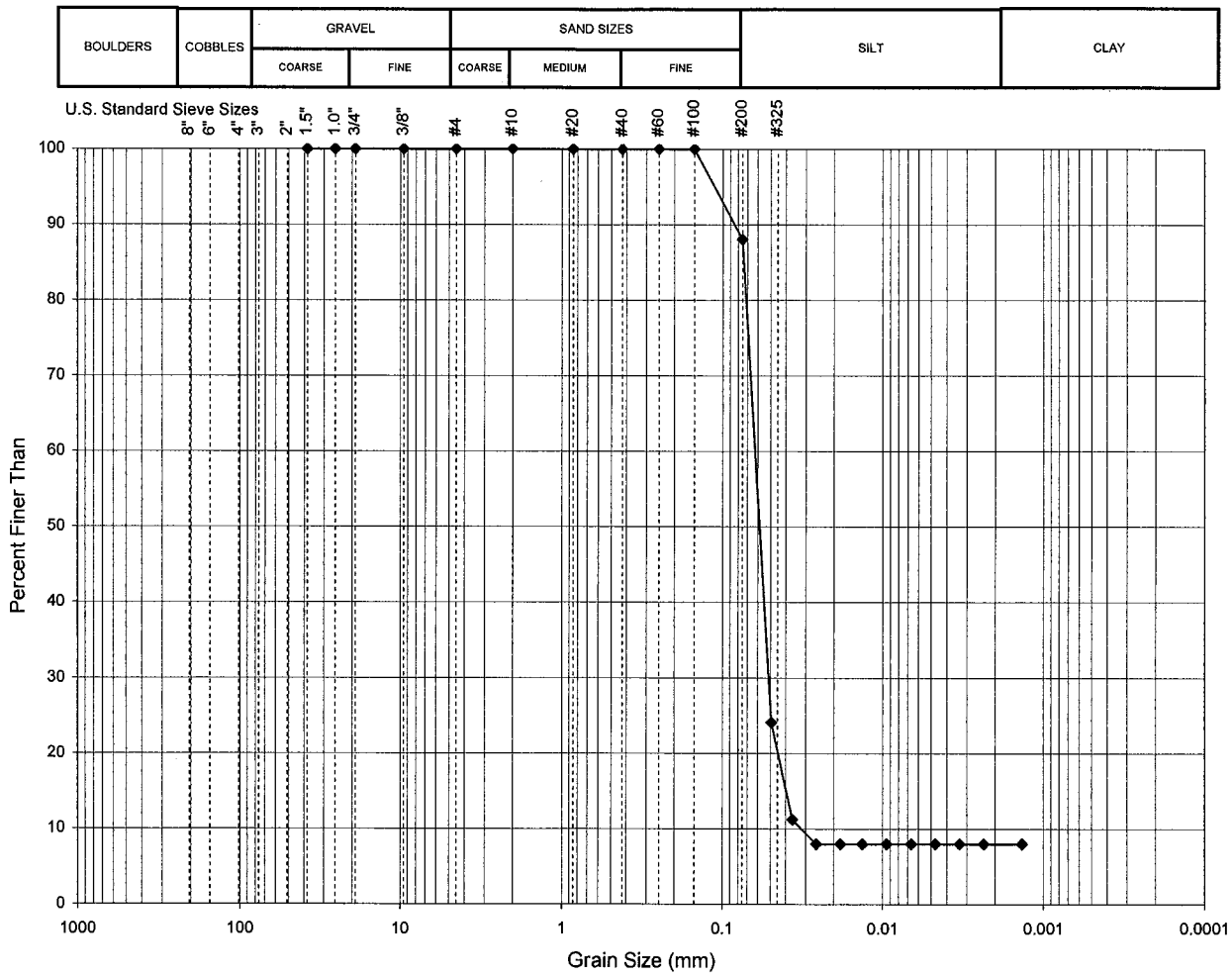
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLP2
Sample Depth:	
Lab ID Number:	L815297-2
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	12 %
ESTIMATED HAZEN NUMBER: 1.23E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	88 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLP2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-2	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	0.000	0.000	0.150	0.000	100.000
NO. 200 SIEVE:	6.000	12.000	0.075	12.000	88.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	10.0	22.0	0.049	24.059	24.059
2.00	6.0	22.0	0.036	11.210	11.210
4.00	5.0	22.0	0.026	7.998	7.998
8.00	5.0	22.0	0.018	7.998	7.998
15.00	5.0	22.0	0.013	7.998	7.998
30.00	5.0	22.0	0.009	7.998	7.998
60.00	5.0	22.0	0.007	7.998	7.998
120.00	5.0	22.0	0.005	7.998	7.998
240.00	5.0	22.0	0.003	7.998	7.998
480.00	5.0	22.0	0.002	7.998	7.998
1440.00	5.0	22.0	0.001	7.998	7.998

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	12.00	0.075 - 0.425
% SILT :	80.00	0.075 - 0.002
% CLAY :	8.00	< 0.002
% CLAY :	8.00	< 0.005

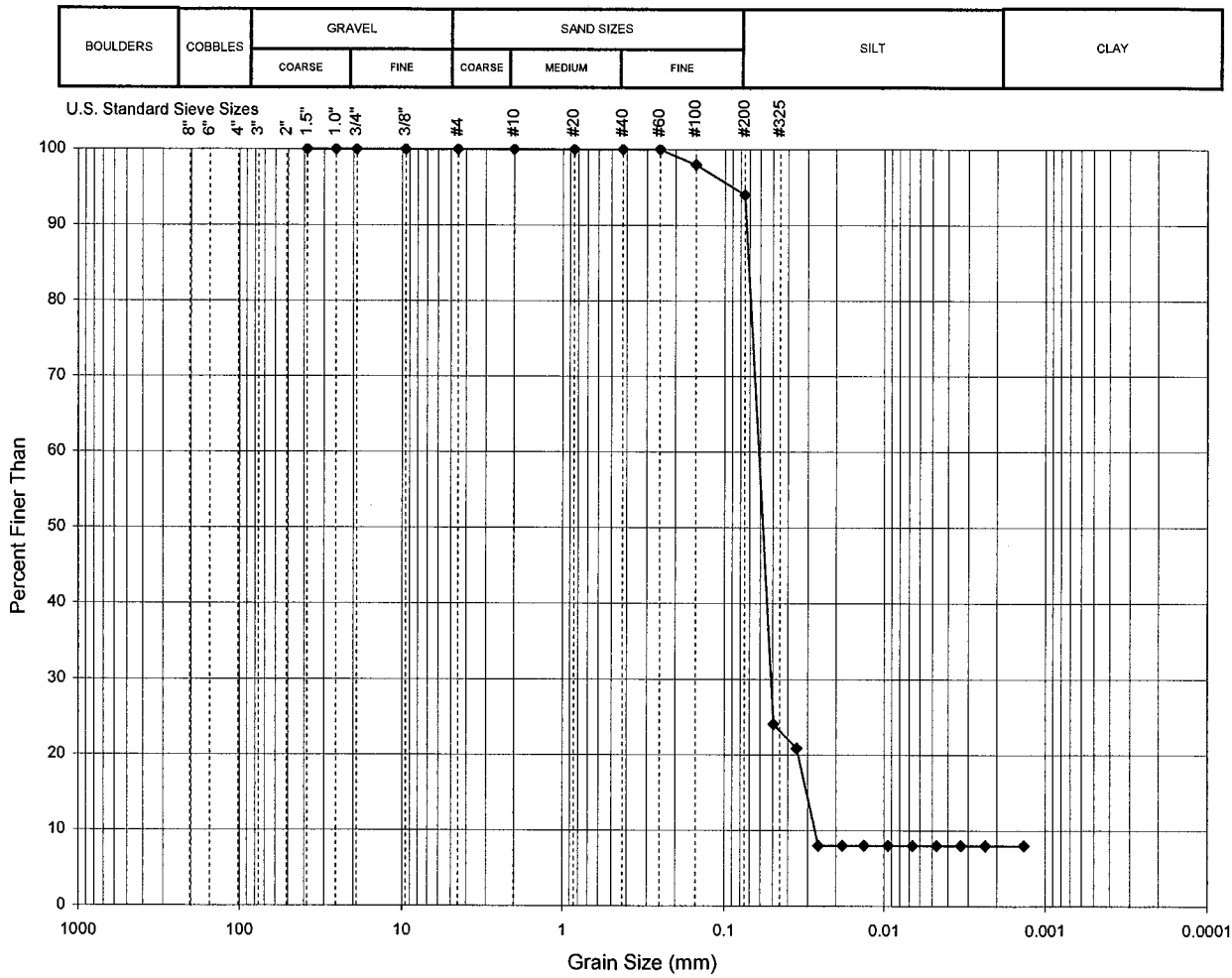
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLP3
Sample Depth:	
Lab ID Number:	L815297-3
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT TRACE CLAY, TRACE SAND	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	6 %
ESTIMATED HAZEN NUMBER: 7.34E-04 cm/s	WITH	11 - 20 %	SILT + CLAY	94 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLP3
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-3	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	1.000	2.000	0.150	2.000	98.000
NO. 200 SIEVE:	2.000	4.000	0.075	6.000	94.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	10.0	22.0	0.049	24.059	24.059
2.00	9.0	22.0	0.035	20.847	20.847
4.00	5.0	22.0	0.026	7.998	7.998
8.00	5.0	22.0	0.018	7.998	7.998
15.00	5.0	22.0	0.013	7.998	7.998
30.00	5.0	22.0	0.009	7.998	7.998
60.00	5.0	22.0	0.007	7.998	7.998
120.00	5.0	22.0	0.005	7.998	7.998
240.00	5.0	22.0	0.003	7.998	7.998
480.00	5.0	22.0	0.002	7.998	7.998
1440.00	5.0	22.0	0.001	7.998	7.998

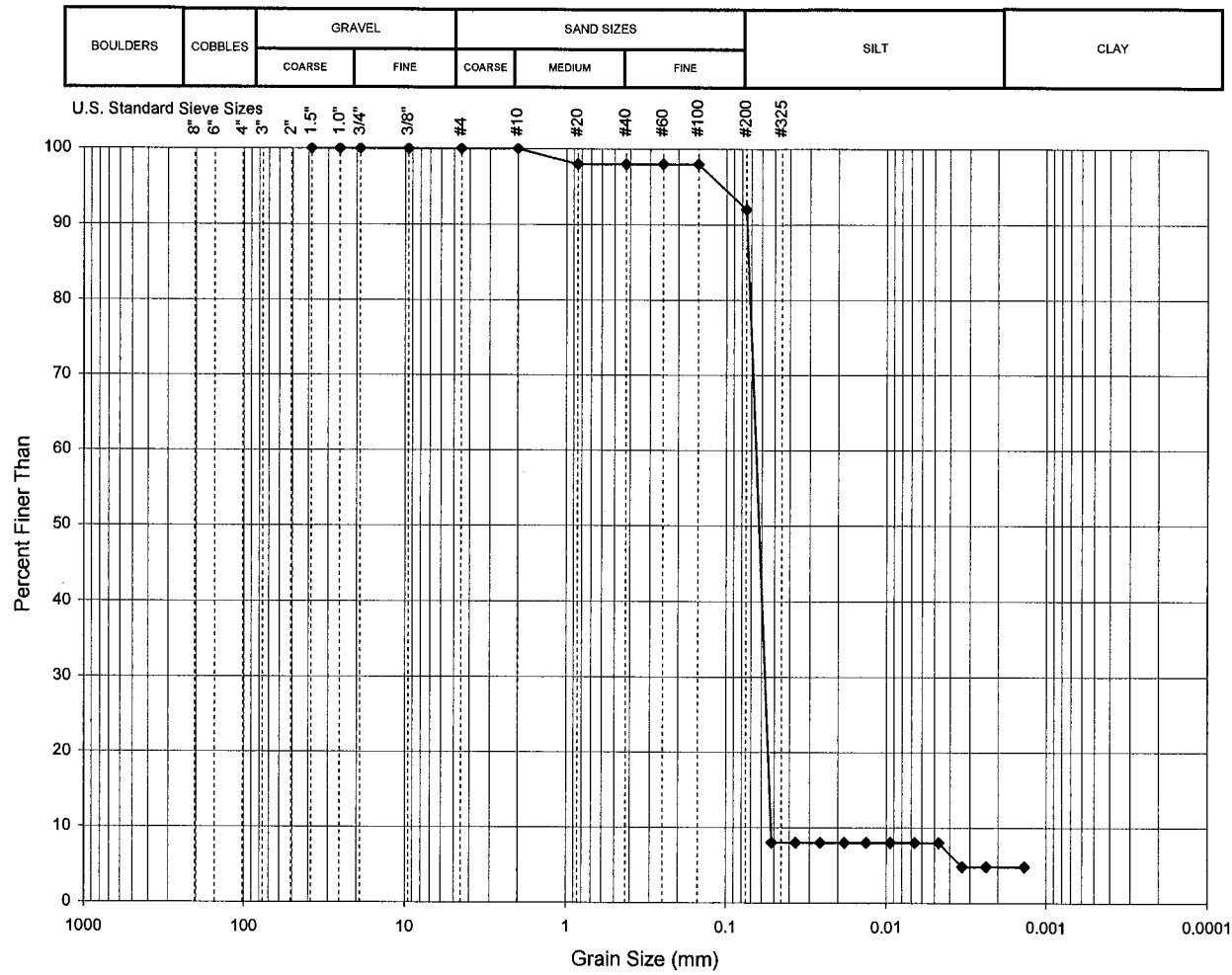
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	6.00	0.075 - 0.425
% SILT :	86.00	0.075 - 0.002
% CLAY :	8.00	< 0.002
% CLAY :	8.00	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLP4
Sample Depth:	
Lab ID Number:	L815297-4
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT, TRACE SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	8 %
ESTIMATED HAZEN NUMBER: 2.71E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	92 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLP4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-4	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	0.000	0.000	0.425	2.000	98.000
NO. 60 SIEVE :	0.000	0.000	0.250	2.000	98.000
NO. 100 SIEVE:	0.000	0.000	0.150	2.000	98.000
NO. 200 SIEVE:	3.000	6.000	0.075	8.000	92.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	5.0	22.0	0.052	7.998	7.998
2.00	5.0	22.0	0.036	7.998	7.998
4.00	5.0	22.0	0.026	7.998	7.998
8.00	5.0	22.0	0.018	7.998	7.998
15.00	5.0	22.0	0.013	7.998	7.998
30.00	5.0	22.0	0.009	7.998	7.998
60.00	5.0	22.0	0.007	7.998	7.998
120.00	5.0	22.0	0.005	7.998	7.998
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	4.0	22.0	0.001	4.786	4.786

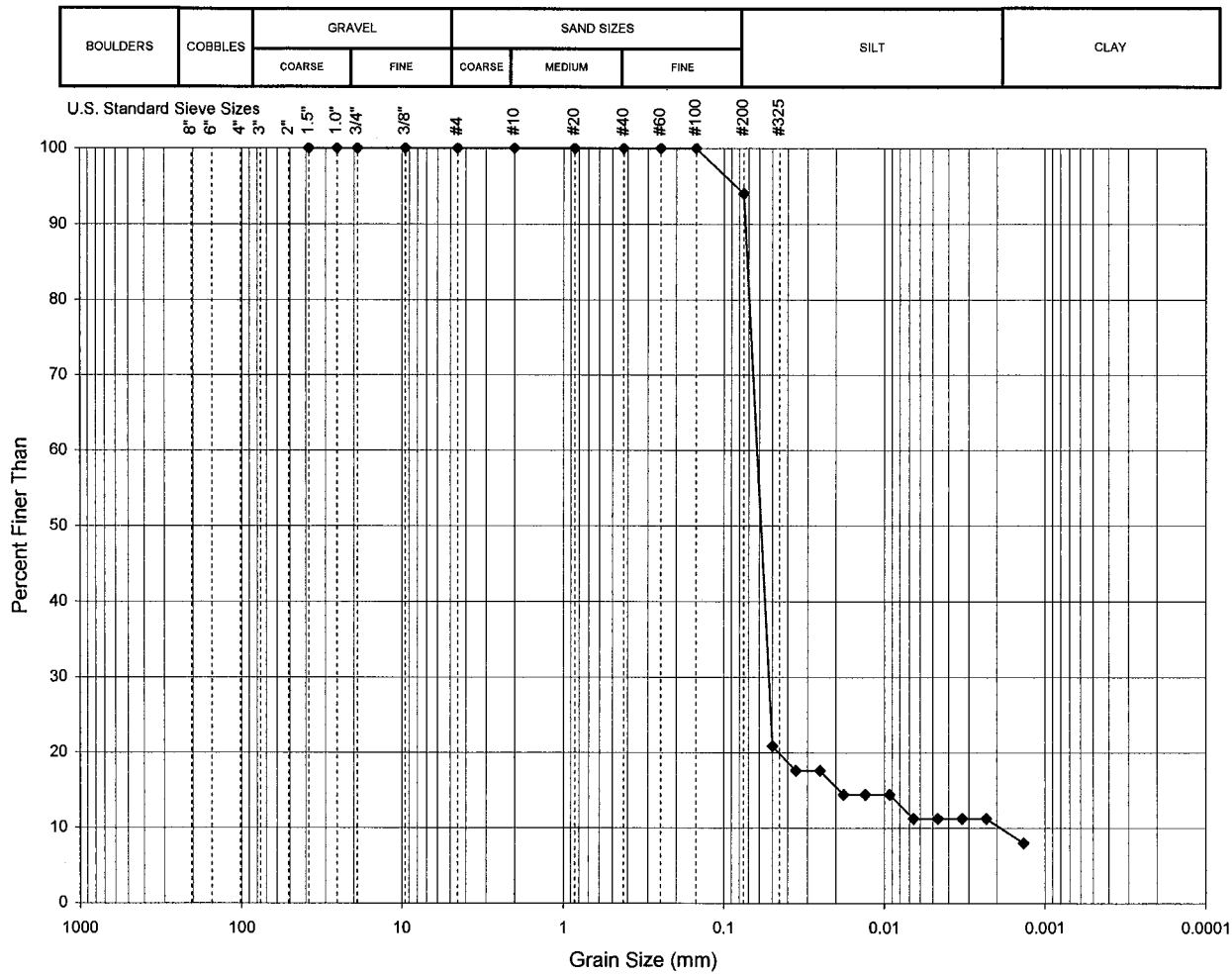
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	2.00	0.425 - 2.0
% FINE SAND :	6.00	0.075 - 0.425
% SILT :	87.21	0.075 - 0.002
% CLAY :	4.79	< 0.002
% CLAY :	8.00	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLP5
Sample Depth:	
Lab ID Number:	L815297-5
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT, TRACE CLAY, TRACE SAND	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	6 %
ESTIMATED HAZEN NUMBER: 3.38E-05 cm/s	WITH	11 - 20 %	SILT + CLAY	94 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLP5
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-5	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	0.000	0.000	0.425	0.000	100.000
NO. 60 SIEVE :	0.000	0.000	0.250	0.000	100.000
NO. 100 SIEVE:	0.000	0.000	0.150	0.000	100.000
NO. 200 SIEVE:	3.000	6.000	0.075	6.000	94.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	9.0	22.0	0.050	20.847	20.847
2.00	8.0	22.0	0.036	17.635	17.635
4.00	8.0	22.0	0.025	17.635	17.635
8.00	7.0	22.0	0.018	14.422	14.422
15.00	7.0	22.0	0.013	14.422	14.422
30.00	7.0	22.0	0.009	14.422	14.422
60.00	6.0	22.0	0.007	11.210	11.210
120.00	6.0	22.0	0.005	11.210	11.210
240.00	6.0	22.0	0.003	11.210	11.210
480.00	6.0	22.0	0.002	11.210	11.210
1440.00	5.0	22.0	0.001	7.998	7.998

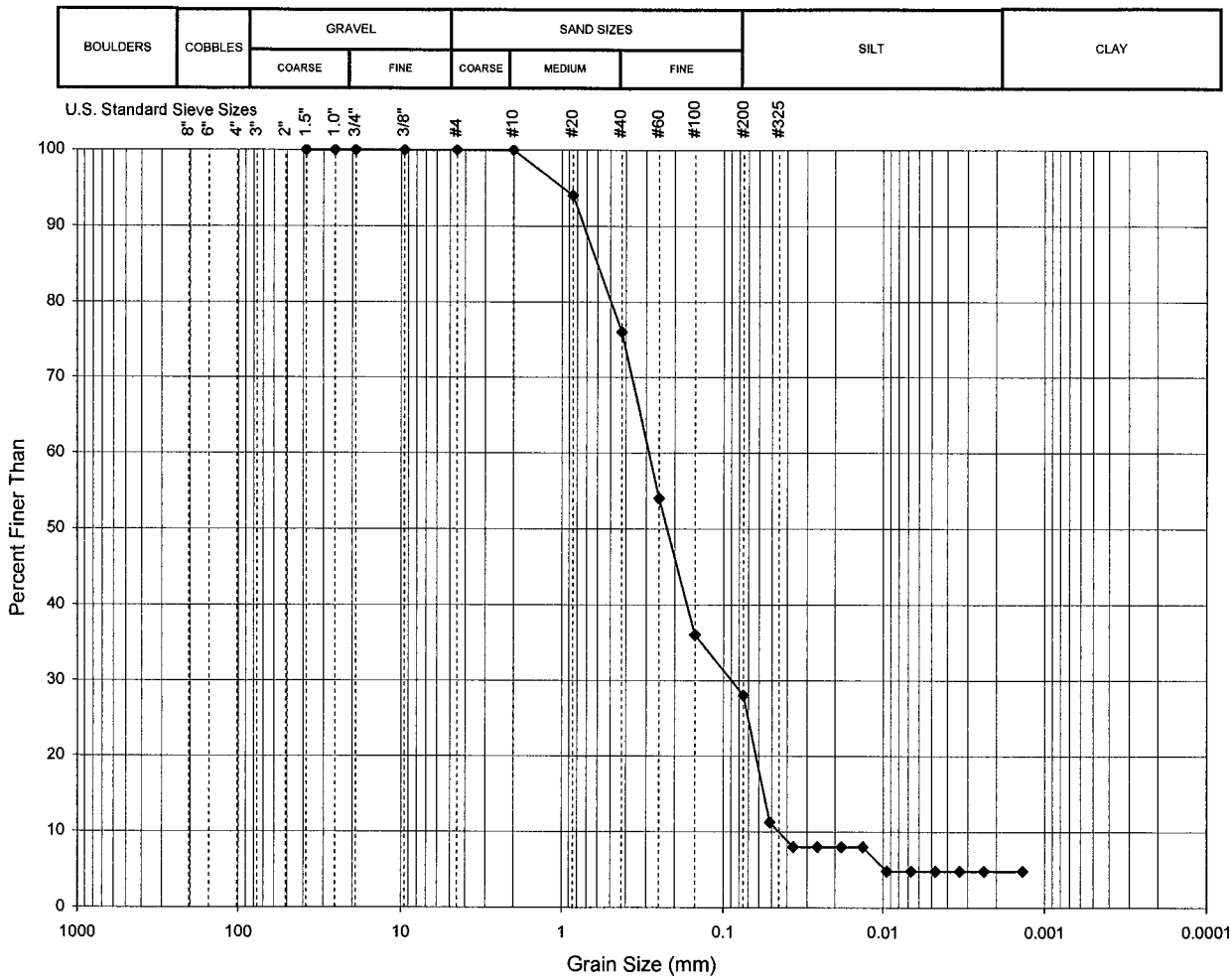
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	0.00	0.425 - 2.0
% FINE SAND :	6.00	0.075 - 0.425
% SILT :	83.71	0.075 - 0.002
% CLAY :	10.29	< 0.002
% CLAY :	11.21	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLL1
Sample Depth:	
Lab ID Number:	L815297-6
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILTY SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	72 %
ESTIMATED HAZEN NUMBER: 2.48E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	28 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLL1
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-6	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	3.000	6.000	0.850	6.000	94.000
NO. 40 SIEVE :	9.000	18.000	0.425	24.000	76.000
NO. 60 SIEVE :	11.000	22.000	0.250	46.000	54.000
NO. 100 SIEVE:	9.000	18.000	0.150	64.000	36.000
NO. 200 SIEVE:	4.000	8.000	0.075	72.000	28.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	6.0	22.0	0.051	11.210	11.210
2.00	5.0	22.0	0.036	7.998	7.998
4.00	5.0	22.0	0.026	7.998	7.998
8.00	5.0	22.0	0.018	7.998	7.998
15.00	5.0	22.0	0.013	7.998	7.998
30.00	4.0	22.0	0.010	4.786	4.786
60.00	4.0	22.0	0.007	4.786	4.786
120.00	4.0	22.0	0.005	4.786	4.786
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	4.0	22.0	0.001	4.786	4.786

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	24.00	0.425 - 2.0
% FINE SAND :	48.00	0.075 - 0.425
% SILT :	23.21	0.075 - 0.002
% CLAY :	4.79	< 0.002
% CLAY :	4.79	< 0.005

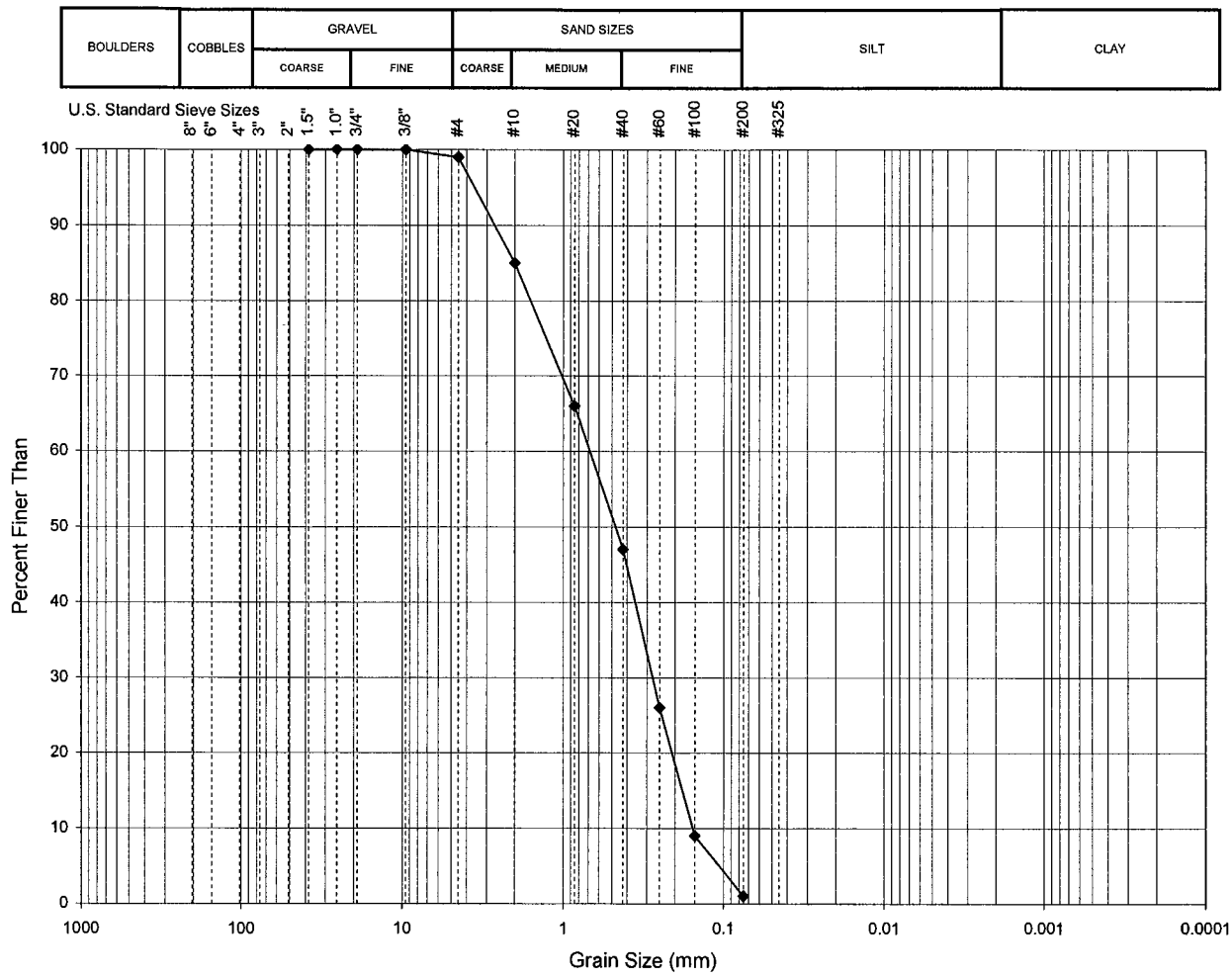
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLL2
Sample Depth:	
Lab ID Number:	L815297-7
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE GRAVEL, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	1 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	98 %
ESTIMATED HAZEN NUMBER: 2.39E-02 cm/s	WITH	11 - 20 %	SILT + CLAY	1 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLL2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-7	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.850	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	1.000	1.000	4.500	1.000	99.000
NO. 10 SIEVE :	14.000	14.000	2.000	15.000	85.000
NO. 20 SIEVE :	19.000	19.000	0.850	34.000	66.000
NO. 40 SIEVE :	19.000	19.000	0.425	53.000	47.000
NO. 60 SIEVE :	21.000	21.000	0.250	74.000	26.000
NO. 100 SIEVE:	17.000	17.000	0.150	91.000	9.000
NO. 200 SIEVE:	8.000	8.000	0.075	99.000	1.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	1.00	> 4.5
% COARSE SAND :	14.00	2.0 - 4.5
% MEDIUM SAND :	38.00	0.425 - 2.0
% FINE SAND :	46.00	0.075 - 0.425
% SILT & CLAY :	1.00	< 0.075

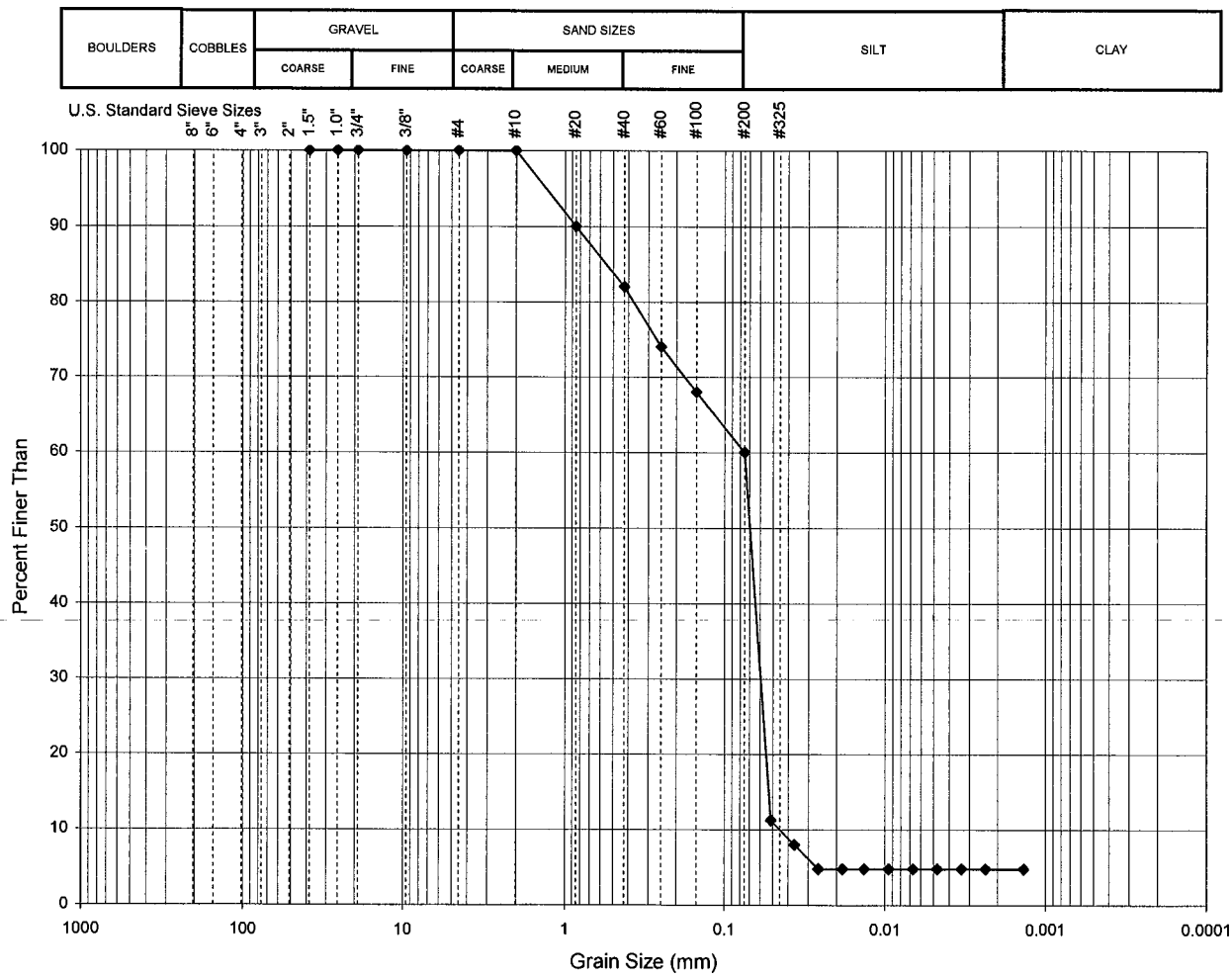
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLL3
Sample Depth:	
Lab ID Number:	L815297-8
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT AND SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	40 %
ESTIMATED HAZEN NUMBER: 2.57E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	60 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLL3
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-8	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	5.000	10.000	0.850	10.000	90.000
NO. 40 SIEVE :	4.000	8.000	0.425	18.000	82.000
NO. 60 SIEVE :	4.000	8.000	0.250	26.000	74.000
NO. 100 SIEVE:	3.000	6.000	0.150	32.000	68.000
NO. 200 SIEVE:	4.000	8.000	0.075	40.000	60.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	6.0	22.0	0.051	11.210	11.210
2.00	5.0	22.0	0.036	7.998	7.998
4.00	4.0	22.0	0.026	4.786	4.786
8.00	4.0	22.0	0.018	4.786	4.786
15.00	4.0	22.0	0.013	4.786	4.786
30.00	4.0	22.0	0.010	4.786	4.786
60.00	4.0	22.0	0.007	4.786	4.786
120.00	4.0	22.0	0.005	4.786	4.786
240.00	4.0	22.0	0.003	4.786	4.786
480.00	4.0	22.0	0.002	4.786	4.786
1440.00	4.0	22.0	0.001	4.786	4.786

