Final Report

Baseline Studies 2022

Prepared for:

Lomiko Metals Inc.
439 – 7184 120th Street
Surrey, BC V3W 0M6

Project No. 106235-04

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Prepared by:

Ausenco Sustainability Inc.
18th Floor, 4515 Central Boulevard
Burnaby, BC, Canada V5H 0C6
T +1.604.669.0424
F +1.604.669.0430
W ausenco.com

Executive Summary

The La Loutre graphite property is situated within the Outaouais administrative region of Quebec, approximately 30 km west-southwest of the city of Mont-Tremblant and 180 km northwest of Montreal.

This work was performed in accordance with the PSA between Hemmera Envirochem Inc. (Hemmera), a wholly-owned subsidiary of Ausenco Engineering Canada Inc. (Ausenco), and Lomiko Metals Inc. ("Lomiko"or "the Client"), and followed the approved workplan dated March 2022.

The objective of early baseline work was to characterize select natural heritage features and sensitivities within the study area in support of the development of the potential open pit graphite mine, and to provide insight into sensitive features requiring consideration that may pose an environmental risk during development and operation, constraint, and opportunities for siting of infrastructure to support mine operations and potential future permitting and approval requirements. Baseline studies for 2022 comprised what have been identified as Valued Components, namely: ecosystems (ecological assessment, terrestrial and aquatic habitat), fish habitat, birds and amphibians, hydrology, water quality and noise. The results of these studies for 2022 are included in this Report. This is the continuation of the 2021 Early Baseline Studies, the results for which had been included in a 2022 Report (March).

A combined terrestrial and aquatics baseline study was conducted for the development of the Project, where an Ecological Land Classification exercise was undertaken, in parallel with a desk-top assessment of potential occurrences of species at risk in the study area. An aquatic habitat characterization was conducted to understand the status of the natural aquatic environment and to provide an overview of the existing conditions within the study of the proposed graphite flake mine. Furthermore, benthic invertebrate community and fisheries studies were conducted in watercourses that are in close proximity to the proposed mine footprint. Hydrometric data such as water level, flow velocity, and river profile data at eight (8) hydrometric stations were measured monthly starting in April 2022; these data were collected to characterize hydrological variation of the streams and lakes within the study area. A total of ten water quality sampling locations has been used to collect monthly surface water samples since May 2022. Finally, baseline noise measurements were conducted in the study area using a Larson Davis 831, Class I sound level meter.

This report has been prepared by Ausenco, based on fieldwork conducted by Ausenco, for sole benefit and use by Lomiko. in performing this work, Ausenco has relied in good faith on information provided by others and has assumed that the information provided by those individuals is both complete and accurate. This work was performed to current industry standard practices for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

This Executive Summary is not intended to be a stand-alone document, but a summary of findings as described in the following Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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List of Acronyms and Abbreviations

Acronym / Abbreviation	Definition
ABA	Acid-Base Accounting
AP	Acid Potential
ARD	Acid Rock Drainage
CCME	Canadian Council of Minister of Environment
DOC	Dissolved Organic Carbon
ET	Evapotranspiration
FDC	Flow-Duration Curve
IDF	Intensity-Duration-Frequency
KZA	Kitigan Zibi Anishinabeg
LGO	Low Grade Ore
LiDAR	Light Detection and Ranging
MELCC	Ministère de l'Environnement de la Lutte contre les changements climatiques
MFFP	Ministère des Forêts, de la Faune et des Parcs
NA	Not Available
ND	Not Detected
NHWM	Natural High-Water Mark
NP	Neuralization Potential
PEA	Preliminary Economic Assessment
PSA	Professional Service Agreement
RMS	Root Mean Square
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
TSS	Total Suspended Solids
USGS	United States Geological Survey
VC	Valued Components
WSC	Water Survey of Canada

List of Symbols and Units of Measure

Symbol / Unit of Measure	Definition
<	Less than
°C	Degree Celsius
a	Datum correction for stage at zero flow
Ag	Silver
Al	Aluminum
As	Arsenic
b	Regression coefficient
B	Boron
Ba	Barium
C	Regression coefficient
Ca	Calcium
$CaCO_3$	Calcium Carbonate
Cd	Cadmium
Cl	Chloride
cm	Centimetre
Co	Cobalt
Cr	Chromium
Cu	Copper
DD	Decimal Degrees
F	Fluoride
Fe	Iron
h	Stage (water level)
Hg	Mercury
K	Potassium
km	Kilometres
L/s	Litres per second
m	Metres
m/s	Metres per second
m^3/s	Metres cubed per second
masl	Metres Above Sea Level
Mg	Magnesium
mg/L	Milligrams per litre
min	Minute
mm	Millimetre

Symbol / Unit of Measure	Definition
Mn	Manganese
Mo	Molybdenum
mS/cm	MilliSiemens per centimetre
Na	Sodium
Ni	Nickel
$N\text{-}NH_3$	Nitrogen Ammonia
$N\text{-}NH_4^+$	Nitrogen Ammonium
$N\text{-}NO_2^-$	Nitrite
$N\text{-}NO_3^-$	Nitrate
NTU	Nephelometric Turbidity Unit
Pb	Lead
ppm	Parts per million
Q	Discharge
Sb	Antimony
Se	Selenium
Sn	Tin
Ti	Titanium
Tl	Thallium
U	Uranium
V	Vanadium
Y	Year
Zn	Zinc
µS/cm	MicroSiemens per centimetre

1.0 Introduction

The La Loutre graphite property is situated within the Outaouais administrative region of Quebec, approximately 30 km west-southwest of the city of Mont-Tremblant and 180 km northwest of Montreal.

The objective of early baseline work was to characterize select natural heritage features and sensitivities within the study area in support of the development of the open-pit graphite mine, and to provide insight into sensitive features requiring consideration that may pose an environmental risk during development and operation, constraint, and opportunities for siting of infrastructure to support mine operations and potential future permitting and approval requirements. Baseline studies for 2022 included what have been identified as Valued Components, namely: ecosystems (ecological assessment, terrestrial and aquatic habitat), fish habitat, hydrology, water quality and noise. The results of these studies for 2022 have been included in this Report. This is the continuation of the 2021 Early Baseline Studies, the results for which have been included in a 2022 Report (March).

1.1 Project Objectives

The objectives of the baseline studies for 2022 were as follows:

- **Objective 1:** Obtain additional information on the natural environment and baseline conditions in the study area through a combination of desktop review and field verification where necessary.
- **Objective 2:** Identify and provide details on environmental sensitivities in support of the EIA process.
- **Objective 3:** Provide reports on the scope of works carried out with intention to build the foundation of baseline reports for the EIA process.

All work has been conducted in compliance with the various applicable Quebec directives, regulations, and protocols.

1.2 Scope of Work

The purpose of baseline studies is to characterize select natural heritage features and sensitivities within the study area in support of the development of the potential open pit graphite mine, and to provide insight into sensitive features requiring consideration that may pose an environmental risk during development and operation, constraint, and opportunities for siting of infrastructure to support mine operations and potentialfuture permitting and approval requirements. Building upon environmental information collected from publicdatabase, from the preliminary environmental surveys (baseline studies) undertaken at the La Loutre project site (mainly in 2015 by WSP) as well as from the alternatives assessment work done by Ausenco during the Preliminary Economic Assessment (PEA), Ausenco focused on collecting more detailed information within the potential resource area and material management footprints. Baseline studies have comprised what have been identified as Valued Components (VC) and have started in 2021. The followingvalued components have been assessed so far: ecosystems (terrestrial including wetlands and aquatic), fish habitat, birds and amphibians, hydrology, water quality and noise.

The results of 2022 studies have been included in this Report.

2.0 Background

2.1 Property Description

2.1.1 Project Location and Ownership

The La Loutre graphite project (hereafter the Project) owned by Lomiko. is located in the Outaouais administrative region, in the province of Quebec, Canada. The property is in the eastern part ofthe Central Metasedimentary Belt in the Grenville Province in Québec, Canada. It is approximately 30 km west-southwest of the city of Mont-Tremblant (about 45 km by road) and 180 km northwest of Montreal. The nearest community is Duhamel, 5 km to the west. The property location is shown in **Figure 2.1**. Lomikoowns 100% of the Project as of March 29, 2021; there are no other agreements governing the Project. (Ausenco, 2021; InnovExplo, 2016).

2.1.2 First Nations

The Project site is located within the Kitigan Zibi Anishinabeg (KZA) First Nations territory. The KZA First Nations are part of the Algonquin Nation and the KZA territory is situated within the Outaouais and Laurentides regions. No official agreement has been made between the KZA First Nations and Lomiko. Consultation and agreements with the KZA First Nation group is required, and KZA must be consulted throughout the Project. Within the KZA Economic Development Plan, there has been pushback from focus groups and survey respondents within the Algonquin community, with 44% voting against mining within the territory. However, 47% provide no indication of their view about mining and indicate all opportunities for development should be open for discussion. The plan describes the potential in economic growth with mining projects and emphasizes a need for educational outreach programs to give communities a better understanding on mining development (KZA Economic Development Plan, 2013-2020).

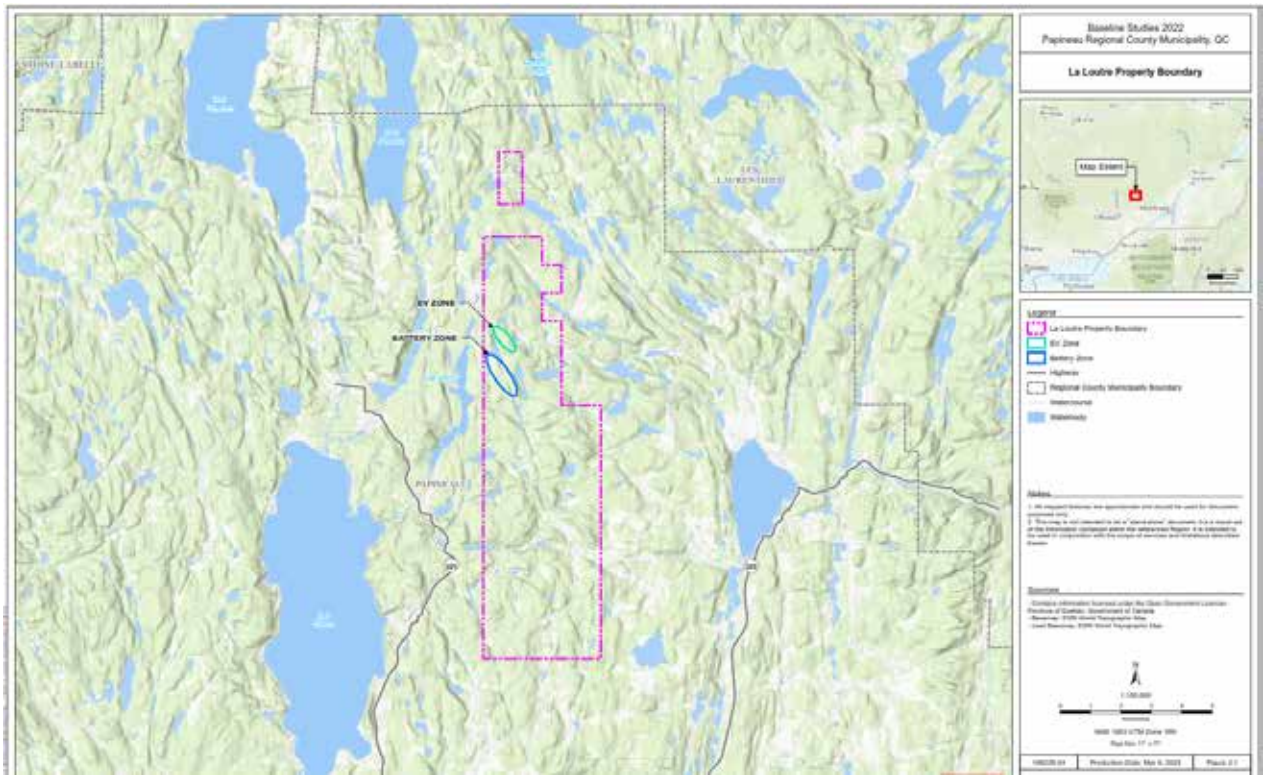


Figure 2.1 **Property boundary of La Loutre, with indicated zones of Refractory (EV) Zone and Battery Zone. Source: Lomiko Metals, 2021**

2.2 Setting

2.2.1 Climate and Meteorology

This section provides a brief description of available climate data including temperature, precipitation, and evaporation for the Project site.

The climate of the region where the La Loutre property is located ranges between temperate to humid continental, based on Koppen classification[1], winters are long and cold, and summers are short. The hottest month is July (18.9 ºC) and the coldest month is January (-12.5 ºC) (Environment Canada climate normal at Chénéville station). The temperature is above freezing for approximately 176 days annually. Total average annual precipitation is 1,090 mm, of which 81 % is rain and 19 % is snow. It precipitates almost 170 days per year with 15 rainy days in June, and 13 snowy days in January.

The climate stations within 30 km of the Project site with a sufficient data record (40 years) are: Chénéville, Notre Dame de la Paix, Huberdeau, Montebello (Sedbergh) and Arundel (**Figure 2.2**). **Table 2.1** indicates distance from the site and their data history period (PEA, Ausenco, 2021).

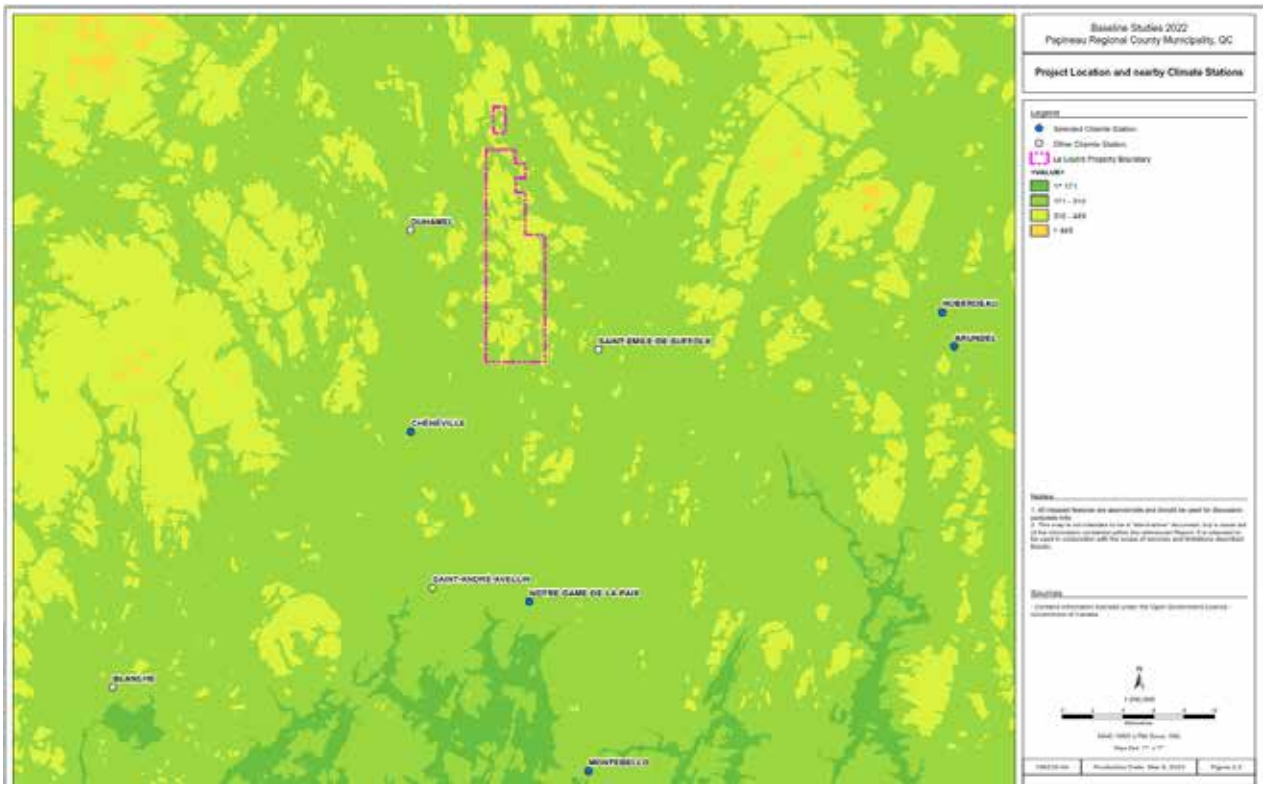


Figure 2.2 Project Location and nearby Climate Stations

[1] Atlas of Canada, 3rd Edition (1957)

Table 2.1 Climate Stations Close to La Loutre Project

Station Name	Station ID	Distance to centre of site (Km)	Elevation (m)	Lat (DD)	Lon (DD)	First Year	Last Year
CHÉNÉVILLE	5586	9	222.5	45.9	-75.08	1964	2020
NOTRE DAME DE LA PAIX	5619	18	183	45.8	-74.98	1979	2020
HUBERDEAU	5593	28	213.4	45.97	-74.63	1913	1980
MONTEBELLO (SEDBERGH)	5612	29	196.6	45.7	-74.93	1956	2015
ARUNDEL	5575	30	191.4	45.95	-74.62	1963	2020

Climate indicators have been calculated from the monthly time-series for the remaining five stations. The climate normals and summary of monthly average hydrologic-related data are summarized in **Table 2.2** to **Table 2.6**.