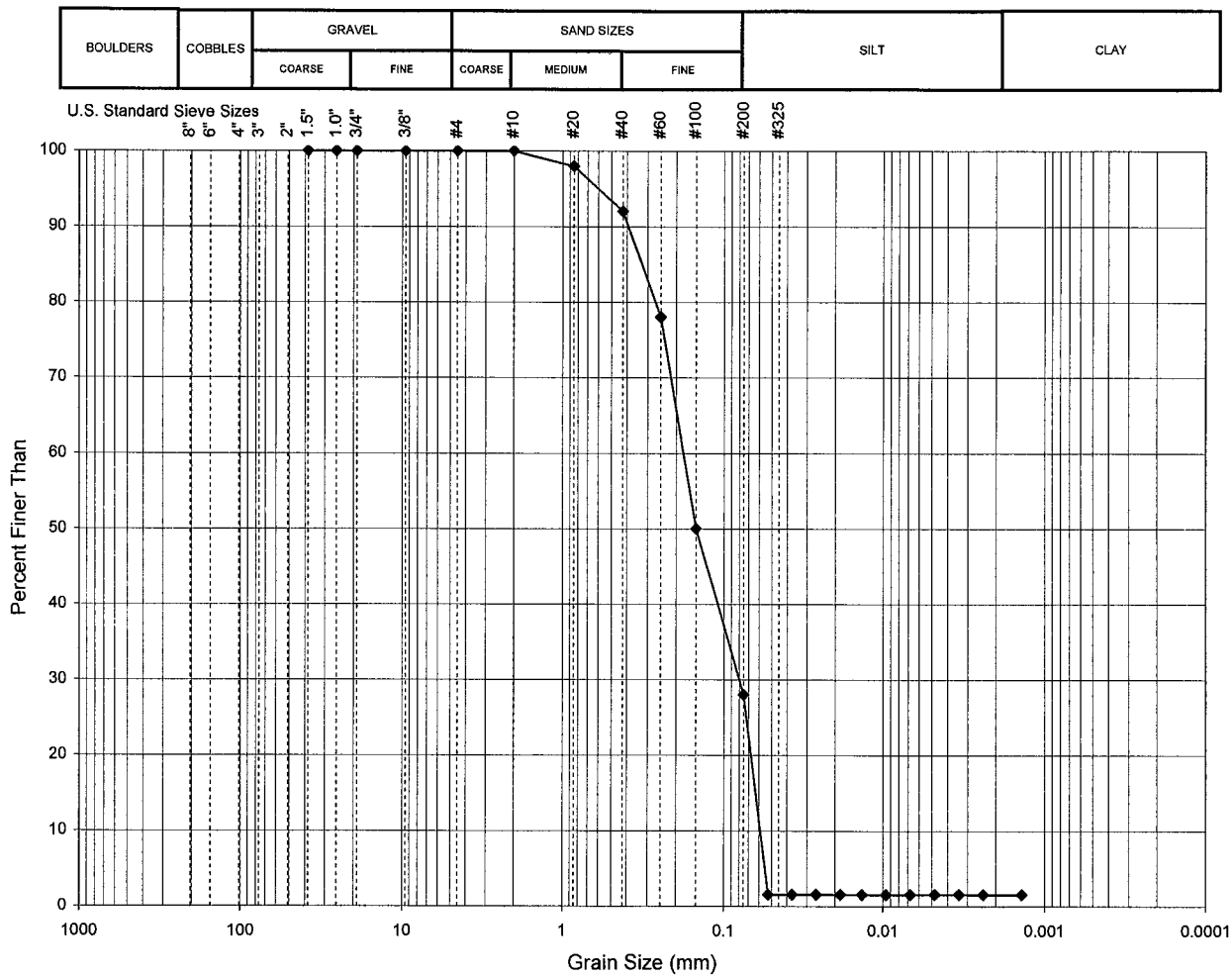
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	18.00	0.425 - 2.0
% FINE SAND :	22.00	0.075 - 0.425
% SILT :	55.21	0.075 - 0.002
% CLAY :	4.79	< 0.002
% CLAY :	4.79	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLL4
Sample Depth:	
Lab ID Number:	L815297-9
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILTY SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	72 %
ESTIMATED HAZEN NUMBER: 3.46E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	28 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLL4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-9	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	3.000	6.000	0.425	8.000	92.000
NO. 60 SIEVE :	7.000	14.000	0.250	22.000	78.000
NO. 100 SIEVE:	14.000	28.000	0.150	50.000	50.000
NO. 200 SIEVE:	11.000	22.000	0.075	72.000	28.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	3.0	22.0	0.053	1.574	1.574
2.00	3.0	22.0	0.037	1.574	1.574
4.00	3.0	22.0	0.026	1.574	1.574
8.00	3.0	22.0	0.019	1.574	1.574
15.00	3.0	22.0	0.014	1.574	1.574
30.00	3.0	22.0	0.010	1.574	1.574
60.00	3.0	22.0	0.007	1.574	1.574
120.00	3.0	22.0	0.005	1.574	1.574
240.00	3.0	22.0	0.003	1.574	1.574
480.00	3.0	22.0	0.002	1.574	1.574
1440.00	3.0	22.0	0.001	1.574	1.574

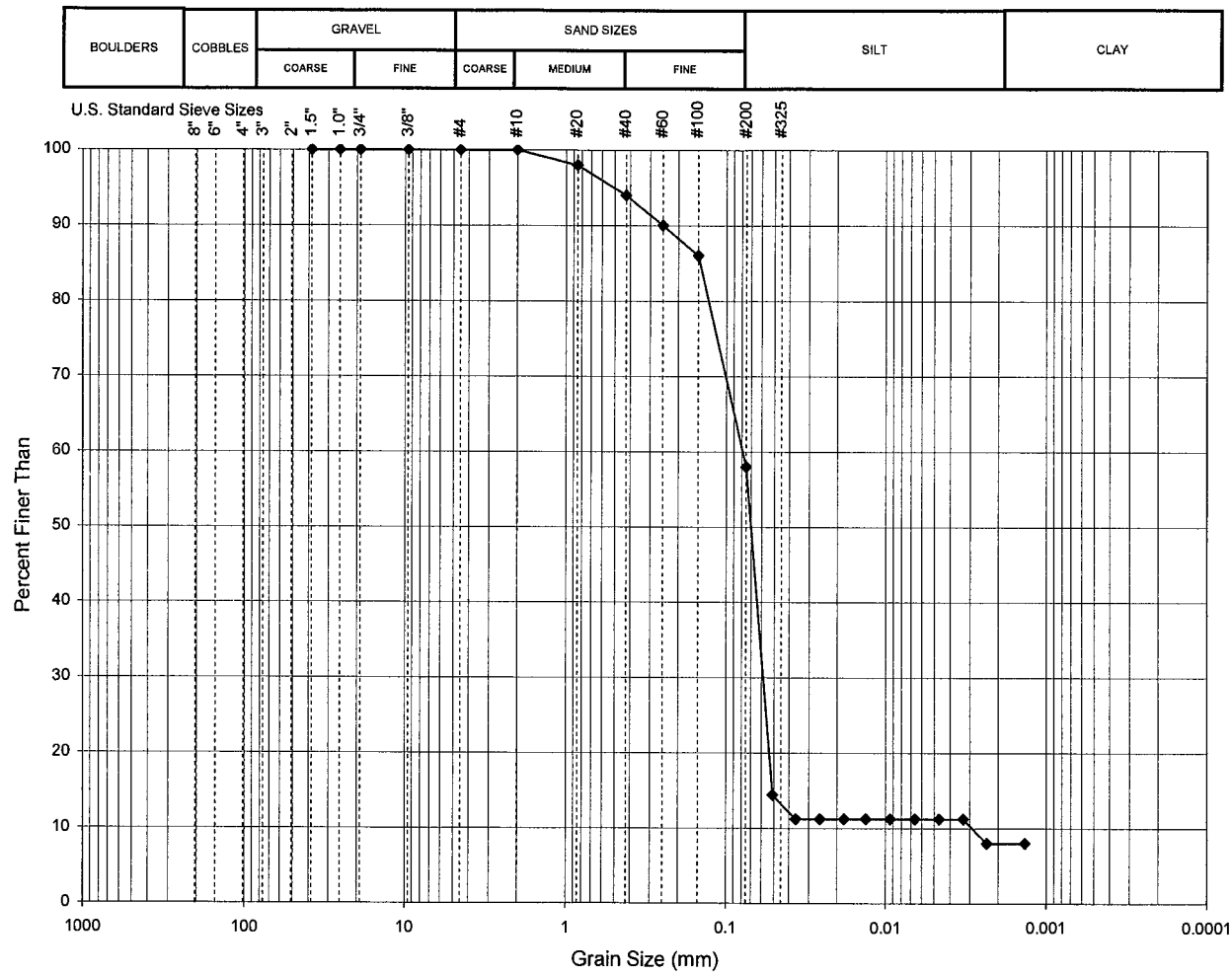
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	8.00	0.425 - 2.0
% FINE SAND :	64.00	0.075 - 0.425
% SILT :	26.43	0.075 - 0.002
% CLAY :	1.57	< 0.002
% CLAY :	1.57	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	BLL5
Sample Depth:	
Lab ID Number:	L815297-10
Technician:	SM1
Sampler:	
Dates:	
Collected On:	9/4/2009
Analyzed:	9/21/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT AND SAND, TRACE CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	42 %
ESTIMATED HAZEN NUMBER: 1.01E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	58 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	15753	Sample Number:	BLL5
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	09/04/09
Lab ID Number:	L815297-10	Date Submitted:	09/04/09
		Date Completed:	09/21/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	2.000	4.000	0.425	6.000	94.000
NO. 60 SIEVE :	2.000	4.000	0.250	10.000	90.000
NO. 100 SIEVE:	2.000	4.000	0.150	14.000	86.000
NO. 200 SIEVE:	14.000	28.000	0.075	42.000	58.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	7.0	22.0	0.051	14.422	14.422
2.00	6.0	22.0	0.036	11.210	11.210
4.00	6.0	22.0	0.026	11.210	11.210
8.00	6.0	22.0	0.018	11.210	11.210
15.00	6.0	22.0	0.013	11.210	11.210
30.00	6.0	22.0	0.009	11.210	11.210
60.00	6.0	22.0	0.007	11.210	11.210
120.00	6.0	22.0	0.005	11.210	11.210
240.00	6.0	22.0	0.003	11.210	11.210
480.00	5.0	22.0	0.002	7.998	7.998
1440.00	5.0	22.0	0.001	7.998	7.998

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	6.00	0.425 - 2.0
% FINE SAND :	36.00	0.075 - 0.425
% SILT :	50.00	0.075 - 0.002
% CLAY :	8.00	< 0.002
% CLAY :	11.21	< 0.005

53146

C of C#

PAGE 1 OF 3

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

60 Northland Road, Unit #1, Waterloo, ON N2V 2B8
Phone: (519) 886-6910 Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

Service Requested:	✓	Regular (default) (5 working days)
Date Required:		Priority (50% surcharge) (2-3 working days)
		Emergency (100% surcharge) (1-2 working days)

COMPANY NAME: EcoMetrix

PROJECT MANAGER: Brian Fraser

PROJECT #: 09-1630

PHONE: 905-794-2325 ex 246

FAX: 905-794-2338

QUOTATION # / PO#:

CRITERIA: Criteria on report (y/n)

Reg 153/04 Table 1 2 3

TCLP ____ MISA ____ SWQG ____

OTHER

REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE EMAILED

EMAIL ____ FAX ____

EMAIL ____

EMAIL2 ____

SELECT: pdf ____ digital ____ both ____

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX			SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	Metals via TCP MS	Mercury via CVAA	Total Organic Carbon	TKN	Grain Size												COMMENTS	LAB ID
Date (mm/dd/yy)	Time (24 hr)	COMP	GRAB	WATER	SOIL	VEG TISSUE																			
					X		BLP1	2	✓	✓	✓	✓	✓												-1
					X		BLP2	2	✓	✓	✓	✓	✓												-2
					X		BLP3	2	✓	✓	✓	✓	✓												-3
					X		BLP4	2	✓	✓	✓	✓	✓												-4
					X		BLP5	2	✓	✓	✓	✓	✓												-5
					X		BLL1	2	✓	✓	✓	✓	✓												-6
					X		BLL2	2	✓	✓	✓	✓	✓												-7
					X		BLL3	2	✓	✓	✓	✓	✓												-8
					X		BLL4	2	✓	✓	✓	✓	✓												-9
					X		BLL5	2	✓	✓	✓	✓	✓												-10
						X	Bamoos Lake	1	✓																	-11
						X	BLLC-1	1	✓																	-12

ANALYSIS REQUEST — INDICATE BOTTLES PRESERVED (HNO3 HgCl2 H2SO4)

SUBMISSION #: C815297

ENTERED BY: PBQ

DATE/TIME ENTERED: 08 Sep 09

BIN #: B621

SAMPLE CONDITION

	MEAN TEMP
FROZEN	
COLD ✓	-5C
AMBIENT	
CONDITION ACCEPTABLE UPON RECEIPT (Y/N) Y	INIT WS

SPECIAL INSTRUCTIONS/COMMENTS

SAMPLED BY: [signature]

DATE & TIME: Sept 4, 2009

RECEIVED BY: Wayne Smith

DATE & TIME: 04-SEP-09 16:40

NOTES AND CONDITIONS

1. Guide number to be provided to ensure proper billing.
2. TAT may vary dependent on complexity of analyses and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

08 Sep 2009 1:55PM ALS Laboratory Group 19055076927 P.1

53145

C of C # PAGE 2 OF 3

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

60 Northland Road, Unit #1, Waterloo, ON N2V 2B8
Phone: (519) 886-6910 Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

Service Requested:	✓	Regular (default) (5 working days)
Date Required:		Priority (50% surcharge) (2-3 working days)
		Emergency (100% surcharge) (1-2 working days)

COMPANY NAME: EcoMetrix

PROJECT MANAGER: Brian Fraser

PROJECT #: 09-1630

PHONE: 905-794-2325 ex246

FAX: 905-794-2338

QUOTATION #: P.O.#:

CRITERIA: Criteria on report (y/n):
Reg 153/04: Table 1 2 3
TCLP ____ MISA ____ PWQO ____
OTHER:

REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE EMAILED
EMAIL: FAX:
EMAIL:
EMAIL:
SELECT: pdf Digital DGR

SAMPLING INFORMATION

Sample Date (mm/dd/yy)	Time (24 hr)	TYPE: COMP	GRAB	MATRIX: WATER	SOIL	Triage	SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	Metals via ICP MS	Mercury via CVAA	Total Organic Carbon	TKN	Grain Size	COMMENTS	LAB ID
						X	BLLC-2	1	/	/					-13
						X	BLLC-3	1	/	/					-14
						X	BLLC-4	1	/	/					-15
						X	BLLC-5	1	/	/					-16
						X	BLT-1L	1	/	/					-17
						X	BLT-2L	1	/	/					-18
						X	BLT-3L	1	/	/					-19
						X	BLT-4L	1	/	/					-20
						X	BLT-5L	1	/	/					-21
						X	BLT-1M	1	/	/					-22
						X	BLT-2M	1	/	/					-23
						X	BLT-3M	1	/	/					-24

ANALYSIS REQUEST — INDICATE BOTTLES FILLED BY TERRA: (PRESERVED (P/F))

SUBMISSION #: L815297

ENTERED BY: PBO

DATE/TIME ENTERED: 08-Sep-09

BIN #:

SPECIAL INSTRUCTIONS/COMMENTS:

SAMPLE CONDITION

	MEAN TEMP
FROZEN	-5C
COLD ✓	
AMBIENT	
CONDITION ACCEPTABLE UPON RECEIPT (Y/N) Y	INIT: WS

SAMPLED BY: M McKinley

RELINQUISHED BY: M McKinley — DATE & TIME: 04/Sept/09

RECEIVED BY: — DATE & TIME:

RECEIVED AT: Wayne Smith — DATE & TIME: 04-SEP-09 16:40

NOTES AND CONDITIONS:
1. Quote number must be provided to ensure proper pricing
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

08 Sep 2009 1:55PM ALS Laboratory Group 19055076927 p.2

53147

C of C #

PAGE 3 OF 3

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

60 Northland Road, Unit #1, Waterloo, ON N2V 2B8
Phone: (519) 886-6910 Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

Service Requested: X Regular (default) (5 working days)
Date Required: Priority (50% surcharge) (2-3 working days)
Emergency (100% surcharge) (1-2 working days)

COMPANY NAME: Eco Metrix
PROJECT MANAGER: Brian Fraser
PROJECT #: 09-1630
PHONE: 905-794-2325 ex 246
FAX: 905-794-2338
QUOTATION #: PO#:

CRITERIA: Criteria on report (Y/N)
Reg 153/04
Table 1 2 3
TCLP ___ MISA ___ PWQO ___
OTHER
REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE EMAILED
E-MAIL: FAX:
EMAIL 1:
EMAIL 2:
SELECT: PDF EXCEL EDD

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX				NUMBER OF CONTAINERS	Metals via ICP MS	Mercury via CVAA	Total Organic Carbon	TKN	Grain Size	COMMENTS	LAB ID
Date (dd-mmm-yy)	Time (hh:mm)	GRAB	COMP	WATER	SOIL	TISSUE	SAMPLE DESCRIPTION (TO APPEAR ON REPORT)								
						X	BLT-4M	1	/	/	/				25
						X	BLT-5M	1	/	/	/				26

INDICATE BOTTLES FILLED / PRESERVED (F/P)
SUBMISSION #: L815297
ENTERED BY: BB
DATE/TIME ENTERED: 08-Sep-09
BIN #:

SPECIAL INSTRUCTIONS/COMMENTS

SAMPLE CONDITION: FROZEN / COLD ✓ / AMBIENT — MEAN TEMP: -5°C
CONDITION ACCEPTABLE UPON RECEIPT (Y/N): Y — INIT: BB

SAMPLED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:
RELINQUISHED BY:	DATE & TIME: Sept 4th 2009	RECEIVED BY: Wayne Smith	DATE & TIME: 04-SEP-09 16:40

NOTES AND CONDITIONS:
1. Quote number must be provided for QUOTE
2. TAT may be dependent on complexity of analytes and lot workload at time of submission. Please contact the lab to confirm TAT's
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section

08 Sep 2009 1:55PM ALS Laboratory Group 19055076927 P.3

Certificate of Analysis

ECOMETRIX INC
ATTN: BRIAN FRASER
6000 Campobello Road
Mississauga ON L5N 2L8

Report Date: 23-NOV-09 14:53 (MT)
Version: FINAL

Lab Work Order #: **L836253** **Date Received:** **03-NOV-09**

Project P.O. #:
Job Reference: 09-1630
Legal Site Desc:
CofC Numbers: 56902

Other Information:

Comments:

Emerson Perez
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L836253-1	L836253-2	L836253-3	L836253-4	L836253-5
	Description	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
	Sampled Date	03-NOV-09	03-NOV-09	03-NOV-09	03-NOV-09	03-NOV-09
	Sampled Time					
	Client ID	S41	S15	S12	S31-1	S31-2
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	21.3	41.8	31.7	35.7	35.8
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	1400	1710	840	1230	1940
Organic / Inorganic Carbon	Fraction Organic Carbon	0.0122	0.0125	0.0170	0.0092	0.0082
	Total Organic Carbon (%)	1.22	1.25	1.70	0.92	0.82
Metals	Aluminum (Al) (mg/kg)	6340	8650	10900	8030	10000
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	<1.0	<1.0	1.4	<1.0	1.2
	Barium (Ba) (mg/kg)	39.2	35.3	44.0	34.6	46.4
	Beryllium (Be) (mg/kg)	<0.50	<0.50	0.67	<0.50	<0.50
	Bismuth (Bi) (mg/kg)	2.0	<1.0	1.0	<1.0	<1.0
	Boron (B) (mg/kg)	<5.0	5.5	6.7	6.9	6.9
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Calcium (Ca) (mg/kg)	3400	6930	2600	5920	7290
	Chromium (Cr) (mg/kg)	23.5	18.8	22.2	18.0	21.3
	Cobalt (Co) (mg/kg)	7.5	7.0	8.7	6.2	7.7
	Copper (Cu) (mg/kg)	16.7	10.0	7.3	5.0	6.2
	Iron (Fe) (mg/kg)	31800	12700	23300	12200	14800
	Lead (Pb) (mg/kg)	4.4	4.4	6.1	3.4	3.8
	Magnesium (Mg) (mg/kg)	2610	4610	2560	3730	4350
	Manganese (Mn) (mg/kg)	309	189	308	437	540
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	1.3	<1.0	<1.0	<1.0	<1.0
	Nickel (Ni) (mg/kg)	12.0	10.1	12.8	10.0	12.9
	Phosphorus (P) (mg/kg)	1020	574	646	449	406
	Potassium (K) (mg/kg)	313	313	324	412	567
	Selenium (Se) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	166	212	230	158	190
	Strontium (Sr) (mg/kg)	9.9	9.6	8.5	9.0	11.1
	Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Tin (Sn) (mg/kg)	3.8	3.8	3.8	3.6	3.6
	Titanium (Ti) (mg/kg)	941	613	732	575	628
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	33.7	21.1	30.1	18.7	21.7
	Zinc (Zn) (mg/kg)	48.8	55.1	88.0	70.7	83.3
	Zirconium (Zr) (mg/kg)	10.7	5.6	9.5	6.3	8.4

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L836253-6	L836253-7	L836253-8	L836253-9	L836253-10
	Description	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
	Sampled Date	03-NOV-09	03-NOV-09	03-NOV-09	03-NOV-09	03-NOV-09
	Sampled Time					
	Client ID	S31-3	S31-4	S31-5	S24	S34
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	33.2	42.1	32.7	36.5	36.7
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	740	1420	900	550	1120
Organic / Inorganic Carbon	Fraction Organic Carbon	0.0063	0.0082	0.0068	0.0040	0.0107
	Total Organic Carbon (%)	0.63	0.82	0.68	0.40	1.07
Metals	Aluminum (Al) (mg/kg)	10500	8450	6860	5820	7950
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As) (mg/kg)	1.2	1.0	<1.0	1.2	1.5
	Barium (Ba) (mg/kg)	49.7	38.0	31.0	25.4	36.1
	Beryllium (Be) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Bismuth (Bi) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Boron (B) (mg/kg)	7.8	8.7	6.0	8.3	11.2
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
	Calcium (Ca) (mg/kg)	3220	4320	2520	36900	58000
	Chromium (Cr) (mg/kg)	21.3	18.3	14.3	19.9	22.9
	Cobalt (Co) (mg/kg)	8.3	6.7	5.3	6.0	7.7
	Copper (Cu) (mg/kg)	6.7	5.1	3.5	6.3	14.4
	Iron (Fe) (mg/kg)	15900	13400	10900	11300	12000
	Lead (Pb) (mg/kg)	4.0	3.7	3.1	6.9	5.0
	Magnesium (Mg) (mg/kg)	3580	3310	2230	8520	16700
	Manganese (Mn) (mg/kg)	675	342	295	309	357
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
	Molybdenum (Mo) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Nickel (Ni) (mg/kg)	13.3	10.3	8.1	10.5	13.5
	Phosphorus (P) (mg/kg)	348	436	404	376	383
	Potassium (K) (mg/kg)	522	371	284	634	892
	Selenium (Se) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
	Sodium (Na) (mg/kg)	205	345	147	179	219
	Strontium (Sr) (mg/kg)	8.9	7.8	6.8	24.3	34.4
	Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Tin (Sn) (mg/kg)	3.7	3.4	3.5	4.3	3.4
	Titanium (Ti) (mg/kg)	618	602	522	554	608
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V) (mg/kg)	21.9	19.4	16.0	21.3	21.6
	Zinc (Zn) (mg/kg)	99.4	80.7	59.0	19.6	25.5
	Zirconium (Zr) (mg/kg)	8.8	7.9	5.8	9.1	13.1

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID	L836253-11	L836253-12	L836253-13	L836253-14	L836253-15
Description	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sampled Date	03-NOV-09	03-NOV-09	03-NOV-09	03-NOV-09	03-NOV-09
Sampled Time					
Client ID	S33	S32	SC-2	SC-3	SC-4
Grouping / **Analyte**					
SOIL					
Physical Tests % Moisture (%)	33.4	44.8	40.3	42.2	53.4
Leachable Anions & Nutrients Total Kjeldahl Nitrogen (mg/kg)	470	640	<200	240	1130
Organic / Inorganic Carbon Fraction Organic Carbon	0.0066	0.0098	0.0058	0.0088	0.0077
Total Organic Carbon (%)	0.66	0.98	0.58	0.88	0.77
Metals Aluminum (Al) (mg/kg)	14000	20900	5800	7950	11100
Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As) (mg/kg)	2.1	3.4	1.4	1.8	3.4
Barium (Ba) (mg/kg)	80.1	104	22.5	31.9	39.7
Beryllium (Be) (mg/kg)	<0.50	0.66	<0.50	<0.50	<0.50
Bismuth (Bi) (mg/kg)	<1.0	1.3	<1.0	<1.0	1.1
Boron (B) (mg/kg)	13.6	19.0	7.1	7.2	8.1
Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	<0.50
Calcium (Ca) (mg/kg)	34200	64200	5170	6180	5280
Chromium (Cr) (mg/kg)	44.1	52.5	18.0	24.5	37.5
Cobalt (Co) (mg/kg)	13.7	18.8	5.4	7.7	12.6
Copper (Cu) (mg/kg)	16.0	35.2	5.3	7.0	8.9
Iron (Fe) (mg/kg)	22200	27600	10900	14900	23200
Lead (Pb) (mg/kg)	7.0	9.3	3.2	3.8	4.3
Magnesium (Mg) (mg/kg)	13100	17300	4060	5550	7450
Manganese (Mn) (mg/kg)	496	830	170	378	498
Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	<0.050
Molybdenum (Mo) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel (Ni) (mg/kg)	26.0	36.1	9.8	13.6	21.8
Phosphorus (P) (mg/kg)	651	775	472	464	433
Potassium (K) (mg/kg)	1480	2450	364	460	535
Selenium (Se) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na) (mg/kg)	367	562	152	192	199
Strontium (Sr) (mg/kg)	30.2	53.4	9.5	9.8	9.9
Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Tin (Sn) (mg/kg)	4.7	4.5	3.8	3.8	3.9
Titanium (Ti) (mg/kg)	943	1190	613	753	1110
Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium (V) (mg/kg)	44.2	53.6	21.0	23.7	33.9
Zinc (Zn) (mg/kg)	47.9	62.5	44.0	66.6	112
Zirconium (Zr) (mg/kg)	21.4	31.2	8.2	7.8	10.7

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L836253-16	L836253-17	L836253-18	L836253-19	
	Description	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
	Sampled Date	03-NOV-09	03-NOV-09	03-NOV-09	03-NOV-09	
	Sampled Time					
	Client ID	SC-5	S36	S35	SC-1	
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	35.1	40.2	39.0	38.2	
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	580	1930	390	650	
Organic / Inorganic Carbon	Fraction Organic Carbon	0.0041	0.0114	0.0090	0.0049	
	Total Organic Carbon (%)	0.41	1.14	0.90	0.49	
Metals	Aluminum (Al) (mg/kg)	7690	9660	6700	7470	
	Antimony (Sb) (mg/kg)	<1.0	<1.0	<1.0	<1.0	
	Arsenic (As) (mg/kg)	2.9	2.0	1.2	2.4	
	Barium (Ba) (mg/kg)	26.7	43.1	30.7	28.4	
	Beryllium (Be) (mg/kg)	<0.50	<0.50	<0.50	<0.50	
	Bismuth (Bi) (mg/kg)	<1.0	<1.0	<1.0	<1.0	
	Boron (B) (mg/kg)	6.8	11.9	11.2	6.3	
	Cadmium (Cd) (mg/kg)	<0.50	<0.50	<0.50	<0.50	
	Calcium (Ca) (mg/kg)	3240	41500	59100	3910	
	Chromium (Cr) (mg/kg)	29.3	26.2	19.5	26.2	
	Cobalt (Co) (mg/kg)	8.8	8.8	5.8	7.9	
	Copper (Cu) (mg/kg)	5.4	11.9	8.3	5.2	
	Iron (Fe) (mg/kg)	16900	14800	10100	15600	
	Lead (Pb) (mg/kg)	2.7	6.7	3.8	3.1	
	Magnesium (Mg) (mg/kg)	5060	12600	17300	4790	
	Manganese (Mn) (mg/kg)	318	463	246	317	
	Mercury (Hg) (mg/kg)	<0.050	<0.050	<0.050	<0.050	
	Molybdenum (Mo) (mg/kg)	<1.0	<1.0	<1.0	<1.0	
	Nickel (Ni) (mg/kg)	16.3	15.3	10.6	14.5	
	Phosphorus (P) (mg/kg)	381	445	415	407	
	Potassium (K) (mg/kg)	435	988	754	423	
	Selenium (Se) (mg/kg)	<1.0	<1.0	<1.0	<1.0	
	Silver (Ag) (mg/kg)	<0.20	<0.20	<0.20	<0.20	
	Sodium (Na) (mg/kg)	193	244	225	168	
	Strontium (Sr) (mg/kg)	8.7	28.8	33.3	9.3	
	Thallium (Tl) (mg/kg)	<1.0	<1.0	<1.0	<1.0	
	Tin (Sn) (mg/kg)	4.4	4.5	4.1	4.8	
	Titanium (Ti) (mg/kg)	851	702	569	801	
	Uranium (U) (mg/kg)	<1.0	<1.0	<1.0	<1.0	
	Vanadium (V) (mg/kg)	25.8	26.8	17.9	24.3	
	Zinc (Zn) (mg/kg)	68.3	30.1	22.7	65.7	
	Zirconium (Zr) (mg/kg)	8.2	16.1	10.9	8.4	

Reference Information

Additional Comments for Sample Listed:

Samplenum	Matrix	Report Remarks	Sample Comments

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
AS,SB,SE-3050-MS-WT	Soil	As, Sb and Se by ICP/MS	SW846 3050B/6020A
HG-WT	Soil	Mercury by CVAA	EPA 7471
MET-WT	Soil	Metal Scan (ICP)	EPA 3050/6010B
		Sample is vigorously digested with nitric acid and hydrogen peroxide. Analysis is conducted by ICP/OES.	
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
TKN-WT	Soil	Total Kjeldahl Nitrogen	APHA 4500-N
TOC-WT	Soil	TOC in Solids	CARTER 21.2

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
WT	ALS LABORATORY GROUP - WATERLOO, ONTARIO, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
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.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group Quality Control Report

Workorder: L836253 Report Date: 23-NOV-09 Page 1 of 6

Client: ECOMETRIX INC
6000 Campobello Road
Mississauga ON L5N 2L8

Contact: BRIAN FRASER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
AS,SB,SE-3050-MS-WT	**Soil**							
Batch R1040509								
WG1032079-2 CVS								
Antimony (Sb)			95		%		63-138	09-NOV-09
Arsenic (As)			86		%		63-138	09-NOV-09
Selenium (Se)			99		%		63-138	09-NOV-09
WG1030436-3 DUP		**L836253-1**						
Antimony (Sb)		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	09-NOV-09
Arsenic (As)		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	09-NOV-09
Selenium (Se)		<1.0	<1.0	RPD-NA	mg/kg	N/A	26	09-NOV-09
WG1030436-2 LCS								
Arsenic (As)			87		%		63-138	09-NOV-09
Selenium (Se)			80		%		63-138	09-NOV-09
WG1030436-1 MB								
Antimony (Sb)			<1.0		mg/kg		1	09-NOV-09
Arsenic (As)			<1.0		mg/kg		1	09-NOV-09
Selenium (Se)			<1.0		mg/kg		1	09-NOV-09
HG-WT	**Soil**							
Batch R1036384								
WG1030471-3 DUP		**L836253-3**						
Mercury (Hg)		<0.050	<0.050	RPD-NA	mg/kg	N/A	20	05-NOV-09
WG1030471-2 LCS								
Mercury (Hg)			117		%		70-130	05-NOV-09
WG1030471-1 MB								
Mercury (Hg)			<0.050		mg/kg		0.05	05-NOV-09
MET-WT	**Soil**							
Batch R1040546								
WG1030835-2 CVS								
Aluminum (Al)			116		%		70-130	05-NOV-09
Barium (Ba)			106		%		60-140	05-NOV-09
Beryllium (Be)			99		%		80-120	05-NOV-09
Bismuth (Bi)			84		%		80-120	05-NOV-09
Boron (B)			99		%		80-120	05-NOV-09
Cadmium (Cd)			102		%		80-120	05-NOV-09
Calcium (Ca)			108		%		80-120	05-NOV-09
Chromium (Cr)			104		%		80-120	05-NOV-09
Cobalt (Co)			104		%		80-120	05-NOV-09
Copper (Cu)			105		%		80-120	05-NOV-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R1040546								
WG1030835-2 CVS								
Iron (Fe)			98		%		80-120	05-NOV-09
Lead (Pb)			91		%		80-120	05-NOV-09
Magnesium (Mg)			106		%		80-120	05-NOV-09
Manganese (Mn)			101		%		80-120	05-NOV-09
Molybdenum (Mo)			92		%		80-120	05-NOV-09
Nickel (Ni)			105		%		80-120	05-NOV-09
Phosphorus (P)			99		%		80-120	05-NOV-09
Potassium (K)			90		%		60-140	05-NOV-09
Silver (Ag)			98		%		80-120	05-NOV-09
Sodium (Na)			109		%		60-140	05-NOV-09
Strontium (Sr)			102		%		63-138	05-NOV-09
Thallium (Tl)			105		%		80-120	05-NOV-09
Uranium (U)			94		%		80-120	05-NOV-09
Vanadium (V)			96		%		80-120	05-NOV-09
Zinc (Zn)			105		%		80-120	05-NOV-09
WG1030835-3 CVS								
Tin (Sn)			103		%		80-120	05-NOV-09
Titanium (Ti)			92		%		60-140	05-NOV-09
Zirconium (Zr)			106		%		80-120	05-NOV-09
WG1030436-3 DUP		**L836253-1**						
Aluminum (Al)		6340	5850		mg/kg	8.1	50	05-NOV-09
Barium (Ba)		39.2	35.5		mg/kg	10	50	05-NOV-09
Beryllium (Be)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	05-NOV-09
Bismuth (Bi)		2.0	1.7	J	mg/kg	0.3	4	05-NOV-09
Boron (B)		<5.0	<5.0	RPD-NA	mg/kg	N/A	30	05-NOV-09
Cadmium (Cd)		<0.50	<0.50	RPD-NA	mg/kg	N/A	30	05-NOV-09
Calcium (Ca)		3400	3300		mg/kg	3.1	30	05-NOV-09
Chromium (Cr)		23.5	24.9		mg/kg	5.7	30	05-NOV-09
Cobalt (Co)		7.5	7.6	J	mg/kg	0.1	4	05-NOV-09
Copper (Cu)		16.7	15.2		mg/kg	9.1	30	05-NOV-09
Iron (Fe)		31800	32100		mg/kg	0.81	30	05-NOV-09
Lead (Pb)		4.4	4.2	J	mg/kg	0.2	4	05-NOV-09
Magnesium (Mg)		2610	2610		mg/kg	0.16	30	05-NOV-09
Manganese (Mn)		309	312		mg/kg	1.2	30	05-NOV-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R1040546								
WG1030436-3 DUP		**L836253-1**						
Molybdenum (Mo)		1.3	1.4	J	mg/kg	0.1	4	05-NOV-09
Nickel (Ni)		12.0	12.5		mg/kg	3.5	30	05-NOV-09
Phosphorus (P)		1020	995		mg/kg	2.5	30	05-NOV-09
Potassium (K)		313	297		mg/kg	5.1	50	05-NOV-09
Silver (Ag)		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	05-NOV-09
Strontium (Sr)		9.9	9.6	J	mg/kg	0.3	4	05-NOV-09
Thallium (Tl)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	05-NOV-09
Tin (Sn)		3.8	4.3	J	mg/kg	0.5	4	05-NOV-09
Titanium (Ti)		941	906		mg/kg	3.8	50	05-NOV-09
Uranium (U)		<1.0	<1.0	RPD-NA	mg/kg	N/A	30	05-NOV-09
Vanadium (V)		33.7	37.9		mg/kg	12	30	05-NOV-09
Zinc (Zn)		48.8	46.7		mg/kg	4.4	30	05-NOV-09
Zirconium (Zr)		10.7	10.7		mg/kg	0.68	30	05-NOV-09
WG1030436-2 LCS								
Aluminum (Al)			107		%		70-130	05-NOV-09
Barium (Ba)			113		%		80-120	05-NOV-09
Beryllium (Be)			103		%		80-120	05-NOV-09
Bismuth (Bi)			103		%		80-120	05-NOV-09
Cadmium (Cd)			106		%		80-120	05-NOV-09
Calcium (Ca)			106		%		80-120	05-NOV-09
Chromium (Cr)			104		%		80-120	05-NOV-09
Cobalt (Co)			106		%		80-120	05-NOV-09
Copper (Cu)			109		%		80-120	05-NOV-09
Iron (Fe)			101		%		80-120	05-NOV-09
Lead (Pb)			106		%		80-120	05-NOV-09
Magnesium (Mg)			110		%		80-120	05-NOV-09
Manganese (Mn)			107		%		80-120	05-NOV-09
Nickel (Ni)			107		%		80-120	05-NOV-09
Phosphorus (P)			102		%		80-120	05-NOV-09
Potassium (K)			93		%		60-140	05-NOV-09
Sodium (Na)			106		%		60-140	05-NOV-09
Strontium (Sr)			103		%		63-138	05-NOV-09
Thallium (Tl)			105		%		80-120	05-NOV-09
Uranium (U)			99		%		80-120	05-NOV-09

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-WT	**Soil**							
Batch R1040546								
WG1030436-2 LCS								
Vanadium (V)			103		%		80-120	05-NOV-09
Zinc (Zn)			115		%		80-120	05-NOV-09
WG1030436-1 MB								
Aluminum (Al)			<5.0		mg/kg		5	05-NOV-09
Barium (Ba)			<1.0		mg/kg		1	05-NOV-09
Beryllium (Be)			<0.50		mg/kg		0.5	05-NOV-09
Bismuth (Bi)			<1.0		mg/kg		1	05-NOV-09
Boron (B)			<5.0		mg/kg		5	05-NOV-09
Cadmium (Cd)			<0.50		mg/kg		0.5	05-NOV-09
Calcium (Ca)			<20		mg/kg		20	05-NOV-09
Chromium (Cr)			<1.0		mg/kg		1	05-NOV-09
Cobalt (Co)			<1.0		mg/kg		1	05-NOV-09
Copper (Cu)			<1.0		mg/kg		1	05-NOV-09
Iron (Fe)			<5.0		mg/kg		5	05-NOV-09
Lead (Pb)			<1.0		mg/kg		1	05-NOV-09
Magnesium (Mg)			<20		mg/kg		20	05-NOV-09
Manganese (Mn)			<1.0		mg/kg		1	05-NOV-09
Molybdenum (Mo)			<1.0		mg/kg		1	05-NOV-09
Nickel (Ni)			<1.0		mg/kg		1	05-NOV-09
Phosphorus (P)			<10		mg/kg		10	05-NOV-09
Potassium (K)			<10		mg/kg		10	05-NOV-09
Silver (Ag)			<0.20		mg/kg		0.2	05-NOV-09
Sodium (Na)			<20		mg/kg		20	05-NOV-09
Strontium (Sr)			<1.0		mg/kg		1	05-NOV-09
Thallium (Tl)			<1.0		mg/kg		1	05-NOV-09
Tin (Sn)			<1.0		mg/kg		1	05-NOV-09
Titanium (Ti)			<5.0		mg/kg		5	05-NOV-09
Uranium (U)			<1.0		mg/kg		1	05-NOV-09
Vanadium (V)			<1.0		mg/kg		1	05-NOV-09
Zinc (Zn)			<1.0		mg/kg		1	05-NOV-09
Zirconium (Zr)			<1.0		mg/kg		1	05-NOV-09
MOISTURE-WT	**Soil**							

ALS Laboratory Group Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT	**Soil**							
Batch R1030172								
WG1029510-3 DUP		**L836253-19**						
% Moisture		38.2	39.9		%	4.2	26	03-NOV-09
WG1029510-2 LCS								
% Moisture			103		%		79-120	03-NOV-09
WG1029510-1 MB								
% Moisture			<0.10		%		0.1	03-NOV-09
TKN-WT	**Soil**							
Batch R1040802								
WG1032171-2 CVS								
Total Kjeldahl Nitrogen			98		%		80-120	09-NOV-09
WG1031576-4 DUP		**L836253-11**						
Total Kjeldahl Nitrogen		470	540	J	mg/kg	70	800	09-NOV-09
WG1031576-2 LCS								
Total Kjeldahl Nitrogen			86		%		70-130	09-NOV-09
WG1031576-1 MB								
Total Kjeldahl Nitrogen			<200		mg/kg		200	09-NOV-09
TOC-WT	**Soil**							
Batch R1039968								
WG1031546-4 DUP		**L836253-13**						
Total Organic Carbon		0.58	0.56	J	%	0.03	0.4	06-NOV-09
Fraction Organic Carbon		N/A	0.0056	J		0.0003	0.004	06-NOV-09
WG1031546-2 LCS								
Total Organic Carbon			97		%		63-138	06-NOV-09
WG1031546-1 MB								
Total Organic Carbon			<0.10		%		0.1	06-NOV-09
Fraction Organic Carbon			<0.0010				0.001	06-NOV-09

ALS Laboratory Group Quality Control Report

Legend:

Limit	99% Confidence Interval (Laboratory Control Limits)
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
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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.

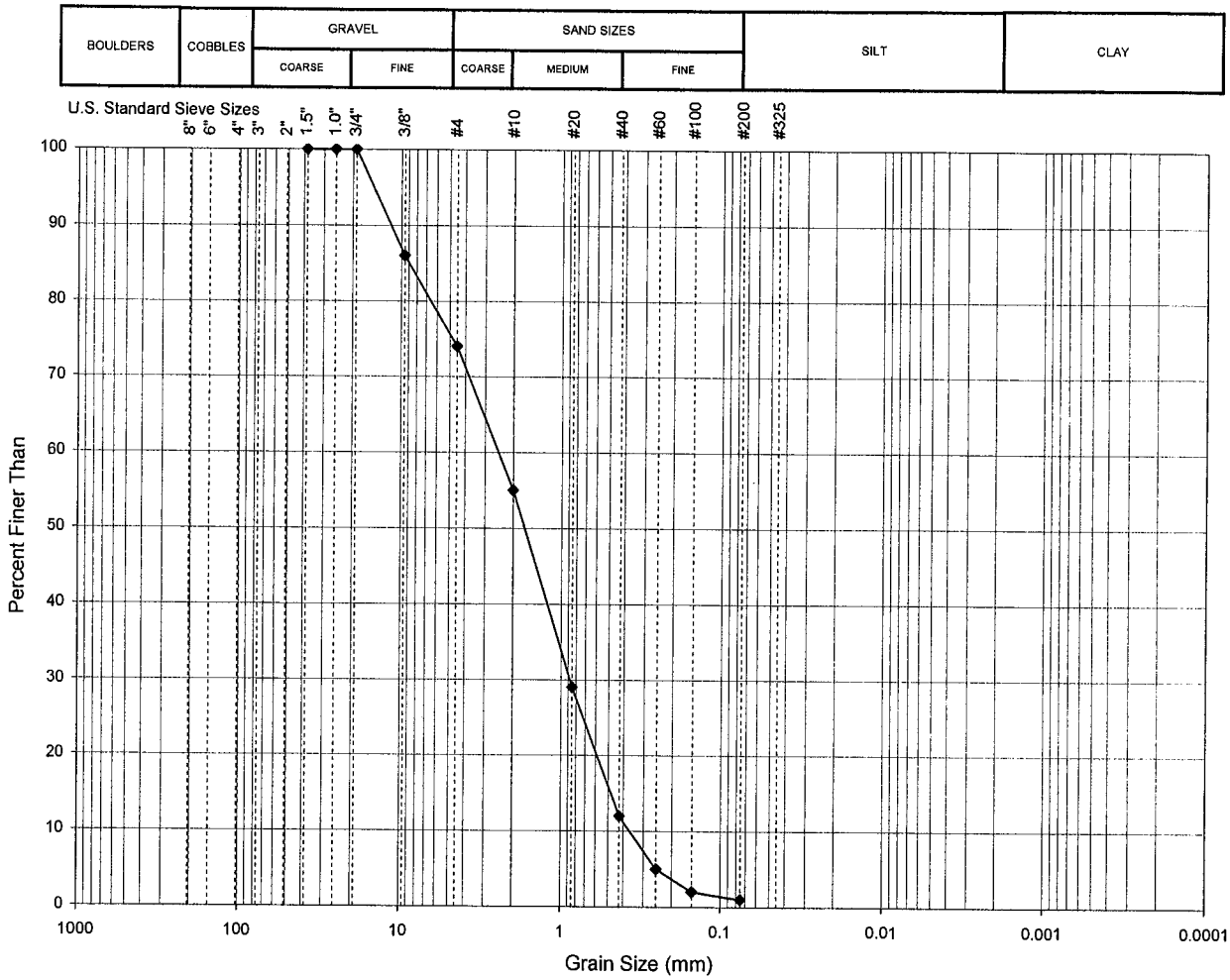
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S41
Sample Depth:	
Lab ID Number:	L836253-1
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
GRAVELLY SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	26 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	73 %
ESTIMATED HAZEN NUMBER: 1.53E-01 cm/s	WITH	11 - 20 %	SILT + CLAY	1 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S41
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-1	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.550	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	14.000	14.000	9.500	14.000	86.000
NO. 4 SIEVE :	12.000	12.000	4.500	26.000	74.000
NO. 10 SIEVE :	19.000	19.000	2.000	45.000	55.000
NO. 20 SIEVE :	26.000	26.000	0.850	71.000	29.000
NO. 40 SIEVE :	17.000	17.000	0.425	88.000	12.000
NO. 60 SIEVE :	7.000	7.000	0.250	95.000	5.000
NO. 100 SIEVE:	3.000	3.000	0.150	98.000	2.000
NO. 200 SIEVE:	1.000	1.000	0.075	99.000	1.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	26.00	> 4.5
% COARSE SAND :	19.00	2.0 - 4.5
% MEDIUM SAND :	43.00	0.425 - 2.0
% FINE SAND :	11.00	0.075 - 0.425
% SILT & CLAY :	1.00	< 0.075

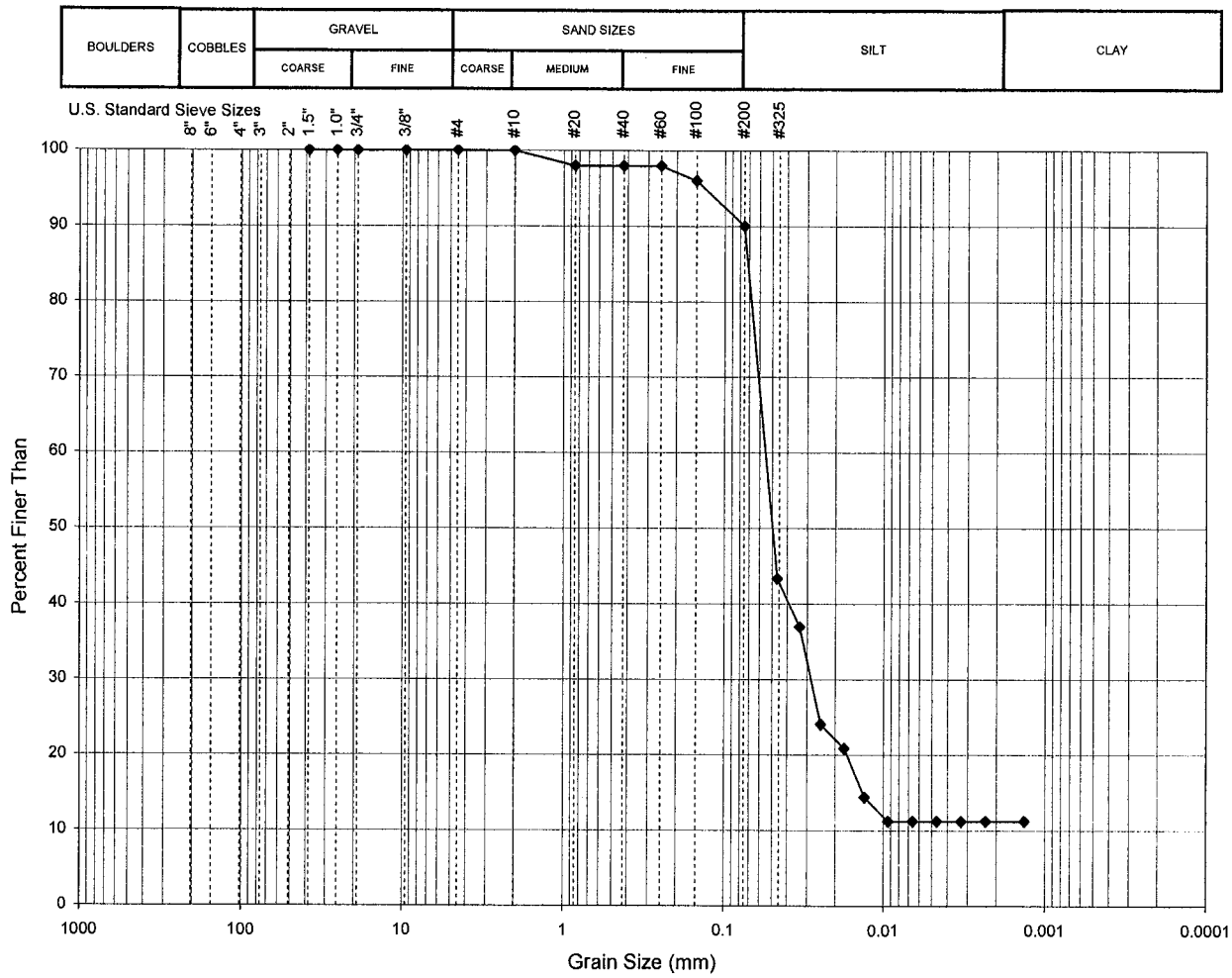
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S15
Sample Depth:	
Lab ID Number:	L836253-2
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT WITH CLAY, TRACE SAND	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	10 %
ESTIMATED HAZEN NUMBER: 6.76E-05 cm/s	WITH	11 - 20 %	SILT + CLAY	90 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S15
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-2	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	0.000	0.000	0.425	2.000	98.000
NO. 60 SIEVE :	0.000	0.000	0.250	2.000	98.000
NO. 100 SIEVE:	1.000	2.000	0.150	4.000	96.000
NO. 200 SIEVE:	3.000	6.000	0.075	10.000	90.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	16.0	22.0	0.046	43.331	43.331
2.00	14.0	22.0	0.033	36.907	36.907
4.00	10.0	22.0	0.025	24.059	24.059
8.00	9.0	22.0	0.018	20.847	20.847
15.00	7.0	22.0	0.013	14.422	14.422
30.00	6.0	22.0	0.009	11.210	11.210
60.00	6.0	22.0	0.007	11.210	11.210
120.00	6.0	22.0	0.005	11.210	11.210
240.00	6.0	22.0	0.003	11.210	11.210
480.00	6.0	22.0	0.002	11.210	11.210
1440.00	6.0	22.0	0.001	11.210	11.210

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	2.00	0.425 - 2.0
% FINE SAND :	8.00	0.075 - 0.425
% SILT :	78.79	0.075 - 0.002
% CLAY :	11.21	< 0.002
% CLAY :	11.21	< 0.005

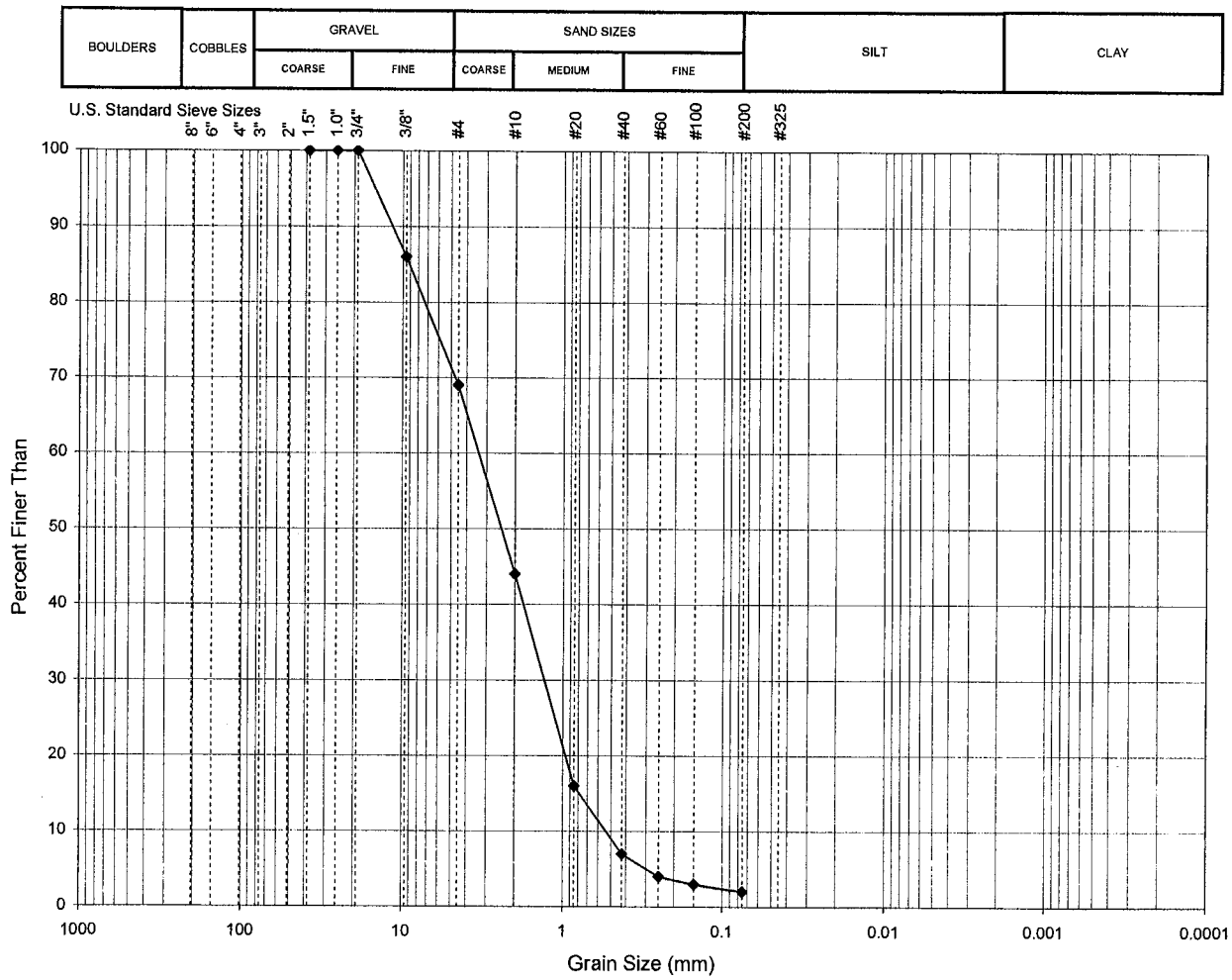
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S12
Sample Depth:	
Lab ID Number:	L836253-3
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
GRAVELLY SAND , TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	31 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	67 %
ESTIMATED HAZEN NUMBER: 2.87E-01 cm/s	WITH	11 - 20 %	SILT + CLAY	2 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S12
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-3	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.440	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	14.000	14.000	9.500	14.000	86.000
NO. 4 SIEVE :	17.000	17.000	4.500	31.000	69.000
NO. 10 SIEVE :	25.000	25.000	2.000	56.000	44.000
NO. 20 SIEVE :	28.000	28.000	0.850	84.000	16.000
NO. 40 SIEVE :	9.000	9.000	0.425	93.000	7.000
NO. 60 SIEVE :	3.000	3.000	0.250	96.000	4.000
NO. 100 SIEVE:	1.000	1.000	0.150	97.000	3.000
NO. 200 SIEVE:	1.000	1.000	0.075	98.000	2.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	31.00	> 4.5
% COARSE SAND :	25.00	2.0 - 4.5
% MEDIUM SAND :	37.00	0.425 - 2.0
% FINE SAND :	5.00	0.075 - 0.425
% SILT & CLAY :	2.00	< 0.075

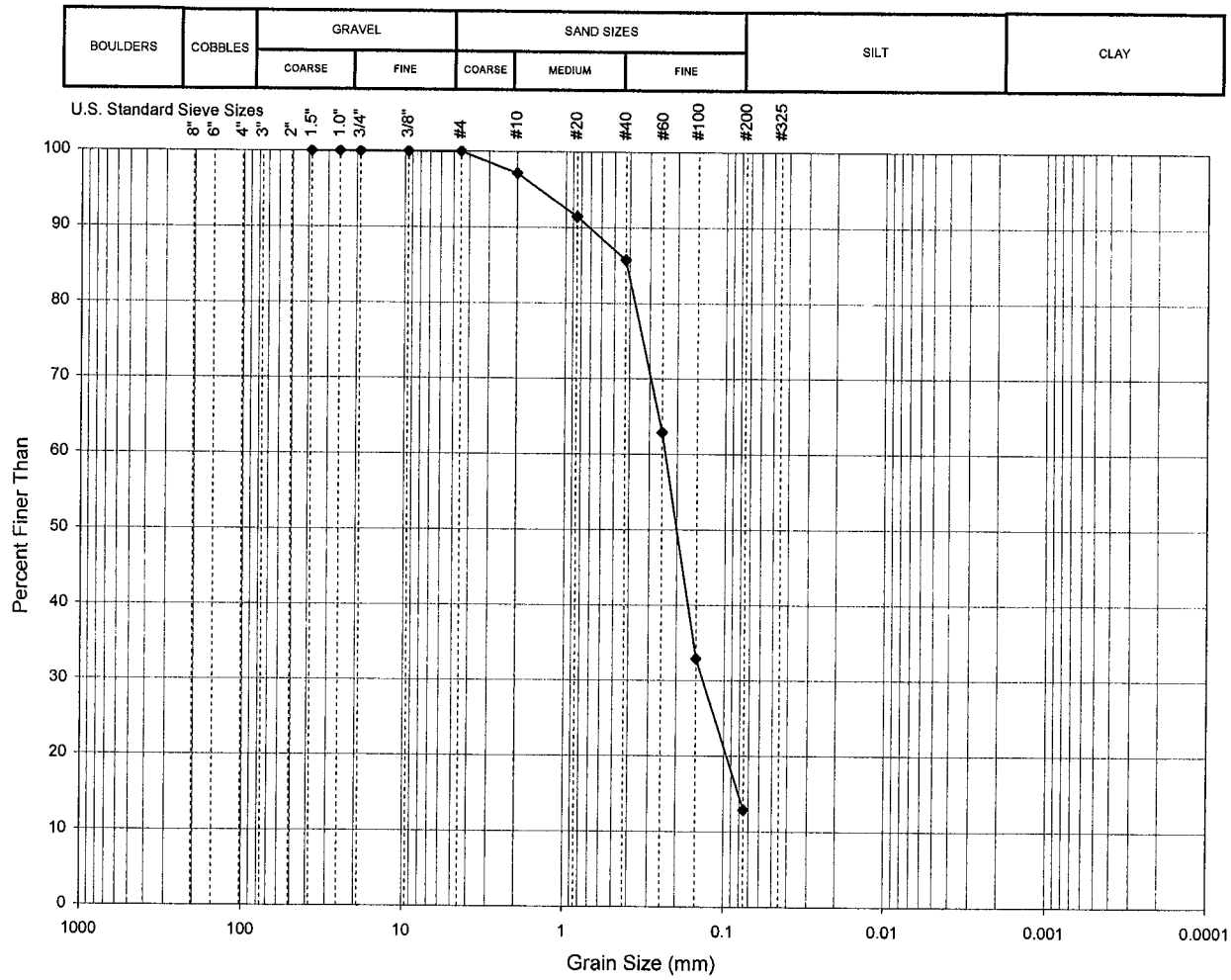
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S31-1
Sample Depth:	
Lab ID Number:	L836253-4
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND WITH SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	87 %
ESTIMATED HAZEN NUMBER: 4.61E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	13 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S31-1
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-4	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	70	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.971	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	2.000	2.857	2.000	2.857	97.143
NO. 20 SIEVE :	4.000	5.714	0.850	8.571	91.429
NO. 40 SIEVE :	4.000	5.714	0.425	14.286	85.714
NO. 60 SIEVE :	16.000	22.857	0.250	37.143	62.857
NO. 100 SIEVE:	21.000	30.000	0.150	67.143	32.857
NO. 200 SIEVE:	14.000	20.000	0.075	87.143	12.857

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

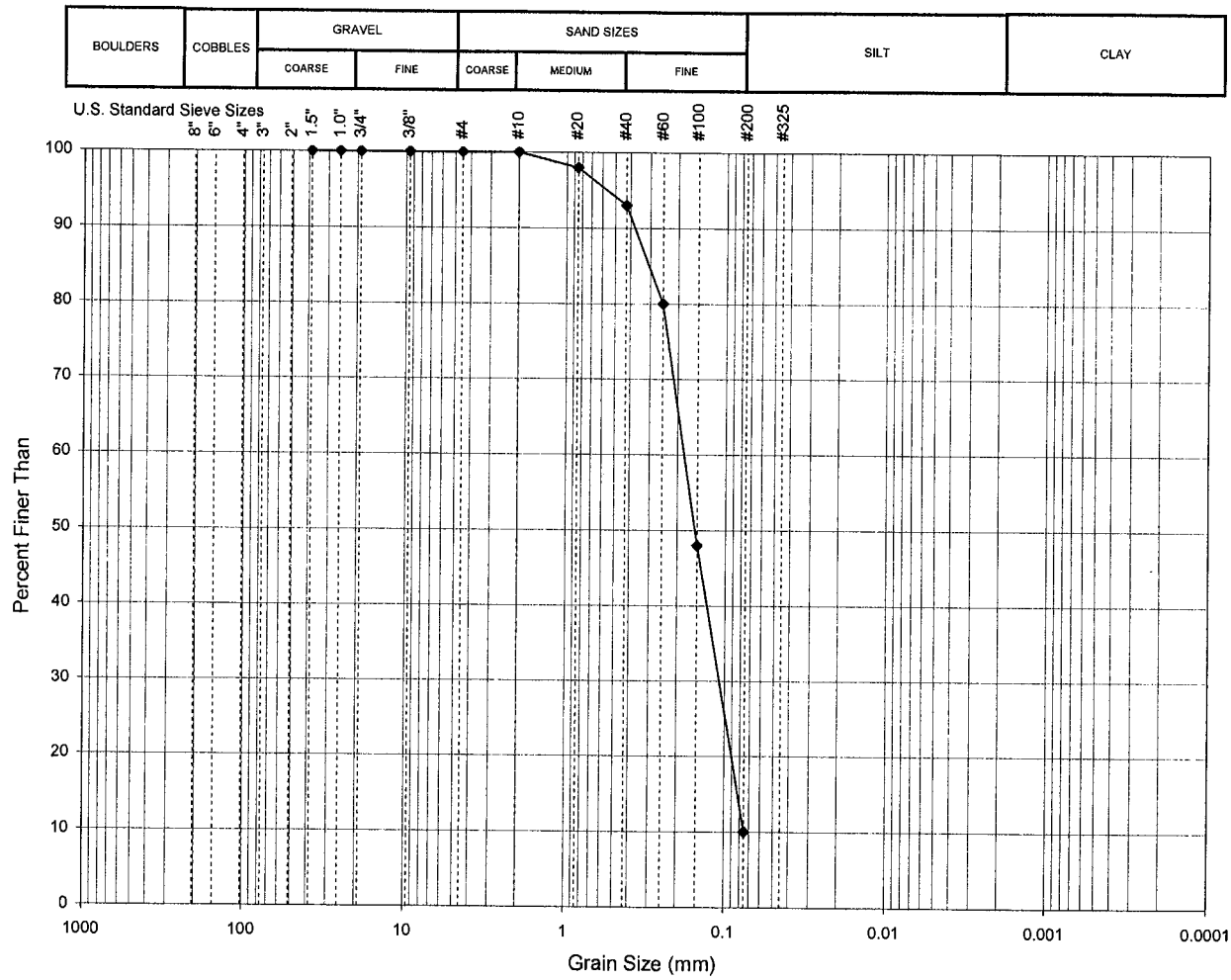
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	2.86	2.0 - 4.5
% MEDIUM SAND :	11.43	0.425 - 2.0
% FINE SAND :	72.86	0.075 - 0.425
% SILT & CLAY :	12.86	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S31-2
Sample Depth:	
Lab ID Number:	L836253-5
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT_CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	90 %
ESTIMATED HAZEN NUMBER: 5.63E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	10 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S31-2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-5	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100 grams	Specific Gravity:	2.650
Hydro. Sample Weight	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	2.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	5.000	5.000	0.425	7.000	93.000
NO. 60 SIEVE :	13.000	13.000	0.250	20.000	80.000
NO. 100 SIEVE:	32.000	32.000	0.150	52.000	48.000
NO. 200 SIEVE:	38.000	38.000	0.075	90.000	10.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