Table 2.2 Chénéville Climate Normal (monthly values)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Daily Average (°C)	-12.5	-10	-4	4.6	11.2	16.5	18.9	17.8	13.2	6.5	0.1	-7.8	4.5
Daily Max (°C)	-6.9	-3.9	1.9	10.6	17.9	23.1	25.3	24.2	19.2	11.5	4.1	-3.3	10.3
Daily Min (°C)	-18.1	-16.2	-10	-1.5	4.5	9.9	12.4	11.3	7.1	1.5	-4	-12.2	-1.3
Rainfall (mm)	22.1	24.6	35	77.6	92.5	94.3	110.1	112.7	101.4	106.7	82.3	30.3	889.7
Snowfall (cm)	50.4	42	34.6	4.4	0	0	0	0	0.1	2.2	18.2	49.4	201.4
Precipitation (mm)	72.6	66.6	69.6	82.1	92.5	94.3	110.1	112.7	101.5	108.9	100.5	79.7	1091.1
Average Snow Depth (cm)	33	42	38	5	0	0	0	0	0	0	2	17	11
Extreme Snow Depth (cm)	110	108	123	90	0	0	0	0	2	8	50	100	

Table 2.3 Notre Dame de la Paix Station Average Climate Indicators (daily measurements)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°C)	-11.7	-9.8	-3.9	4.8	11.7	16.8	19.1	17.9	13.4	6.8	0.5	-7.8	4.8
Max Temp (°C)	-6.3	-4.0	1.8	10.2	18.4	23.2	25.7	24.4	19.6	11.9	4.5	-2.9	10.5
Min Temp (°C)	-17.0	-15.7	-9.4	-1.0	5.1	10.4	12.9	11.6	7.3	1.7	-3.8	-12.1	-0.8
Rainfall (mm)	0.8	0.5	1.1	2.5	2.9	3.3	3.4	3.2	3.3	3.2	2.3	0.9	822
Snowfall (cm)	1.4	1.5	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.5	181
Precipitation (mm)	2.2	2.0	2.0	2.7	2.9	3.3	3.4	3.2	3.3	3.2	2.8	2.5	1004
Maximum Rain (mm)	43	34	35	45	49	56	82	62	100	76	47	51	
Maximum Snowfall (cm)	20	40	38	20	3	0	0	0	0	16	32	35	
Average Snow Depth (cm)	30	42	33	2	0	0	0	0	0	0	1	13	10

Table 2.4 Huberdeau Station Average Monthly Climate Indicators (daily measurements)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°C)	-11.6	-10.8	-4.1	3.9	11.0	16.4	18.9	17.5	13.0	7.0	0.0	-8.6	4.4
Max Temp (°C)	-6.0	-4.5	1.6	9.6	17.8	22.8	25.2	23.9	18.9	12.3	3.9	-4.0	10.1
Min Temp (°C)	-17.2	-17.1	-9.7	-1.7	4.4	10.0	12.5	11.1	7.1	1.7	-3.9	-13.1	-1.3
Rainfall (mm)	0.7	0.4	1.0	1.9	2.4	3.3	3.1	3.0	3.1	2.6	2.0	0.8	725
Snowfall (cm)	1.7	1.7	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.8	1.8	219
Precipitation (mm)	2.4	2.1	2.0	2.1	2.4	3.3	3.1	3.0	3.1	2.6	2.7	2.6	945
Maximum Rain (mm)	42	54	85	45	46	101	74	65	57	58	49	45	
Maximum Snow (cm)	46	45	44	25	6	0	0	0	0	15	27	43	

Table 2.5 Montebello Station Average Monthly Climate Indicators (daily measurements)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°C)	-11.4	-9.9	-3.3	5.0	11.9	16.7	19.2	18.0	13.4	6.9	0.5	-7.7	5.0
Max Temp (°C)	-6.5	-4.6	1.9	10.6	18.3	22.7	25.1	23.8	18.9	11.7	4.3	-3.4	10.2
Min Temp (°C)	-16.3	-15.2	-8.5	-0.6	5.6	10.7	13.3	12.1	7.9	2.2	-3.3	-11.9	-0.3
Rainfall (mm)	0.9	0.7	1.2	2.6	3.0	3.6	3.5	3.5	3.7	3.3	2.7	1.3	899
Snowfall (cm)	1.9	1.8	1.1	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.7	2.0	236
Precipitation (mm)	2.8	2.5	2.3	2.9	3.0	3.6	3.5	3.5	3.7	3.3	3.4	3.3	1136
Maximum Rain (mm)	53	57	40	43	71	68	72	83	107	60	60	51	
Maximum Snow (cm)	39	52	58	28	4	0	0	0	0	20	35	55	
Average Snow Depth (cm)	30.4	41.7	38.4	5.7	0.0	0.0	0.0	0.0	0.0	0.1	1.8	15.7	11.1

Table 2.6 Arundel Station Average Monthly Climate Indicators (daily measurements)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°C)	-13.7	-11.3	-4.7	3.9	11.3	15.9	18.7	17.4	11.8	5.6	-0.5	-9.6	3.7
Max Temp (°C)	-7.5	-4.7	1.5	10.1	18.3	22.6	25.3	23.9	17.7	10.7	3.6	-4.2	9.8
Min Temp (°C)	-19.9	-17.8	-10.7	-2.3	4.3	9.1	12.0	11.0	5.9	0.3	-4.7	-15.1	-2.3
Rainfall (mm)	0.5	0.5	1.2	2.0	2.9	3.1	2.5	3.3	3.0	3.1	2.4	0.7	755
Snowfall (cm)	1.9	1.5	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.7	2.1	227
Precipitation (mm)	2.4	2.0	2.2	2.3	2.9	3.1	2.5	3.3	3.0	3.2	3.0	2.9	983
Maximum Rain (mm)	29.2	33	33	32	34.5	49	51	67.2	50.8	50.8	57.9	23.4	
Maximum Snow (cm)	50.8	31	30.2	43.7	6	0	0	0	0	11.4	25.4	41.7	
Average Snow Depth (cm)	35.5	51.3	48.5	5.5	0.0	0.0	0.0	0.0	0.0	0.1	1.2	14.1	13.0

Average monthly and annual values of rainfall and snowfall have been interpolated over the project site (**Table 2.7**) using the long-term measurements of rainfall and snowfall and the Cubic Spline method (**Figure 2.3**). The figure shows that, total precipitation increases to the southwest, about 1.5% over the study area. Based on the different climate stations close to the La Loutre property, these components of the precipitation are interpolated over the Project site.

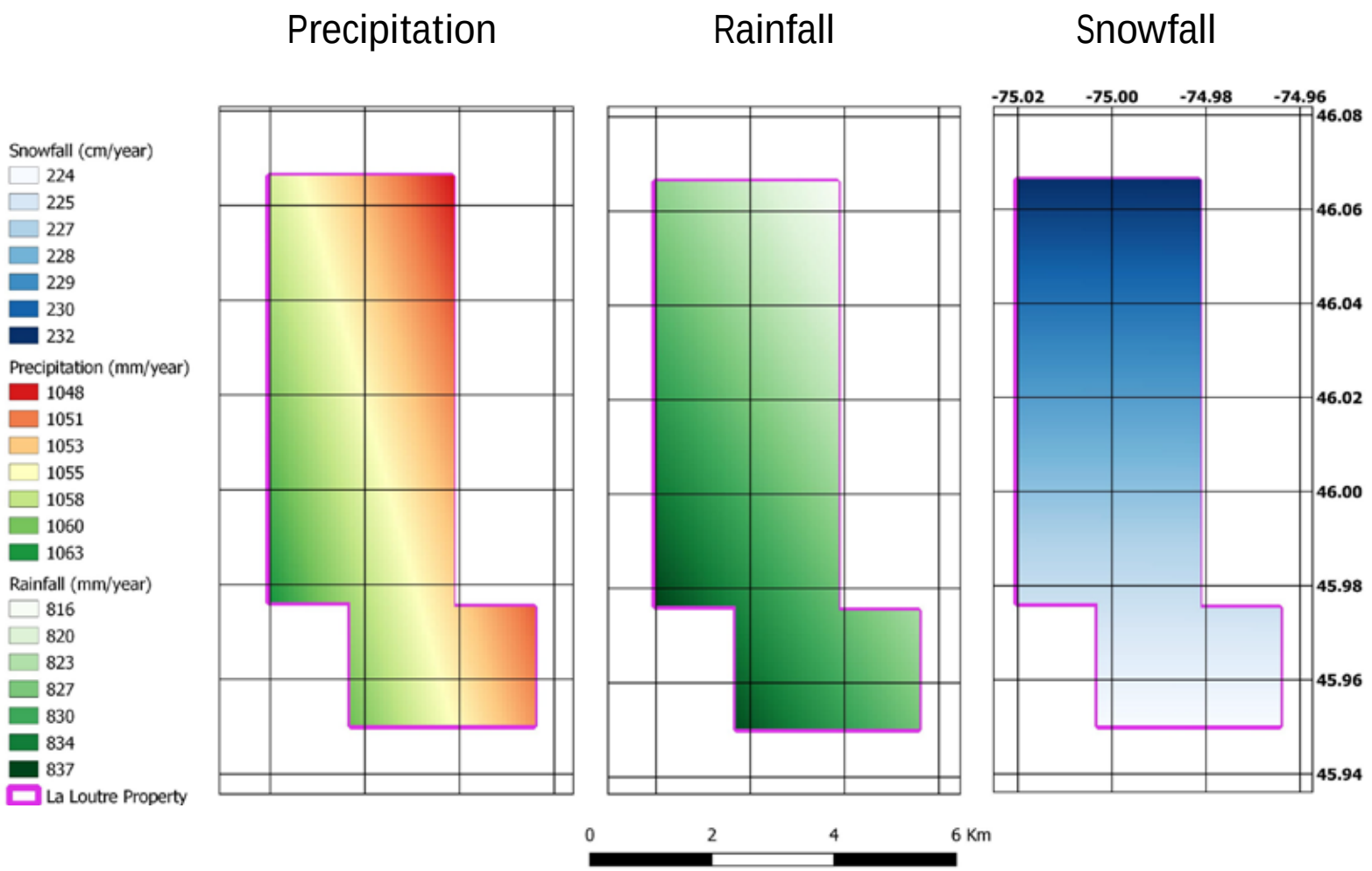


Figure 2.3 Interpolated Annual Snowfall, Rainfall and Total Precipitation over La Loutre

Table 2.7 Interpolated Rainfall, Snowfall and Total Precipitation over La Loutre

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall (mm)	22.9	17.2	33.3	70.8	85.1	99.9	103	101.2	99.8	94.8	71.4	27.5	827
Snowfall (cm)	54.2	52.3	34.7	7.3	0.0	0.0	0.0	0.0	0.0	1.9	21.4	56.1	228
Total Precipitation (mm)	73.4	66.0	65.9	78.4	87.2	102	106	103.6	102.1	97.8	92.1	81.1	1055

Evaporation data is not available from the climate stations close to the site. The average ET at this site is estimated at between 400 to 500 mm/year based on the approximate location of the La Loutre property (**Figure 2.4**) on the Canadian average annual ET map[2].

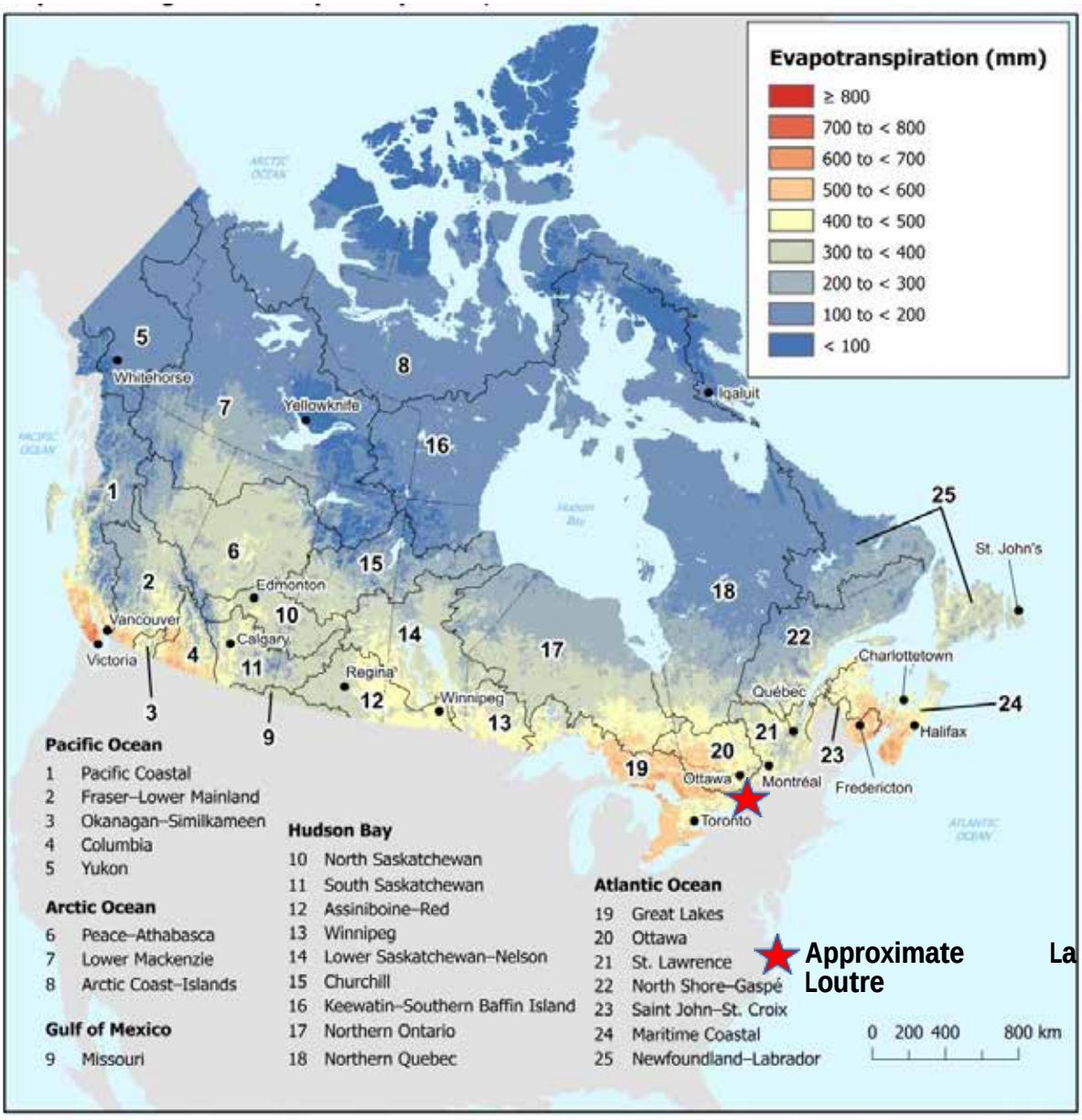


Figure 2.4 Average Annual Evapotranspiration over Canadian Landmass (1981 – 2010)

The monthly precipitation and its partitioning between rain and snow is shown in **Figure 2.5**. Precipitation is highest over the warmer months from May to October.

[2] Source: Statistics Canada, Environment, Energy and Transportation Statistics Division, 201

(a) (b)

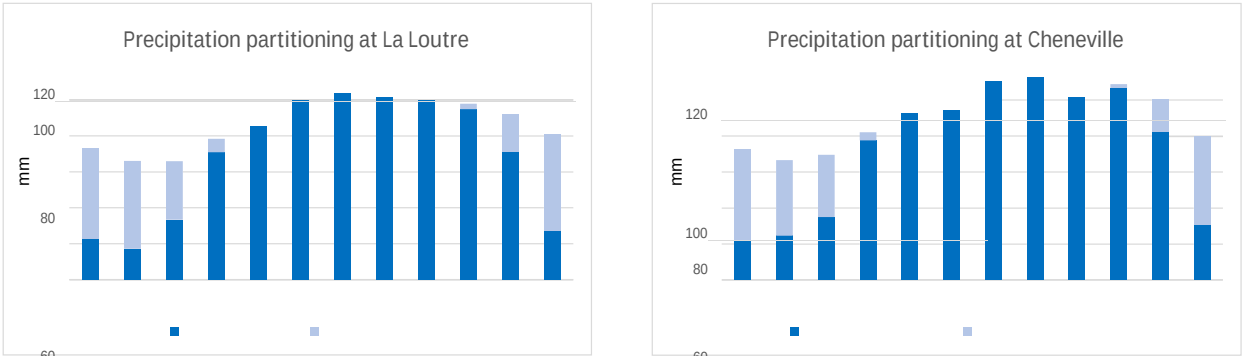


Figure 2.5 Monthly Average Precipitation and Partitioning into Rain and Snow for (a) La Loutre Property and (b) Chénéville station (source: Environment and Climate Change Canada Historic Weather Datasets)[3]

The extreme precipitation events for the La Loutre site has been estimated based on the Intensity-Duration-Frequency (IDF) curves optioned from Environment Canada for the closest climate station which is Chénéville (code: 7031375). **Table 2.8** summarizes storm events for various return periods.