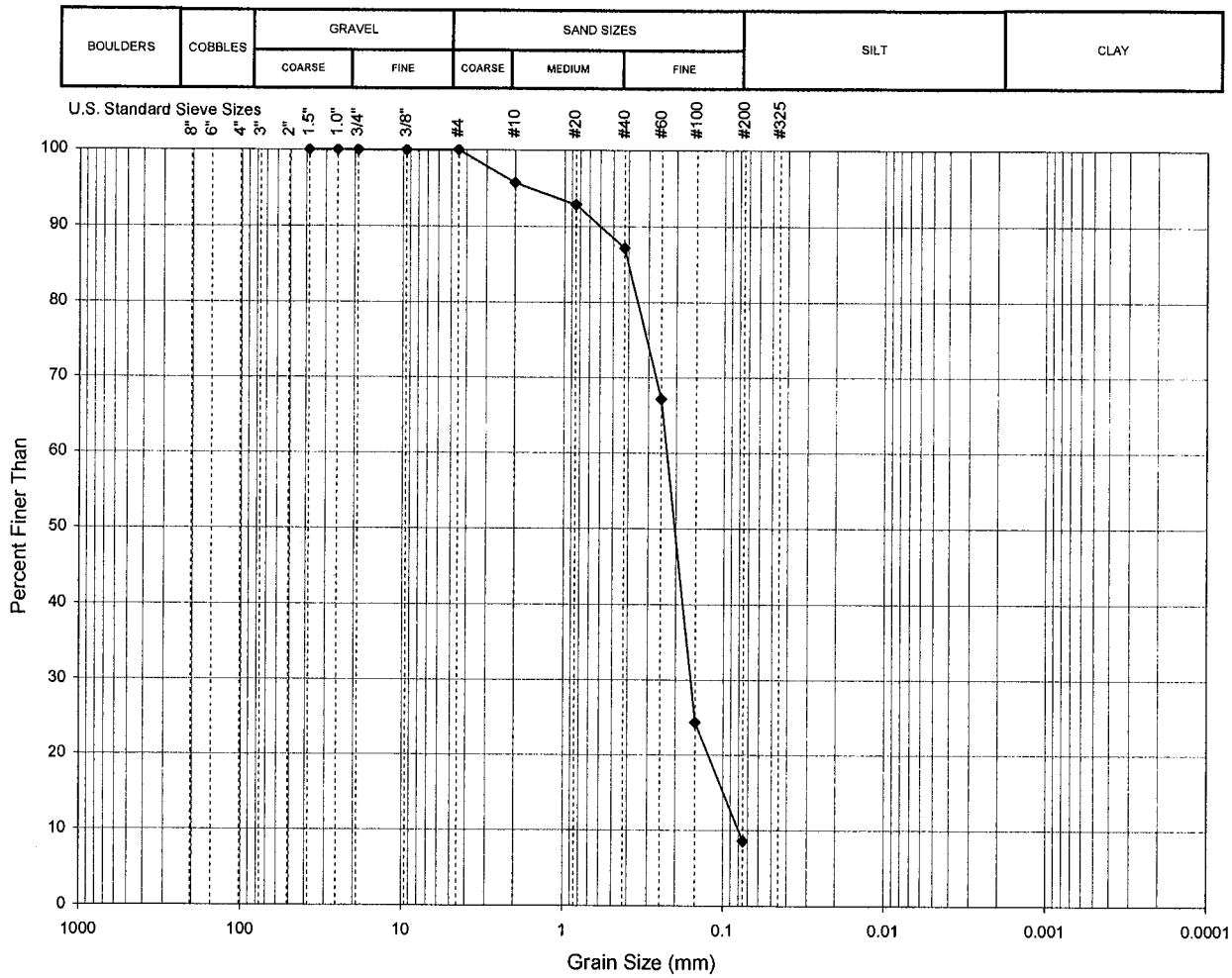
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	7.00	0.425 - 2.0
% FINE SAND :	83.00	0.075 - 0.425
% SILT & CLAY :	10.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S31-3
Sample Depth:	
Lab ID Number:	L836253-6
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	91 %
ESTIMATED HAZEN NUMBER: 6.38E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	9 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S31-3
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-6	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	70 grams	Specific Gravity:	2.650
Hydro. Sample Weight	grams	Liquid Specific Gravity:	1.000
% Past #10	0.957 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	3.000	4.286	2.000	4.286	95.714
NO. 20 SIEVE :	2.000	2.857	0.850	7.143	92.857
NO. 40 SIEVE :	4.000	5.714	0.425	12.857	87.143
NO. 60 SIEVE :	14.000	20.000	0.250	32.857	67.143
NO. 100 SIEVE:	30.000	42.857	0.150	75.714	24.286
NO. 200 SIEVE:	11.000	15.714	0.075	91.429	8.571

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	4.29	2.0 - 4.5
% MEDIUM SAND :	8.57	0.425 - 2.0
% FINE SAND :	78.57	0.075 - 0.425
% SILT & CLAY :	8.57	< 0.075

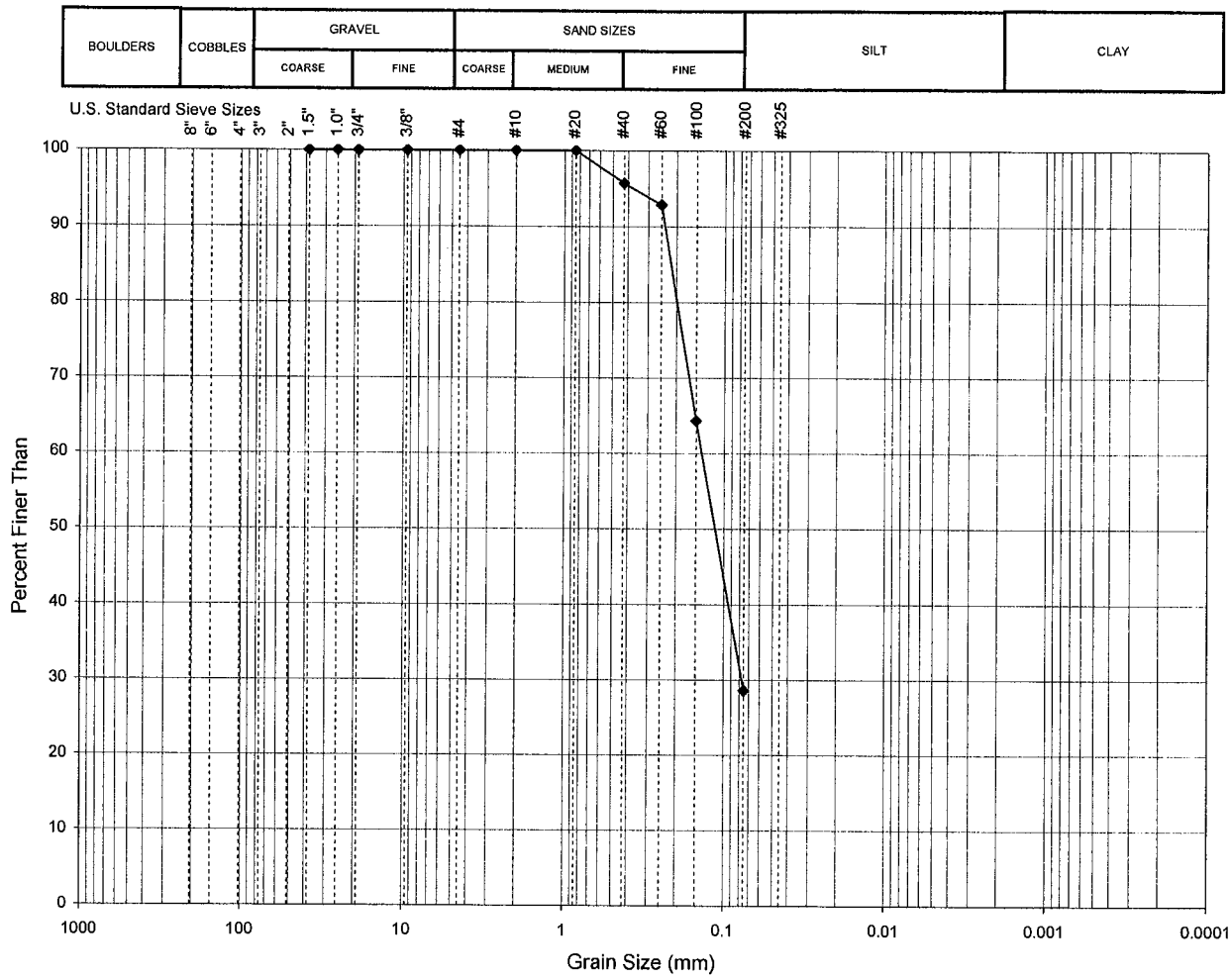
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S31-4
Sample Depth:	
Lab ID Number:	L836253-7
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILTY CLAYEY SAND	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	71 %
ESTIMATED HAZEN NUMBER: 2.74E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	29 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S31-4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-7	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	70	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	3.000	4.286	0.425	4.286	95.714
NO. 60 SIEVE :	2.000	2.857	0.250	7.143	92.857
NO. 100 SIEVE:	20.000	28.571	0.150	35.714	64.286
NO. 200 SIEVE:	25.000	35.714	0.075	71.429	28.571

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

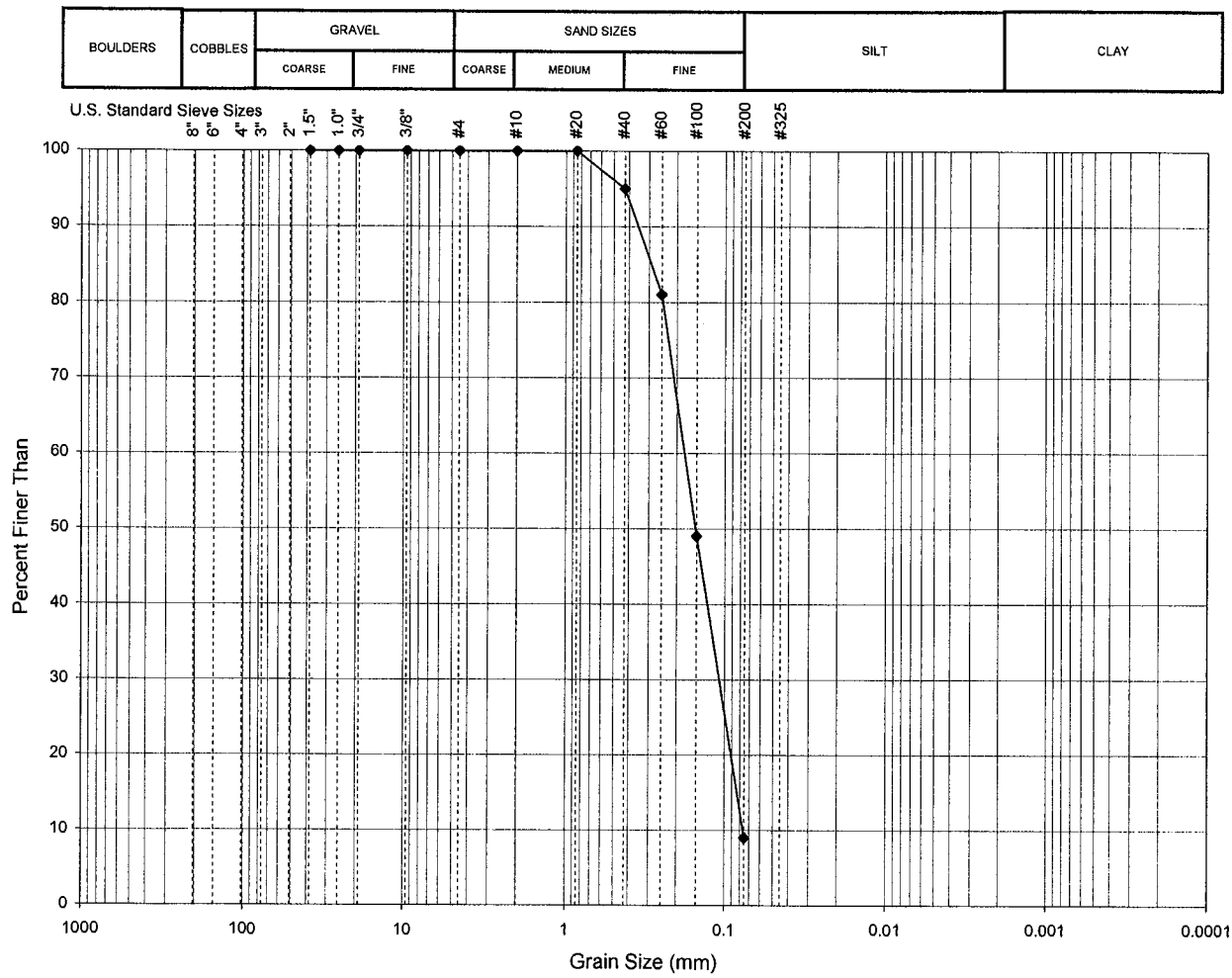
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	4.29	0.425 - 2.0
% FINE SAND :	67.14	0.075 - 0.425
% SILT & CLAY :	28.57	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S31-5
Sample Depth:	
Lab ID Number:	L836253-8
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	91 %
ESTIMATED HAZEN NUMBER: 5.28E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	9 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S31-5
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-8	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100 grams	Specific Gravity:	2.650
Hydro. Sample Weight	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	5.000	5.000	0.425	5.000	95.000
NO. 60 SIEVE :	14.000	14.000	0.250	19.000	81.000
NO. 100 SIEVE:	32.000	32.000	0.150	51.000	49.000
NO. 200 SIEVE:	40.000	40.000	0.075	91.000	9.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	5.00	0.425 - 2.0
% FINE SAND :	86.00	0.075 - 0.425
% SILT & CLAY :	9.00	< 0.075

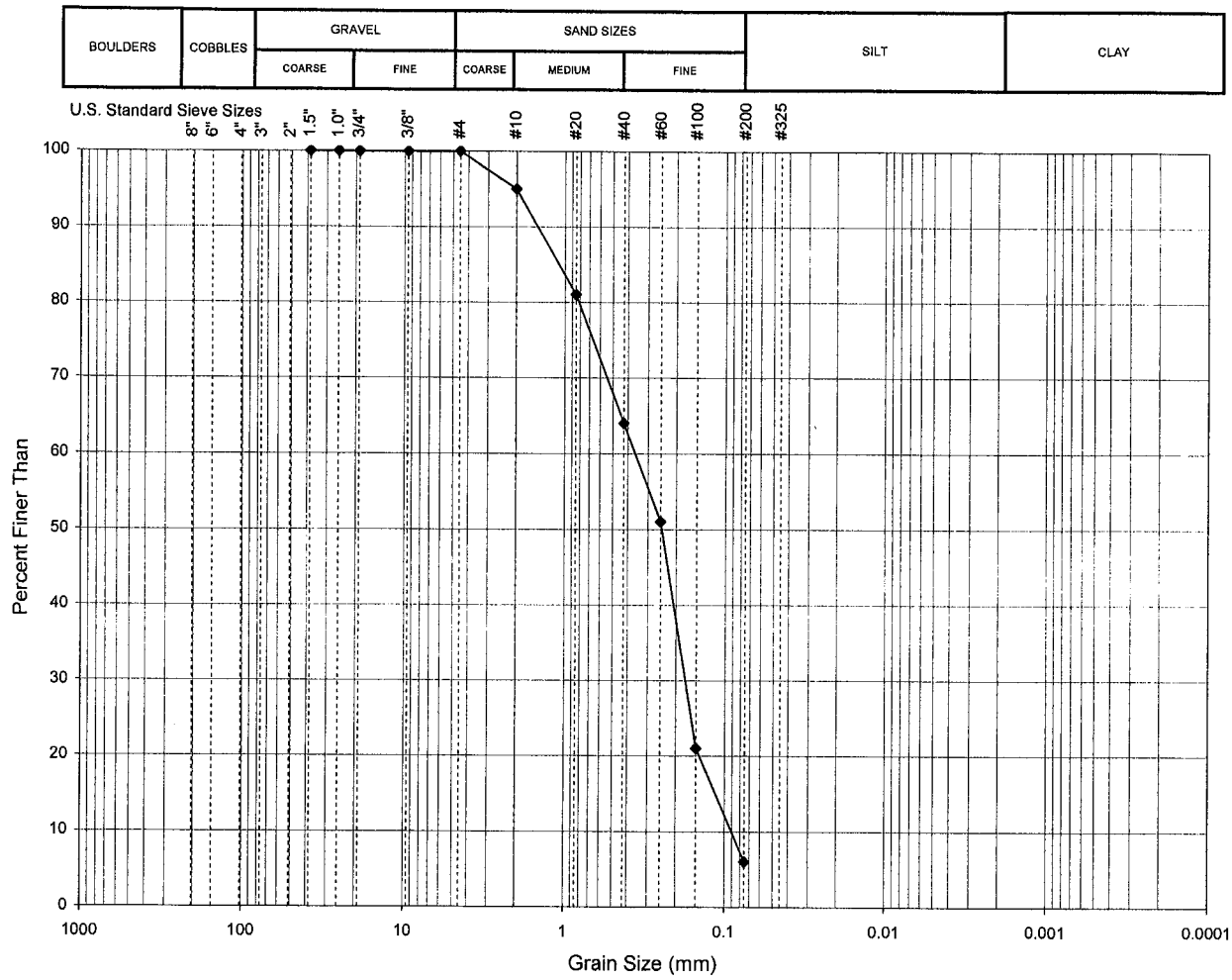
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S24
Sample Depth:	
Lab ID Number:	L836253-9
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	94 %
ESTIMATED HAZEN NUMBER: 8.14E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	6 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S24
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-9	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.950	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	5.000	5.000	2.000	5.000	95.000
NO. 20 SIEVE :	14.000	14.000	0.850	19.000	81.000
NO. 40 SIEVE :	17.000	17.000	0.425	36.000	64.000
NO. 60 SIEVE :	13.000	13.000	0.250	49.000	51.000
NO. 100 SIEVE:	30.000	30.000	0.150	79.000	21.000
NO. 200 SIEVE:	15.000	15.000	0.075	94.000	6.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

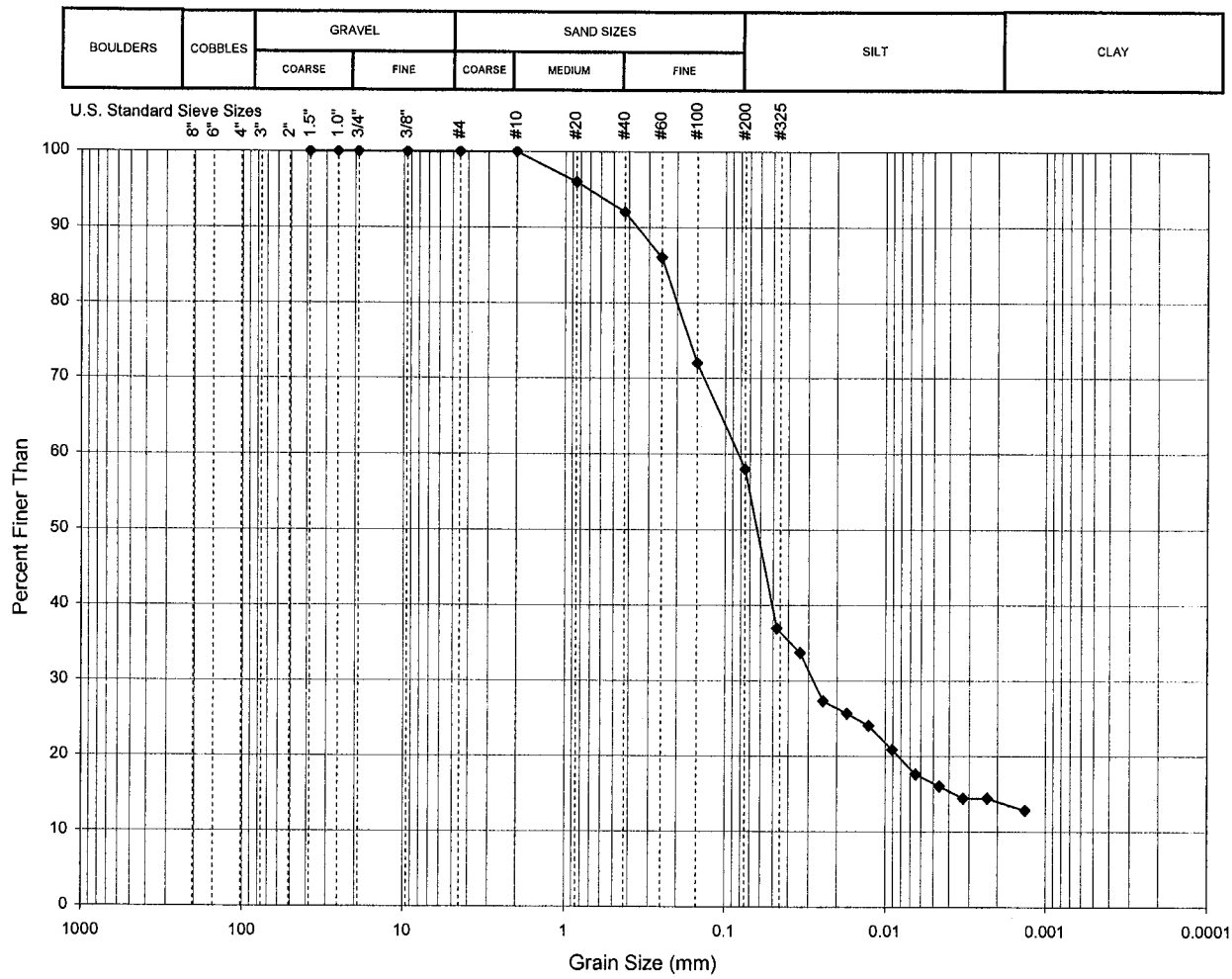
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	5.00	2.0 - 4.5
% MEDIUM SAND :	31.00	0.425 - 2.0
% FINE SAND :	58.00	0.075 - 0.425
% SILT & CLAY :	6.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S34
Sample Depth:	
Lab ID Number:	L836253-10
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT AND SAND WITH CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	42 %
ESTIMATED HAZEN NUMBER: 2.67E-07 cm/s	WITH	11 - 20 %	SILT + CLAY	58 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S34
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-10	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	50	grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000	grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	2.000	4.000	0.850	4.000	96.000
NO. 40 SIEVE :	2.000	4.000	0.425	8.000	92.000
NO. 60 SIEVE :	3.000	6.000	0.250	14.000	86.000
NO. 100 SIEVE:	7.000	14.000	0.150	28.000	72.000
NO. 200 SIEVE:	7.000	14.000	0.075	42.000	58.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	14.0	22.0	0.047	36.907	36.907
2.00	13.0	22.0	0.034	33.695	33.695
4.00	11.0	22.0	0.024	27.271	27.271
8.00	10.5	22.0	0.017	25.665	25.665
15.00	10.0	22.0	0.013	24.059	24.059
30.00	9.0	22.0	0.009	20.847	20.847
60.00	8.0	22.0	0.006	17.635	17.635
120.00	7.5	22.0	0.005	16.028	16.028
240.00	7.0	22.0	0.003	14.422	14.422
480.00	7.0	22.0	0.002	14.422	14.422
1440.00	6.5	22.0	0.001	12.816	12.816

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	8.00	0.425 - 2.0
% FINE SAND :	34.00	0.075 - 0.425
% SILT :	44.01	0.075 - 0.002
% CLAY :	13.99	< 0.002
% CLAY :	16.41	< 0.005

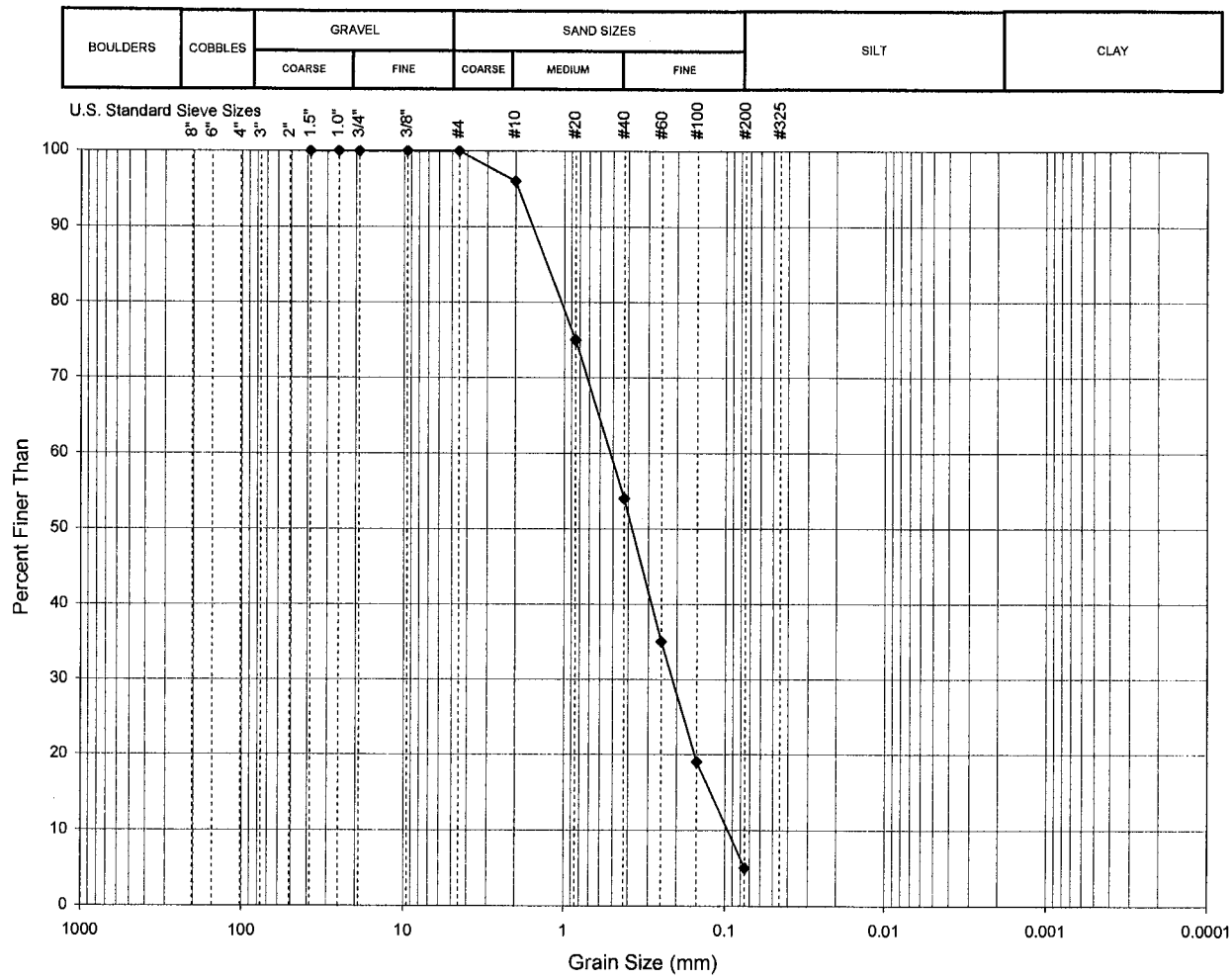
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S33
Sample Depth:	
Lab ID Number:	L836253-11
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	95 %
ESTIMATED HAZEN NUMBER: 9.23E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	5 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S33
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-11	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.960	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	4.000	4.000	2.000	4.000	96.000
NO. 20 SIEVE :	21.000	21.000	0.850	25.000	75.000
NO. 40 SIEVE :	21.000	21.000	0.425	46.000	54.000
NO. 60 SIEVE :	19.000	19.000	0.250	65.000	35.000
NO. 100 SIEVE:	16.000	16.000	0.150	81.000	19.000
NO. 200 SIEVE:	14.000	14.000	0.075	95.000	5.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

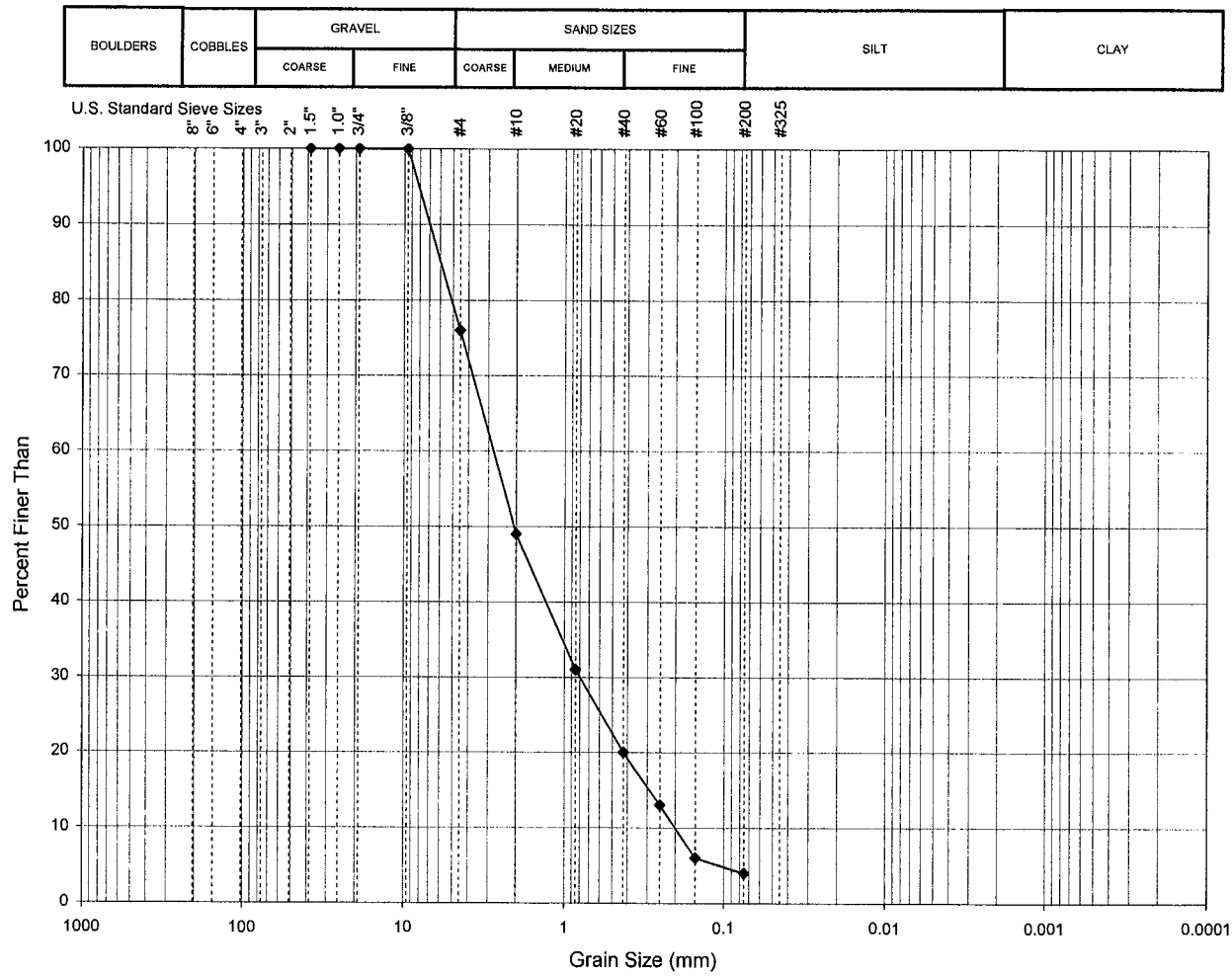
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	4.00	2.0 - 4.5
% MEDIUM SAND :	42.00	0.425 - 2.0
% FINE SAND :	49.00	0.075 - 0.425
% SILT & CLAY :	5.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S32
Sample Depth:	
Lab ID Number:	L836253-12
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
GRAVELLY SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	24 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	72 %
ESTIMATED HAZEN NUMBER: 3.97E-02 cm/s	WITH	11 - 20 %	SILT + CLAY	4 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S32
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-12	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.490	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	24.000	24.000	4.500	24.000	76.000
NO. 10 SIEVE :	27.000	27.000	2.000	51.000	49.000
NO. 20 SIEVE :	18.000	18.000	0.850	69.000	31.000
NO. 40 SIEVE :	11.000	11.000	0.425	80.000	20.000
NO. 60 SIEVE :	7.000	7.000	0.250	87.000	13.000
NO. 100 SIEVE:	7.000	7.000	0.150	94.000	6.000
NO. 200 SIEVE:	2.000	2.000	0.075	96.000	4.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

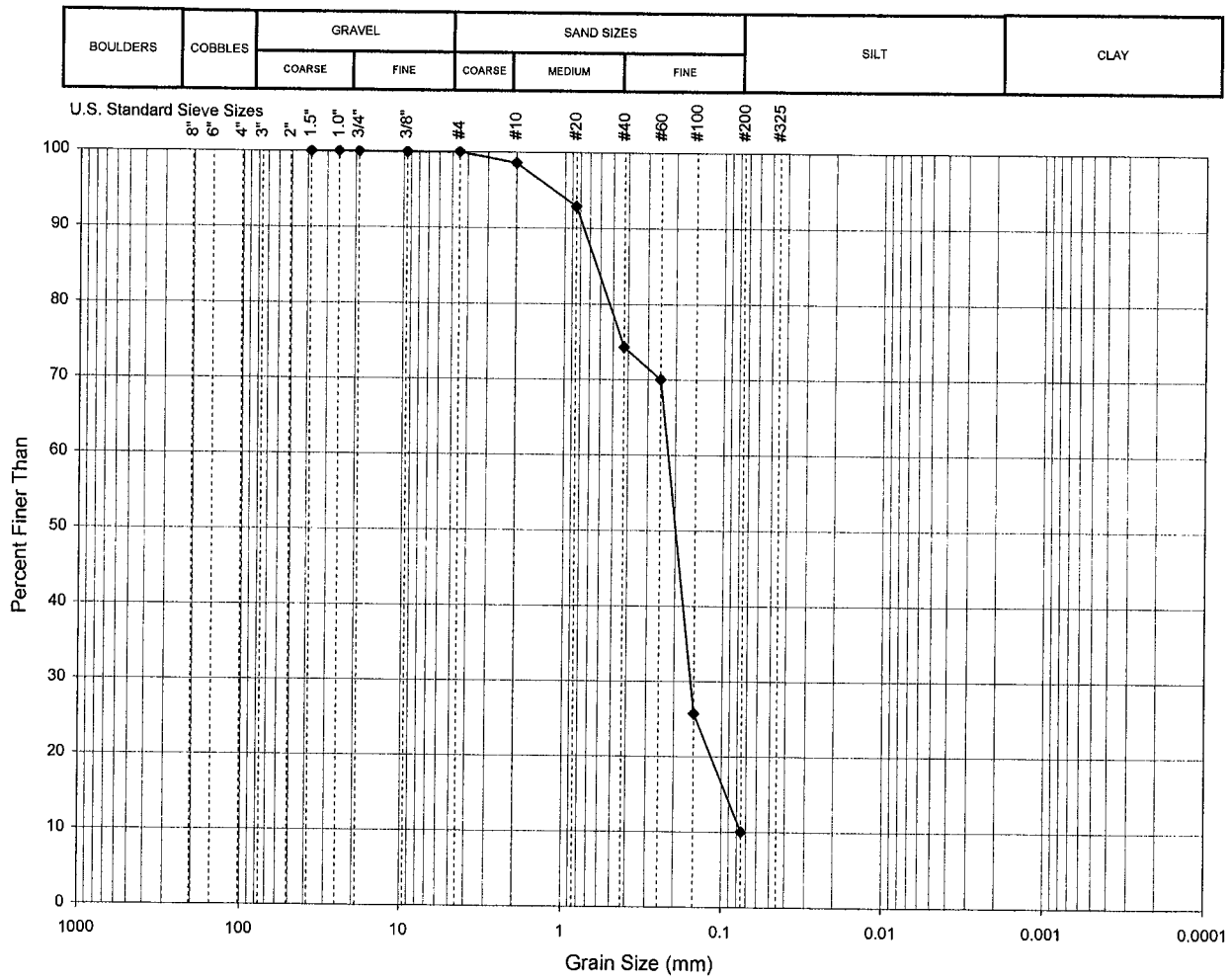
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	24.00	> 4.5
% COARSE SAND :	27.00	2.0 - 4.5
% MEDIUM SAND :	29.00	0.425 - 2.0
% FINE SAND :	16.00	0.075 - 0.425
% SILT & CLAY :	4.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	SC-2
Sample Depth:	
Lab ID Number:	L836253-13
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	90 %
ESTIMATED HAZEN NUMBER: 5.62E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	10 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	SC-2
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-13	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	70	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.986	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	1.000	1.429	2.000	1.429	98.571
NO. 20 SIEVE :	4.000	5.714	0.850	7.143	92.857
NO. 40 SIEVE :	13.000	18.571	0.425	25.714	74.286
NO. 60 SIEVE :	3.000	4.286	0.250	30.000	70.000
NO. 100 SIEVE:	31.000	44.286	0.150	74.286	25.714
NO. 200 SIEVE:	11.000	15.714	0.075	90.000	10.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

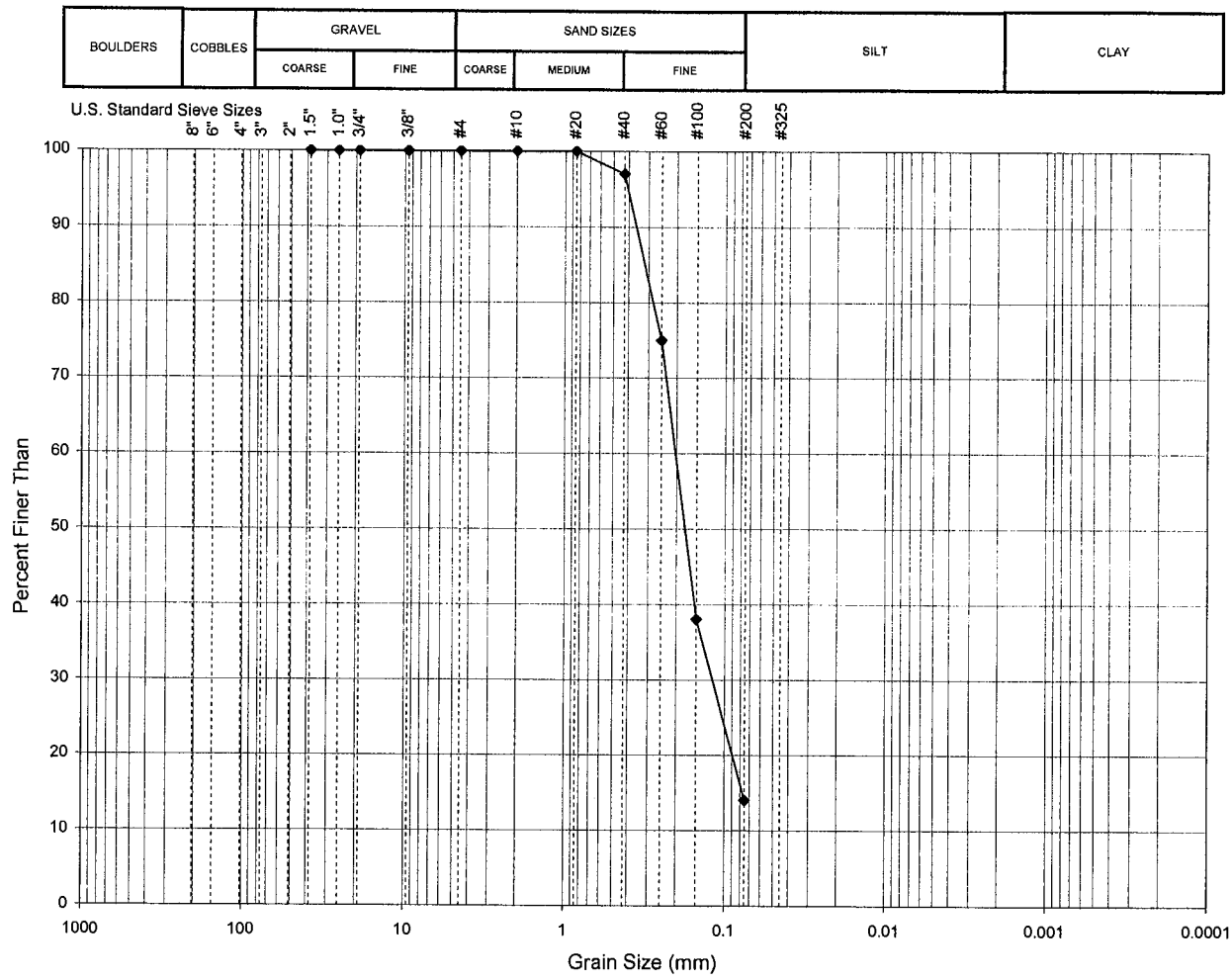
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	1.43	2.0 - 4.5
% MEDIUM SAND :	24.29	0.425 - 2.0
% FINE SAND :	64.29	0.075 - 0.425
% SILT & CLAY :	10.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	SC-3
Sample Depth:	
Lab ID Number:	L836253-14
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND WITH SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	86 %
ESTIMATED HAZEN NUMBER: 4.46E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	14 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	SC-3
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-14	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	3.000	3.000	0.425	3.000	97.000
NO. 60 SIEVE :	22.000	22.000	0.250	25.000	75.000
NO. 100 SIEVE:	37.000	37.000	0.150	62.000	38.000
NO. 200 SIEVE:	24.000	24.000	0.075	86.000	14.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

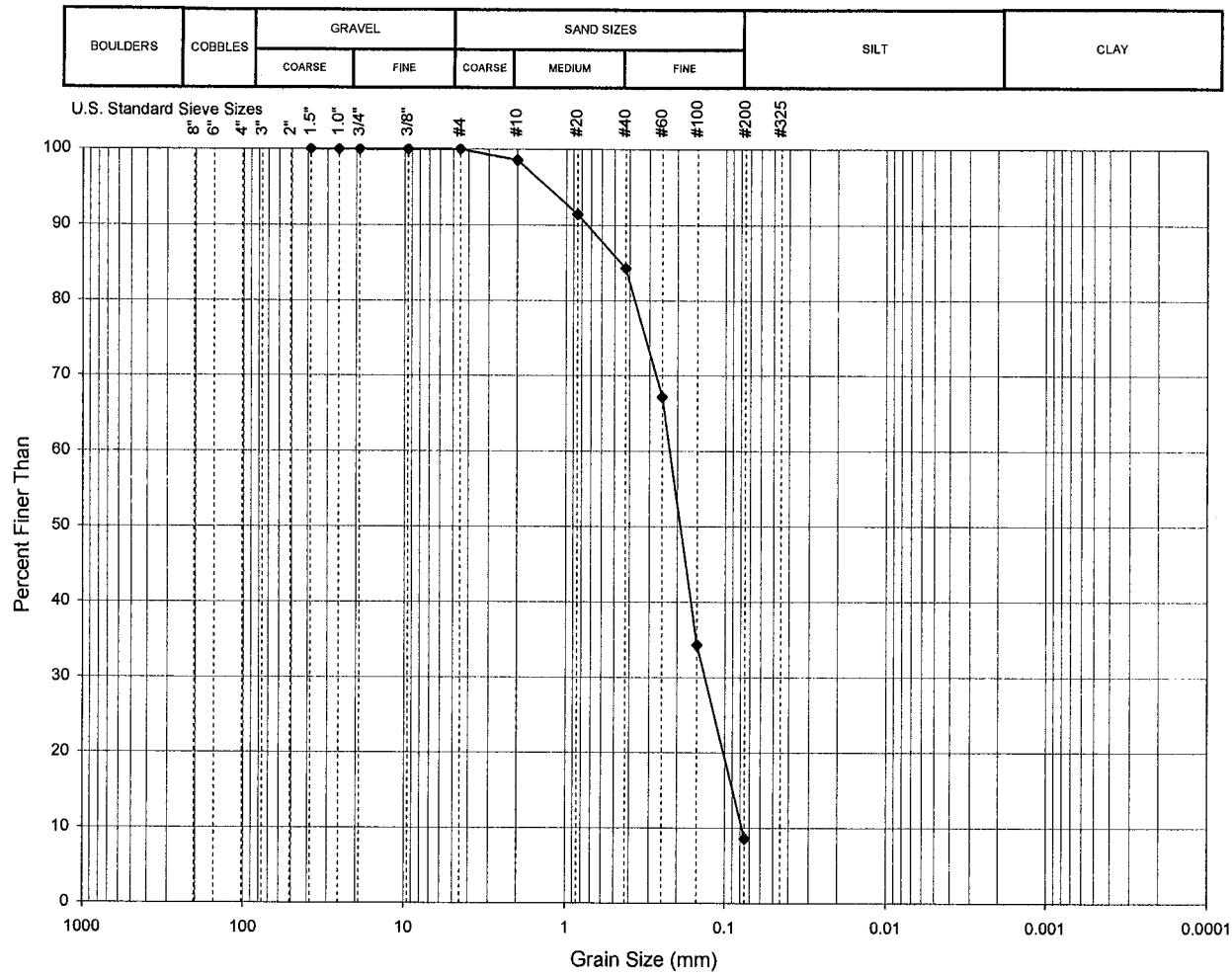
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	3.00	0.425 - 2.0
% FINE SAND :	83.00	0.075 - 0.425
% SILT & CLAY :	14.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	SC-4
Sample Depth:	
Lab ID Number:	L836253-15
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	91 %
ESTIMATED HAZEN NUMBER: 6.08E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	9 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	SC-4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-15	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	70 grams	Specific Gravity:	2.650
Hydro. Sample Weight	grams	Liquid Specific Gravity:	1.000
% Past #10	0.986 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	1.000	1.429	2.000	1.429	98.571
NO. 20 SIEVE :	5.000	7.143	0.850	8.571	91.429
NO. 40 SIEVE :	5.000	7.143	0.425	15.714	84.286
NO. 60 SIEVE :	12.000	17.143	0.250	32.857	67.143
NO. 100 SIEVE:	23.000	32.857	0.150	65.714	34.286
NO. 200 SIEVE:	18.000	25.714	0.075	91.429	8.571

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	1.43	2.0 - 4.5
% MEDIUM SAND :	14.29	0.425 - 2.0
% FINE SAND :	75.71	0.075 - 0.425
% SILT & CLAY :	8.57	< 0.075

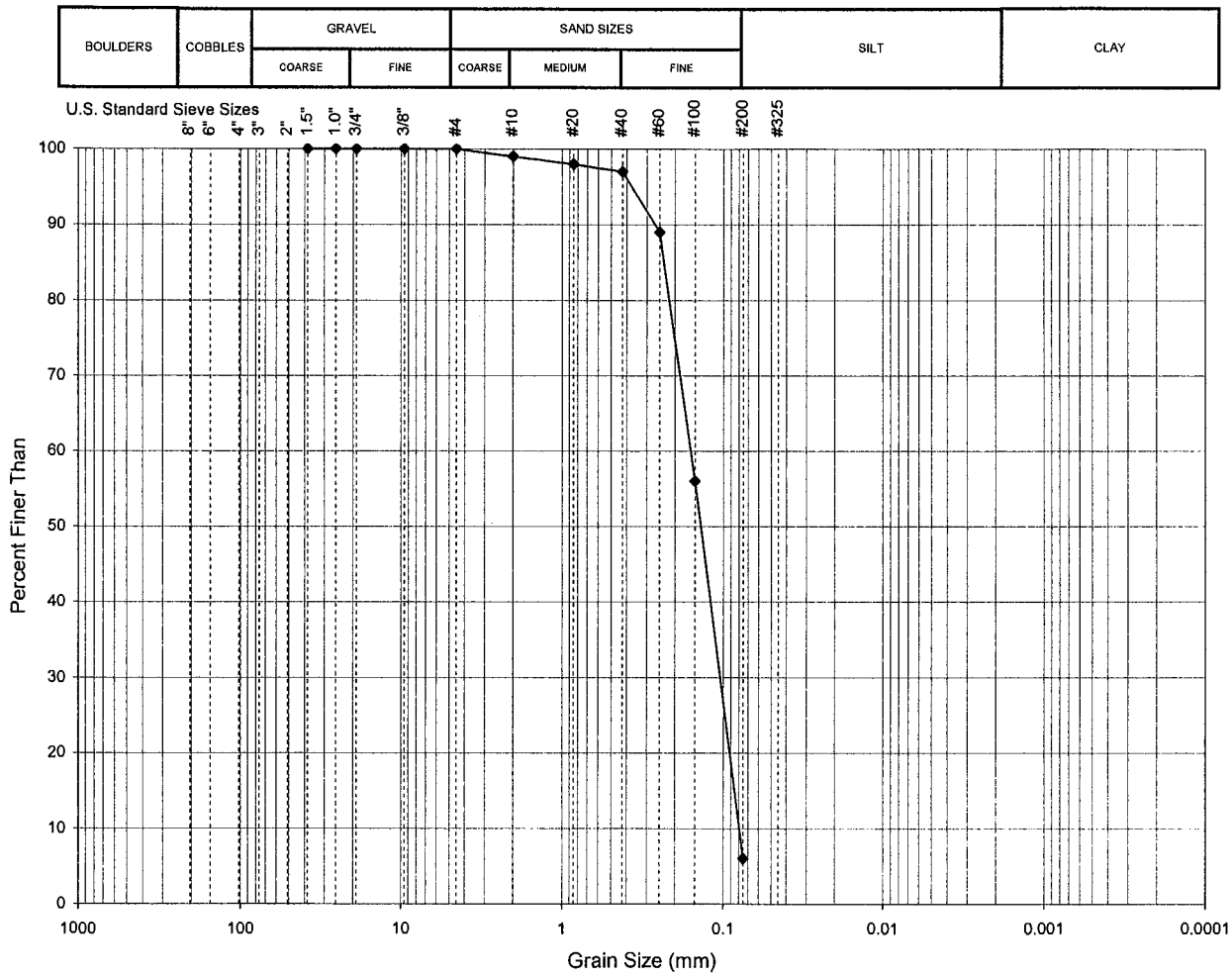
ALS

SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	SC-5
Sample Depth:	
Lab ID Number:	L836253-16
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	94 %
ESTIMATED HAZEN NUMBER: 6.28E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	6 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	SC-5
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-16	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.990	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	1.000	1.000	2.000	1.000	99.000
NO. 20 SIEVE :	1.000	1.000	0.850	2.000	98.000
NO. 40 SIEVE :	1.000	1.000	0.425	3.000	97.000
NO. 60 SIEVE :	8.000	8.000	0.250	11.000	89.000
NO. 100 SIEVE:	33.000	33.000	0.150	44.000	56.000
NO. 200 SIEVE:	50.000	50.000	0.075	94.000	6.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

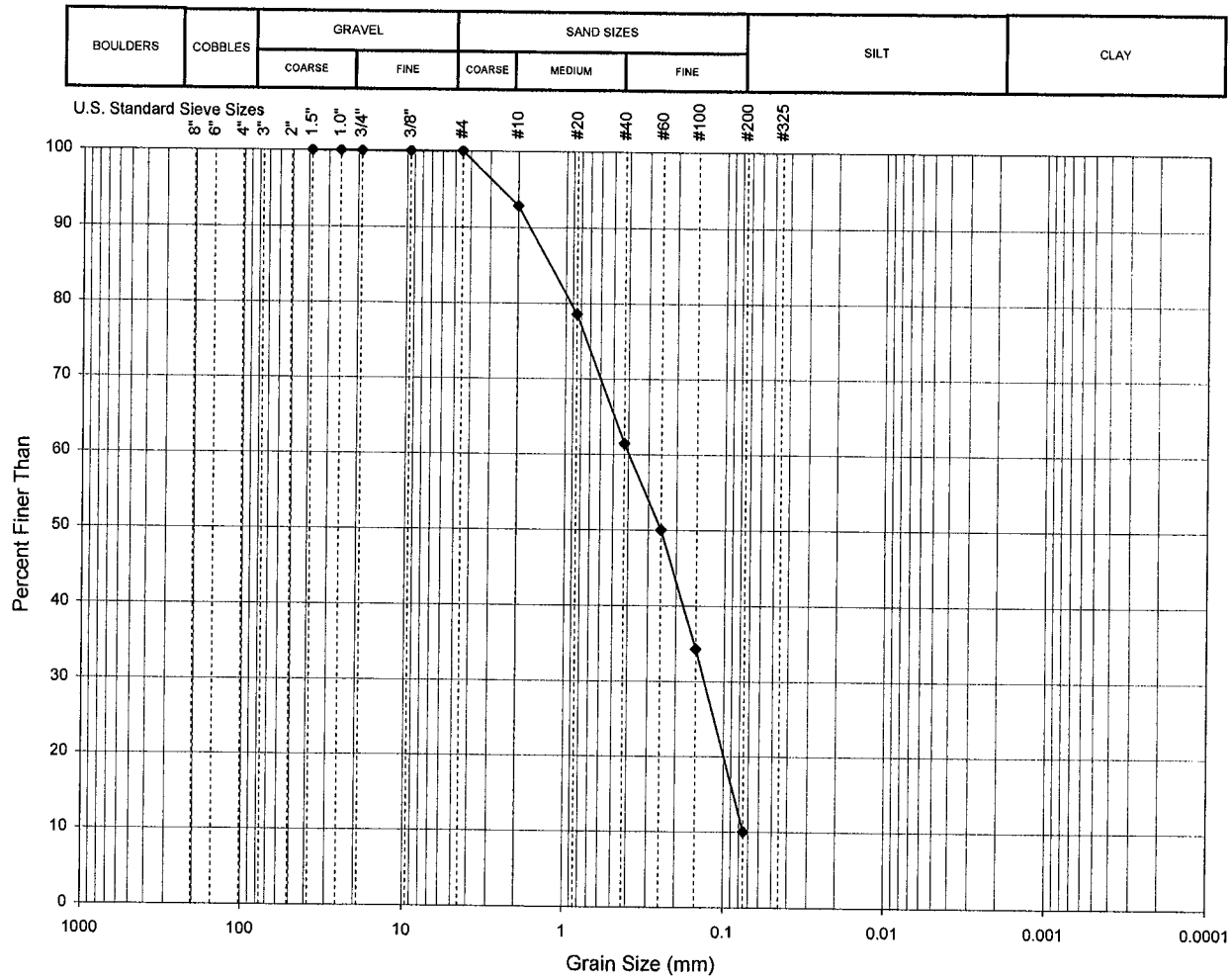
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	1.00	2.0 - 4.5
% MEDIUM SAND :	2.00	0.425 - 2.0
% FINE SAND :	91.00	0.075 - 0.425
% SILT & CLAY :	6.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	S36
Sample Depth:	
Lab ID Number:	L836253-17
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	90 %
ESTIMATED HAZEN NUMBER: 5.63E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	10 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	S36
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-17	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	70	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	0.929	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	5.000	7.143	2.000	7.143	92.857
NO. 20 SIEVE :	10.000	14.286	0.850	21.429	78.571
NO. 40 SIEVE :	12.000	17.143	0.425	38.571	61.429
NO. 60 SIEVE :	8.000	11.429	0.250	50.000	50.000
NO. 100 SIEVE:	11.000	15.714	0.150	65.714	34.286
NO. 200 SIEVE:	17.000	24.286	0.075	90.000	10.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

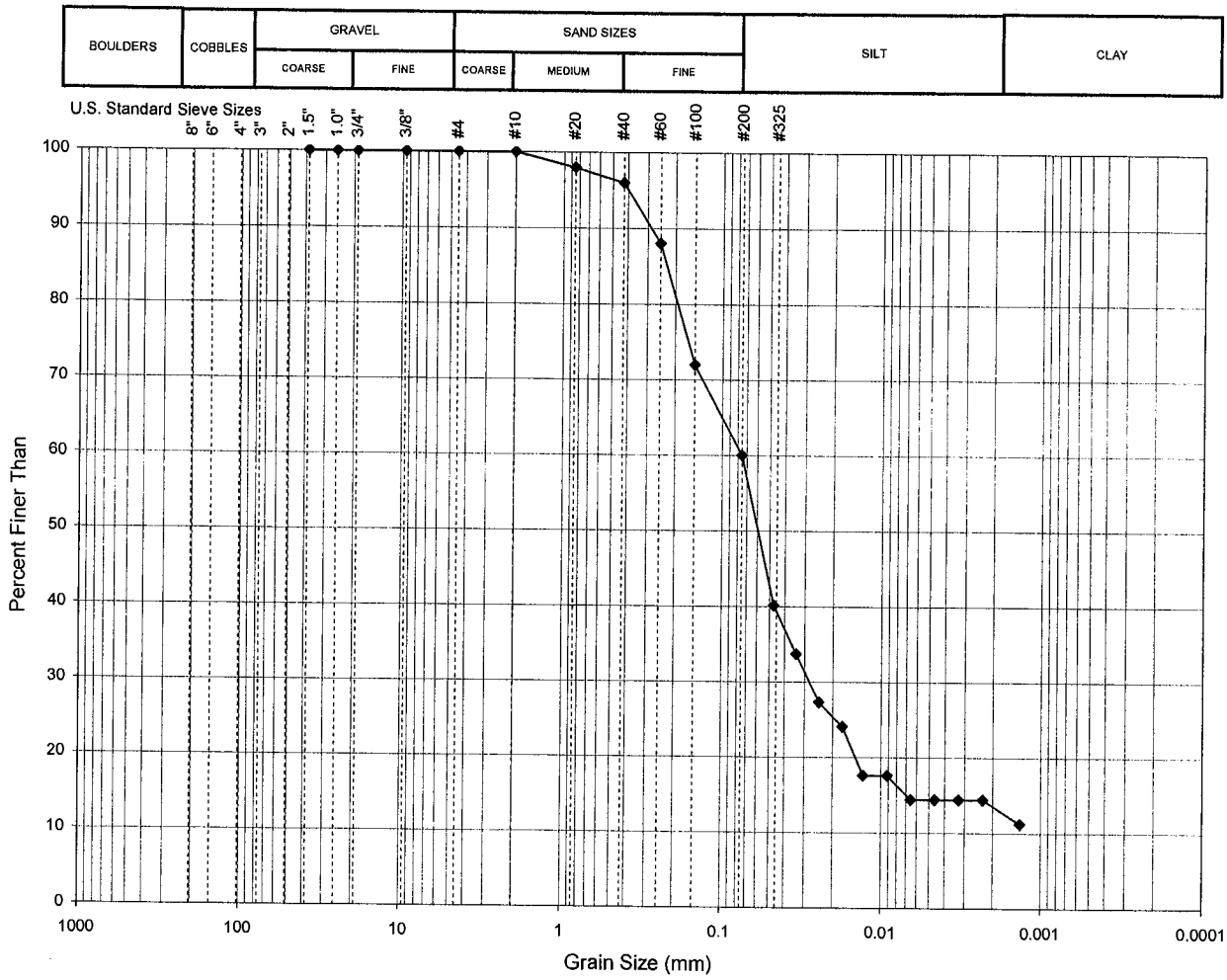
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	7.14	2.0 - 4.5
% MEDIUM SAND :	31.43	0.425 - 2.0
% FINE SAND :	51.43	0.075 - 0.425
% SILT & CLAY :	10.00	< 0.075

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	SC-4
Sample Depth:	
Lab ID Number:	L836253-18
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SILT AND SAND, WITH CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	40 %
ESTIMATED HAZEN NUMBER: 1.21E-06 cm/s	WITH	11 - 20 %	SILT + CLAY	60 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	SC-4
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-18	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	50 grams	Specific Gravity:	2.650
Hydro. Sample Weight	50.000 grams	Liquid Specific Gravity:	1.000
% Past #10	1.000 * 100	Grav Factor:	1.606
Sub Factor	1.000		

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	1.000	2.000	0.850	2.000	98.000
NO. 40 SIEVE :	1.000	2.000	0.425	4.000	96.000
NO. 60 SIEVE :	4.000	8.000	0.250	12.000	88.000
NO. 100 SIEVE:	8.000	16.000	0.150	28.000	72.000
NO. 200 SIEVE:	6.000	12.000	0.075	40.000	60.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00	15.0	22.0	0.047	40.119	40.119
2.00	13.0	22.0	0.034	33.695	33.695
4.00	11.0	22.0	0.024	27.271	27.271
8.00	10.0	22.0	0.017	24.059	24.059
15.00	8.0	22.0	0.013	17.635	17.635
30.00	8.0	22.0	0.009	17.635	17.635
60.00	7.0	22.0	0.007	14.422	14.422
120.00	7.0	22.0	0.005	14.422	14.422
240.00	7.0	22.0	0.003	14.422	14.422
480.00	7.0	22.0	0.002	14.422	14.422
1440.00	6.0	22.0	0.001	11.210	11.210

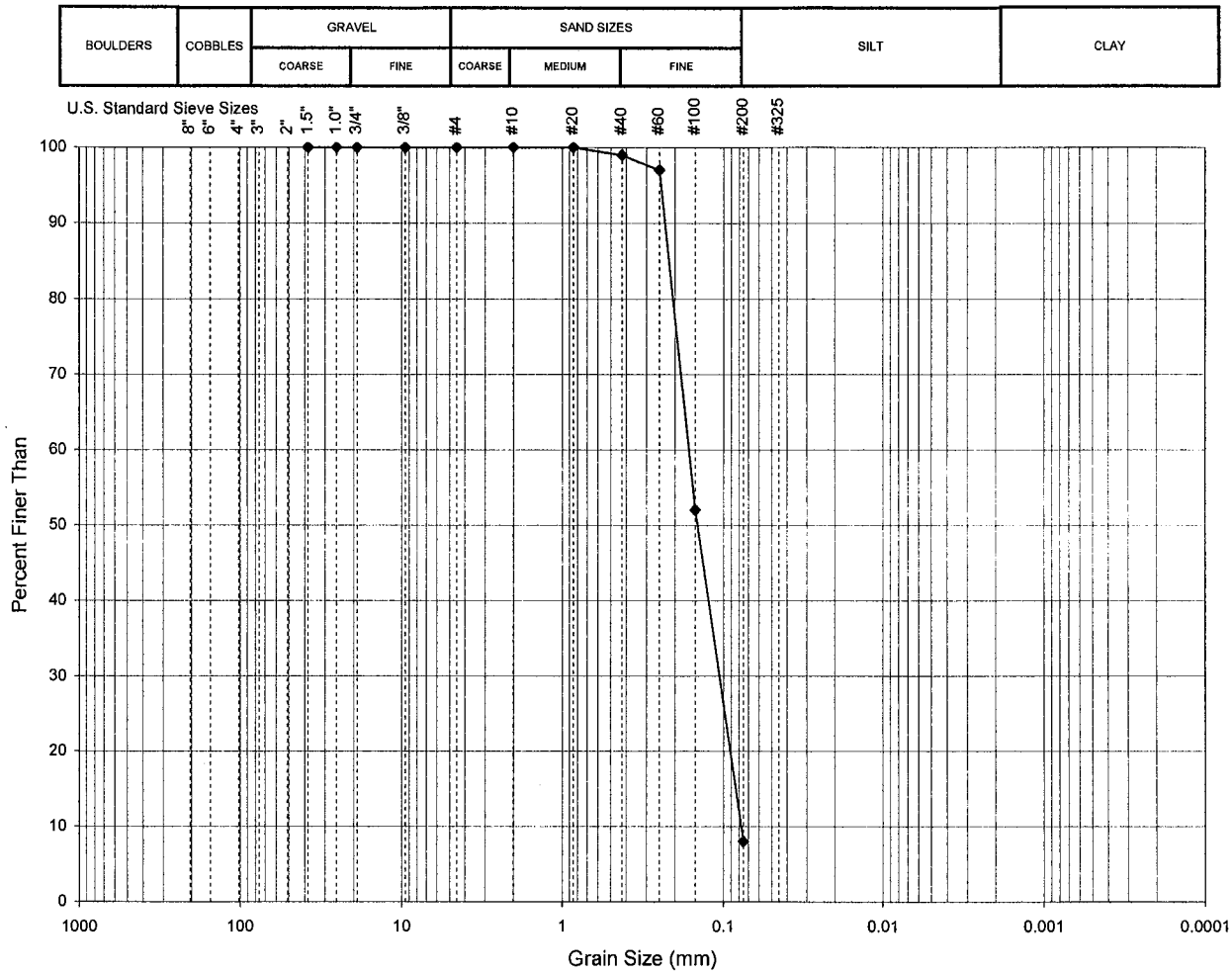
GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	4.00	0.425 - 2.0
% FINE SAND :	36.00	0.075 - 0.425
% SILT :	46.44	0.075 - 0.002
% CLAY :	13.56	< 0.002
% CLAY :	14.42	< 0.005