Table 2.8 Precipitation Depths of Extreme Storm Events for the Chénéville Station

Station	Event Duration	2 Year	5 Year	Precipitation Depth (mm) 10 Year	25 Year	50 Year	100 Year
Chénéville (7031375)	5 min	6.9	9.1	10.6	12.5	13.8	15.2
	10 min	10.3	13.4	15.4	18	19.9	21.8
	15 min	12.3	15.7	17.9	20.8	22.9	25
	30 min	17.2	22.3	25.7	30	33.2	36.4
	1 h	21.9	28.8	33.4	39.1	43.4	47.7
	2 h	26.8	36.1	42.3	50.1	55.8	61.6
	6 h	35.7	48.3	56.7	67.3	75.1	82.9
	12 h	41.9	55.2	64.1	75.3	83.5	91.8
	24 h	48	62.7	72.4	84.7	93.8	102.9

2.2.2 Geomorphology and Topography

The La Loutre property is gently undulating with an average elevation of 300 masl, with the hills and valleys-oriented northwest-southeast or northeast-southwest (InnovExplo, 2016). A thin overburden layer comprises glacial sand, gravel, and pebbles, and there is minor exposed bedrock (≤5 %) (Consul-Teck, 2019).

[3] Averaging is done for the total historical measurement period at respective stations

3.0 Physical Environment Baseline

The overall study area for baseline studies 2022, shown in **Figure 3.1** has been determined based on the Project's site infrastructure proposed in PEA (Ausenco Engineering Canada, 2021).

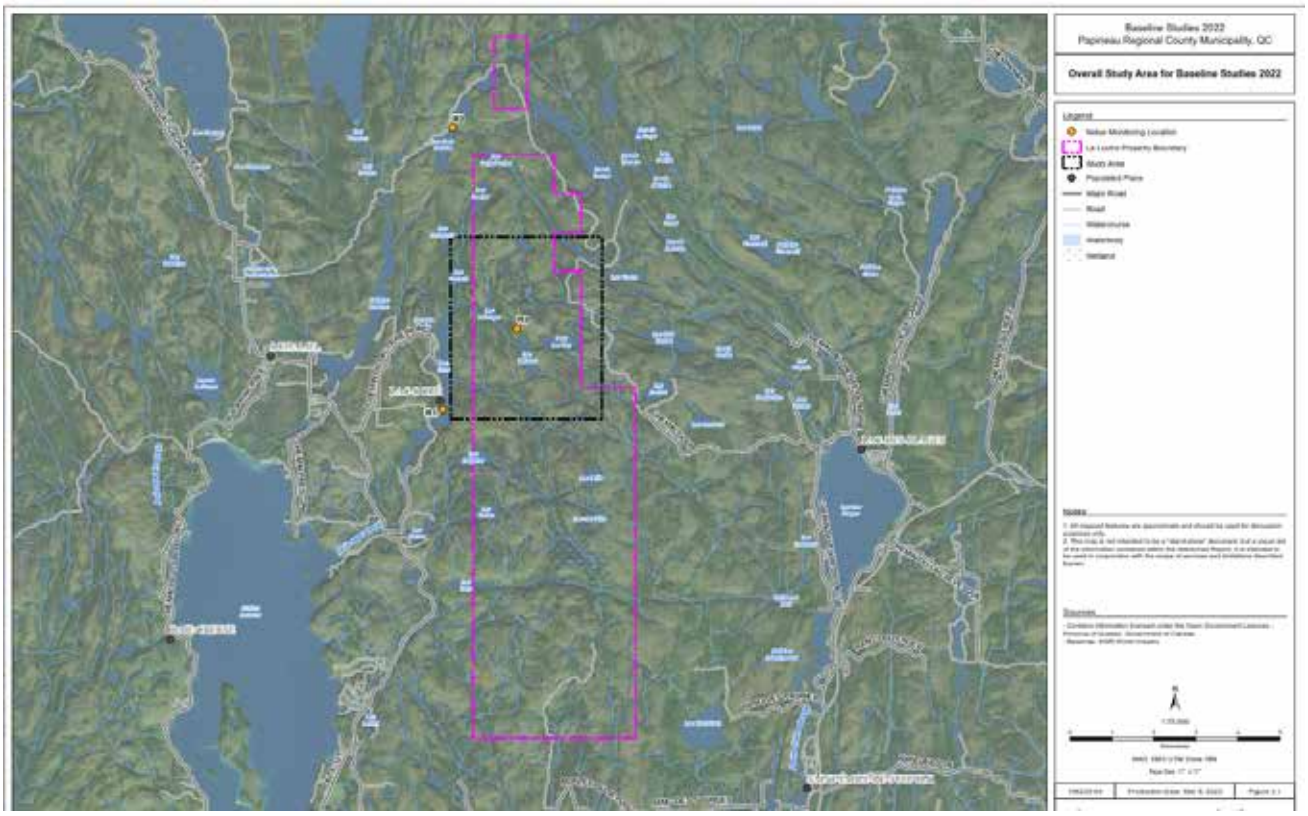


Figure 3.1 Overall Study Area for Baseline Studies 2022

3.1 Acoustic Environment

3.1.1 Introduction

The La Loutre graphite project (hereafter the Project) owned by Lomiko is located in the Outaouais administrative region, in the province of Quebec, Canada, and is in the eastern part of the Central Metasedimentary Belt in the Grenville Province in Québec. The Project site is located within the Kitigan Zibi Anishinabeg (KZA) First Nations territory. The KZA First Nations are part of the Algonquin Nation and the KZA territory is situated within the Outaouais and Laurentides regions. This section summarizes the approach and findings of a baseline study completed for the acoustic environment.

For the purpose of this baseline study, acoustic environment is defined as the sound quality in the outdoor environment. Noise is defined as unwanted sound in the environment and is the energy added to the air in the form of acoustical waves. Noise is measured in decibels (dB), and for environmental noise assessments, the A-weighted decibel (dBA) is used to represent the relative loudness perceived by the human ear.

3.1.2 Objectives

The objective of the baseline study is to characterize existing conditions of the acoustic environment in support of future environmental studies for the Project. Acoustic Environment has been selected as a Valued Component (VC) for future environmental studies because of its potential to interact with Project activities, regulatory requirements, importance to stakeholders and potential effects to Indigenous interests. Project activities have the potential to interact with the acoustic environment during the construction and operation phase. At sufficiently high levels, exposure to Project-related noise can cause public annoyance and interfere with sleep and communication.

The baseline study of the acoustic environment has been conducted based on the information requirements identified in the Project Description for the Project (**Section 2.1**).

3.1.3 Selection of Metrics

The selection of metrics for the Acoustic Environment has been based on the information requirements in the Project Description (**Section 2.1**) and a review of potential effects. The metrics consider regulatory requirements for the Project and potential effects on public sentiment and human health from Project activities. Metrics for the baseline study are:

- Daytime sound levels (L_d), defined as the 12-hour period from 7:00 am to 7:00 pm
- Evening sound levels (L_e), defined as the 3-hour period from 7:00 pm to 10:00 pm
- Nighttime sound levels (L_n), defined as the 9-hour period from 10:00 pm to 7:00 am
- Day-night sound levels (L_{dn}), the equivalent sound level over 24 hours with a 10 dB penalty added during nighttime hours to account for increased human sensitivity to noise during this time (see Equation 1).
- $$L_{dn} = 10 \log \left(\frac{12\left(10^{L_d/10}\right)+3\left(10^{L_e/10}\right)+9\left(10^{(L_n+10)/10}\right)}{24} \right)$$ Equation 1

3.1.4 Spatial Boundaries

The property location is illustrated in **Figure 2.1** of **Section 2.1**. The Study Assessment Area (SAA) for the Acoustic Environment VC is defined as the area within 5-km of the Battery Zone. This complies with applicable regulatory requirements for noise effects assessments (see **Section 3.1.5**) and includes all sensitive receptors, locations where there may be heightened sensitivity to noise, identified in the vicinity of the Project.

3.1.5 Regulatory and Policy Context

Environmental noise in Quebec is regulated by the provincial government. Under Section X of the *Loi Surla Qualité de l'Environnement*, the Government of Quebec may make regulations that:

a) prohibit or limit excessive or unnecessary noise inside or outside any building;

b) determine the terms and conditions of use of any vehicle, engine, piece of machinery, instrumentor equipment that generates noise;

c) prescribe noise intensity standards.

Pursuant to the Loi Sur La Qualité de L'Environnement, the Quebec Ministry of Sustainable Development, Environment, Wildlife, and Parks has established Instruction Note 98-01 (Handling noise complaints and requirements for companies that generate it), which applies to stationary sources including mining activities.

In addition, this baseline study considers guidance from Health Canada. Legislation that may apply to Project activities with the potential to affect noise are summarized in **Table 3.1** and key policies and guidelines are summarized in **Table 3.2**.

Table 3.1 Key Legislation Summary

Responsible Agency	Legislation	Applicability to the Project
Province of Quebec	*Loi sur la Qualité de l'Environnement*	The Project will generate noise during construction and operation.

Table 3.2 Key Policies and Guidelines

Policy / Guideline	Responsible Agency	Applicability to the Project
Handling noise complaints and making demands on the companies that generate it	Quebec Ministry of Environment and Fight against Climate Change	Establishes the methods and criteria for judging the acceptability of noise emissions.
Evaluating Human Health Impacts in Environmental Assessment: Noise	Health Canada	Provides general guidance for assessing health risks associated with noise.

3.1.5.1 Quebec

The assessment sound level of a stationary source associated with a mining activity must be assessed in accordance with the requirements of Instruction Note 98-01 (Handling noise complaints and requirements for companies that generate it). The province of Quebec allows for the use of one of two potential assessment sound levels, evaluated as the continuous one-hour sound level ($L_{Ar,1h}$), for stationary sources. The $L_{Ar,1h}$ shall be chosen as the greater of the following sound levels:

1. the residual noise level as measured according to appropriate guidance, or
2. the maximum level allowed according to the zoning and the time of day, as summarized in the following table:

Table 3.3 Maximum Sound Level of Stationary Sources

Zoning Category	Daytime (dBA)	Night (dBA)
I	45	40
II	50	45
III	55	50
IV	70	70

Notes: Daytime is defined from 7:00 to 19:00 (equivalent to L_d in this baseline study), while nighttime is defined from 19:00 to 7:00 (encompassing L_e and L_n in this baseline study).

The choice of zoning category is based on the uses permitted by the local municipal zoning by-law, and the zoning categories are defined as follows:

I. Land intended for single or semi-detached dwellings, schools, hospitals or other educational, health or convalescent institutions. Land of an existing dwelling in an agricultural zone.
II. Land intended for multi-unit dwellings, mobile home parks, institutions or campsites.
III. Land intended for commercial uses or recreational parks. However, the night-time noise level only applies within the property boundaries of establishments used for residential purposes. In other cases, the maximum noise level for daytime also applies at night.
IV. Land zoned for industrial or agricultural purposes. However, on the grounds of an existingdwelling in an industrial zone and established in accordance with the municipal by-laws inforce at the time of its construction, the criteria are 50 dBA at night and 55 dBA during the day.

3.1.5.2 Health Canada

Health Canada has published its Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada 2017), which provides information on potential adverse human health effects to noise exposure. For estimating the likelihood of sleep disturbance, Health Canada provides a threshold of 30 dBA indoor for continuous noise. Accounting for an outdoor-to-indoor transmission loss with windows partially open of 15 dBA, the equivalent outdoor threshold is 45 dBA. To minimize interference with speech comprehension, Health Canada recommends an outdoor threshold of 55 dBA.

The Health Canada document also provides an estimation of typical baseline noise levels, based on a qualitative description of community characteristics and an average census-based population density. These values are provided in **Table 3.4**. The SAA has an average census-based population density of < 1 people/km^2.[4] Therefore, the expected estimated baseline sound level should be in line with a Quiet Rural community (i.e., L_{dn} ≤ 45 dBA).

Table 3.4 Estimation of Typical Baseline Noise Levels

Community Type (Qualitative Description)	Average Census Tract Population Density, Numberof People Per Square km	Estimated BaselineSound Level, L_{dn} (dBA)
Quiet Rural dwelling units more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers	28	≤ 45
Quiet Suburban Residential remote from large cities, industrial activity and trucking	249	48 – 52
Normal Suburban Residential not located near industrial activity	791	53 – 57
Urban Residential not immediately adjacent to heavily travelled roads and industrial areas	2,493	58 – 62
Noisy Urban Residential near relatively busy roads or industrial area	7,913	63 – 67
Very Noisy Urban Residential	24,925	68 – 72

[4] https://censusmapper.ca

3.1.6 Existing Conditions

The existing acoustic environment is influenced by land uses within the SAA. The area is largely undeveloped, with the nearest community, Duhamel, located 5 km to the west. Two (2) sensitive receptors were identified in the SAA:

- Cottage community on the western shore of Lac Dore (Zoning Category I)
- Pourvoirie Club Des Douze, a hunting and fishing outfitter (Zoning Category II)

3.1.6.1 Methods

Existing or baseline noise monitoring has been conducted at three representative locations (**Table 3.5**) using a Larson Davis Model 831 sound level meter, which meets international standards IEC 61672-1:2013 Class 1specifications. Baseline noise monitoring was conducted during three different times of the year to consider seasonal variations, with a duration of approximately 24 hours each session. Continuous datalogging wasenabled at one-minute intervals and data were averaged to provide L_d, L_e, L_n, and L_{dn}.

3.1.6.2 Monitoring Locations

Baseline noise monitoring has been conducted at two (2) locations representative of the sensitive receptors identified within the SAA. Selection of sensitive receptors followed Quebec guidance outlined in Instruction Note 98-01 (Handling noise complaints and requirements for companies that generate it) to choose locations “most exposed to the source noise”. A third monitoring location on the Project site was also chosen for baseline monitoring purposes. This monitoring location would currently be considered Zoning Category I. However, upon development of the Project, this site would be considered Zoning Category IV. See location of the noise monitoring sites in **Figure 3.1**.

Table 3.5 Baseline Noise Monitoring Locations

Site ID	Location	UTM Zone 18N		Rationale	Date of Monitoring
		Easting	Northing		
R1	Southwest of site at cottageslocated along Lac Dore 46°00'43.4"N 75°01'33.3"W	497994	5095381	Considers existing noise levels at nearby Lac Dore residential cottages	Feb 2-3, 2022 May 15-16, 2022 Aug 3-4, 2022
R2	Pourvoirie Club Des Douzes(north-northwest of site) 46°04'20.4"N 75°01'21.8"W	498221	5102084	Considers existing noise levels at outfitters	Feb 3-4, 2022 May 14-15, 2022 Aug 2-3, 2022
R3	Project Site 46°01'45.4"N 75°00'11.3"W	499768	5097300	Considers existing on-site noise levels	Feb 4-5, 2022 Aug 1-2, 2022

3.1.6.3 Results

Baseline noise monitoring results from the three representative locations have been summarized in **Table 3.6**. Overall, existing noise levels at the three representative locations are similar. For all three locations, the predominant sources of noise are wildlife and weather related (e.g., rainfall). Engine noises

were also notedin and around Pourvoirie Club Des Douzes (R2), which is consistent with land uses in the area.

Given the nature of these sources, measured daytime sound levels were generally higher than nighttime sound levels.Detailed information on baseline noise monitoring data is provided in **Appendix A**.

Table 3.6 Baseline Noise Monitoring Results

Site ID	Date	Measured Sound Level (dBA)			
		Daytime Sound Level, L_d	**Evening Sound Level, L_e**	**Nighttime Sound Level, L_n**	**Day-Night Sound Level, L_{dn}**
R1	Feb 2-3, 2022	44.4	36.3	37.4	45.4
	May 15-16, 2022	38.0	34.6	31.5	39.4
	Aug 3-4, 2022	45.5	36.6	37.7	46.1
R2	Feb 3-4, 2022	41.3	36.5	36.3	43.6
	May 14-15, 2022	44.0	39.2	45.8	52.0
	Aug 2-3, 2022	42.7	42.4	22.5	40.9
R3	Feb 4-5, 2022	38.4	36.3	36.3	43.0
	Aug 1-2, 2022	39.2	39.5	45.3	51.2

3.1.6.3.1 Quebec Guidelines

These monitored values can be compared to the relevant zoning and the time of day, as summarized in Table 3.3, for determination of the assessment sound level for each location. Based on provincial guidance and the measurements provided in Table 3.6, appropriate assessment sound level values for each sensitive receptor would be:

1. R1:
    a. Day – Zoning Category I (45 dBA)
    b. Night – Zoning Category I (40 dBA)
2. R2 –
    a. Day – Zoning Category II (50 dBA)
    b. Night – Zoning Category II (45 dBA)

3.1.6.3.2 Health Canada Guidelines

As expected, all measured sound levels were within the Health Canada thresholds for the *Quiet Rural* and *Quiet Suburban Residential* community categories.

To meet Health Canada's sleep disturbance threshold of 30 dBA indoor for continuous noise, outdoor noise levels need to be less than 45 dBA during nighttime hours (L_n). The general measured nighttime values are below 45 dBA at all locations, although two sites (R2 and R3) did have minor exceedances of this level,

each on one occasion. This indicates that the current acoustical environment would not pose any potential sleep disturbance to residents at the monitored locations.

All sites meet Health Canada's speech comprehension indoor threshold of 40 dBA, as all L_d and L_e values are below the equivalent outdoor value of 55 dBA. Consequently, current acoustical environments would not pose any potential issues for speech comprehension to local residents at the monitored locations.

3.1.7 Conclusion

Situated in remote rural Quebec, the SAA for Acoustic Environment is largely unpopulated, consisting primarily of forested land uses. Sensitive receptors in the SAA include Indigenous traditional use sites, and rural residences west of the La Loutre property. Existing noise levels are typical for a remote rural area and reflect the influence of local wildlife and weather. Based on provincial guidance, appropriate assessment sound levels for the cottage community on the western shore of Lac Dore would be 45 and 40 dBA for day and night, respectively, while appropriate assessment sound levels for the Pourvoirie Club Des Douze would be 50 and 45 dBA for day and night, respectively.