ALS
SENTINEL DIVISION - WATERLOO

PARTICLE SIZE DISTRIBUTION CURVE

ASTM METHOD D422-63

Project Name:	Ecometrix INC ~ MISSISSAUGA
Project Number:	
Sample Location:	
Sample Number:	SC-1
Sample Depth:	
Lab ID Number:	L836253-19
Technician:	SM1
Sampler:	
Dates:	
Collected On:	11/3/2009
Analyzed:	11/19/2009



DESCRIPTION	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY	
SAND, TRACE SILT+CLAY	AND	36 - 50 %	GRAVEL	0 %
	ADJECTIVE (e.g. sandy)	21 - 35 %	SAND	92 %
ESTIMATED HAZEN NUMBER: 5.99E-03 cm/s	WITH	11 - 20 %	SILT + CLAY	8 %
NOTE: UNIFIED SOIL CLASSIFICATION SYSTEM	TRACE	1 - 10 %		

GRAIN SIZE DETERMINATIONS

Project Name:	Ecometrix INC ~ MISSISSAUGA	Sample Location:	
Project Number:	Q22482-15753	Sample Number:	SC-1
Sampler:		Sample Depth:	
Technician:	SM1	Date Sampled:	11/03/09
Lab ID Number:	L836253-19	Date Submitted:	11/03/09
		Date Completed:	11/19/09

Total Sample Weight	100	grams	Specific Gravity:	2.650
Hydro. Sample Weight		grams	Liquid Specific Gravity:	1.000
% Past #10	1.000	* 100	Grav Factor:	1.606
Sub Factor	1.000			

Sieve Size	Weight Retained (grams)	Percent Retained	Diameter (mm)	Cum. % Retained	Cum. % Passing
38.1 mm. DIA.:	0.000	0.000	38.100	0.000	100.000
25.4 mm. DIA.:	0.000	0.000	25.400	0.000	100.000
19.0 mm. DIA.:	0.000	0.000	19.000	0.000	100.000
9.5 mm. DIA.:	0.000	0.000	9.500	0.000	100.000
NO. 4 SIEVE :	0.000	0.000	4.500	0.000	100.000
NO. 10 SIEVE :	0.000	0.000	2.000	0.000	100.000
NO. 20 SIEVE :	0.000	0.000	0.850	0.000	100.000
NO. 40 SIEVE :	1.000	1.000	0.425	1.000	99.000
NO. 60 SIEVE :	2.000	2.000	0.250	3.000	97.000
NO. 100 SIEVE:	45.000	45.000	0.150	48.000	52.000
NO. 200 SIEVE:	44.000	44.000	0.075	92.000	8.000

Time (min)	Hydrometer Reading	Temperature (C)	Diameter (mm)	% Suspended (Subsample)	% Suspended (Total Sample)
1.00			-	-	-
2.00			-	-	-
4.00			-	-	-
8.00			-	-	-
15.00			-	-	-
30.00			-	-	-
60.00			-	-	-
120.00			-	-	-
240.00			-	-	-
480.00			-	-	-
1440.00			-	-	-

GRAIN SIZE	% BY WT.	DIA. RANGE (mm)
% GRAVEL :	0.00	> 4.5
% COARSE SAND :	0.00	2.0 - 4.5
% MEDIUM SAND :	1.00	0.425 - 2.0
% FINE SAND :	91.00	0.075 - 0.425
% SILT & CLAY :	8.00	< 0.075

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

60 Northland Road, Unit #1, Waterloo, ON N2V 2B9
Phone: (519) 886-6910 Fax: (519) 886-9047
CANADA TOLL FREE: 1-800-668-9878

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

56902

C of C #

PAGE 1 OF 1

Service Requested:	✓	Regular (default) (5 working days)
Date Required:		Priority (50% surcharge) (2-3 working days)
		Emergency (100% surcharge) (1-2 working days)

COMPANY NAME: EcoMetrix

PROJECT MANAGER: Brian Fraser

PROJECT: 09-1630

PHONE: 905-794-2325

FAX: 905-794-2338

QUOTATION #: E22482

PO#:

SAMPLING INFORMATION

CRITERIA: Criteria on report (y/n) ___

Reg 153/04

Table 1 2 3

TCLP ___ MISA ___ PWQO ___

OTHER ___

REPORT DISTRIBUTION: ALL FINAL RESULTS WILL BE MAILED

EMAIL X FAX ___

EMAIL1 BFraser@ecometrix.ca

EMAIL2 ___

SELECT: pdf X digital X both X

ANALYSIS REQUEST

INDICATE SOTTLES FIELD FILTERED/PRESERVED (F/P)

SUBMISSION #: L836253

ENTERED BY: PBO

DATE/TIME ENTERED: 03-Nov-09

ERIN #: 818 5

Sample Date/Time: Date (yy/mm/dd)	Time (24 hr)	TYPE: COMP	GRAB	MATRIX: WATER	SOIL	SED	SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	Metals by ICPMS	Mercury by CVAA	TOC	TKN	Grain Size	COMMENTS	LAB ID
						X	S41, SC-3	2	X	X	X	X	X		-1
							S15, SC-4								-2
							S12, SC-5								-3
							S31-1								-4
							S31-2								-5
							S31-3								-6
							S31-4								-7
							S31-5								-8
							S24, S36								-9
							S34, S35								-10
							S33, SC-1								-11
							S32, SC-2								-12

SPECIAL INSTRUCTIONS/COMMENTS

SAMPLE CONDITION

	MEAN TEMP
FROZEN	
COLD ✓	9
AMBIENT	
CONDITION ACCEPTABLE UPON RECEIPT (Y/N) ___	INIT

SAMPLED BY: Kate

RELINQUISHED BY: DATE & TIME: ___

RECEIVED BY: DATE & TIME: Nov.2/09 1535

RECEIVED AT LAB BY: PIL DATE & TIME: 03-NOV-09 09:00 4 DLC

NOTES AND CONDITIONS

1. Quote number must be provided to ensure proper pricing
2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs
3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section

White - report copy YELLOW - File copy PINK - Customer Copy

11-03-'09 08:59 FROM-5198869047 T-694 P0001/0002 F-821

ECOMETRIX INC.
ATTN: BRIAN FRASER
6800 CAMPOBELLO ROAD
MISSISSAUGA ON L5N 2L8

Date Received: 22-JUN-11
Report Date: 30-JUN-11 07:14 (MT)
Version: FINAL

Client Phone: 905-794-2325

Certificate of Analysis

Lab Work Order #: L1021726
Project P.O. #: NOT SUBMITTED
Job Reference: 11-1837
Legal Site Desc:
C of C Numbers: L1021726



Richard Clara
General Manager, Thunder Bay

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1021726-1	L1021726-2	L1021726-3	L1021726-4	L1021726-5
Description	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sampled Date	11-JUN-11	08-JUN-11	11-JUN-11	11-JUN-11	11-JUN-11
Sampled Time	12:00	12:00	12:00	12:00	12:00
Client ID	L20	L4	L29	L26	L25
Grouping / **Analyte**					
SOIL					
Physical Tests % Moisture (%)	86.9	84.3	83.1	91.2	88.4
Leachable Anions & Nutrients Total Kjeldahl Nitrogen (mg/kg)	15600 EHR	12900 EHR	8810 EHR	19700 EHR	19500 EHR
Anions and Nutrients Phosphorus, Total (mg/kg)	2910	890	715	876	2170
Organic / Inorganic Carbon Fraction Organic Carbon	0.133	0.126	0.153	0.241	0.148
Total Organic Carbon (%)	13.3	12.6	15.3	24.1	14.8
Metals Aluminum (Al) (ug/g)	9920	9230	6120	7490	11600
Antimony (Sb) (ug/g)	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As) (ug/g)	3.9	3.7	2.9	3.3	2.8
Barium (Ba) (ug/g)	65.4	65.7	119	72.9	67.9
Beryllium (Be) (ug/g)	0.52	0.73	<0.50	<0.50	<0.50
Bismuth (Bi) (ug/g)	<1.0	<1.0	<1.0	<1.0	<1.0
Boron (B) (ug/g)	<5.0	<5.0	<5.0	<5.0	<5.0
Cadmium (Cd) (ug/g)	1.08	1.11	0.73	1.72	1.41
Calcium (Ca) (ug/g)	6500	2280	4160	1660	1720
Chromium (Cr) (ug/g)	11.9	7.0	6.0	7.3	9.5
Cobalt (Co) (ug/g)	4.2	1.4	3.8	1.4	1.5
Copper (Cu) (ug/g)	30.3	12.2	16.4	10.1	10.6
Iron (Fe) (ug/g)	26500	8250	11300	5610	9360
Lead (Pb) (ug/g)	13.4	31.3	21.6	27.4	20.0
Lithium (Li) (ug/g)	4.2	2.9	1.7	<1.0	3.0
Magnesium (Mg) (ug/g)	2400	890	1330	450	958
Manganese (Mn) (ug/g)	349	101	107	70.6	79.9
Mercury (Hg) (mg/kg)	0.082	0.099	0.081	0.139	0.132
Molybdenum (Mo) (ug/g)	1.3	1.0	1.0	1.1	1.2
Nickel (Ni) (ug/g)	7.8	6.2	7.2	6.1	5.5
Phosphorus (P) (ug/g)	2020	670	1280	549	1040
Potassium (K) (ug/g)	730	400	430	220	460
Selenium (Se) (ug/g)	1.3	1.3	<1.0	1.8	1.4
Silver (Ag) (ug/g)	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na) (ug/g)	<100	140	<100	<100	<100
Strontium (Sr) (ug/g)	17.9	13.0	33.0	12.9	11.0
Thallium (Tl) (ug/g)	<0.50	<0.50	<0.50	<0.50	<0.50
Tin (Sn) (ug/g)	<5.0	<5.0	<5.0	<5.0	<5.0
Titanium (Ti) (ug/g)	513	176	988	164	193
Uranium (U) (ug/g)	1.2	<1.0	<1.0	<1.0	1.2
Vanadium (V) (ug/g)	11.6	11.1	22.6	8.2	11.3

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1021726-6	L1021726-7			
	Description	SEDIMENT	SEDIMENT			
	Sampled Date	11-JUN-11	11-JUN-11			
	Sampled Time	12:00	12:00			
	Client ID	L27	L24			
Grouping	**Analyte**					
SOIL						
Physical Tests	% Moisture (%)	90.2	72.4			
Leachable Anions & Nutrients	Total Kjeldahl Nitrogen (mg/kg)	14500 EHR	7250 EHR			
Anions and Nutrients	Phosphorus, Total (mg/kg)	793	838			
Organic / Inorganic Carbon	Fraction Organic Carbon	0.250	0.108			
	Total Organic Carbon (%)	25.0	10.8			
Metals	Aluminum (Al) (ug/g)	9060	12300			
	Antimony (Sb) (ug/g)	<1.0	<1.0			
	Arsenic (As) (ug/g)	2.9	2.4			
	Barium (Ba) (ug/g)	64.1	66.2			
	Beryllium (Be) (ug/g)	<0.50	<0.50			
	Bismuth (Bi) (ug/g)	<1.0	<1.0			
	Boron (B) (ug/g)	<5.0	<5.0			
	Cadmium (Cd) (ug/g)	1.06	<0.50			
	Calcium (Ca) (ug/g)	1690	1830			
	Chromium (Cr) (ug/g)	4.8	16.4			
	Cobalt (Co) (ug/g)	1.2	2.5			
	Copper (Cu) (ug/g)	11.4	7.0			
	Iron (Fe) (ug/g)	7890	8720			
	Lead (Pb) (ug/g)	20.4	14.4			
	Lithium (Li) (ug/g)	<1.0	8.2			
	Magnesium (Mg) (ug/g)	298	1560			
	Manganese (Mn) (ug/g)	111	60.2			
	Mercury (Hg) (mg/kg)	0.119	0.110			
	Molybdenum (Mo) (ug/g)	1.4	<1.0			
	Nickel (Ni) (ug/g)	4.3	8.8			
	Phosphorus (P) (ug/g)	928	559			
	Potassium (K) (ug/g)	270	530			
	Selenium (Se) (ug/g)	2.1	<1.0			
	Silver (Ag) (ug/g)	<0.20	<0.20			
	Sodium (Na) (ug/g)	<100	<100			
	Strontium (Sr) (ug/g)	9.4	12.0			
	Thallium (Tl) (ug/g)	<0.50	<0.50			
	Tin (Sn) (ug/g)	<5.0	<5.0			
	Titanium (Ti) (ug/g)	61.8	245			
	Uranium (U) (ug/g)	<1.0	1.2			
	Vanadium (V) (ug/g)	9.5	16.4			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1021726-1	L1021726-2	L1021726-3	L1021726-4	L1021726-5
Description	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sampled Date	11-JUN-11	08-JUN-11	11-JUN-11	11-JUN-11	11-JUN-11
Sampled Time	12:00	12:00	12:00	12:00	12:00
Client ID	L20	L4	L29	L26	L25
Grouping **Analyte**					
SOIL					
Metals Zinc (Zn) (ug/g)	116	55.9	75.2	116	82.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1021726-6	L1021726-7			
	Description	SEDIMENT	SEDIMENT			
	Sampled Date	11-JUN-11	11-JUN-11			
	Sampled Time	12:00	12:00			
	Client ID	L27	L24			
Grouping	**Analyte**					
SOIL						
Metals	Zinc (Zn) (ug/g)	58.8	46.2			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
EHR	Exceeded Recommended Holding Time On Receipt: Proceed With Analysis As Requested
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**
HG-WT	Soil	Mercury by CVAA	EPA 7471
MET-UG/G-CCMS-WT	Soil	Metal Scan Collision Cell ICPMS	EPA 200.2/6020A
	Sample is vigorously digested with nitric acid and hydrogen peroxide. Analysis is conducted by ICP/OES.		
MOISTURE-WT	Soil	% Moisture	Gravimetric: Oven Dried
P-TOTAL-WT	Soil	Phosphorous, Total	APHA 4500-P B E
	A homogenized soil sample is digested to convert the total phosphorus to orthophosphate. The orthophosphate reacts with ammonium molybdate and potassium antimonyl tartrate to form a antimonyl-phosphomolybdate complex. This complex is measured colorimetrically and reported as phosphorus.		
TKN-WT	Soil	Total Kjeldahl Nitrogen	APHA 4500-N
	A homogenized soil sample is digested to convert the TKN to ammonium sulphate. The ammonia ions are heated to produce a colour complex. The absorbance measured by the instrument is proportional to the concentration of ammonium sulphate in the sample and is reported as TKN.		
TOC-WT	Soil	TOC & FOC in Solids	CARTER 21.2

** 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
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

L1021726

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

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

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # L1021726 Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	ECOMETRIX INC	Standard / Other (specify):		Regular (Default) ✓
Contact:	BRIAN FRASER	(PDF) / (Excel) / Digital / Fax		Priority (Specify Date Required → →) Surcharges apply
Address:	6800 Campobello Rd Mississauga ON	Email 1:	bfraser@ecometrix.ca	Emergency (1 Business Day) - 100% Surcharge
Phone:	905-794-2325 x246 Fax: 905-794-2338	Email 2:	jtetreault@ecometrix.ca	For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Invoice To	Same as Report ? (Yes) No	Client / Project Information		Analysis Request

THE QUESTIONS BELOW MUST BE ANSWERED FOR WATER SAMPLES (circle Yes or No)

Are any samples taken from a regulated DW System? Yes No

If yes, an authorized Drinking Water COC MUST be used for this submission.

Is the water sampled intended to be potable for human consumption? Yes No

Job #: 11-1937
PO / AFE:
LSD:
Quote #:

Lab Work Order # (lab use only):
ALS Contact:
Sampler:

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total phosphorous	TKN	TOC	Metals ICP-MS	Low Cndy Hg								Number of Containers
L20	L20	June 11/11	12:00	Sediments	✓	✓	✓	✓	✓								2
L4	L4	June 8/11			✓	✓	✓	✓	✓								2
L29	L29	June 11/11			✓	✓	✓	✓									2
L26	L26				✓	✓	✓	✓									4
L25	L25				✓	✓	✓	✓									2
L27	L27				✓	✓	✓	✓									2
L24	L24				✓	✓	✓	✓									3

Special Instructions / Regulations / Hazardous Details

Reg 153 Table 1 2 3 TCLP MISA PWQO OTHER (please specify): Metals scan includes Hg for all samples.
Circle one - Note drinking water samples MUST USE DW Chain of Custody

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes (No ?) If Yes add SIF
Jon Tetreault	22-June-11	1:40		22-JUN-11	13:45	8.3 °C		22-JUN-11		

8.0 - 8.5

SEE SIF.

TYFM014 26-Mar-10

Your Project #: MB1E2732
Site Location: 11-1864
Your C.O.C. #: 08337999

Attention: SUB CONTRACTOR
MAXXAM ANALYTICS
CAMPOBELLO
6740 CAMPOBELLO ROAD
MISSISSAUGA, ON
CANADA L5N 2L8

Report Date: 2011/09/27

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B188722
Received: 2011/09/20, 08:35

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chlorophyll A (water)(sin)	3	2011/09/20	2011/09/22	BBY6SOP-00002	SM-10200 H

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Sheleeza Mohamed, Burnaby Customer Service
Email: SMohamed@maxxam.ca
Phone# (604) 734 7276

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B188722
Report Date: 2011/09/27

MAXXAM ANALYTICS
Client Project #: MB1E2732
Site Location: 11-1864

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BO6694	BO6695	BO6696		
Sampling Date		2011/09/13	2011/09/13	2011/09/13		
COC Number		08337999	08337999	08337999		
	Units	**W1 (KX3437-01R)**	**W2 (KX3438-01R)**	**W3 (KX3439-01R)**	**RDL**	**QC Batch**
Parameter						
Chlorophyll a	ug/L	1.4	1.8	1.5	0.5	5194141

RDL = Reportable Detection Limit

Maxxam Job #: B188722
Report Date: 2011/09/27

MAXXAM ANALYTICS
Client Project #: MB1E2732
Site Location: 11-1864

Package 1	6.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Results relate only to the items tested.

MAXXAM ANALYTICS
Attention: SUB CONTRACTOR
Client Project #: MB1E2732
P.O. #:
Site Location: 11-1864

Quality Assurance Report

Maxxam Job Number: VB188722

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5194141	CR5	Method Blank	Chlorophyll a	2011/09/22	<0.5		ug/L	

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Validation Signature Page

Maxxam Job #: B188722

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



ROB REINERT, Data Validation Coordinator

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

08337999

MAXXAM ANALYTICS
6740 Campobello Road
Mississauga, Ontario, L5N 2L8
Phone: (905) 817-5700
Fax: (905) 817-5777

Maxxam

EcoMetrix Incorporated
Maxxam PM Jolanta Goralczyk

SUBCONTRACTING REQUEST FORM

To: Campo to Burnaby Subcontract

Job# B1E2732

☐ Yes ☑ No International Sample/BioHazard (if yes, add copy of Movement Cert., heat treat is required prior to disposal)
☐ Yes ☑ No Special Protocol (if yes, Protocol _____)

Received @ Subcontract Lab by (sign) _____ (print) NabedAmer

Received @ Subcontract Lab (Date) Sept 20, 2011 (Time) 08:35

Received Lab's Job # B188722 Inspected by (print) Anthony SIF ☐ Yes ☐ No

Upon receipt, record 3 temperatures for **each** package/cooler. If required by contract or legal sample,indicate if custody sealed.

Temp1 5 Temp2 7 Temp3 7 Custody sealed NA

Sample ID	Matrix	Test(s) Required		Container	Date Sampled	Date Required
KX3437-01R \ W1	W	Chlorophyll	B06694	1(CHLA)	2011/09/13	2011/09/27
KX3438-01R \ W2	W	Chlorophyll	B06695	1(CHLA)	2011/09/13	2011/09/27
KX3439-01R \ W3	W	Chlorophyll	B06696	1(CHLA)	2011/09/13	2011/09/27

COMMENT: 1 L SAMPLE VOLUME USED.

NOTES:
1) Please call us if due date cannot be met. Please reference Sample ID on your report.
2) Include copy of this completed form, Client COC & signed final report to **scontractor@maxxamanalytics.com**

B188722

SHIPPING INSTRUCTIONS

☐ Ship Immediately (highlight Yellow)
☐ Requires 9am
☑ Requires Sat. Delivery
☐ Regular Ship next available day
☐ Ship Cold
☐ Ship Room Temp
☐ Ship Frozen
☐ COC Must be Attached

Sender (Print) MUSRAT Initial _____

SHIPPING DEPARTMENT CHECKLIST

☑ Correct Shipping location
☑ Correct Sample Ids (Paperwork vs Bottles)
☑ Yes ☐ No Special-Cooler, Ice, Tape-custody seal, Date&Sign

Date Shipped 2011/09/19
Shipper (Print) MUSRAT Initial _____

16-Sep-11 08:00
JOLANTA GORALCZYK

B1E2732
FW ENV-735

CHAIN OF CUSTODY RECORD

52408 Page 1 of 1

Maxxam 6740 Campobello Road, Mississauga, ON L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5778 Toll Free

INVOICE INFORMATION	REPORT INFO	PROJECT INFORMATION	MAXXAM JOB NUMBER
Company Name: Eco Metrix	Company Name:	Quotation #:	
Contact Name: Karen Peterson	Contact Name:	P.O. #:	CHAIN OF CUSTODY #
Address: 6800, campobello rd	Address:	Project #: 11-1861	00
Phone: 416-651-2700 Fax:	Phone: Fax:	Site Location: Markham	
Email: KPeterson@ecometrix.ca	Email:	Site #:	
		Sampled By: KP	

Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

Regulation 153 (2011): Table 1, Table 2, Table 3, Table ___, Res/Park, Ind/Comm, Agri/Other, Med/Fine, Coarse, For RSC

Other Regulations: CCME, Reg. 558, MISA, PWQO, Other (specify): ___, Sanitary Sewer Bylaw, Storm Sewer Bylaw, Municipality: ___

Include Criteria on Certificate of Analysis (Y/N)?

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

ANALYSIS REQUESTED (Please be specific)

TURNAROUND TIME (TAT) REQUIRED

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.

Regular (Standard) TAT: (5-7 working days for most tests) ☑

Rush TAT: ***Samples must be received by 3pm to guarantee your TAT***

Rush Confirmation #: PN ___

☐ 1 day ☐ 2 days ☐ 3 days

Date/Time Req'd: ___

TATs for certain tests are > 5 days. Please contact your Project Manager for details.

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	Chlorophyll	# of Cont.	COMMENTS / TAT COMMENTS
1	W1	Sept 13/11		SW	N	N		1	
2	W2	↓		↓				1	
3	W3	↓		↓				1	
4									
5									
6									
7									
8									
9									
10									

B188722

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:	#JARS USED AND NOT SUBMITTED
Karen Peterson	2011/09/15		Jolanta Goralczyk	2011/09/16	8:00	

Laboratory Use Only			
Custody Seal	Yes	No	Temperature (°C) on Receipt
Present		☑	
Intact		☑	3/2/3°C

*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

APPENDIX 4: Supporting Benthic Invertebrate Data

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Pic River and Lake Superior														
Station	HL-P (Hare Lake Profundal)					HL-L (Hare Lake Littoral)					LS (Port Munroe)				
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
ROUNDWORMS															
P. Nemata	-	1	-	12	8	32	64	8	96	-	-	6	3	-	-
FLATWORMS															
P. Platyhelminthes															
Cl. Turbellaria															
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Tricladida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDS															
P. Annelida															
WORMS															
Cl. Oligochaeta															
F. Enchytraeidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae															
Dero digitata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais variabilis	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-
Nais sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophidonais serpentina	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-
Slavina appendiculata	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-
Stylaria lacustris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vejdovskyella comata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tubificidae															
Aulodrilus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aulodrilus pluriseta	-	-	-	-	-	-	-	-	-	-	16	-	-	-	-
Ilyodrilus templetoni	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-	8	6	10	3	-
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-	-	8	1	4	-
Spirosperma ferox	-	-	-	-	-	-	-	-	-	-	8	4	3	7	4
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
immatures with hair chaetae	-	-	-	-	-	-	8	-	32	-	-	-	1	2	-
immatures without hair chaetae	-	-	-	-	-	-	-	-	16	4	-	10	11	9	-
F. Lumbricidae															
Eiseniella tetraedra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indetermiate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae															
Lumbriculus variegatus	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-
Stylodrilus heringianus	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
F. Sparganophilidae															
Sparganophilus	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-
LEECHES															
Cl. Hirudinea															
F. Erpobdellidae															
Nephelopsis obscura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Glossiphoniidae															
Helobdella stagnalis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Haemopidae															
Haemopis plumbea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS															
P. Arthropoda															
MITES															
Cl. Arachnida															
O. Acarina	-	8	2	-	-	-	48	-	48	4	8	8	-	8	4
SEED SHRIMPS															
Cl. Ostracoda	8	5	-	-	4	20	8	-	48	4	32	48	36	60	56
WATER SCUDS															
O. Amphipoda															
F. Crangonyctidae															
Crangonyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hyalellidae															
Hyalella	-	-	-	-	-	76	56	8	48	-	-	-	-	-	-
F. Pontoporeiidae															
Diporeia	-	3	-	-	-	-	-	-	-	-	24	2	-	7	-
AQUATIC SOW BUGS															
O. Isopoda															
F. Asellidae															
Caecidotea	-	-	-	-	-	-	-	-	-	-	8	2	-	1	36
Lirceus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPOSSUM SHRIMPS															
O. Mysidacea															
Mysis relicta	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
SPRINGTAILS															
Cl. Entognatha															
O. Collembola	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INSECTS															
Cl. Insecta															
BEETLES															
O. Coleoptera															
F. Chrysomelidae															
Donacia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dryopidae															
Helichus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae															
Coptotomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dytiscus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Graphoderus liberus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hygrotus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Pic River and Lake Superior															
Station	HL-P (Hare Lake Profundal)					HL-L (Hare Lake Littoral)					LS (Port Munroe)					
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Neoporus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Elmidae																
Dubiraphia larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Optioservus larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Gyrinidae																
Dineutus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gyrinus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Haliplidae																
Haliplus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Hydrophilidae																
Laccobius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Paracymus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MAYFLIES																
O. Ephemeroptera																
F. Baetidae																
Acerpenna macdunnoughi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Baetis tricaudatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Baetis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Callibaetis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Procloeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Caenidae																
Caenis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Ephemeridae																
Hexagenia	-	-	-	-	-	-	-	4	-	4	-	-	-	-	-	
F. Ephemerellidae																
Ephemerella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Eurylophella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Heptageniidae																
Epeorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Heptagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Maccaffertium modestum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Maccaffertium vicarium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Maccaffertium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Leptophlebiidae																
Habrophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Leptophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Paraleptophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
AQUATIC MOTHS																
O. Lepidoptera																
F. Pyralidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
O. Megaloptera																
ALDERFLIES																
F. Sialidae																
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
O. Odonata																
DAMSELFLIES																
F. Coenagrionidae																
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Lestidae																
Lestes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DRAGONFLIES																
F. Aeshnidae																
Aeshna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Cordulegastridae																
Cordulegaster	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Corduliidae/Libellulidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Corduliidae																
Cordulia shurtleffi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Epitheca	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	
F. Gomphidae																
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Libellulidae																
Leucorrhinia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
STONEFLIES																
O. Plecoptera																
F. Capniidae																
Paracapnia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Chloroperlidae																
Alloperla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Leuctridae																
Leuctra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Nemouridae																
Nemoura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Perlodidae																
Isoperla bilineata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Isoperla lata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Taeniopterygidae																
Taeniopteryx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BUGS																
O. Hemiptera																
F. Corixidae																
Hesperocorixa scabricula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sigara penniensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sigara signata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sigara sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Pic River and Lake Superior															
Station	HL-P (Hare Lake Profundal)					HL-L (Hare Lake Littoral)					LS (Port Munroe)				
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F. Gerridae															
Gerris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Notonectidae															
Notonecta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CADDISFLIES															
O. Trichoptera															
F. Dipseudopsidae															
Phylocentropus	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
F. Hydropsychidae															
Cheumatopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche betteni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche dicantha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche slossonae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche sparna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae															
Oxyethira	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lepidostomatidae															
Lepidostoma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptoceridae															
Oecetis	-	-	-	-	-	4	-	4	-	-	-	2	-	-	4
pupae	-	-	-	-	-	**8**	-	-	-	-	-	-	-	-	-
F. Limnephilidae															
Glyphopsyche irrorata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hesperophylax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydatophylax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydatophylax/Pycnopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nemotaulius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Molannidae															
Molanna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Phryganeidae															
Agrypnia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Polycentropodidae															
Polycentropus	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-
F. Rhyacophilidae															
Rhyacophila	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES															
O. Diptera															
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BITING-MIDGE															
F. Ceratopogonidae															
Atrichopogon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bezzia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Culicoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dasyhelea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mallochohelea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Probezzia	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PHANTOM MIDGE															
F. Chaoboridae															
Chaoborus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MIDGES															
F. Chironomidae															
chironomid pupae	**8**	**1**	-	-	-	-	-	**4**	**16**	-	**24**	**32**	**33**	**14**	**24**
S.F. Chironominae															
Chironomus	16	-	-	4	16	-	-	-	-	-	-	-	-	-	-
Cladopelma	-	-	-	-	-	-	-	-	-	-	-	-	4	7	-
Cladotanytarsus	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
Cryptochironomus	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-
Demicryptochironomus	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-
Endochironomus	-	-	2	-	-	-	-	4	-	-	-	-	-	-	-
Glyptotendipes	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-
Lipiniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	16	8	-	4	-	-	-	-	-	-	-	-	-	-	4
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	8	-	-	4	-	-	-	-	-
Pagastiella	-	-	-	-	-	-	48	-	-	4	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
Paralauterborniella	-	-	-	-	-	-	-	-	-	-	8	12	8	4	12
Paratanytarsus	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
Paratendipes	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Phaenopsectra	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-
Polypedilum aviceps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum halterale	-	-	-	-	-	-	-	-	-	-	16	14	1	-	4
Polypedilum scalaenum	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-
Polypedilum tritum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pseudochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellina	-	-	-	-	-	24	-	8	-	8	8	4	3	4	-
Stempellinella	-	-	-	-	-	-	8	-	-	-	-	2	-	-	-
Stenochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stictochironomus	60	16	-	28	32	-	8	-	-	-	-	26	4	4	28
Tanytarsus	-	-	-	-	-	4	88	-	112	12	48	24	20	32	32
Tribelos	-	-	-	-	-	-	48	-	-	-	-	-	-	-	-
Xenochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae															

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Pic River and Lake Superior														
Station	HL-P (Hare Lake Profundal)					HL-L (Hare Lake Littoral)					LS (Port Munroe)				
Replicate	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Potthastia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Protanypus	-	-	-	-	-	-	-	-	-	-	-	8	7	7	8
S.F. Orthocladiinae															
Brillia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaetocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heleniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotanytarsus	-	-	-	-	-	-	24	-	-	12	-	-	-	-	-
Heterotrissocladius	-	-	-	-	-	-	40	-	48	8	32	4	5	1	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nanocladius	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-
Orthocladius annectens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parachaetocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-
Parakiefferiella	-	-	-	-	-	-	16	-	-	-	-	-	-	-	-
Parametriocnemus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psectrocladius	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-
?Psilometriocnemus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tvetenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zalutschia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae															
Monodiamesa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prodiamesa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae															
Ablabesmyia	-	-	-	-	-	12	-	4	16	-	-	-	-	-	-
Clinotanypus	-	-	-	-	-	-	8	12	-	-	-	-	-	-	-
Labrudinia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Larsia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Monopelopia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Natarsia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Procladius	-	1	4	-	-	24	8	-	-	-	40	16	9	5	-
Thienemannimyia complex	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Trissopelopia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zavrelimyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dixidae															
Dixa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dixella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Empididae															
Chelifera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hemerodromia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ephydridae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tabanidae															
Chrysops	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-
F. Tipulidae															
Antocha	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicranota	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnophila	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molophilus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhabdomastix	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tipula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCS															
P. Mollusca															
SNAILS															
Cl. Gastropoda															
F. Hydrobiidae															
Amnicola	-	-	-	-	-	-	24	4	-	-	16	8	-	-	-
Pyrgulopsis	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-
F. Lymnaeidae															
Fossaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Physidae															
Physella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Planorbidae															
Planorbella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Valvatidae															
Valvata lewisi/sincera	-	-	-	-	-	-	-	-	-	-	8	6	-	1	4
Valvata tricarinata	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-
CLAMS															
Cl. Bivalvia															
F. Sphaeriidae															
Cyclocalyx	8	34	14	32	32	164	152	44	112	8	40	54	39	27	32
Sphaerium (Musculium)	-	-	-	-	8	-	16	-	-	-	-	-	-	-	-
F. Unionidae															
Anodontoides ferussacianus	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Pyganodon	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS	120	77	22	80	100	396	697	108	656	73	376	322	211	218	252
TOTAL NUMBER OF TAXA [a]	6	8	4	5	6	13	22	11	14	12	20	28	27	25	13