3.2 Hydrology

La Loutre property is located 16 Km east of Papineau-Labelle Wildlife Reserve, 5 Km east of Duhamel and 9 Km northeast of Chénéville, in the Province of Quebec. Land elevation changes within the property are considerable (ranging between +260 to +390 m). Terrain slopes are mild to moderate for large parts of the property. However, steep hill domains with slopes as high as 33% exist across the site. More than ten small lakes and ponds (ranging from 0.02 to 0.3 Km^2 in size) which are fed by surface runoff and groundwater convergence, are located within the property limits. The largest of these lakes are Lake Tallulah, Petit Lac Vert, Lake Bélanger and Lake Scelier. According to the streams layer acquired from the CanVec dataset (Natural Resources Canada, 2019), the length of stream segments within the site boundaries amount to 65 km. The catchment boundary and the major drainage paths within the study area were delineated through GISanalysis of the publicly available National Topographic Survey of Canada (NTS) 1:50,000 scale. Sub- catchments within the La Loutre property along with the streams and lakes are presented in **Figure 3.2** below:

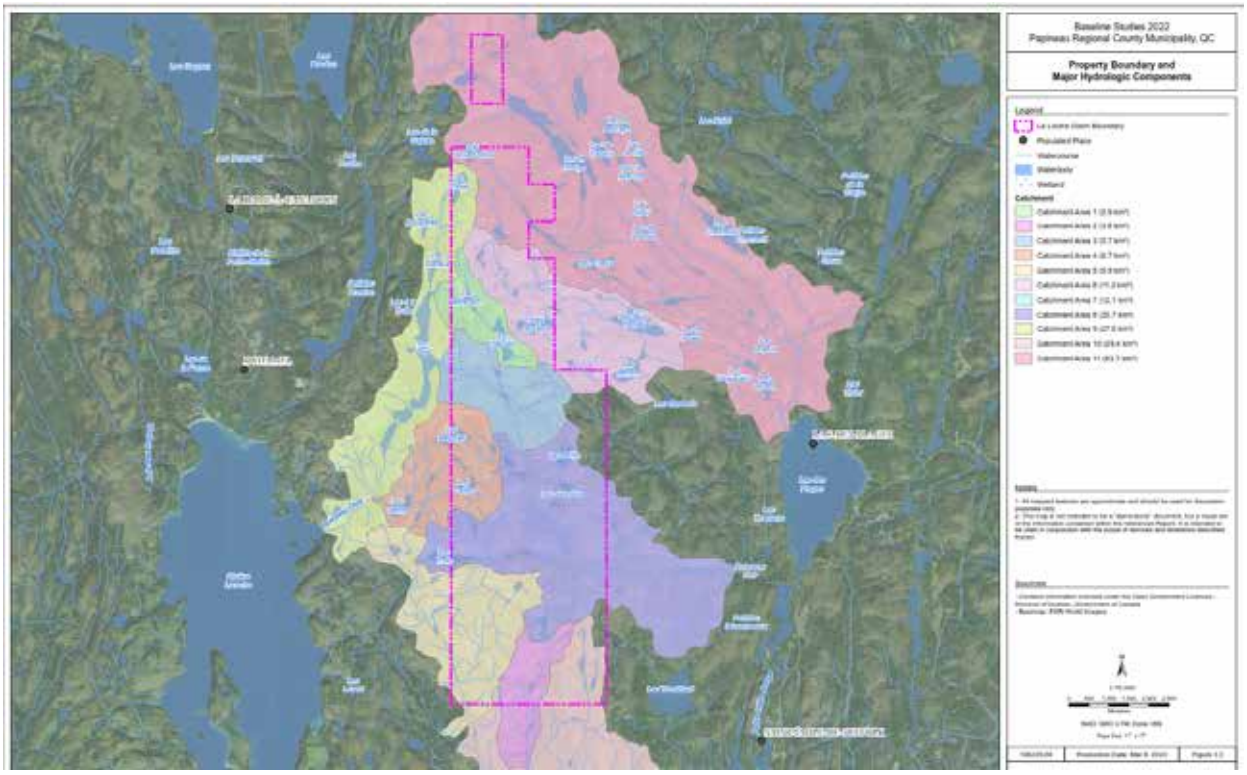


Figure 3.2 Property boundary and major hydrologic components

3.2.1 Hydrometric Stations

Water level, flow velocity and river profile data were collected as part of the baseline studies between April and September of 2022, were paused during hunting season, and resumed in November, prior to winterizing the stations. These data were collected to characterize the hydrological variations of the streams and lakes within the study area. Collected data during the baseline monitoring program provides an understanding of the hydrological response of the watercourses and allow for characterization of the existing hydrology baseline for the La Loutre site. While the length of these records is not appropriate for long-term frequency analyses and historical trends, previous water level and flow measurements at a regional scale was acquired from publicly available sources.

The locations of all hydrometric stations are presented in **Figure 3.3** below. In 2021, nine (9) stations were planned for monthly hydrometric monitoring: seven (7) flow measurement stations and two (2) lake level-monitoring stations. During the first field visit, it was revealed that access to station FM_S1 was not possible (no measurement has been recorded for this station). Hydrometric data at eight (8) stations was obtained on a monthly basis. Additionally, some stations were inaccessible during specific months due to poor weather and/or safety concerns during hunting season.

The locations of these stations have been selected to provide a good picture of the background hydrologic conditions, particularly at the claim boundaries. It is important to document existing rates (low flows and peaks) outflowing the claim. Additionally, a few monitoring points at or around the proposed facilities (from the PEA layout) were considered.

In addition to monthly measurements, four of the eight above-mentioned stations were equipped with water level loggers. Water levels were recorded at five-minute intervals at these stations (FM_S3, FM_S5, LM_L2 and LM_L3). Stream water levels will be used along with rating curves (**Section 3.2.3**) to calculate continuous discharge rates at five-minute intervals.

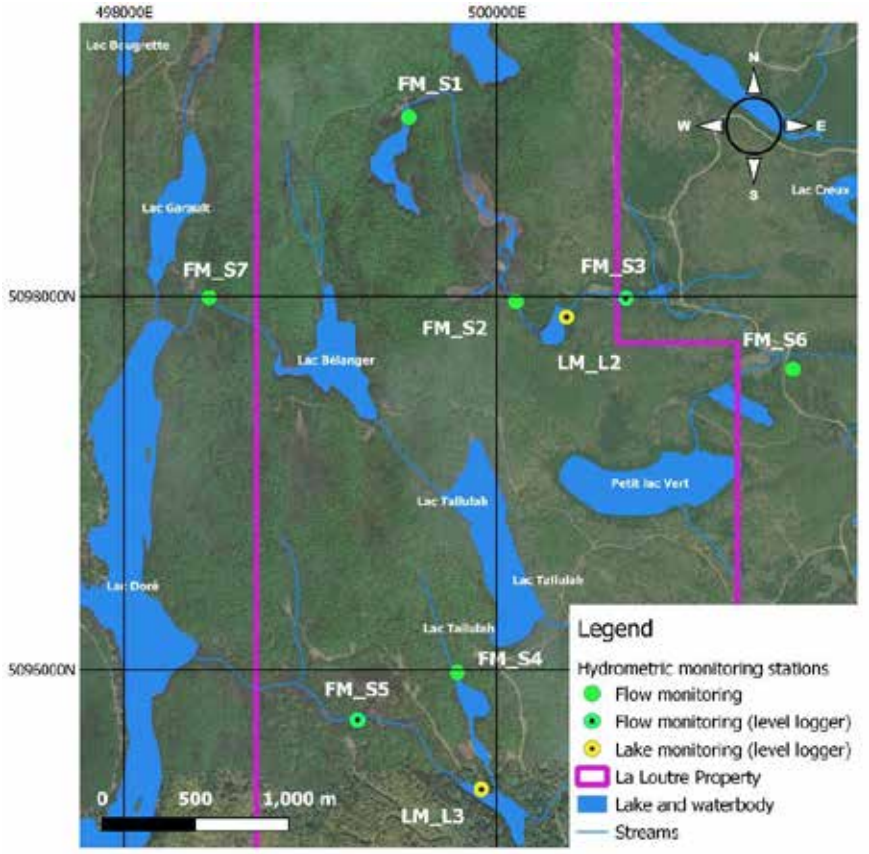


Figure 3.3 Location of hydrometric stations at La Loutre mine site

To assess the hydrologic conditions of the Project site, a set of nine hydrometric measurement points have been located at and around the project footprint area. Names, coordinates, and location of these stations relative to proposed facilities are described in **Table 3.7** below.

Table 3.7 Hydrometric stations at the Project site

Station	WGS Coordinates		UTM Zone 8N		Approximate watercourse Width (m)	Description	Logger
	Lat	Lon	Easting	Northing			
FM_S1	46.04419	-75.00612	499526	5098958	3	Upstream of the proposedco-disposal facility, downstream of unnamed lake	
FM_S2	46.03533	-74.99868	500101	5097972	3	Located on the stream segment crossing the proposed co-disposal facility, upstream of processplant.	
FM_S3	46.03548	-74.99108	500690	5097989	5.5	Located on the stream segment crossing the proposed co-disposal facility, downstream ofprocess plant.	X
FM_S4	46.01743	-75.00276	499786	5095984	3.6	Downstream of BS Open Pit, upstream of unnamed lake Southwest of Lake Tallulah	
FM_S5	46.01514	-75.00968	499251	5095730	2.8	Downstream of FM_S4, upstream of Lake Doré	X
FM_S6	46.03206	-74.97947	501589	5097610	4.5	Downstream of co-disposal facility and Petit lac Vert, upstream of Lac Bois Tombé	
FM_S7	46.03550	-75.01998	498454	5097992	3.5	Downstream of Lake Bélanger, upstream of Lake Doré, North of BN Open Pit	
LM_L2	46.03459	-74.99528	500372	5097888	-	Water level of unnamed lake between FM_S2 and FM_S3, south of proposed co-disposal facility	X
LM_L3	46.01179	-75.00100	499915	5095355	-	Water level of unnamed lake upstream of FM_S5 and Lac Doré	X

Discharge rates have been measured at accessible flow measurement stations (FM_S#) on a monthly basis (**Photo 3.1**). Also, water level loggers were installed at four stations (FM_S3, FM_S5, LM_L2 and LM_L3) to record water level fluctuations.

Photo 3.1 Discharge measurement at (left) FM_S5 station and (right) FM-S3 station

3.2.2 Discharge Measurements

The velocity-area method is a commonly used method for measuring flow in low to moderate gradient channels and can be used in small streams and large rivers. In smaller watercourses, measurements are collected by wading and using a current (velocity) meter. Wading measurements are limited at high flows by safe instream working conditions (i.e. depths and/or velocities are suitable to allow safe stream access). At low flows, depth and velocity accuracy are limited by current-meter measurement precision.

Hydrometric stations were installed in August 2021, remained through the fall and continued into 2022. Monthly discharge measurements were conducted using the velocity-area method to provide data to develop rating curves. Total discharge at each flow measurement location was calculated using the area and velocity from a series of point measurements taken along the cross-section of the stream at each station.A cross section was established at each station that is perpendicular to the flow, and the wetted stream channel width was determined using a tape measure fixed to the top of the bank on each side.

The Quebec environmental measurement guideline (CEAEQ, 2019) specifies a minimum of seven sub-sections for streams of width between 1 and 3 m and a minimum of 13 points for widths between 3 and 5 m. The stream was divided into 10 to 15 sub-sections where individual velocity and depth measurements were recorded. The water depth and mean velocity were measured at each point across the stream cross-section, using a current velocity meter and the measurements were spaced such that each sub-section contains approximately less than 10% of the total flow. For each sampling point at a crossing location (sample station), stream discharge (Q; m^3/s) was calculated by the mid-section method (CEAEQ, 2019). The total discharge for a sample station is calculated by adding the discharge of all sub-sections for each stream-crossing location.

Flow measurements have been conducted once a month between August 2021 and December 2022 at most of the stations. Exceptions were cold months and stations with limited access. A summary of discharge rates is presented in **Table 3.8** below:

Table 3.8 Discharge measurements at stations

Year	Month	Flow (m^3/s)					
		FM_S2	FM_S3	FM-S4	FM_S5	FM_S6	FM_S7
2021	August	NO ACCESS	0.04	NO ACCESS	0.118	NO ACCESS	NO ACCESS
	September	0.005	0.009	NO ACCESS	0.01	0.04	0.013
	October	0.027	0.026	NO ACCESS	0.07	0.058	0.037
	November	0.045	0.068	0.002	0.242	0.113	0.077
2022	April	0.014	0.073	0.002	0.125	0.205	0.108
	May	0.000	0.012	0.001	0.055	0.074	0.024
	June	0.000	0.012	0.000	0.016	0.026	0.020
	July	0.000	0.005	0.000	0.006	0.000	0.006
	August	0.000	0.047	0.002	0.180	0.146	0.061
	December	0.000	0.024	0.001	0.093	0.050	0.063

1- Measurement was not possible due to poor weather conditions for other months/stations.
2- November 2021 field campaign was postponed to 7th of December due to unforeseen conditions
3- Zero discharge rates at FM_S2, FM_S4, and FM_S6 were reported because of very slow velocities (not detectable).

3.2.3 Rating Curves

Continuous measurement of flow rates of a stream is impractical. However, stream water levels (stages) could be monitored continuously or at regular short time intervals (e.g. using water level loggers) and converted to continuous flow using rating curves. At stream cross-sections a relation exists between water level and discharge rates which is called stage-discharge rating curve or simply rating curve. A rating curve could be established by having a number of concurrent observations of water level and discharge at a specific point over a sufficient period of time.

Water discharge measurements, as mentioned in **Section 3.2.2**, were used to develop stage-discharge relationships for hydrometric station wherever sufficient data was available. The individual discharge and concurrent stage values were plotted to produce stage-discharge relationship/rating curves (rating curve) for hydrometric stations. The relationships were used to convert water level data (stage) recorded by the water loggers into a continuous discharge time-series.

The quality of a rating curve is a function of the number and accuracy of the individual data points that are used to generate the curve. Stage-discharge curves can be developed even with a few points. However, additional readings increase the accuracy of the curves. At least ten measurement point pairs are recommended by guidelines for accurately estimating discharge rates (MoE, 2018). To calibrate a single segment rating curve, Water Survey of Canada (WSC) suggests a minimum of 6 measurements (Rainville, Hutchinson, Stead, Moncur, & Elliott, 2016). Discharge measurements at or near peak values are particularly important to define flow and runoff during short flood events. Depending on the geometry of river/stream valleys, rating curves (mathematical relationship) can vary considerably between low-flow and high-flow periods. To avoid erroneous discharge estimation for such cases, two-stage rating curves may be developed, for low-flow and high-flow conditions. This is important as peak discharge rates of long return

periods (>2 years) have most likely not been recorded and extrapolation beyond the range of the observed data could result in increased error and uncertainty. However, any discharge extrapolation beyond that limit will have a high uncertainty associated with it (ISO, 2010).

Methods specified by ISO (2010), and Rantz (1982) were followed to develop the rating curves. The concurrently measured water level (stage) and water discharge data were plotted on a logarithmic scale, and the Root Mean Square (RMS) error was assessed to produce a best-fit line for the rating curve. The best-fit line was represented by a power function for the stage-discharge relationship.

$$Q = C\ (h - a)b$$

where *Q* is the discharge (m^3/s), *C* and *b* are regression coefficients; *h* is the stage (water level; m). Variable *a* represents a datum correction for stage at zero flow (m), assuming that the gauge is positioned at a level below the point of zero flow.

Generally, periodic measurements are needed to validate the underlying stage-discharge relationship and to track changes or shifts in the rating curve. The United States Geological Survey (USGS) recommends a minimum of ten discharge measurements per year, unless it has been demonstrated that the stage discharge relation is invariant in time. This would ensure covering the full range of flows necessary for developing rating curves. It also limits the extrapolation range up to twice the maximum measured discharge (between 1.5 and 2). However, having a few pair points of stage-discharge measurements at the current phase, rating curves were prepared wherever at least three stage-discharge records were available.

Rating curves were developed for five stations in the study area including FM_S2, FM_S3, FM_S5, FM_S6, and FM_S7 (**Figure 3.4** to **Figure 3.9**). Currently, between four to ten measurements have been conducted per station. This number of measurements is sufficient to establish a robust rating curve; however, the limited number of discharge measurements reduces its reliability. The accuracy of rating curves would significantly increase with the continued use of hydrometric measurements, water level monitoring, and capturing more high-water discharge rates.