[a] Bold entries excluded from taxa count

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

						Bamoos Lake									
Station	Lentic Stations					BLL (Bamoos Lake Littoral)					BLP (Bamoos Lake Profundal)				
Replicate	L9	L13a	L13	L16	L26	1	2	3	4	5	1	2	3	4	5
ROUNDWORMS															
P. Nemata	64	40	-	-	-	-	4	-	-	-	-	-	1	1	-
FLATWORMS															
P. Platyhelminthes															
Cl. Turbellaria															
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Tricladida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANNELIDS															
P. Annelida															
WORMS															
Cl. Oligochaeta															
F. Enchytraeidae	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Naididae															
Dero digitata	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais sp.	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophidonais serpentina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stylaria lacustris	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-
Vejdovskyella comata	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tubificidae															
Aulodrilus americanus	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Aulodrilus pluriseta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ilyodrilus templetoni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-
Limnodrilus udekemianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spirosperma ferox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	16	-	32	-	-	-	-	-	-	-	-	-	-	-	-
immatures without hair chaetae	-	-	32	-	-	8	8	-	-	8	1	-	-	-	-
F. Lumbricidae															
Eiseniella tetraedra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indetermiate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lumbriculidae															
Lumbriculus variegatus	32	8	-	16	-	-	-	-	-	-	-	-	-	-	-
Stylodrilus heringianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Sparganophilidae															
Sparganophilus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LEECHES															
Cl. Hirudinea															
F. Erpobdellidae															
Nephelopsis obscura	33	-	-	1	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Glossiphoniidae															
Helobdella stagnalis	16	8	32	-	-	-	-	-	-	-	-	-	-	-	-
F. Haemopidae															
Haemopis plumbea	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS															
P. Arthropoda															
MITES															
Cl. Arachnida															
O. Acarina	32	96	32	32	32	8	8	-	-	16	-	-	-	-	-
SEED SHRIMPS															
Cl. Ostracoda	16	200	-	96	-	-	-	-	-	-	-	-	-	-	-
WATER SCUDS															
O. Amphipoda															
F. Crangonyctidae															
Crangonyx	-	-	-	32	-	-	-	-	-	-	-	-	-	-	-
F. Hyalellidae															
Hyalella	337	190	224	720	-	-	-	-	-	-	-	-	-	-	-
F. Pontoporeiidae															
Diporeia	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-
AQUATIC SOW BUGS															
O. Isopoda															
F. Asellidae															
Caecidotea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lirceus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPOSSUM SHRIMPS															
O. Mysidacea															
Mysis relicta	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-
SPRINGTAILS															
Cl. Entognatha															
O. Collembola	-	-	-	-	32	-	-	-	-	-	-	-	-	-	-
INSECTS															
Cl. Insecta															
BEETLES															
O. Coleoptera															
F. Chrysomelidae															
Donacia	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
F. Dryopidae															
Helichus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dytiscidae															
Coptotomus	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-
Dytiscus	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Graphoderus liberus	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hygrotus	-	8	-	16	32	-	-	-	-	-	-	-	-	-	-

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

						Bamoos Lake									
Station	Lentic Stations					BLL (Bamoos Lake Littoral)					BLP (Bamoos Lake Profundal)				
Replicate	L9	L13a	L13	L16	L26	1	2	3	4	5	1	2	3	4	5
Neoporus	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-
immature	-	**8**	32	-	-	-	-	-	-	-	-	-	-	-	-
F. Elmidae															
Dubiraphia larvae	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Optioservus larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Gyrinidae															
Dineutus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyrinus	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Haliplidae															
Haliplus	16	24	128	64	-	-	-	-	-	-	-	-	-	-	-
F. Hydrophilidae															
Laccobius	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracymus	-	8	-	32	-	-	-	-	-	-	-	-	-	-	-
MAYFLIES															
O. Ephemeroptera															
F. Baetidae															
Acerpenna macdunnoughi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Baetis tricaudatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Baetis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Callibaetis	16	48	-	32	-	-	-	-	-	-	-	-	-	-	-
Procloeon	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-
F. Caenidae															
Caenis	16	-	-	128	-	-	-	-	-	-	-	-	-	-	-
F. Ephemeridae															
Hexagenia	-	-	-	-	-	-	4	8	8	-	-	-	-	-	-
F. Ephemerellidae															
Ephemerella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eurylophella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Heptageniidae															
Epeorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heptagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maccaffertium modestum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maccaffertium vicarium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maccaffertium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptophlebiidae															
Habrophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leptophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AQUATIC MOTHS															
O. Lepidoptera															
F. Pyralidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Megaloptera															
ALDERFLIES															
F. Sialidae															
Sialis	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-
O. Odonata															
DAMSELFLIES															
F. Coenagrionidae															
immature	32	16	32	-	192	-	-	-	-	-	-	-	-	-	-
F. Lestidae															
Lestes	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-
DRAGONFLIES															
F. Aeshnidae															
Aeshna	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-
F. Cordulegastridae															
Cordulegaster	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Corduliidae/Libellulidae	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-
F. Corduliidae															
Cordulia shurtleffi	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Epitheca	16	-	64	-	-	-	-	-	-	-	-	-	-	-	-
F. Gomphidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Libellulidae															
Leucorrhinia	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	64	64	-	-	-	-	-	-	-	-	-	-
STONEFLIES															
O. Plecoptera															
F. Capniidae															
Paracapnia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Chloroperlidae															
Alloperla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leuctridae															
Leuctra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Nemouridae															
Nemoura	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Perlodidae															
Isoperla bilineata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isoperla lata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Taeniopterygidae															
Taeniopteryx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BUGS															
O. Hemiptera															
F. Corixidae															
Hesperocorixa scabricula	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Sigara penniensis	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-
Sigara signata	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Sigara sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	17	**208**	-	**96**	128	-	-	-	-	-	-	-	-	-	-

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

						Bamoos Lake									
Station	Lentic Stations					BLL (Bamoos Lake Littoral)					BLP (Bamoos Lake Profundal)				
Replicate	L9	L13a	L13	L16	L26	1	2	3	4	5	1	2	3	4	5
F. Gerridae															
Gerris	32	8	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	**16**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Notonectidae															
Notonecta	16	8	-	2	32	-	-	-	-	-	-	-	-	-	-
CADDISFLIES															
O. Trichoptera															
F. Dipseudopsidae															
Phylocentropus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae															
Cheumatopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche betteni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche dicantha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche slossonae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche sparna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydroptilidae															
Oxyethira	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lepidostomatidae															
Lepidostoma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Leptoceridae															
Oecetis	16	-	-	32	-	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae															
Glyphopsyche irrorata	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Hesperophylax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydatophylax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydatophylax/Pycnopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nemotaulius	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	32	**56**	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Molannidae															
Molanna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Phryganeidae															
Agrypnia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	64	16	32	-	32	-	-	-	-	-	-	-	-	-	-
F. Polycentropodidae															
Polycentropus	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-
F. Rhyacophilidae															
Rhyacophila	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRUE FLIES															
O. Diptera															
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	**16**	-	-	-	-	-	-	-	-	-	-	-
BITING-MIDGE															
F. Ceratopogonidae															
Atrichopogon	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bezzia	-	16	64	16	64	-	-	-	-	-	-	-	-	-	-
Culicoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dasyhelea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mallochohelea	-	-	-	-	-	-	-	8	8	-	-	-	-	-	-
Probezzia	32	16	-	16	-	-	-	-	-	-	-	-	-	-	-
pupae	-	**8**	-	-	-	-	-	-	-	-	-	-	-	-	-
PHANTOM MIDGE															
F. Chaoboridae															
Chaoborus americanus	-	16	-	176	32	-	-	-	-	-	-	-	-	-	-
MIDGES															
F. Chironomidae															
chironomid pupae	**16**	**32**	**32**	**240**	**704**	**8**	**4**	-	-	-	**1**	**1**	-	-	**1**
S.F. Chironominae															
Chironomus	-	-	-	-	32	-	-	-	-	-	15	8	9	-	6
Cladopelma	16	24	-	-	64	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	48	40	-	16	-	-	-	-	-	-	-	-	-	-	-
Cryptochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Demicryptochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	32	64	-	16	-	-	-	-	-	-	-	-	-	-	-
Endochironomus	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-
Glyptotendipes	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lipiniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	-	40	-	-	-	-	-	-	-	-	-	-	1	-	1
Microtendipes	-	8	-	-	-	-	4	8	-	-	-	-	-	-	-
Nilothauma	-	-	-	32	-	-	-	-	-	-	-	-	-	-	-
Pagastiella	32	88	1120	16	-	-	20	-	8	8	-	-	-	-	-
Parachironomus	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paralauterborniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	176	-	96	-	-	-	-	-	-	-	-	-	-	-	-
Paratendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phaenopsectra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum aviceps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum halterale	16	24	-	-	-	-	4	-	-	-	-	-	-	-	-
Polypedilum scalaenum	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-
Polypedilum tritum	-	56	32	-	-	-	-	-	-	-	-	-	-	-	-
Pseudochironomus	32	-	-	32	-	-	-	-	-	-	-	-	-	-	-
Stempellina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellinella	-	-	-	-	-	16	8	-	-	-	-	-	-	-	-
Stenochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stictochironomus	-	16	-	-	-	-	-	-	-	-	2	8	4	9	10
Tanytarsus	480	336	544	64	1280	8	36	8	48	8	-	-	-	-	-
Tribelos	16	16	32	-	-	-	-	-	-	-	-	-	-	-	-
Xenochironomus	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae															

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

						Bamoos Lake									
Station	Lentic Stations					BLL (Bamoos Lake Littoral)					BLP (Bamoos Lake Profundal)				
Replicate	L9	L13a	L13	L16	L26	1	2	3	4	5	1	2	3	4	5
Potthastia	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-
Protanypus	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1
S.F. Orthocladiinae															
Brillia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chaetocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heleniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heterotanytarsus	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-
Heterotrissocladius	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Mesocricotopus	-	-	-	-	-	-	-	-	-	-	2	2	3	-	2
Nanocladius	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orthocladius annectens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parachaetocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parakiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parametriocnemus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psectrocladius	16	112	1216	80	256	-	-	-	-	-	-	-	-	-	-
?Psilometriocnemus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tvetenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zalutschia	-	-	-	-	64	-	-	-	-	-	-	-	-	-	-
S.F. Prodiamesinae															
Monodiamesa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prodiamesa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Tanypodinae															
Ablabesmyia	16	72	416	64	672	-	-	-	-	-	-	-	-	-	-
Clinotanypus	-	8	32	-	-	-	-	-	-	-	-	-	-	-	-
Labrudinia	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Larsia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Monopelopia	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-
Natarsia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Procladius	112	144	736	192	1600	-	28	8	32	8	-	-	-	-	-
Thienemannimyia complex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trissopelopia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zavrelimyia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dixidae															
Dixa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dixella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Empididae															
Chelifera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hemerodromia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Ephydridae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tabanidae															
Chrysops	-	1	64	-	-	-	-	-	-	-	-	-	-	-	-
F. Tipulidae															
Antocha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dicranota	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnophila	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molophilus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhabdomastix	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-
Tipula	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCS															
P. Mollusca															
SNAILS															
Cl. Gastropoda															
F. Hydrobiidae															
Amnicola	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrgulopsis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lymnaeidae															
Fossaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Physidae															
Physella	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Planorbidae															
Planorbella	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-
immature	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Valvatidae															
Valvata lewisi/sincera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Valvata tricarinata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS															
Cl. Bivalvia															
F. Sphaeriidae															
Cyclocalyx	272	80	288	384	96	8	36	8	64	48	31	8	12	16	22
Sphaerium (Musculium)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Unionidae															
Anodontoides ferussacianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyganodon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS	2359	2352	5445	2842	5408	72	168	56	184	96	56	29	33	29	43
TOTAL NUMBER OF TAXA [a]	46	47	28	38	18	7	12	7	7	6	8	6	8	4	6

[a] Bold entries excluded from taxa count

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Assorted Marathon Area													
Station	Stream Stations			S42 (Stream 6 downstream of Hwy 17)					Stream Stations					
Replicate	S12	S15	S24	1	2	3	4	5	S32	S43	S44	S45	S46	S41
ROUNDWORMS														
P. Nemata	5	8	-	-	-	8	-	-	-	8	-	-	-	-
FLATWORMS														
P. Platyhelminthes														
Cl. Turbellaria														
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O. Tricladida	-	-	-	-	-	-	-	-	-	-	-	-	-	32
ANNELIDS														
P. Annelida														
WORMS														
Cl. Oligochaeta														
F. Enchytraeidae	2	352	72	16	-	-	-	-	-	8	-	-	-	96
F. Naididae														
Dero digitata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais variabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nais sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ophidonais serpentina	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stylaria lacustris	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vejdovskyella comata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Tubificidae														
Aulodrilus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aulodrilus pluriseta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ilyodrilus templetoni	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus hoffmeisteri	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	16	24	-	16	-	-	-	-	-	-	-
Rhyacodrilus montana	-	-	-	16	-	40	192	18	-	-	-	-	-	-
Spirosperma ferox	-	-	-	-	-	-	-	-	-	-	-	4	-	-
Tasserkidrilus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	2	-	8	-	-	-	-	-	-	-	-	-	-	32
immatures without hair chaetae	2	-	8	-	-	-	-	-	-	-	-	-	-	-
F. Lumbricidae														
Eiseniella tetraedra	-	-	-	-	-	-	-	-	-	-	-	-	-	144
indetermiate	-	-	-	-	-	-	-	-	-	8	4	-	8	192
F. Lumbriculidae														
Lumbriculus variegatus	-	-	-	-	-	40	-	-	-	-	-	-	-	-
Stylodrilus heringianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Sparganophilidae														
Sparganophilus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LEECHES														
Cl. Hirudinea														
F. Erpobdellidae	-													
Nephelopsis obscura	3	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	16	-	-	-	-	-	-	-	-	-	-
F. Glossiphoniidae														
Helobdella stagnalis	24	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Haemopidae														
Haemopis plumbea	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARTHROPODS														
P. Arthropoda														
MITES														
Cl. Arachnida														
O. Acarina	46	16	-	-	-	24	-	-	-	-	-	-	8	16
SEED SHRIMPS														
Cl. Ostracoda	2	304	-	-	-	8	-	-	-	-	-	4	-	-
WATER SCUDS														
O. Amphipoda														
F. Crangonyctidae														
Crangonyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hyalellidae														
Hyalella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Pontoporeiidae														
Diporeia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AQUATIC SOW BUGS														
O. Isopoda														
F. Asellidae														
Caecidotea	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lirceus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPOSSUM SHRIMPS														
O. Mysidacea														
Mysis relicta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS														
Cl. Entognatha														
O. Collembola	2	-	8	-	-	-	-	-	-	-	-	-	-	-
INSECTS														
Cl. Insecta														
BEETLES														
O. Coleoptera														
F. Chrysomelidae														
Donacia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Dryopidae														
Helichus	-	-	-	-	-	-	-	-	-	-	8	-	-	-
F. Dytiscidae														
Coptotomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dytiscus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Graphoderus liberus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hygrotus	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Assorted Marathon Area														
Station	Stream Stations			S42 (Stream 6 downstream of Hwy 17)					Stream Stations						
Replicate	S12	S15	S24	1	2	3	4	5	S32	S43	S44	S45	S46	S41	
Neoporus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Elmidae															
Dubiraphia larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Optioservus larvae	-	-	-	-	-	-	-	-	-	-	-	-	-	112	
F. Gyrinidae															
Dineutus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gyrinus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Haliplidae															
Haliplus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Hydrophilidae															
Laccobius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Paracymus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MAYFLIES															
O. Ephemeroptera															
F. Baetidae															
Acerpenna macdunnoughi	58	-	-	-	-	-	8	-	2	-	-	-	-	-	
Baetis tricaudatus	-	-	-	-	-	-	-	-	-	40	-	-	-	2080	
Baetis sp.	-	-	-	-	-	-	-	-	2	-	16	-	-	-	
Callibaetis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Procloeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Caenidae															
Caenis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Ephemeridae															
Hexagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Ephemerellidae															
Ephemerella	-	-	-	-	-	-	-	-	-	-	-	-	-	1536	
Eurylophella	122	-	-	-	-	-	-	-	-	-	-	-	-	16	
F. Heptageniidae															
Epeorus	-	-	-	-	-	-	-	-	-	-	-	-	-	48	
Heptagenia	-	-	-	-	-	-	-	-	-	-	-	-	-	32	
Maccaffertium modestum	-	-	-	-	-	-	-	-	-	-	-	-	-	368	
Maccaffertium vicarium	55	-	-	-	-	-	-	-	-	-	-	-	-	240	
Maccaffertium	**10**	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Leptophlebiidae															
Habrophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	208	
Leptophlebia	114	16	-	-	-	-	-	-	-	-	-	-	-	16	
Paraleptophlebia	-	-	-	-	-	-	-	-	-	-	-	-	-	1088	
AQUATIC MOTHS															
O. Lepidoptera															
F. Pyralidae	-	-	-	-	-	-	-	2	-	-	-	-	-	-	
O. Megaloptera															
ALDERFLIES															
F. Sialidae															
Sialis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
O. Odonata															
DAMSELFLIES															
F. Coenagrionidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Lestidae															
Lestes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DRAGONFLIES															
F. Aeshnidae															
Aeshna	-	-	-	-	-	8	-	-	-	-	-	-	-	-	
F. Cordulegastridae															
Cordulegaster	1	-	-	-	-	-	1	-	-	-	-	-	-	-	
F. Corduliidae/Libellulidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Corduliidae															
Cordulia shurtleffi	-	1	-	-	-	-	-	-	-	-	-	-	-	-	
Epitheca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Gomphidae															
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	32	
F. Libellulidae															
Leucorrhinia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
STONEFLIES															
O. Plecoptera															
F. Capniidae															
Paracapnia	45	-	-	-	-	8	-	-	-	-	-	-	24	1520	
indeterminate	4	-	-	-	-	-	-	-	-	-	20	-	88	-	
F. Chloroperlidae															
Alloperla	-	-	-	-	-	-	-	-	-	-	-	-	-	48	
indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	48	
F. Leuctridae															
Leuctra	2	-	-	-	-	104	-	-	-	-	-	-	16	1152	
F. Nemouridae															
Nemoura	-	-	40	-	-	-	-	-	6	-	8	-	456	16	
F. Perlodidae															
Isoperla bilineata	-	-	-	-	-	-	-	-	-	-	-	-	-	1024	
Isoperla lata	-	-	-	-	-	-	-	-	-	-	-	-	-	32	
immature	2	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Taeniopterygidae															
Taeniopteryx	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
BUGS															
O. Hemiptera															
F. Corixidae															
Hesperocorixa scabricula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sigara penniensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sigara signata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sigara sp.	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Assorted Marathon Area													
Station	Stream Stations			S42 (Stream 6 downstream of Hwy 17)					Stream Stations					
Replicate	S12	S15	S24	1	2	3	4	5	S32	S43	S44	S45	S46	S41
F. Gerridae														
Gerris	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Notonectidae														
Notonecta	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CADDISFLIES														
O. Trichoptera														
F. Dipseudopsidae														
Phylocentropus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae														
Cheumatopsyche	-	-	-	-	-	-	-	-	-	-	-	-	-	528
Hydropsyche betteni	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydropsyche dicantha	-	-	-	-	-	-	-	-	-	-	-	-	-	128
Hydropsyche slossonae	-	-	-	-	-	-	-	-	-	-	-	-	-	192
Hydropsyche sparna	-	-	-	-	-	-	-	-	-	-	-	-	-	624
Hydropsyche immature	-	-	-	-	-	-	-	-	-	-	-	-	-	**48**
F. Hydroptilidae														
Oxyethira	50	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Lepidostomatidae														
Lepidostoma	-	-	-	-	-	24	8	-	-	8	-	-	-	352
F. Leptoceridae														
Oecetis	-	4	-	-	-	-	-	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Limnephilidae														
Glyphopsyche irrorata	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hesperophylax	-	-	-	-	-	-	-	-	-	-	-	-	16	-
Hydatophylax	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Hydatophylax/Pycnopsyche	24	-	16	-	-	64	-	**6**	4	8	-	-	-	32
Nemotaulius	-	-	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	8	-	-	-	-	-	8	20	-	-	32
F. Molannidae														
Molanna	-	-	-	-	-	8	-	-	-	-	-	-	-	-
F. Phryganeidae														
Agrypnia	-	4	-	-	-	-	-	-	-	-	-	-	-	-
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Polycentropodidae														
Polycentropus	2	-	-	-	-	-	-	-	-	-	-	-	-	-
F. Rhyacophilidae														
Rhyacophila	2	4	-	-	-	-	-	-	-	-	-	-	-	416
TRUE FLIES														
O. Diptera														
indeterminate	-	-	-	8	-	-	-	-	2	-	-	4	8	-
pupae	**2**	-	-	**16**	-	-	-	-	-	-	-	-	-	-
BITING-MIDGE														
F. Ceratopogonidae														
Atrichopogon	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bezzia	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Culicoides	-	-	-	-	-	24	16	-	-	-	-	-	-	-
Dasyhelea	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Mallochohelea	4	-	-	-	4	16	-	2	-	-	-	-	-	-
Probezzia	16	-	-	-	-	-	-	-	-	-	-	-	-	128
pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PHANTOM MIDGE														
F. Chaoboridae														
Chaoborus americanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MIDGES														
F. Chironomidae														
chironomid pupae	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Chironominae														
Chironomus	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Cladopelma	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Cladotanytarsus	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Cryptochironomus	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Demicryptochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Dicrotendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Endochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glyptotendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lipiniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Micropsectra	-	-	-	-	-	-	-	-	-	-	-	-	-	1728
Microtendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pagastiella	-	-	-	8	-	-	-	-	-	-	-	-	-	-
Parachironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladopelma	-	-	-	-	-	-	16	-	-	-	-	-	-	-
Paralauterborniella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paratendipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phaenopsectra	-	-	-	-	-	-	8	-	-	-	-	-	-	-
Polypedilum aviceps	-	-	-	-	-	-	-	-	-	-	-	-	-	1136
Polypedilum halterale	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum scalaenum	34	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum tritum	6	-	-	8	-	-	-	-	-	-	-	-	-	32
Pseudochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stempellina	-	-	-	16	-	104	64	10	-	-	-	-	-	-
Stempellinella	2	-	-	-	-	-	8	-	-	-	-	-	-	-
Stenochironomus	2	-	-	-	-	8	-	-	-	-	-	-	-	-
Stictochironomus	2	-	32	-	20	-	-	-	-	24	12	20	16	-
Tanytarsus	4	16	-	-	-	-	-	-	-	-	-	-	-	-
Tribelos	2	-	-	152	84	104	8	14	-	-	-	-	-	-
Xenochironomus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.F. Diamesinae														

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

	Assorted Marathon Area														
Station	Stream Stations			S42 (Stream 6 downstream of Hwy 17)					Stream Stations						
Replicate	S12	S15	S24	1	2	3	4	5	S32	S43	S44	S45	S46	S41	
Potthastia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Protanypus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S.F. Orthocladiinae															
Brillia	4	-	-	8	-	16	-	2	-	16	4	-	56	80	
Chaetocladius	6	-	24	-	-	-	-	-	-	-	-	-	-	-	
Cricotopus	-	44	-	-	-	-	-	-	-	-	-	-	-	240	
Cricotopus/Orthocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	16	
Eukiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	16	
Heleniella	-	-	40	-	-	8	16	-	-	-	-	-	24	-	
Heterotanytarsus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Heterotrissocladius	-	-	-	8	4	16	56	-	-	-	-	-	-	-	
Mesocricotopus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nanocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Orthocladius annectens	-	-	-	-	-	-	-	-	-	-	-	-	-	16	
Parachaetocladius	-	-	-	-	-	-	-	-	-	-	-	-	-	496	
Paracladius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Parakiefferiella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Parametriocnemus	-	-	-	-	-	-	-	-	-	-	-	-	8	64	
Psectrocladius	-	16	-	-	-	-	-	-	-	-	-	-	-	-	
?Psilometriocnemus	-	-	-	-	-	-	-	-	-	-	-	-	8	-	
Tvetenia	-	-	-	-	-	-	-	-	-	-	-	-	-	176	
Xylotopus	24	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zalutschia	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
S.F. Prodiamesinae															
Monodiamesa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Prodiamesa	-	-	24	-	-	-	-	-	-	-	4	16	8	-	
S.F. Tanypodinae															
Ablabesmyia	-	40	-	-	-	-	-	-	-	-	-	-	-	-	
Clinotanypus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Labrudinia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Larsia	22	-	-	8	-	-	-	-	-	-	-	-	-	-	
Monopelopia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Natarsia	4	-	-	-	-	8	-	-	-	-	-	-	-	-	
Procladius	2	12	-	24	-	-	8	-	2	-	-	-	-	-	
Thienemannimyia complex	128	-	-	-	-	8	-	-	-	-	-	-	-	576	
Trissopelopia	-	-	-	-	-	88	8	8	-	-	-	4	-	288	
Zavrelimyia	98	-	16	8	-	40	-	-	-	-	-	-	232	-	
F. Dixidae															
Dixa	-	-	-	-	-	-	-	-	-	-	-	-	16	-	
Dixella	2	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Empididae															
Chelifera	-	-	-	-	-	16	-	-	-	-	-	-	-	48	
Hemerodromia	24	-	-	-	-	-	-	-	-	-	-	-	-	-	
Neoplasta	4	4	-	-	-	8	-	-	2	-	-	-	-	-	
F. Ephydridae	-	-	-	-	-	-	-	-	-	-	4	-	-	-	
F. Tabanidae															
Chrysops	-	-	-	32	-	-	-	2	-	8	-	-	-	-	
F. Tipulidae															
Antocha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dicranota	4	-	-	-	-	-	8	-	4	16	-	4	24	32	
Limnophila	-	-	-	-	4	-	8	2	-	-	-	-	-	-	
Molophilus	-	-	56	8	-	-	-	-	-	-	4	-	16	-	
Pilaria	-	-	-	8	4	8	-	4	-	-	-	-	-	-	
Rhabdomastix	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Tipula	-	-	-	-	-	8	-	-	-	-	-	-	-	-	
MOLLUSCS															
P. Mollusca															
SNAILS															
Cl. Gastropoda															
F. Hydrobiidae															
Amnicola	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pyrgulopsis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Lymnaeidae															
Fossaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Physidae															
Physella	-	-	-	8	-	-	-	-	-	-	-	-	-	-	
F. Planorbidae															
Planorbella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
immature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Valvatidae															
Valvata lewisi/sincera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Valvata tricarinata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CLAMS															
Cl. Bivalvia															
F. Sphaeriidae															
Cyclocalyx	40	104	-	144	140	664	160	128	-	-	-	-	-	-	
Sphaerium (Musculium)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
F. Unionidae															
Anodontoides ferussacianus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pyganodon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TOTAL NUMBER OF ORGANISMS	1025	981	344	536	284	1480	609	200	24	152	104	56	1032	17568	
TOTAL NUMBER OF TAXA [a]	47	24	12	20	8	28	18	12	8	11	11	7	18	50	

[a] Bold entries excluded from taxa count

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

Station	SC (Sturdee Cove)				
Replicate	1	2	3	4	5
ROUNDWORMS					
P. Nemata	-	-	-	-	-
FLATWORMS					
P. Platyhelminthes					
Cl. Turbellaria					
indeterminate	1	-	-	-	-
O. Tricladida	-	-	-	-	-
ANNELIDS					
P. Annelida					
WORMS					
Cl. Oligochaeta					
F. Enchytraeidae	-	-	-	-	-
F. Naididae					
Dero digitata	-	-	-	-	-
Nais variabilis	-	-	-	-	-
Nais sp.	-	-	-	-	-
Ophidonais serpentina	-	-	-	-	-
Slavina appendiculata	-	-	-	-	-
Stylaria lacustris	-	-	-	-	-
Vejdovskyella comata	-	-	-	-	-
F. Tubificidae					
Aulodrilus americanus	-	4	2	5	5
Aulodrilus pluriseta	-	8	-	-	-
Ilyodrilus templetoni	-	-	-	-	-
Limnodrilus hoffmeisteri	-	-	-	-	-
Limnodrilus udekemianus	-	-	-	-	-
Rhyacodrilus montana	2	4	2	3	7
Spirosperma ferox	5	65	56	9	13
Tasserkidrilus americanus	-	-	-	-	-
immatures with hair chaetae	-	-	-	10	10
immatures without hair chaetae	-	-	-	-	5
F. Lumbricidae					
Eiseniella tetraedra	-	-	-	-	-
indetermiate	-	-	-	-	-
F. Lumbriculidae					
Lumbriculus variegatus	-	8	-	-	-
Stylodrilus heringianus	4	17	2	-	5
F. Sparganophilidae					
Sparganophilus	-	-	-	-	-
LEECHES					
Cl. Hirudinea					
F. Erpobdellidae					
Nephelopsis obscura	-	-	-	-	-
immature	-	-	-	-	-
F. Glossiphoniidae					
Helobdella stagnalis	-	3	2	8	-
F. Haemopidae					
Haemopis plumbea	-	-	-	-	-
ARTHROPODS					
P. Arthropoda					
MITES					
Cl. Arachnida					
O. Acarina	-	7	2	16	5
SEED SHRIMPS					
Cl. Ostracoda	9	161	100	176	54
WATER SCUDS					
O. Amphipoda					
F. Crangonyctidae					
Crangonyx	-	-	-	-	-
F. Hyalellidae					
Hyalella	-	2	-	-	-
F. Pontoporeiidae					
Diporeia	7	6	10	-	8
AQUATIC SOW BUGS					
O. Isopoda					
F. Asellidae					
Caecidotea	-	3	-	8	-
Lirceus	1	1	-	-	-
OPOSSUM SHRIMPS					
O. Mysidacea					
Mysis relicta	-	-	-	-	-
SPRINGTAILS					
Cl. Entognatha					
O. Collembola	-	-	-	-	-
INSECTS					
Cl. Insecta					
BEETLES					
O. Coleoptera					
F. Chrysomelidae					
Donacia	-	-	-	-	-
F. Dryopidae					
Helichus	-	-	-	-	-
F. Dytiscidae					
Coptotomus	-	-	-	-	-
Dytiscus	-	-	-	-	-
Graphoderus liberus	-	-	-	-	-
Hygrotus	-	-	-	-	-

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

Station	SC (Sturdee Cove)				
Replicate	1	2	3	4	5
Neoporus	-	-	-	-	-
immature	-	-	-	-	-
F. Elmidae					
Dubiraphia larvae	-	-	-	-	-
Optioservus larvae	-	-	-	-	-
F. Gyrinidae					
Dineutus	-	-	-	-	-
Gyrinus	-	-	-	-	-
F. Haliplidae					
Haliplus	-	-	-	-	-
F. Hydrophilidae					
Laccobius	-	-	-	-	-
Paracymus	-	-	-	-	-
MAYFLIES					
O. Ephemeroptera					
F. Baetidae					
Acerpenna macdunnoughi	-	-	-	-	-
Baetis tricaudatus	-	-	-	-	-
Baetis sp.	-	-	-	-	-
Callibaetis	-	-	-	-	-
Procloeon	-	-	-	-	-
F. Caenidae					
Caenis	-	-	-	-	-
F. Ephemeridae					
Hexagenia	-	-	-	-	-
F. Ephemerellidae					
Ephemerella	-	-	-	-	-
Eurylophella	-	-	-	-	-
F. Heptageniidae					
Epeorus	-	-	-	-	-
Heptagenia	-	-	-	-	-
Maccaffertium modestum	-	-	-	-	-
Maccaffertium vicarium	-	-	-	-	-
Maccaffertium	-	-	-	-	-
F. Leptophlebiidae					
Habrophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
AQUATIC MOTHS					
O. Lepidoptera					
F. Pyralidae	-	-	-	-	-
O. Megaloptera					
ALDERFLIES					
F. Sialidae					
Sialis	-	-	-	-	-
O. Odonata					
DAMSELFLIES					
F. Coenagrionidae					
immature	-	-	-	-	-
F. Lestidae					
Lestes	-	-	-	-	-
DRAGONFLIES					
F. Aeshnidae					
Aeshna	-	-	-	-	-
F. Cordulegastridae					
Cordulegaster	-	-	-	-	-
F. Corduliidae/Libellulidae	-	-	-	-	-
F. Corduliidae					
Cordulia shurtleffi	-	-	-	-	-
Epitheca	-	-	-	-	-
F. Gomphidae					
immature	-	-	-	-	-
F. Libellulidae					
Leucorrhinia	-	-	-	-	-
immature	-	-	-	-	-
STONEFLIES					
O. Plecoptera					
F. Capniidae					
Paracapnia	-	-	-	-	-
indeterminate	-	-	-	-	-
F. Chloroperlidae					
Alloperla	-	-	-	-	-
indeterminate	-	-	-	-	-
F. Leuctridae					
Leuctra	-	-	-	-	-
F. Nemouridae					
Nemoura	-	-	-	-	-
F. Perlodidae					
Isoperla bilineata	-	-	-	-	-
Isoperla lata	-	-	-	-	-
immature	-	-	-	-	-
F. Taeniopterygidae					
Taeniopteryx	-	-	-	-	-
BUGS					
O. Hemiptera					
F. Corixidae					
Hesperocorixa scabricula	-	-	-	-	-
Sigara penniensis	-	-	-	-	-
Sigara signata	-	-	-	-	-
Sigara sp.	-	-	-	-	-
immature	-	-	-	-	-

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

Station	SC (Sturdee Cove)				
Replicate	1	2	3	4	5
F. Gerridae					
Gerris	-	-	-	-	-
immature	-	-	-	-	-
F. Notonectidae					
Notonecta	-	-	-	-	-
CADDISFLIES					
O. Trichoptera					
F. Dipseudopsidae					
Phylocentropus	-	-	-	-	-
F. Hydropsychidae					
Cheumatopsyche	-	-	-	-	-
Hydropsyche betteni	-	-	-	-	-
Hydropsyche dicantha	-	-	-	-	-
Hydropsyche slossonae	-	-	-	-	-
Hydropsyche sparna	-	-	-	-	-
Hydropsyche immature	-	-	-	-	-
F. Hydroptilidae					
Oxyethira	-	-	-	-	-
F. Lepidostomatidae					
Lepidostoma	-	-	-	-	-
F. Leptoceridae					
Oecetis	-	-	14	8	1
pupae	-	-	-	-	-
F. Limnephilidae					
Glyphopsyche irrorata	-	-	-	-	-
Hesperophylax	-	-	-	-	-
Hydatophylax	-	-	-	-	-
Hydatophylax/Pycnopsyche	-	-	-	-	-
Nemotaulius	-	-	-	-	-
immature	-	-	-	-	-
F. Molannidae					
Molanna	-	-	-	-	-
F. Phryganeidae					
Agrypnia	-	-	-	-	-
immature	-	-	-	-	-
F. Polycentropodidae					
Polycentropus	-	-	-	-	-
F. Rhyacophilidae					
Rhyacophila	-	-	-	-	-
TRUE FLIES					
O. Diptera					
indeterminate	1	-	-	-	-
pupae	-	-	-	-	-
BITING-MIDGE					
F. Ceratopogonidae					
Atrichopogon	-	-	-	-	-
Bezzia	-	-	-	-	-
Culicoides	-	-	-	-	-
Dasyhelea	-	-	-	-	-
Mallochohelea	1	9	4	-	2
Probezzia	-	-	-	-	-
pupae	-	-	-	-	-
PHANTOM MIDGE					
F. Chaoboridae					
Chaoborus americanus	-	-	-	-	-
MIDGES					
F. Chironomidae					
chironomid pupae	-	-	-	-	-
S.F. Chironominae					
Chironomus	-	-	-	-	-
Cladopelma	-	-	-	-	-
Cladotanytarsus	-	-	-	-	-
Cryptochironomus	-	2	2	32	6
Demicryptochironomus	-	2	2	-	2
Dicrotendipes	1	4	-	-	-
Endochironomus	-	-	-	-	-
Glyptotendipes	-	-	-	-	-
Lipiniella	1	-	-	-	1
Micropsectra	-	18	-	8	-
Microtendipes	3	20	26	32	3
Nilothauma	-	-	-	-	-
Pagastiella	-	-	-	-	-
Parachironomus	-	-	-	-	-
Paracladopelma	-	-	-	-	2
Paralauterborniella	-	-	-	-	-
Paratanytarsus	-	-	-	-	-
Paratendipes	-	-	-	-	-
Phaenopsectra	-	-	-	-	-
Polypedilum aviceps	-	-	-	-	-
Polypedilum halterale	-	-	-	-	-
Polypedilum scalaenum	2	4	12	32	6
Polypedilum tritum	-	-	-	-	-
Pseudochironomus	-	-	-	-	-
Stempellina	-	-	-	-	-
Stempellinella	-	-	-	-	-
Stenochironomus	-	-	-	-	-
Stictochironomus	-	-	-	-	-
Tanytarsus	17	178	222	56	73
Tribelos	-	-	-	-	1
Xenochironomus	-	-	-	-	-
S.F. Diamesinae					

TABLE A4.1: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2009 (RAW COUNTS).