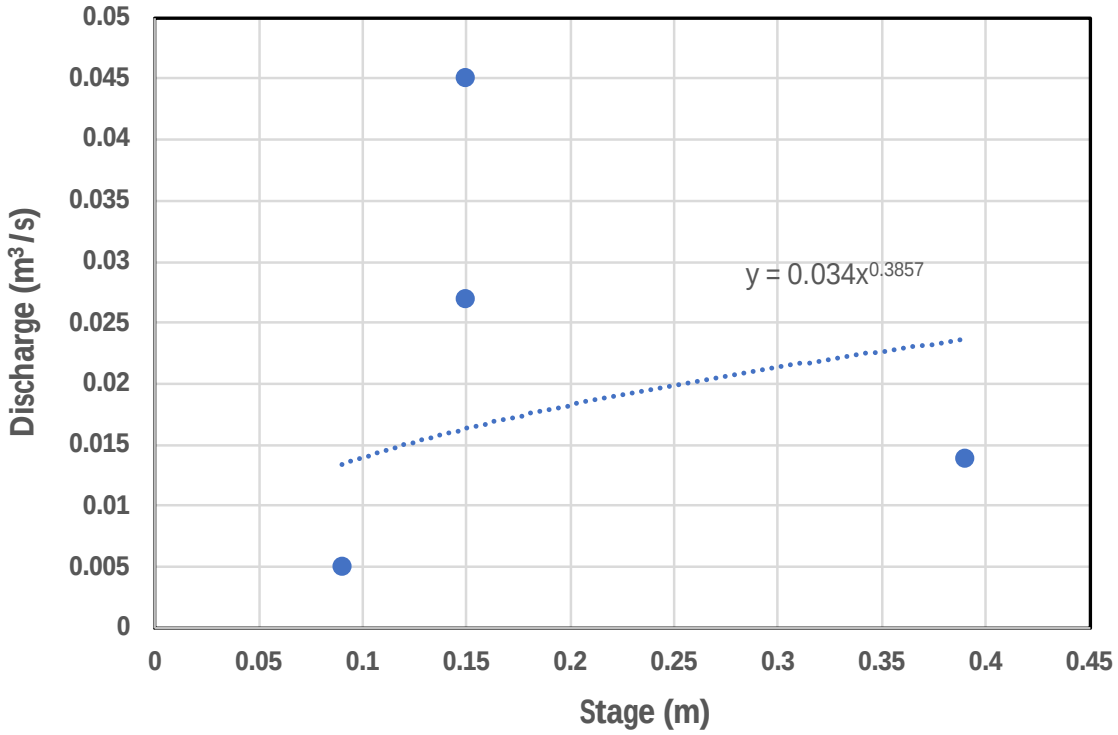


Figure 3.4 Stage-discharge curve at the FM_S2 station

Flow measurements in shallow and slow-flow watercourses, is often challenging and is considerably uncertain. For instance, measured discharge rates at 0.15 m stage ranges between 27 and 45 L/s (**Figure 3.4**). This is most likely due to inaccuracy of velocimeter measurements at such shallow flows. Flow velocities at shallow sub-sections of FM_S2 were often below the detection limit (zero velocity recorded). These velocities along the centerline were between 6 to 24 cm/s. Therefore, rating curves at this station should be used with caution.

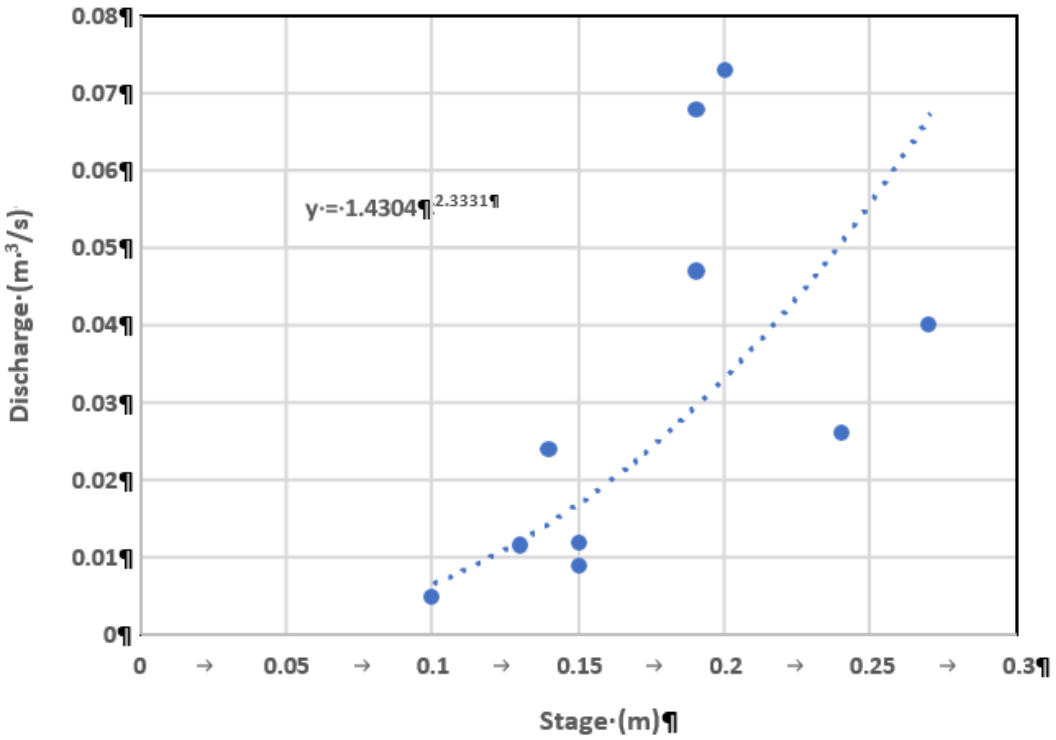


Figure 3.5 Stage-discharge curve at the FM_S3 station

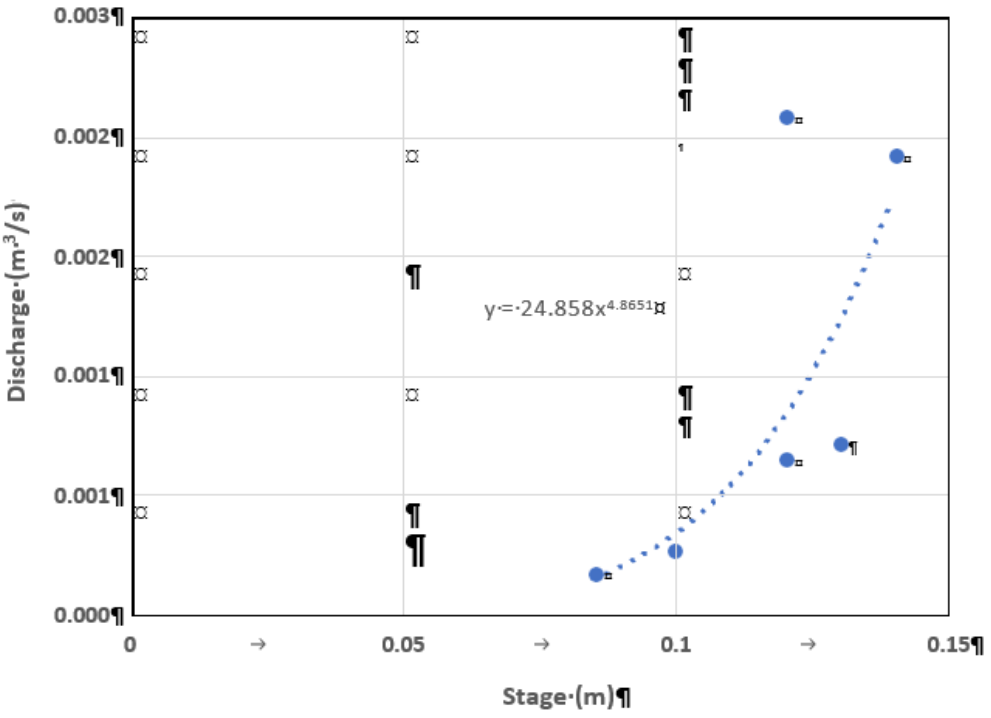


Figure 3.6 Stage-discharge curve at the FM_S4 station

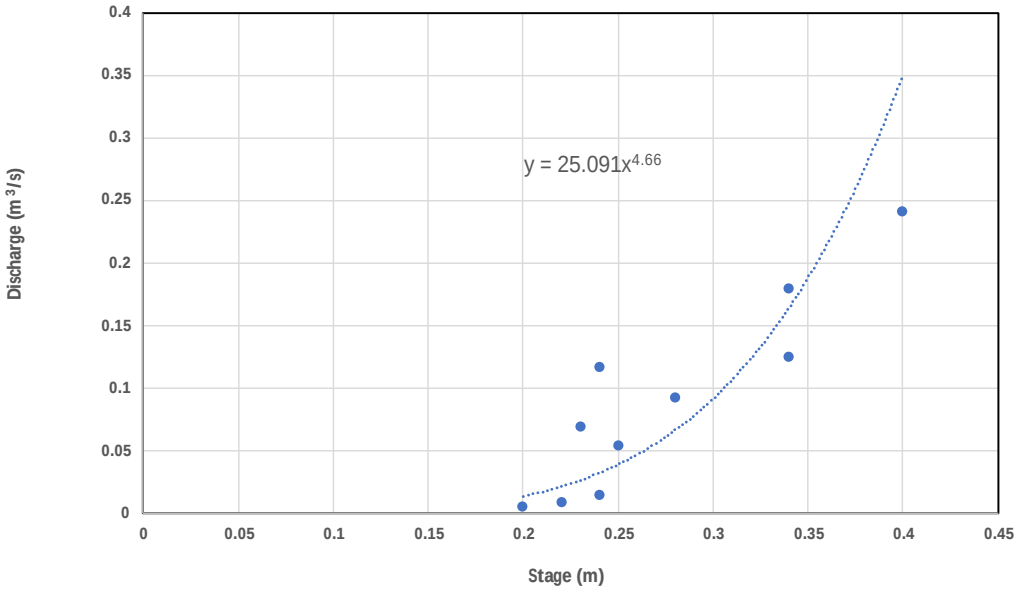


Figure 3.7 Stage-discharge curve at the FM_S5 station

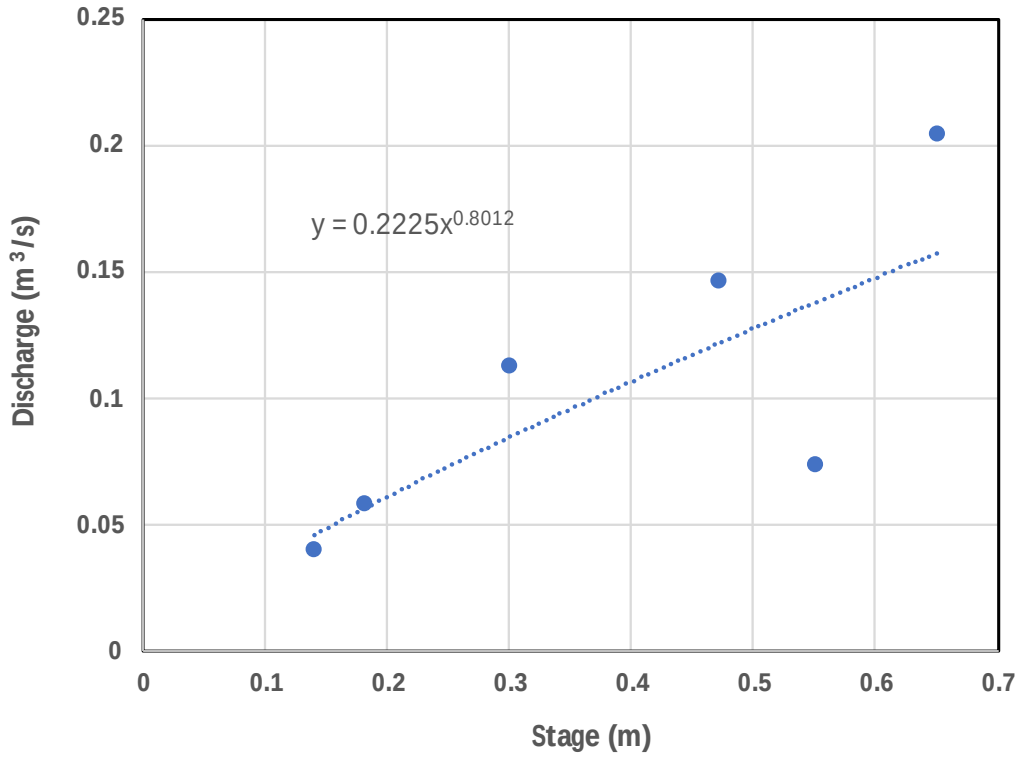


Figure 3.8 Stage-discharge curve at the FM_S6 station

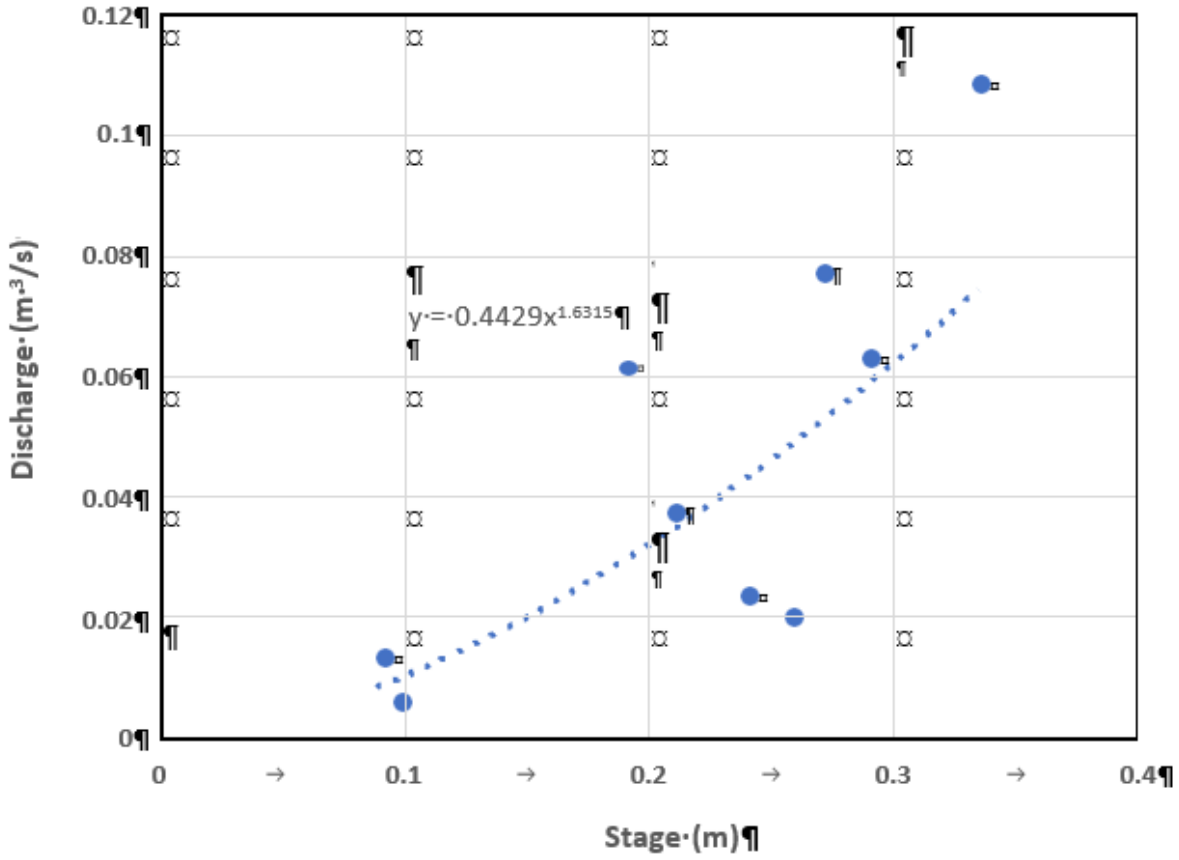


Figure 3.9 Stage-discharge curve at the FM_S7 station

3.2.4 Hydrograph

As discussed in **Section 3.2.1**, four water level loggers were installed to continuously record water levels. Two of these loggers were installed in streams FM_S3 and FM_S5. Water discharge estimates were calculated by applying the developed stage-discharge relationship to the recorded stage data. This allowed daily discharge hydrographs to be developed for each hydrometric station. Limitations for using rating curves beyond suggested levels should be considered (**Section 3.2.3**).

Water discharge estimates were calculated throughout the period of level logging by applying the stage-discharge curves developed using observed discharge-stage/depth values (**Section 3.2.3**). Water level (and temperature) were recorded for two stream stations (FM_S3 and FM_S5) and two lakes (LM_L2 and LM_L3). Currently, logged water levels have been downloaded for the period of late-August 2021 to late-April 2022. Recorded values of FM_S3 between October and December and from February to late March were not available. At FM_S5, the only unavailable period was between February and late March. Daily discharge hydrographs were calculated for these periods and are shown in **Figure 3.10** and **Figure 3.11** below:

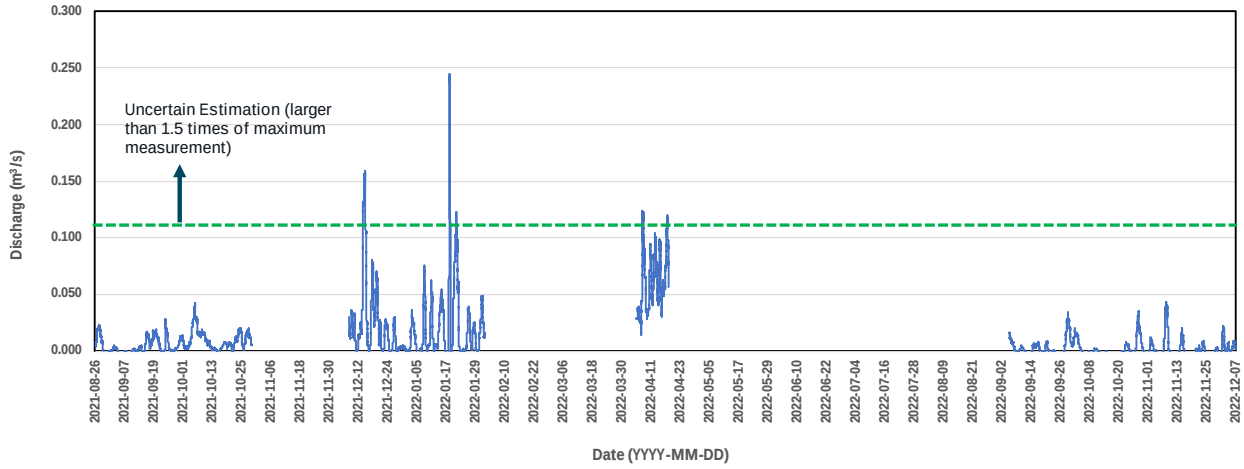


Figure 3.10 Daily hydrograph at hydrometric station FM_S3

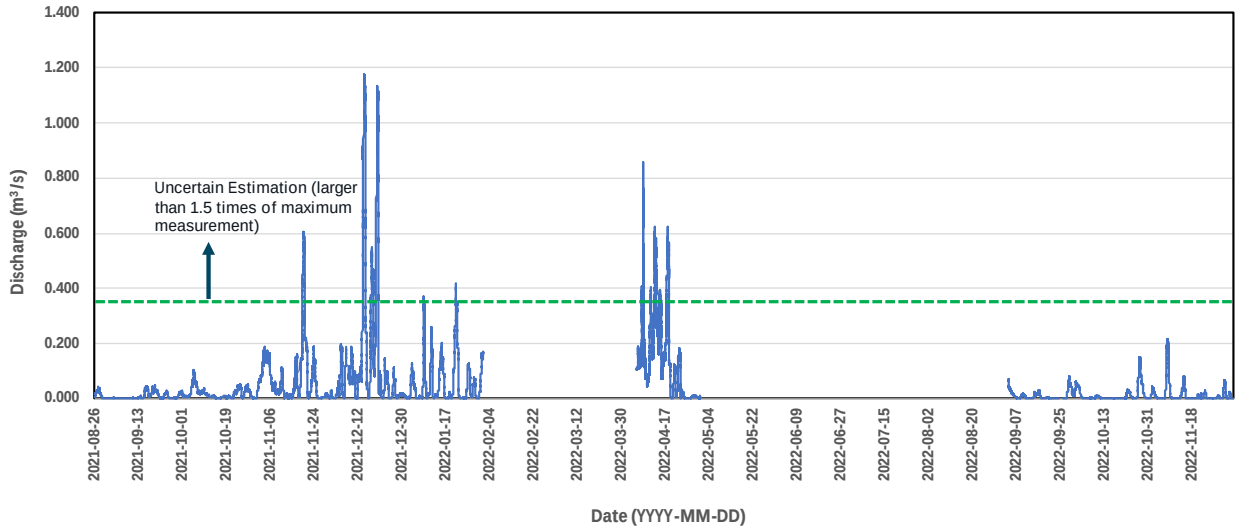


Figure 3.11 Daily hydrograph at hydrometric station FM_S5

Lake water levels were also recorded during these periods. Although the duration for data collection is not sufficient for certain conclusion, the effect of early fall precipitation and collected runoff in lake level fluctuations is evident. Additionally, water levels in both lakes gradually drops down (approximately 500mm between December to late January). As shown in **Figure 3.12** and **Figure 3.13**, lake water levels rise approximately 200mm from the end of August until late October due to runoff collection and precipitation.

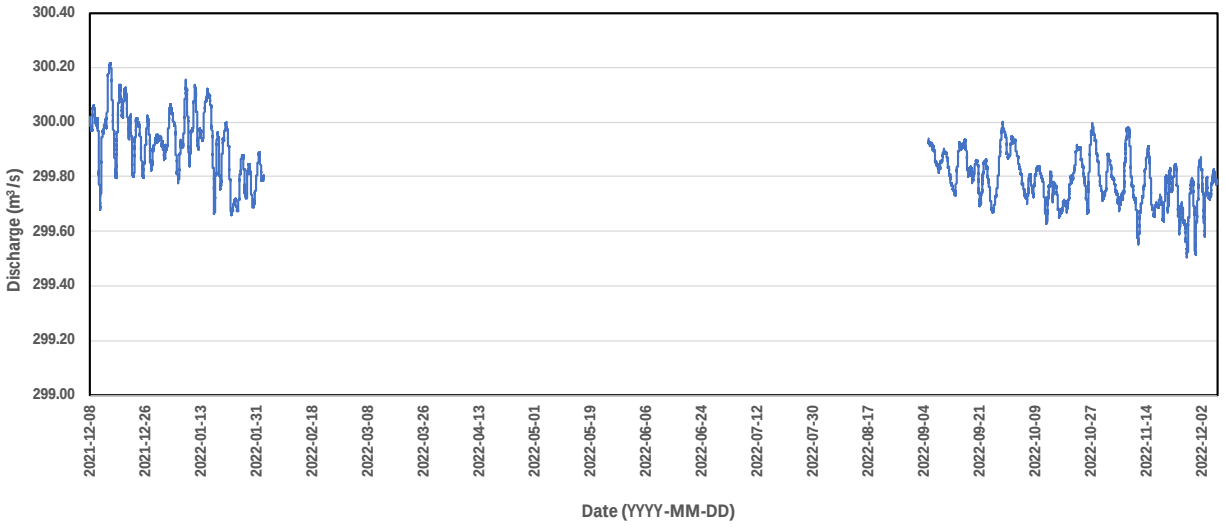


Figure 3.12 Daily hydrograph of lake water level at hydrometric station LM_L2

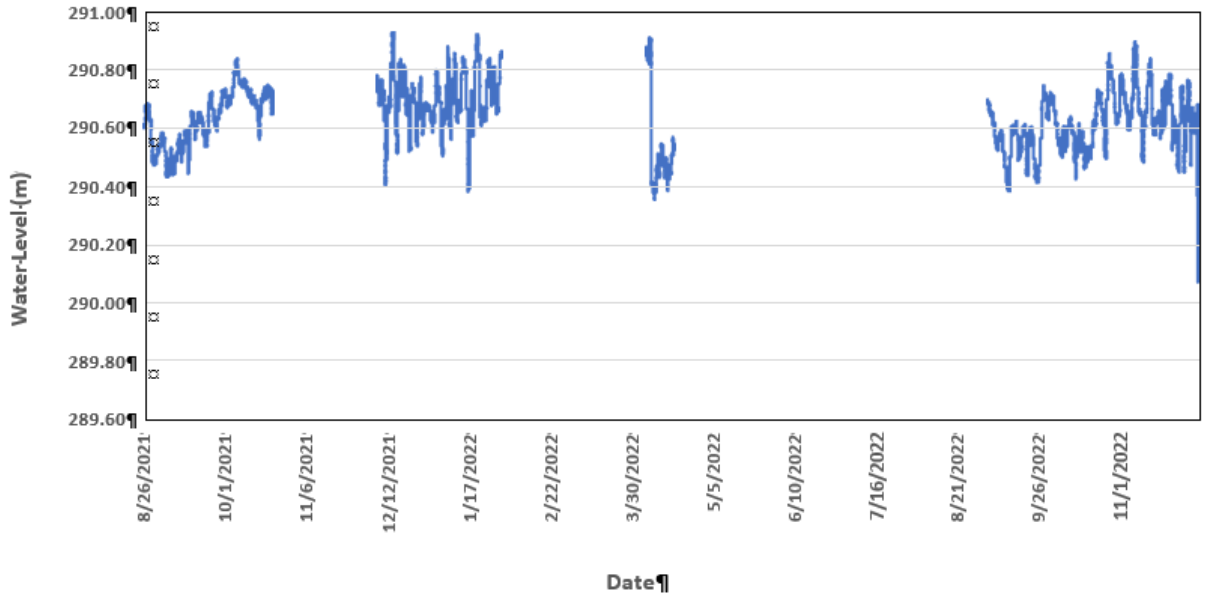


Figure 3.13 Daily hydrograph of lake water level at hydrometric station LM_L3

3.2.5 Flow Duration Curve

The flow-duration curve (FDC) is a cumulative frequency curve that shows the percentage of time-specified discharges that were equaled or exceeded during a given period by combining all discharge estimations at equal time intervals (min, hourly, or daily). In other words, it is the discharge as a function of percentage of time that discharge is exceeded (Searcy, 1959). Hydrologists use FDC to show if a design flow (or a minimum acceptable flow rate) can be expected to exceed, and what the exceedance percentage of time

is. An FDC was constructed to assess the cumulative distribution of stream flows. Daily discharge data obtained from the hydrograph (based on continuous level logger data) was used to construct the flow duration curve.

Hydrographs were aggregated and averaged to hourly temporal resolution and were ranked sequentially from largest to smallest and then an exceedance probability for each flow measurement was calculated.

Flow duration curves were developed for the stream stations where level logging was conducted (FM_S3 and FM_S5). These curves, however, should be considered as those for summer and fall discharge rates and they could not be used to estimate hourly/daily flow rates during freshet or winter periods. **Figure 3.14** and **Figure 3.15** present FDC for these stations.

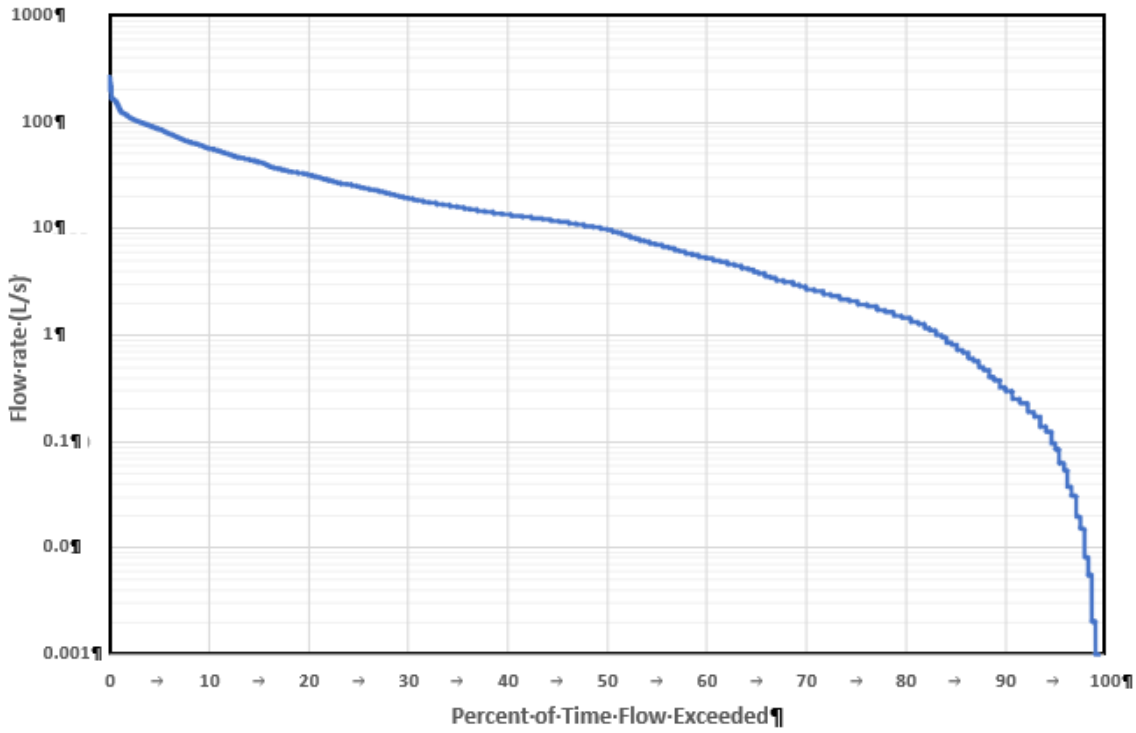


Figure 3.14 Duration curve for hourly flow, FM_S3 station across the La Loutre property

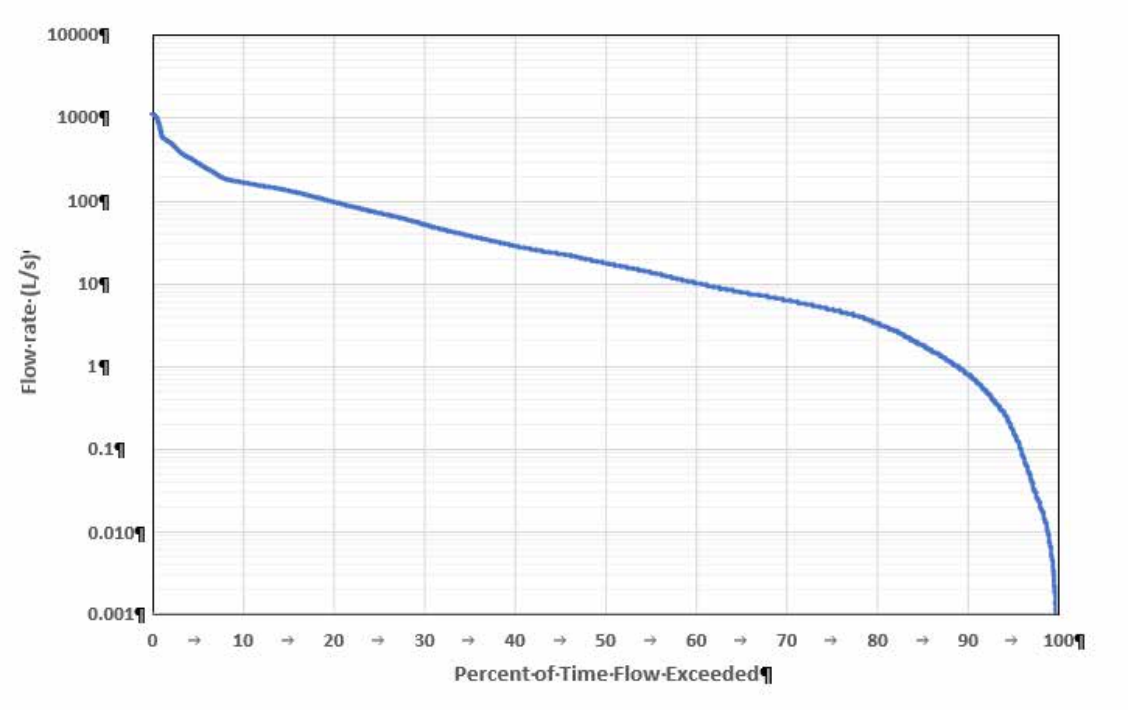


Figure 3.15 Duration curve for hourly flow, FM_S5 station across the La Loutre property

The FDC is a graphical representation of the cumulative frequency distribution of streamflow data over a specified period. It is a tool commonly used in hydrology to analyze and understand the frequency and duration of streamflow events.

The FDC displays the percentage of time that a given flow rate was exceeded during the time period being analyzed. The curve is typically plotted with flow rate on the y-axis and the percentage of time that flow rate was exceeded on the x-axis. For example, a point on the curve representing a flow rate of 50 m^3/s and a percentage of time exceeded of 30% would indicate that flow rates of 50 m^3/s or higher occurred 30% of the time during the period being analyzed.

The FDC can be used to identify the frequency and duration of high and low flow events, as well as to estimate the available water supply in a given watershed. The curve can also be used to compare the characteristics of different watersheds and to evaluate the impact of land use changes on streamflow patterns.

The FDC is plotted with exceedance frequency versus hourly discharge, illustrating flow variability. For instance, Q10/Q90 is a common measure of streamflow variability. It corresponds to the ratio of a flow rate that is exceeded 10% of the time (Q10) over the flow that is exceeded 90% of the time of the time (Q90).

It should be emphasized that the plotted FDC shape varies depending on the length of flow records. It is very improbable to capture large flood rates during the current span of level logging (three to five months), and therefore the left side of the curve (high flow rates) should be considered with contingency.

3.2.6 Regional Flood Frequency Analysis

Throughout the current field monitoring program, discharge and water levels have been measured and logged for a few months (between five to nine months). Although these measurements provide a good benchmark for estimating flow rates and lake storages, they span only through one year and may not represent multi- annual fluctuations. As mentioned in **Section 3.2.3**, rating curves may result in uncertain peak flow values when extrapolated beyond observed values.

In the absence of complete observation and measurement, and to fill the uncertainty gap, regional flood frequency analysis was conducted using long-term observed discharge rates at publicly managed hydrometric stations in the proximity of the Project site.

Several stations from Water Survey of Canada (WSC) in the vicinity of the project site were examined, and three were selected for the regional analysis (**Table 3.9**). The selected stations would be chosen based on similarity of topographic and hydrologic features, proximity to the project site and duration of historic available data. However, none of the stations in proximity of the project site had comparable drainage size to that of the streams within the site.