Station	SC (Sturdee Cove)				
Replicate	1	2	3	4	5
Potthastia	-	-	-	-	-
Protanypus	1	2	2	8	1
S.F. Orthocladiinae					
Brillia	-	-	-	-	-
Chaetocladius	-	-	-	-	-
Cricotopus	-	-	-	-	-
Cricotopus/Orthocladius	-	-	-	-	-
Eukiefferiella	-	-	-	-	-
Heleniella	-	-	-	-	-
Heterotanytarsus	-	-	-	-	-
Heterotrissocladius	3	36	12	112	20
Mesocricotopus	-	-	-	-	-
Nanocladius	-	-	-	-	-
Orthocladius annectens	-	-	-	-	-
Parachaetocladius	-	-	-	-	-
Paracladius	-	28	-	-	1
Parakiefferiella	-	-	-	-	-
Parametriocnemus	-	-	-	-	-
Psectrocladius	-	-	-	-	-
?Psilometriocnemus	-	-	-	-	-
Tvetenia	-	-	-	-	-
Xylotopus	-	-	-	-	-
Zalutschia	-	-	-	-	-
S.F. Prodiamesinae					
Monodiamesa	4	-	-	8	3
Prodiamesa	-	-	-	-	-
S.F. Tanypodinae					
Ablabesmyia	-	-	-	-	-
Clinotanypus	-	-	-	-	-
Labrudinia	-	-	-	-	-
Larsia	-	6	4	-	1
Monopelopia	-	-	-	-	-
Natarsia	-	-	-	-	-
Procladius	14	54	54	88	22
Thienemannimyia complex	-	2	4	-	-
Trissopelopia	-	-	-	-	-
Zavrelimyia	-	-	-	-	-
F. Dixidae					
Dixa	-	-	-	-	-
Dixella	-	-	-	-	-
F. Empididae					
Chelifera	-	-	-	-	-
Hemerodromia	-	-	-	-	-
Neoplasta	-	-	-	-	-
F. Ephydridae	-	-	-	-	-
F. Tabanidae					
Chrysops	-	-	-	-	-
F. Tipulidae					
Antocha	-	-	-	-	-
Dicranota	-	-	-	-	-
Limnophila	-	-	-	-	-
Molophilus	-	-	-	-	-
Pilaria	-	-	-	-	-
Rhabdomastix	-	-	-	-	-
Tipula	-	-	-	-	-
MOLLUSCS					
P. Mollusca					
SNAILS					
Cl. Gastropoda					
F. Hydrobiidae					
Amnicola	1	1	-	-	-
Pyrgulopsis	-	-	2	-	1
F. Lymnaeidae					
Fossaria	1	-	-	-	-
F. Physidae					
Physella	-	-	-	-	-
F. Planorbidae					
Planorbella	-	-	-	-	-
immature	-	-	-	-	-
F. Valvatidae					
Valvata lewisi/sincera	3	10	16	24	5
Valvata tricarinata	-	2	4	16	1
CLAMS					
Cl. Bivalvia					
F. Sphaeriidae					
Cyclocalyx	20	67	58	88	49
Sphaerium (Musculium)	-	-	-	-	-
F. Unionidae					
Anodontoides ferussacianus	-	-	-	-	-
Pyganodon	-	-	-	-	-
TOTAL NUMBER OF ORGANISMS	102	734	614	747	313
TOTAL NUMBER OF TAXA [a]	22	31	24	21	29

[a] Bold entries excluded from taxa count

TABLE A4.2: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2011 (RAW COUNTS).

	Lentic Stations					Stream Stations							
Station	L20	L24	L25	L27	L29	S18	S20	S51A	S59	S60	S61	S62	S69
ROUNDWORMS													
P. Nemata	64	168	2528	272	48	16	64	176	1024	48	24	32	-
ANNELIDS													
P. Annelida													
WORMS													
Cl. Oligochaeta													
F. Enchytraeidae	48	64	-	32	-	-	-	16	32	-	-	48	16
F. Naididae													
Nais variabilis	32	-	-	-	-	-	-	-	64	-	-	-	-
Nais	-	8	-	32	16	-	-	-	-	-	-	-	-
Slavina appendiculata	16	-	-	-	-	-	-	-	32	-	-	-	-
Vejdovskyella comata	-	-	-	-	16	-	-	-	128	-	-	-	-
F. Tubificidae													
Aulodrilus americanus	32	-	-	-	-	-	-	-	-	-	-	-	-
Aulodrilus pigueti	16	-	-	-	-	-	-	-	-	-	-	-	-
Limnodrilus udekemianus	32	-	-	-	-	-	-	-	-	-	-	-	-
immatures with hair chaetae	32	-	-	16	-	-	8	-	-	-	-	-	-
F. Lumbricidae													
Eiseniella tetraedra	-	-	-	-	-	-	-	-	-	-	-	-	2
F. Lumbriculidae													
Lumbriculus	-	8	-	-	16	-	-	-	-	16	-	-	16
F. Sparganophilidae													
Sparganophilus	-	-	-	16	-	-	-	-	-	-	-	-	-
LEECHES													
Cl. Hirudinea													
F. Erpobdellidae													
Erpobdella parva	-	-	-	-	-	4	2	1	-	-	-	-	-
immature	16	-	-	-	1	-	-	-	-	-	-	-	-
F. Glossiphoniidae													
Helobdella stagnalis	16	-	-	-	16	-	8	-	-	-	-	-	-
ARTHROPODS													
P. Arthropoda													
MITES													
Cl. Arachnida													
O. Acarina	16	32	80	48	32	48	193	96	96	48	64	-	80
SEED SHRIMPS													
Cl. Ostracoda	-	-	-	-	-	8	-	-	-	-	-	-	16
WATER SCUDS													
O. Amphipoda													
F. Crangonyctidae													
Crangonyx	-	-	-	-	1	-	-	-	-	-	-	-	-
F. Hyalellidae													
Hyalella	336	-	-	-	-	-	-	-	-	-	-	-	-
SPRINGTAILS													
Cl. Entognatha													
O. Collembola	16	-	48	-	48	32	-	-	-	64	8	-	16
INSECTS													
Cl. Insecta													
BEETLES													
O. Coleoptera													
F. Dytiscidae													
Agabus	-	-	-	-	-	-	-	-	-	-	-	2	-
Graphoderus	1	-	-	-	48	-	-	-	-	-	-	-	-
Hydroporus	-	8	-	-	-	-	-	-	-	-	-	-	-
Neoporus	16	168	-	-	-	-	-	-	-	-	-	-	-
immature	-	**56**	64	-	-	8	32	-	32	-	8	-	-
F. Gyrinidae													
Gyrinus	16	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydrophilidae													
Paracymus	-	-	-	-	-	8	-	-	-	-	-	-	-
F. Staphylinidae	-	-	-	-	-	8	-	-	-	-	-	-	-
MAYFLIES													
O. Ephemeroptera													
F. Arthropleidae													

TABLE A4.2: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2011 (RAW COUNTS).

	Lentic Stations					Stream Stations							
Station	L20	L24	L25	L27	L29	S18	S20	S51A	S59	S60	S61	S62	S69
Arthroplea bipunctata	-	96	32	-	-	-	-	-	-	16	-	-	-
F. Baetidae													
Acerpenna	-	-	-	-	-	-	-	-	-	-	-	-	32
Baetis	-	-	-	-	-	136	-	-	-	-	-	-	160
Callibaetis	-	-	-	-	32	-	-	-	-	-	-	-	-
F. Caenidae													
Caenis	16	-	-	-	16	-	-	-	-	-	-	-	-
F. Ephemerellidae													
Eurylophella bicolor	-	-	-	-	-	32	-	-	-	-	-	-	48
Eurylophella temporalis	32	-	-	-	-	-	-	-	-	-	-	-	-
Eurylophella immature	-	-	-	-	-	**56**	40	-	-	-	-	-	**144**
immature	-	-	-	-	-	-	-	48	-	-	-	-	-
F. Heptageniidae													
Heptagenia	-	-	-	-	-	-	-	-	-	-	-	-	32
F. Siphlonuridae													
Siphlonurus	-	-	-	-	-	8	-	16	-	-	-	-	-
AQUATIC MOTHS													
O. Lepidoptera													
F. Pyralidae	16	-	-	-	-	-	-	-	-	-	-	-	-
O. Odonata													
DAMSELFLIES													
F. Coenagrionidae													
Enallagma	-	-	-	33	17	-	-	-	-	-	-	1	-
immature	-	40	-	**16**	-	-	-	-	-	-	-	-	-
F. Lestidae													
immature	-	-	80	-	-	-	-	-	-	-	-	-	-
DRAGONFLIES													
F. Aeshnidae													
Aeshna	-	-	-	2	-	-	-	-	-	-	1	2	-
immature	-	-	-	-	48	8	-	-	-	-	-	-	-
F. Corduliidae													
Cordulia shurtleffi	-	-	-	-	32	-	-	-	2	-	-	-	-
Epitheca	-	-	-	-	-	-	8	-	1	-	-	-	-
Somatochlora	1	-	-	-	1	-	-	-	-	-	1	-	-
immature	**16**	-	-	-	-	-	-	-	-	-	-	-	-
F. Libellulidae													
Leucorrhinia	-	12	-	-	80	-	-	-	-	-	-	-	-
Libellula	-	-	-	-	-	-	-	-	-	-	-	1	-
immature	32	**48**	-	-	-	-	-	-	-	16	-	-	-
STONEFLIES													
O. Plecoptera													
F. Leuctridae													
Leuctra	-	-	-	-	-	72	96	32	-	-	-	-	160
F. Nemouridae													
Amphinemura	-	-	-	-	-	96	-	32	-	-	-	-	352
Nemoura	-	-	-	-	-	-	-	-	-	-	-	-	16
F. Perlodidae													
Isoperla	-	-	-	-	-	-	-	-	-	-	-	-	211
BUGS													
O. Hemiptera													
F. Corixidae													
Sigara	16	8	16	-	-	-	-	-	-	16	-	-	-
immature	-	**136**	-	-	-	-	-	-	64	**80**	-	-	-
F. Notonectidae													
Notonecta	-	-	-	-	-	-	-	-	-	1	-	-	-
immature	-	24	-	80	64	-	-	-	32	**16**	-	16	-
CADDISFLIES													
O. Trichoptera													
F. Dipseudopsidae													
Phylocentropus	1	-	-	-	-	-	-	-	-	-	-	-	-
F. Hydropsychidae													
Hydropsyche betteni	-	-	-	-	-	-	56	-	-	-	1	-	-
Hydropsyche immature	-	-	-	-	-	-	-	-	-	-	-	-	32
Parapsyche	-	-	-	-	-	9	-	-	-	-	-	-	-
pupae	-	-	-	-	-	-	**8**	-	-	-	-	-	**16**
F. Lepidostomatidae													
Lepidostoma	-	-	-	-	-	16	240	96	-	-	-	-	16
F. Leptoceridae													

TABLE A4.2: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2011 (RAW COUNTS).

	Lentic Stations					Stream Stations							
Station	L20	L24	L25	L27	L29	S18	S20	S51A	S59	S60	S61	S62	S69
Ceraclea	16	-	-	-	-	-	-	-	-	-	-	-	-
Oecetis	112	-	32	-	32	-	-	-	-	-	-	-	-
F. Limnephilidae													
Ironoquia	-	-	-	-	-	2	-	-	-	-	-	-	-
Limnephilus	16	-	-	-	-	-	-	-	-	-	-	-	1
Pycnopsyche	-	-	-	-	-	1	9	33	-	-	-	-	-
immature	**16**	-	-	-	16	**8**	-	**80**	-	-	24	32	**160**
pupae	-	-	-	-	-	**1**	-	**16**	-	-	-	-	-
F. Philopotamidae													
Dolophilodes	-	-	-	-	-	16	-	-	-	-	-	-	272
F. Phryganeidae													
Banksiola	-	-	-	16	-	-	-	-	-	1	-	1	-
F. Polycentropodidae													
Polycentropus	-	10	80	-	-	8	16	18	-	32	-	1	-
immature	-	-	-	-	-	-	-	-	32	-	-	-	-
F. Rhyacophilidae													
Rhyacophila	-	-	-	-	-	-	-	-	-	-	-	-	2
TRUE FLIES													
O. Diptera													
indeterminate	-	-	-	-	-	-	8	32	-	-	8	-	16
BITING-MIDGE													
F. Ceratopogonidae													
Atrichopogon	-	168	-	-	240	-	-	16	32	-	-	-	-
Bezzia	240	80	112	80	64	24	16	16	96	48	40	16	-
Ceratopogon	-	8	-	-	-	-	-	-	-	-	-	-	-
Dasyhelea	-	-	-	-	-	-	-	-	-	16	-	-	-
Probezzia	-	48	-	-	-	-	-	-	-	-	-	-	-
pupae	-	-	**16**	-	**32**	-	-	-	-	-	-	-	-
PHANTOM MIDGE													
F. Chaoboridae													
Chaoborus americanus	48	-	16	16	48	-	-	-	-	16	-	-	-
MIDGES													
F. Chironomidae													
chironomid pupae	**144**	**40**	**320**	**128**	**672**	**8**	**176**	**112**	**416**	**256**	**8**	**160**	**96**
S.F. Chironominae													
Chironomus	-	-	128	32	96	-	-	-	192	768	8	16	-
Cladopelma	16	-	256	64	-	-	-	-	32	448	16	16	-
Cladotanytarsus	32	-	-	-	192	-	-	-	-	48	-	-	-
Cryptochironomus	-	-	-	-	32	-	-	-	-	16	-	-	-
Cryptotendipes	16	-	-	-	-	-	-	-	-	-	-	-	-
Dicrotendipes	16	-	96	-	-	-	-	-	-	80	-	-	-
Endochironomus	48	-	-	-	-	-	-	-	-	-	-	-	-
Lauterborniella	-	-	-	-	96	-	-	-	-	-	-	-	-
Micropsectra	-	-	-	-	-	80	-	2272	64	-	-	-	16
Microtendipes	256	-	-	-	32	-	-	-	416	-	-	-	-
Nilothauma	-	-	-	-	-	-	-	-	96	-	-	-	-
Pagastiella	32	-	-	-	-	-	-	-	-	-	-	-	-
Parachironomus	32	-	-	-	-	-	-	-	-	-	-	-	-
Paratanytarsus	-	32	704	-	-	-	-	-	160	48	8	-	-
Paratendipes	-	8	-	-	-	8	-	160	-	-	-	-	16
Polypedilum aviceps	-	-	-	-	-	8	8	-	-	-	-	-	128
Polypedilum halterale	48	-	32	32	32	-	-	-	-	16	-	-	-
Polypedilum sp.	32	8	-	-	64	-	-	-	-	16	-	-	64
Stempellina	-	-	-	-	-	-	-	-	-	-	-	-	16
Stempellinella	-	-	-	-	-	-	-	-	-	-	-	-	96
Stenochironomus	-	-	-	-	-	8	-	-	-	-	-	-	-
Tanytarsus	176	-	384	1040	2016	-	120	32	800	320	152	352	16
S.F. Orthocladiinae													
Brillia	-	-	-	-	-	16	-	320	-	-	-	-	80
Chaetocladius	-	-	-	-	-	-	-	32	-	-	-	-	-
Corynoneura	16	32	32	-	-	16	-	96	-	-	-	-	32
Cricotopus	-	-	-	-	-	-	184	64	-	-	56	64	-
Cricotopus/Orthocladius	-	-	-	-	-	16	-	-	-	-	-	-	-
Eukiefferiella	-	-	-	-	-	32	8	96	-	-	-	-	-
Heterotrissocladius	-	-	-	-	-	-	-	160	96	-	-	-	-
Limnophyes	-	-	-	-	32	8	-	-	-	-	-	-	-
Nanocladius	-	-	-	-	-	-	40	-	-	-	-	-	-
Orthocladius (S.) lignicola	-	-	-	-	-	8	-	-	-	-	-	-	-

TABLE A4.2: BENTHIC MACROINVERTEBRATES COLLECTED FROM THE MARATHON AREA, 2011 (RAW COUNTS).

	Lentic Stations					Stream Stations							
Station	L20	L24	L25	L27	L29	S18	S20	S51A	S59	S60	S61	S62	S69
Parakiefferiella	16	-	-	-	-	-	-	-	-	-	-	-	64
Parametriocnemus	-	-	-	-	-	8	120	-	-	-	8	-	16
Psectrocladius	-	88	1312	944	480	-	32	160	1216	432	144	928	-
Pseudosmittia	-	8	-	32	32	-	-	-	-	-	8	-	-
Rheocricotopus	-	-	-	-	-	8	-	-	-	-	-	-	-
Thienemanniella	-	-	-	-	-	16	-	-	-	-	-	-	16
Tvetenia	-	-	-	-	-	-	16	64	-	-	8	-	-
S.F. Tanypodinae													
Ablabesmyia	160	368	448	640	160	-	-	-	224	304	16	32	-
Clinotanypus	32	-	-	-	-	-	-	-	-	-	-	-	-
Guttipelopia	-	-	-	-	-	-	-	-	-	16	-	-	-
Labrudinia	32	-	-	-	64	-	-	-	-	-	-	-	-
Larsia	-	-	-	-	64	-	-	-	-	16	-	-	-
Macropelopia	-	-	-	-	-	-	-	-	-	-	-	-	16
Monopelopia	-	88	64	64	-	-	-	-	-	32	-	-	-
Natarsia	-	8	-	32	-	-	-	-	-	-	-	-	16
Nilotanypus	-	-	-	-	-	8	-	-	-	-	-	-	96
Procladius	352	-	96	96	832	8	-	-	288	272	72	-	-
Psectrotanypus	16	-	-	-	-	-	-	-	-	-	-	-	-
Thienemannimyia complex	16	-	-	-	32	8	280	96	320	-	48	176	128
Trissopelopia	-	-	-	-	-	8	-	-	-	-	-	-	48
Zavrelimyia	-	-	-	-	-	24	48	128	32	-	8	16	288
F. Culicidae													
?Culex	-	-	-	-	-	-	-	-	-	16	-	-	-
F. Dixidae													
Dixa	-	-	-	-	-	-	-	-	-	-	-	-	16
F. Dolichopodidae	-	24	-	-	-	-	-	-	-	-	-	-	-
F. Empididae													
Neoplasta	-	-	-	-	-	-	8	32	-	-	-	-	-
F. Simuliidae	-	-	-	16	-	624	1232	704	3712	-	304	2944	416
F. Tabanidae													
Chrysops	-	-	-	-	-	-	-	-	-	1	-	-	-
F. Tipulidae													
Dicranota	-	-	-	-	-	16	-	16	-	-	-	-	-
Pedicia	-	-	-	-	-	2	-	-	1	-	-	-	-
Pilaria	-	8	-	-	-	-	-	-	-	-	-	-	-
MOLLUSCS													
P. Mollusca													
SNAILS													
Cl. Gastropoda													
F. Lymnaeidae													
Fossaria	-	-	-	-	-	-	-	-	-	-	-	-	16
F. Valvatidae													
Valvata	160	-	-	-	-	-	-	-	-	-	-	-	-
CLAMS													
Cl. Bivalvia													
F. Sphaeriidae													
Cyclocalyx	128	-	240	16	784	-	632	32	201	53	56	1	-
TOTAL NUMBER OF ORGANISMS	3059	1902	7216	3795	6676	1563	3708	5300	9933	3592	1099	4857	3512
TOTAL NUMBER OF TAXA [a]	50	28	23	24	40	42	28	31	30	31	25	21	41

[a] Bold entries excluded from taxa count

TABLE A4.3: BENTHIC MACROINVERTEBRATES COLLECTED FROM HARE CREEK, 2011 (RAW COUNTS)

Station	S11				
Replicate	1	2	3	4	5
ROUNDWORMS					
P. Nemata	20	10	4	-	-
ANNELIDS					
P. Annelida					
WORMS					
Cl. Oligochaeta					
F. Enchytraeidae	8	2	-	-	6
F. Naididae					
Nais behningi	-	4	-	-	-
F. Tubificidae					
Rhyacodrilus	2	4	-	-	-
immatures without hair chaetae	-	2	-	-	-
F. Lumbricidae					
indeterminate	-	-	-	-	2
ARTHROPODS					
P. Arthropoda					
MITES					
Cl. Arachnida					
Subcl. Acari	-	2	8	4	6
INSECTS					
Cl. Insecta					
BEETLES					
O. Coleoptera					
F. Dryopidae					
Helichus	2	-	-	-	-
F. Elmidae					
Optioservus larvae	-	2	-	2	2
MAYFLIES					
O. Ephemeroptera					
F. Baetidae					
Baetis tricaudatus	4	4	-	8	-
F. Ephemerellidae					
Ephemerella	20	16	20	28	28
Eurylophella	-	-	212	62	232
F. Heptageniidae					
Epeorus	10	6	-	2	2
Maccaffertium vicarium	-	2	21	4	14
Maccaffertium immature	2	**4**	**16**	**2**	**10**
Rhithrogena	6	16	-	-	-
Stenacron	-	-	4	-	-
F. Leptophlebiidae					
Paraleptophlebia	120	178	16	26	54
O. Odonata					
DRAGONFLIES					
F. Aeshnidae					
Boyeria	7	5	1	-	-
F. Cordulegastridae					
Cordulegaster	2	2	-	-	-
F. Gomphidae					
Ophiogomphus	2	2	2	3	2
immature	**38**	**8**	**28**	**6**	**24**
STONEFLIES					
O. Plecoptera					
F. Capniidae					
Paracapnia	22	36	8	6	26
F. Chloroperlidae					
indeterminate	-	6	-	-	-
F. Leuctridae					
Leuctra	4	2	-	2	2
F. Perlidae					
Acroneuria	3	2	15	1	1
Paragnetina	9	7	-	11	4
immature	-	**6**	-	-	-

TABLE A4.3: BENTHIC MACROINVERTEBRATES COLLECTED FROM HARE CREEK, 2011 (RAW COUNTS)

Station	S11				
Replicate	1	2	3	4	5
F. Perlodidae					
immature	-	-	-	2	4
CADDISFLIES					
O. Trichoptera					
F. Glossosomatidae					
Glossosoma	-	-	-	-	4
F. Hydropsychidae					
Cheumatopsyche	-	-	12	12	64
Hydropsyche sparna	70	10	-	50	18
Hydropsyche	**68**	**8**	-	**48**	**26**
F. Hydroptilidae					
Oxyethira	6	4	4	-	-
F. Lepidostomatidae					
Lepidostoma	-	-	36	26	38
F. Leptoceridae					
Mystacides	-	-	4	-	-
Oecetis	18	8	76	16	104
F. Odontoceridae					
Psilotreta	-	-	16	2	2
F. Philopotamidae					
Dolophilodes	-	4	-	-	-
F. Polycentropodidae					
Neureclipsis	14	8	-	-	20
Polycentropus	-	2	-	-	-
F. Rhyacophilidae					
Rhyacophila	142	6	16	2	2
TRUE FLIES					
O. Diptera					
BITING-MIDGE					
F. Ceratopogonidae					
Bezzia	2	2	-	-	-
MIDGES					
F. Chironomidae					
chironomid pupae	**8**	**6**	**24**	**22**	**20**
S.F. Chironominae					
Micropsectra	34	90	4	6	4
Polypedilum aviceps	-	2	-	4	2
Rheotanytarsus	12	34	8	26	12
Stempellinella	-	10	-	-	-
Tanytarsus	-	-	-	-	2
S.F. Orthocladiinae					
Cricotopus bicinctus	-	-	-	4	-
Cricotopus/Orthocladius	2	-	52	2	16
Eukiefferiella	2	4	-	2	-
Parametriocnemus	2	4	-	-	-
Thienemanniella	-	-	-	2	-
Tvetenia	-	-	-	4	2
S.F. Tanypodinae					
Helopelopia	-	4	48	10	50
?Labrudinia	-	-	-	-	4
Rheopelopia	26	10	12	8	18
Thienemannimyia complex	4	-	-	-	-
F. Empididae					
Hemerodromia	4	-	-	-	-
F. Simuliidae	16	22	-	-	2
F. Tipulidae					
Dicranota	-	2	-	-	-
MOLLUSCS					
P. Mollusca					
SNAILS					
Cl. Gastropoda					
F. Planorbidae					
immature	4	-	-	-	-

TABLE A4.3: BENTHIC MACROINVERTEBRATES COLLECTED FROM HARE CREEK, 2011 (RAW COUNTS)

Station	S11				
Replicate	1	2	3	4	5
CLAMS					
Cl. Bivalvia					
F. Sphaeriidae					
Cyclocalyx	4	22	136	1028	528
Sphaerium (Musculium) securis	-	-	12	12	-
Sphaerium (Musculium) immature	-	-	-	**20**	6
TOTAL NUMBER OF ORGANISMS	719	590	815	1475	1363
TOTAL NUMBER OF TAXA[a]	34	41	25	32	35

[a] Bold entries excluded from taxa count

TABLE A4.4: CALCULATION OF SUBSAMPLING ERROR FOR BENTHIC MACROINVERTEBRATE SAMPLES FROM LAKE SUPERIOR, BAMOOS LAKE AND MARATHON AREA (2009).

Station	Whole Organisms	Number of Organism	Number of Organism	Number of Organism	Number of Organism	Actual Density*	Precision % range		Accuracy min	Accuracy max
LS4	0	108	110	-	-	218	1.8	-	0.9	-
L9	7	68	79	-	-	-	13.9	-	-	-
BLL2	0	19	23	-	-	-	17.4	-	-	-
S15	1	118	127	-	-	-	7.1	-	-	-
SC-5	-	135	178	-	-	313	24.2	-	13.7	-

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

TABLE A4.4: PERCENT RECOVERY OF BENTHIC MACROINVERTEBRATES FROM SAMPLES COLLECTED FROM LAKE SUPERIOR, BAMOOS LAKE AND MARATHON AREA (2009)

Station	Number of Organisms Recovered (initial	Number of Organisms in Re-sort	Percent Recovery
HL-P2	76	77	98.7%
LS-3	208	211	98.6%
BLL-2	38	42	90.5%
BLP-5	43	43	100.0%
S15	236	245	96.3%
SC-5	298	313	95.2%
		Average % Recovery	96.5%

TABLE A4.5: SAMPLE FRACTIONS SORTED FROM LAKE SUPERIOR, BAMOOS LAKE AND MARATHON AREA (2009)

Station	Fraction Sorted	Station	Fraction Sorted	Station	Fraction Sorted
HL-P1	1/4	BLL1	1/8	S12	1/2
HL-P2	WHOLE	BLL2	1/4 [c]	S15	1/4 [c]
HL-P3	1/2	BLL3	1/8	S24	1/8
HL-P4	1/4	BLL4	1/8	S31-1	1/8
HL-P5	1/4	BLL5	1/8	S31-2	1/4
Hl-L1	1/4	BLP1	WHOLE	S31-3	1/8
Hl-L2	1/8	BLP2	WHOLE	S31-4	1/8
Hl-L3	1/4	BLP3	WHOLE	S31-5	1/2
Hl-L4	1/16	BLP4	WHOLE	S32	1/2
Hl-L5	1/4	BLP5	WHOLE	S33	1/8
LS-1	1/8			S34	1/4
LS-2	1/2			S35	1/4
LS-3	WHOLE			S36	1/8
LS-4	WHOLE [a]			S41	1/16
LS-5	1/4			SC-1	WHOLE
L9	1/16 [b]			SC-2	WHOLE
Lake 13	1/8			SC-3	1/2
Lake 13a	1/32			SC-4	1/8
Lake 16	1/16			SC-5	WHOLE [a]
Lake 26	1/32				

[a] two halves sorted for subsampling error calculations.
[b] two 1/32 sorted for subsampling calculations.
[c] two eigths sorted for subsampling calculations.

QA/QC Notes

Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group.
Immatures were not counted toward total number of taxa unless they were the sole representative of their taxa group.

Sample fractions took over 5 hours to sort due to high quantities of organic material.
As such, accuracy and precision estimates were limited for this project. ZEAS has shown that the precision and accuracy estimates are influenced by density. When at least 150 organisms are removed per subsampled fraction, the probability of passing the 20 % precision and accuracy criteria is high (Zaranko and Keene, 2005). Based on ZEAS's data it is reasonable to conclude that these criteria may not have been met for some samples due to low densities.

Zaranko, D.T. and J. Keene. 2005. Are the costs to meet environmental effects monitoring (EEM) benthic sample precision and accuracy criteria justified? In Dixon, D.G., S. Munro and A.J. Niimi (eds). Proceedings of the 32nd Annual Aquatic Toxicity Workshop: October 3 to 5, 2005, Waterloo, Ontario. Can. Tech. Rep. Fish. Aquat. Sci: 2617. 120p.