Table 3.9 Water Survey of Canada Flow Stations in the Vicinity of the La Loutre site

ID	Station Name	Station #	Drainage Area (km^2)	Available years of data
1	Petite Nation Au Pont	02LD005	1,330	1968 - 2019
2	Rouge en amont de la McNeil	02LC029	5,460	1964 - 2019
3	Saint-Louis (Ruisseau)	02LC043	39.9	1968 - 2019

Location of these stations (and other stations) relative to the Project site is shown in **Figure 3.16** below:

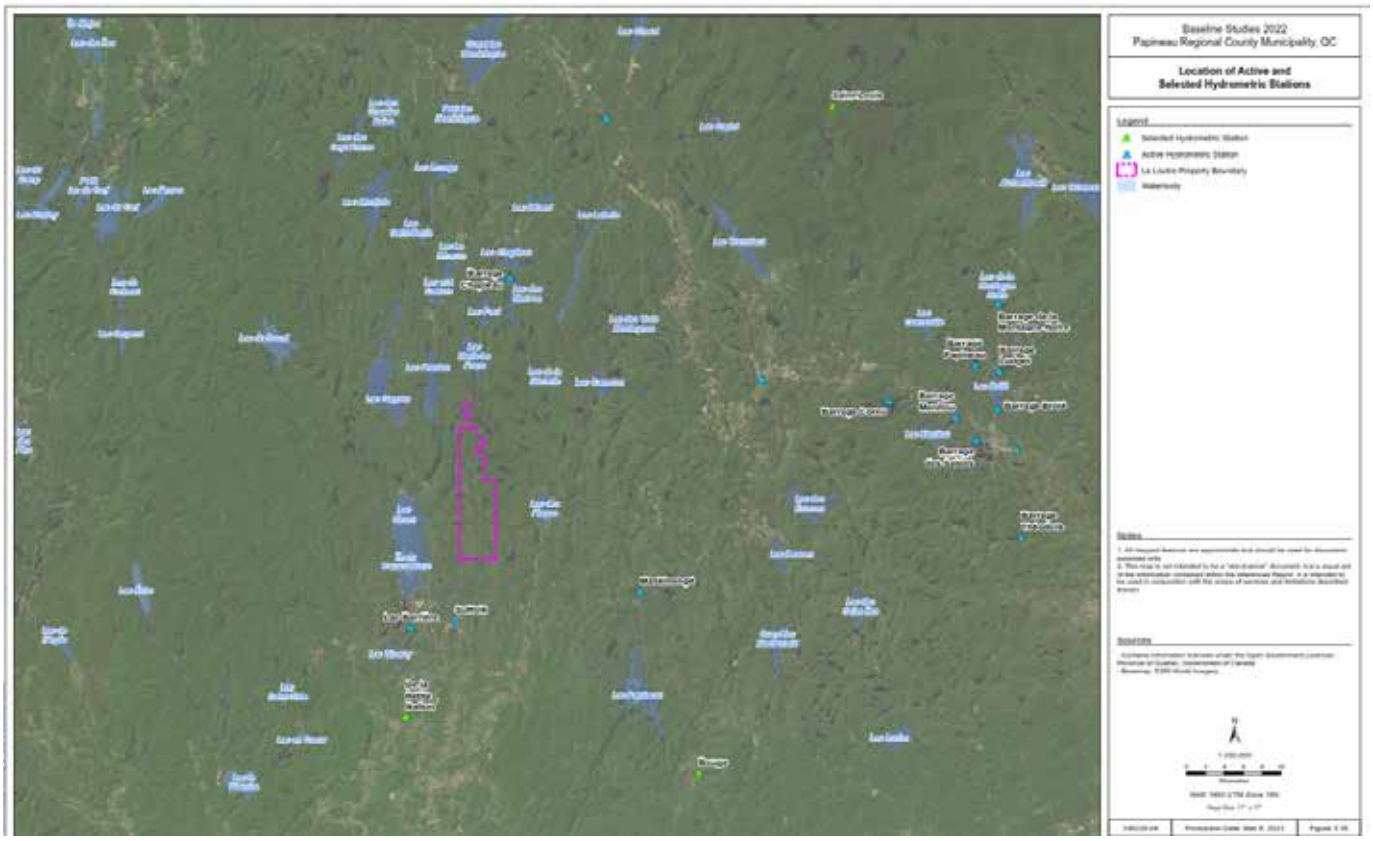


Figure 3.16 Location of active and selected hydrometric stations

HYFRAN-PLUS software, version 2.2, was used to perform frequency analysis and to obtain the peak floods for 1, 10, 20, 50, 100, 200, 500 and 1,000-year flood events. Two statistical fits were examined: Gumbel and Log-Pearson Type 3 (LP3). Both distributions fit reasonably well with the observed flow rates.

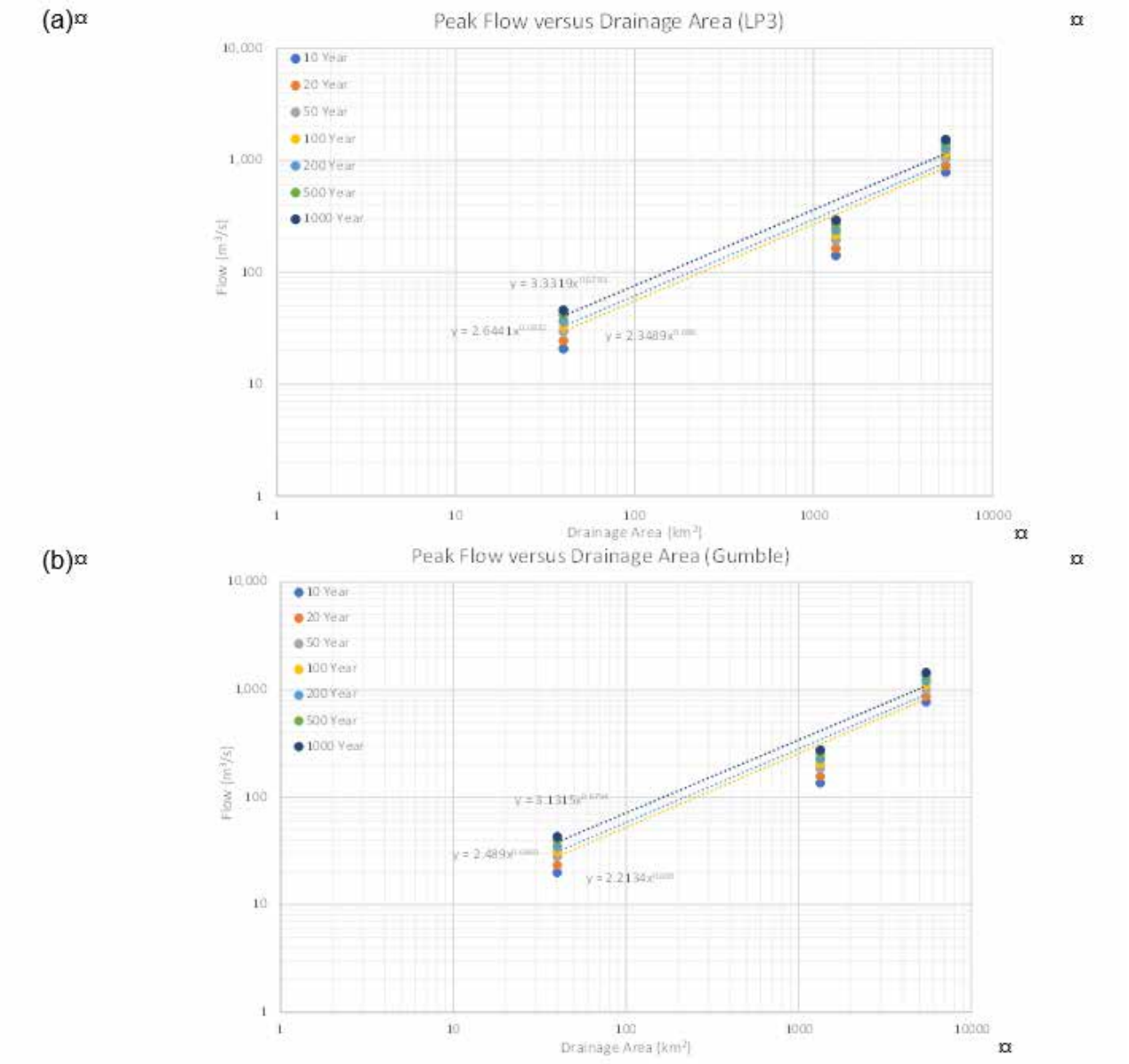


Figure 3.17 Regional Flood Frequency Analysis for Different Return Periods using (a) Log- Pearson Type3, and (b) Gumbel Distributions (Equations are for 100, 200 and 1000- year storms)

As it has been proven in a wealth of literature (O'Connell 1868, Creager, Justin and Hinds 1944, Ayalew, et al. 2014), power law formulas are good predictors of peak discharge based on drainage area. A power equation was calibrated for streams in the vicinity of the La Loutre property to estimate peak flows in watercourses. The calibrated curve is parametrized for the catchment (drainage) area at the three hydrometric stations (**Table 3.9**). The curve was calibrated by minimizing the Mean Square Error.

The property is extended across almost 38.6 km^2 but the drainage area of each water course is different. As the catchment of some streams extends beyond property limit, some are even larger than the property surface area. We focused on flow rates at the locations of the monitoring stations (**Figure 3.3**). Estimated peak flow rates of these watercourses are presented in **Table 3.10**.

Table 3.10 Peak Flow Rates of the Traversing Stream segment (100 to 1000-year Return Period)

Station	Drainage Area(ha)	Peak flow (m^3/s) for return periods					
		LP3			Gumbel		
		100Y	200Y	1000Y	100Y	200Y	1000Y
FM_S2	161.6	3.3	3.7	4.6	3.1	3.5	4.3
FM_S3	247	4.4	4.9	6.2	4.1	4.6	5.8
FM_S4	16.3	0.7	0.8	1.0	0.6	0.7	0.9
FM_S5	358.3	5.6	6.3	7.9	5.3	6.0	7.5
WQ_S3	516.4	7.2	8.1	10.1	6.8	7.7	9.6
WQ_S4	279.4	4.8	5.3	6.7	4.5	5.0	6.3

The values provided in the table above are preliminary estimates for design purposes. It should also be noted that these values were estimated using limited flow data available from the watersheds nearby the project site. The design of water management structures would then rely on the results of the rainfall runoff analysis.

3.3 Surface Water Quality

A total of 11 water quality sampling stations have been identified to collect samples/data in 2022. An additional station was added in the summer to reflect the point where part of the Project site catchment flows into Lac Doré. Water quality monitoring was conducted as per the Guide d'échantillonnage à des fins d'analyses environnementales (MELCC, 2008), Guide de caractérisation physicochimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel (MELCC, 2017), Directive 2019 sur l'Industrie Minière (2012); as well as per other federal and provincial guidelines.

The annual surface water quality baseline program included a monthly field program and data collection. Samples were collected monthly from May 2022 to December 2022, sampling for October and November 2022 was cancelled due to safety reasons during the hunting season. Specific tasks completed in 2022 as part of the water quality baseline assessment included the following:

- Review and analysis of existing and public data sources.
- Collection of monthly surface water quality baseline data at the La Loutre property.
- Statistical summary of existing and newly acquired data.
- Compile and tabulate data.

3.3.1 Sampling Locations

The water quality study area and sampling stations are shown on **Figure 3.18**, and summarized in **Table 3.11**. The study area focuses on surface water components within sub-catchments 6 and 8 (the proposed location of the mine facility) and also sub-catchments 5 and 7, which would be potentially impacted by the proposed mine design.

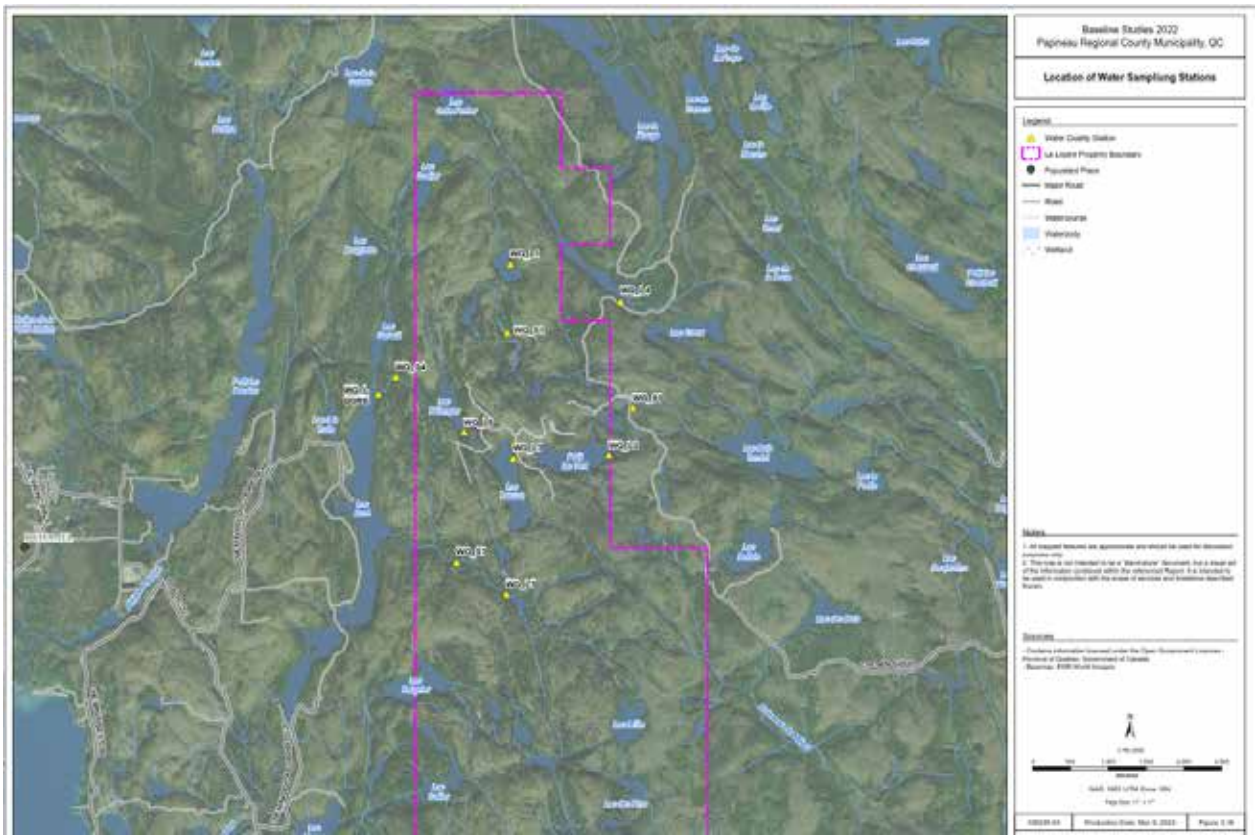


Figure 3.18 Location of Water Quality Sampling Stations across La Loutre Property

In total, ten stations were sampled from May to December depending on accessibility and weather conditions, and one station was sampled from July to December. These sampling stations were in streams (WQ_S#) or lakes (WQ_L#)

Table 3.11 Locations and Dates of the 2022 Surface Water Quality Monitoring Program.

Station	WGS Coordinates		UTM Zone 8N		Sampling Locations	May	Jun	Jul	Aug	Sep	Dec
	Lat	Lon	Easting	Northing							
WQ_S1	46.04038	-75.00145	499888	5098534	Downstream of unnamed lake upstream of proposed Co-disposal facility's location	X	X	X	X	X	X
WQ_S3	46.03206	-74.97947	501589	5097610	Downstream of proposed mine design, upstream of Lac Bois Tombé	X	X	X	X	X	X
WQ_S4	46.03550	-75.01998	498454	5097992	Upstream of Lac Doré	X	X	X	X	X	X

Station	WGS Coordinates		UTM Zone 8N		Sampling Locations	May	Jun	Jul	Aug	Sep	Dec
	Lat	Lon	Easting	Northing							
WQ_S7	46.015134	-75.00962	499255	5095729	Upstream of unnamed lake south of proposed facilities	X	X	X	X	X	X
WQ_L1	46.047850	-75.00040	499969	5099364	Unnamed lake north of mine proposed facilities	X	X	X	X	X	X
WQ_L2	46.02685	-74.98365	501265	5097031	Lake Petit lac Vert	X	X	X	X	X	X
WQ_L4	46.043808	-74.98154	501428	5098915	Unnamed lake downstream of Lac Ovila-Fortier, upstream of Lac la Rouge	X	X	X	X	X	X
WQ_L5	46.026529	-74.99993	500005	5096995	Lake Tallulah	X	X	X	X	X	X
WQ_L6	46.029381	-75.00835	499354	5097311	Unnamed lake upstream of Lac Doré	X	X	X	X	X	X
WQ_L7	46.011642	-75.00114	499912	5095341	Unnamed lake south of mine proposed facilities	X	X	X	X	X	X
WQ-L DORE	46.033598	-75.02254	498255	5097781	Lake Dore			X	X	X	X

3.3.2 Sampling Techniques

Grab sampling was the technique used to collect the water quality samples. Grab sampling is a recognised form of collecting surface water quality samples and involves the sampler dipping the sample container into the waterbody with the mouth of the jar facing upstream to allow the bottle to fill up. Sterilized nitrile gloves were worn at all times during sample collection to avoid sample contamination. Sample containers were rinsed with distilled water prior to trace metal sampling. Travel and field blanks were also provided to the laboratory for quality assurance/quality control. Water quality samples were taken concurrently with flow monitoring data collection.

3.3.3 Applicable Guidelines and Standards

According to the Guide de caractérisation physicochimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel (MELCC, 2017), baseline water quality should be evaluated based on surface water quality criteria of the Ministère de l'Environnement et de la Lutte contre les changements climatiques[5]. For this purpose, it is recommended to use criteria for Protection of Aquatic life (long-term)

[5] Ministère de l'Environnement et de la Lutte contre les changements climatiques

and those for prevention of contamination in fish tissues (for human or terrestrial fauna consumption). These guidelines are intended to protect all forms of aquatic life and all aspects of aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term from anthropogenic stressors such as chemical inputs or changes to physical components. Criteria for water quality were derived from the Ministry website and were used for analysis (MELCC, 2021). These criteria are often consistent with those determined by Canadian Council of Minister of Environment, which provide the science-based benchmark for a nationally consistent level of protection for aquatic life in Canada (CCME 2021).

3.3.4 Sample Analysis

Water quality monitoring followed the Guide de caractérisation physicochimique de l'état initial du milieu aquatique avant l'implantation d'un projet industriel (MELCC, 2017). According to this guideline a set of water quality parameters should be collected for the baseline initial state studies. **Table 3.12** presents these parameters.

Table 3.12 Base Parameters for Initial State Characterisation of Surface Water (MELCC, 2017).

Physico-chemistry and Nutrients	Total Metals
Alkalinity	Aluminum
Dissolved organic carbon	Antimony
Specific conductivity	Silver
Hardness	Arsenic
Total suspended solids	Barium
Dissolved oxygen	Cadmium
pH	Chromium
Total dissolved solids	Cobalt
Temperature	Copper
Turbidity	Iron
Ammonia as nitrogen	Beryllium
Total nitrogen	Boron
Nitrate	Manganese
Nitrite	Molybdenum
Total phosphorus	Nickel
Fecal coliform	Lead
Major Ions	Selenium
Calcium	Strontium
Fluoride	Uranium
Sodium	Vanadium
Chloride	Zinc
Magnesium	
Potassium	
Sulfate	

Samples were shipped to Bureau Veritas laboratory for analysis. Baseline water quality review included results of laboratory analyses and in situ field measurements (e.g., specific conductivity, temperature, pH, turbidity, etc.). **Table 3.13** to **Table 3.18** below provides data for conventional parameters and Table 3.19 to Table 3.24 provides total metals concentrations. All tables provide a comparison to applicable guidelines and exceedance of guideline criteria are highlighted.

Table 3.13 Conventional Parameters of Surface Water, May 2022.

Parameter	Units	Station										Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Specific conductivity	µS/cm	0.041	0.064	0.061	0.040	0.050	0.025	0.052	0.069	0.051	0.036	No criteria	No criteria	No criteria
Total alkalinity (as $CaCO_3$)	mg/L	12	28	27	14	17	5.7	21	28	17	13	10	No criteria	No criteria
Calcium	mg/L	6.6	9.6	10	5.2	7.6	3.4	8.2	11	7.5	5.3	No criteria	No criteria	No criteria
Chloride	mg/L	0.27	0.33	0.32	0.30	0.36	0.30	0.37	0.35	0.38	0.31	230	No criteria	No criteria
Dissolved organic carbon	mg/L	3.6	3.4	5.2	3.2	4.3	6.5	7.3	5.5	4.4	6.1	No criteria	No criteria	No criteria
Fluoride	mg/L	0.028	0.034	0.034	0.030	0.034	0.029	0.039	0.035	0.034	0.026	0.2	No criteria	No criteria
Magnesium	mg/L	0.57	1.3	0.69	1.0	1.1	0.51	0.98	1.3	0.98	0.60	No criteria	No criteria	No criteria
Nitrate	mg/L	0.033	0.026	0.043	0.053	0.058	ND	0.022	0.029	0.063	0.043	45	No criteria	No criteria
Nitrite	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	No criteria	No criteria
Ammonia (as N)	mg/L	ND	ND	0.027	0.025	ND	ND	0.020	ND	ND	ND	1.2	No criteria	No criteria
Potassium	mg/L	0.31	0.73	0.56	0.62	0.62	0.44	0.52	0.67	0.59	0.49	No criteria	No criteria	No criteria
Sodium	mg/L	0.56	0.66	0.66	0.65	0.60	0.56	0.64	0.62	0.59	0.60	No criteria	No criteria	No criteria
Total dissolved solids	mg/L	43	38	56	26	46	29	44	62	37	31	No criteria	No criteria	No criteria
Total suspended solids	mg/L	0.29	0.88	0.29	0.49	0.29	2.2	2.6	1.4	0.31	0.84	25	No criteria	No criteria
Turbidity	NTU	0.56	0.38	0.66	0.71	0.42	0.67	0.81	0.48	0.44	0.41	2	No criteria	No criteria
Total phosphorus	mg/L	0.0077	0.053	0.0062	0.006	0.0054	0.0086	0.011	0.008	0.0064	0.0066	0.03	No criteria	No criteria

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.14 Conventional Parameters of Surface Water, June 2022.

Parameter	Units	Station										Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Specific conductivity	µS/cm	0.040	0.061	0.057	0.037	0.045	0.026	0.052	0.068	0.049	0.033	No criteria	No criteria	No criteria
Total alkalinity (as $CaCO_3$)	mg/L	13	26	25	14	16	8.6	23	31	17	11	10	No criteria	No criteria
Calcium	mg/L	6.3	9.3	9.8	5.0	6.6	3.8	8.6	11	7.3	5.2	No criteria	No criteria	No criteria
Chloride	mg/L	0.22	0.28	0.25	0.26	0.29	0.19	0.26	0.18	0.30	0.19	230	No criteria	No criteria
Dissolved organic carbon	mg/L	3.7	3.3	5.2	3.3	4.0	8.0	8.5	6.5	4.3	7.6	No criteria	No criteria	No criteria
Fluoride	mg/L	0.031	0.036	0.038	0.033	0.034	0.033	0.044	0.038	0.035	0.036	0.2	No criteria	No criteria
Magnesium	mg/L	0.52	1.2	0.65	0.98	0.97	0.57	0.99	1.2	0.94	0.61	No criteria	No criteria	No criteria
Nitrate	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025	45	No criteria	No criteria
Nitrite	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	No criteria	No criteria
Ammonia (as N)	mg/L	0.064	0.084	0.074	0.110	0.075	0.086	0.072	0.084	0.076	0.082	1.2	No criteria	No criteria
Potassium	mg/L	0.27	0.67	0.49	0.58	0.57	0.41	0.49	0.49	0.56	0.43	No criteria	No criteria	No criteria
Sodium	mg/L	0.51	0.61	0.60	0.62	0.57	0.57	0.57	0.59	0.56	0.57	No criteria	No criteria	No criteria
Total dissolved solids	mg/L	41	48	59	51	43	52	59	60	50	49	No criteria	No criteria	No criteria
Total suspended solids	mg/L	0.61	0.52	0.51	1.6	0.72	0.81	0.71	0.92	0.90	1.3	25	No criteria	No criteria
Turbidity	NTU	0.58	0.33	0.43	1.1	0.65	0.95	0.66	0.70	0.61	0.58	2	No criteria	No criteria
Total phosphorus	mg/L	0.0068	0.0038	0.0066	0.0079	ND	0.012	0.011	0.008	0.0059	0.0076	0.03	No criteria	No criteria

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.15 Conventional Parameters of Surface Water, July 2022.

Parameter	Units	Station											Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-LDORE	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Specific conductivity	µS/cm	0.039	0.061	0.057	0.042	0.047	0.029	0.056	0.079	0.049	0.038	0.051	No criteria	No criteria	No criteria
Total alkalinity (as $CaCO_3$)	mg/L	14	27	25	14	17	11	27	38	18	15	21	10	No criteria	No criteria
Calcium	mg/L	6.1	9.1	9.7	5.1	6.9	4.7	9.9	14	7.2	6.3	7.9	No criteria	No criteria	No criteria
Chloride	mg/L	0.21	0.27	0.23	0.25	0.27	0.13	0.20	0.16	0.29	0.15	0.56	230	No criteria	No criteria
Dissolved organic carbon	mg/L	4.0	3.4	5.4	3.3	4.2	9.0	11	7.1	4.2	8.2	4.7	No criteria	No criteria	No criteria
Fluoride	mg/L	0.032	0.035	0.040	0.027	0.038	0.041	0.043	0.044	0.039	0.042	0.036	0.2	No criteria	No criteria
Magnesium	mg/L	0.46	1.1	0.59	0.89	0.87	0.61	0.98	1.30	0.84	0.62	0.61	No criteria	No criteria	No criteria
Nitrate	mg/L	ND	ND	ND	ND	ND	ND	ND	0.028	0.051	0.090	ND	45	No criteria	No criteria
Nitrite	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	No criteria	No criteria
Ammonia (as N)	mg/L	ND	ND	ND	ND	ND	ND	0.024	ND	ND	ND	ND	1.2	No criteria	No criteria
Potassium	mg/L	0.25	0.66	0.44	0.58	0.55	0.26	0.34	0.52	0.55	0.31	0.48	No criteria	No criteria	No criteria
Sodium	mg/L	0.48	0.58	0.58	0.60	0.54	0.56	0.52	0.57	0.54	0.57	0.62	No criteria	No criteria	No criteria
Total dissolved solids	mg/L	39	48	61	45	57	50	62	88	60	63	64	No criteria	No criteria	No criteria
Total suspended solids	mg/L	4.0	1.7	0.2	1.4	1.5	2.0	0.4	2.5	1.3	2.6	1.1	25	No criteria	No criteria
Turbidity	NTU	0.88	0.43	0.73	0.91	0.84	1.3	0.83	0.95	0.78	1.4	0.53	2	No criteria	No criteria
Total phosphorus	mg/L	0.0074	0.0036	0.008	0.0081	0.007	0.018	0.017	0.012	0.0051	0.011	ND	0.03	No criteria	No criteria

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.16 Conventional Parameters of Surface Water, August 2022.

Parameter	Units	Station											Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-LDORE	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Specific conductivity	µS/cm	0.041	0.063	0.061	0.039	0.048	0.033	0.064	0.10	0.054	0.043	0.051	No criteria	No criteria	No criteria
Total alkalinity (as $CaCO_3$)	mg/L	12	25	25	13	16	12	29	47	20	15	20	10	No criteria	No criteria
Calcium	mg/L	6.2	9.2	10.0	4.9	6.7	5.1	11.0	17.0	7.9	7.1	8	No criteria	No criteria	No criteria
Chloride	mg/L	0.20	0.26	0.21	0.36	0.28	0.086	0.18	0.13	0.27	0.12	0.61	230	No criteria	No criteria
Dissolved organic carbon	mg/L	4.3	3.6	5.6	3.8	4.5	10	13	7.8	4.1	0.44	5.0	No criteria	No criteria	No criteria
Fluoride	mg/L	0.029	0.034	0.040	0.029	0.034	0.039	0.045	0.041	0.038	0.041	0.040	0.2	No criteria	No criteria
Magnesium	mg/L	0.52	1.20	0.68	0.93	0.89	0.68	1.2	1.7	0.94	0.74	0.66	No criteria	No criteria	No criteria
Nitrate	mg/L	ND	ND	ND	ND	ND	ND	ND	0.041	0.079	0.062	ND	45	No criteria	No criteria
Nitrite	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	No criteria	No criteria
Ammonia (as N)	mg/L	ND	ND	ND	ND	ND	ND	0.027	0.041	ND	ND	ND	1.2	No criteria	No criteria
Potassium	mg/L	0.26	0.67	0.43	0.57	0.53	0.25	0.33	0.52	0.55	0.31	0.48	No criteria	No criteria	No criteria
Sodium	mg/L	0.57	0.69	0.67	0.68	0.62	0.58	0.58	0.68	0.62	0.66	0.74	No criteria	No criteria	No criteria
Total dissolved solids	mg/L	36	43	49	29	35	41	74	65	43	47	39	No criteria	No criteria	No criteria
Total suspended solids	mg/L	1.4	0.4	0.8	1.6	1.6	3.2	1.2	1.2	0.6	1	1.2	25	No criteria	No criteria
Turbidity	NTU	0.62	0.37	0.52	0.70	0.84	1.9	0.89	2.0	0.44	0.91	0.54	2	No criteria	No criteria
Total phosphorus	mg/L	0.0081	0.0072	0.0082	0.0086	0.0083	0.017	0.017	0.022	0.0071	0.013	0.0076	0.03	No criteria	No criteria

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.17 Conventional Parameters of Surface Water, September 2022.

Parameter	Units	Station											Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-LDORE	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Specific conductivity	µS/cm	0.039	0.061	0.056	0.037	0.046	0.035	0.058	0.066	0.047	0.038	0.052	No criteria	No criteria	No criteria
Total alkalinity (as $CaCO_3$)	mg/L	12	25	24	12	16	13	26	29	15	15	21	10	No criteria	No criteria
Calcium	mg/L	6.3	9.7	10.0	5.3	7.3	6.0	10.0	12.0	7.5	7.0	8.5	No criteria	No criteria	No criteria
Chloride	mg/L	0.26	0.33	0.33	0.39	0.34	0.26	0.41	0.32	0.33	0.26	0.63	230	No criteria	No criteria
Dissolved organic carbon	mg/L	4.3	3.8	6.8	3.7	4.9	12	11	9.4	5.7	12	5.4	No criteria	No criteria	No criteria
Fluoride	mg/L	0.034	0.039	0.043	0.037	0.050	0.043	0.048	0.045	0.042	0.044	0.040	0.2	No criteria	No criteria
Magnesium	mg/L	0.57	1.4	0.76	1.1	1.1	0.88	1.2	1.3	0.98	0.87	0.76	No criteria	No criteria	No criteria
Nitrate	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45	No criteria	No criteria
Nitrite	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02	No criteria	No criteria
Ammonia (as N)	mg/L	0.048	0.046	0.054	0.041	0.049	0.051	0.083	0.062	0.056	0.055	0.056	1.2	No criteria	No criteria
Potassium	mg/L	0.27	0.75	0.48	0.65	0.61	0.50	0.55	0.52	0.58	0.49	0.53	No criteria	No criteria	No criteria
Sodium	mg/L	0.53	0.65	0.65	0.68	0.59	0.59	0.56	0.59	0.61	0.58	0.72	No criteria	No criteria	No criteria
Total dissolved solids	mg/L	50	71	68	57	49	84	83	83	62	70	81	No criteria	No criteria	No criteria
Total suspended solids	mg/L	1.0	1.1	0.7	2.1	0.6	1.8	0.72	0.82	1.3	3.3	4.9	25	No criteria	No criteria
Turbidity	NTU	0.50	0.37	0.46	0.70	0.54	1.1	0.70	0.98	0.57	1.3	0.052	2	No criteria	No criteria
Total phosphorus	mg/L	0.0064	0.0048	0.0079	0.0074	0.0075	0.016	0.010	0.0095	0.0069	0.018	0.0046	0.03	No criteria	No criteria

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.18 Conventional Parameters of Surface Water, December 2022.

Parameter	Units	Station										Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-LDORE	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Specific conductivity	µS/cm	0.028	0.063	0.051	0.039	0.045	0.021	0.058	0.070	0.050	0.032	0.052	No criteria	No criteria	No criteria
Total alkalinity (as $CaCO_3$)	mg/L	9.8	29	29	14	21	5.3	29	31	22	8.0	23	10	No criteria	No criteria
Calcium	mg/L	2.9	8.4	7.1	5.0	6.6	2.7	8.1	11.0	7.3	5.0	9.0	No criteria	No criteria	No criteria
Chloride	mg/L	1.2	1.8	1.3	2.5	2.0	1.8	0.71	0.39	1.5	2.0	3.4	230	No criteria	No criteria
Dissolved organic carbon	mg/L	5.5	3.6	7.2	3.6	4.1	8.9	6.6	6.1	4.8	7.4	5.1	No criteria	No criteria	No criteria
Fluoride	mg/L	0.029	0.036	0.046	0.030	0.032	0.040	0.033	0.031	0.034	0.030	0.035	0.2	No criteria	No criteria
Magnesium	mg/L	0.41	1.40	0.78	1.10	0.88	0.56	1.20	1.40	1.00	0.70	0.83	No criteria	No criteria	No criteria
Nitrate	mg/L	0.17	0.17	0.20	0.17	0.22	0.27	0.14	0.073	0.22	0.25	0.28	45	No criteria	No criteria
Nitrite	mg/L	ND	ND	0.021	ND	ND	ND	ND	ND	ND	ND	0.025	0.02	No criteria	No criteria
Ammonia (as N)	mg/L	ND	0.033	ND	0.074	0.054	0.021	ND	0.035	0.031	ND	ND	1.2	No criteria	No criteria
Potassium	mg/L	0.12	0.64	0.48	0.58	0.61	0.65	0.74	0.68	0.61	0.65	0.54	No criteria	No criteria	No criteria
Sodium	mg/L	0.48	0.48	0.51	0.49	0.59	0.61	0.52	0.49	0.50	0.63	0.65	No criteria	No criteria	No criteria
Total dissolved solids	mg/L	42	60	54	32	36	40	50	76	48	64	46	No criteria	No criteria	No criteria
Total suspended solids	mg/L	5.7	1.2	0.92	0.9	0.8	1.1	0.7	1.9	0.71	0.9	1.5	25	No criteria	No criteria
Turbidity	NTU	0.69	0.40	0.58	0.57	0.56	0.64	0.65	0.77	0.51	0.58	0.44	2	No criteria	No criteria
Total phosphorus	mg/L	0.022	0.013	0.013	0.0093	0.0094	0.016	0.011	0.011	0.010	0.012	0.0088	0.03	No criteria	No criteria

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.19 Concentration of Total Metals and Criteria Exceedances, May 2022.

Parameter	Units	Station										Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Aluminum	mg/L	0.023	0.012	0.038	0.023	0.033	0.110	0.068	0.032	0.032	0.087	0.33	No criteria	No criteria
Antimony	mg/L	0.000038	0.000024	0.000024	0.000028	0.000030	0.000036	0.000040	0.000032	0.000024	0.000031	0.24	0.64	No criteria
Silver	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000032	11.00	No criteria
Arsenic	mg/L	0.00013	0.000090	0.000099	ND	0.000095	0.00011	0.00012	0.00011	0.000087	0.00011	0.15	0.021	No criteria
Barium	mg/L	0.0055	0.0069	0.0065	0.0062	0.0053	0.0078	0.0055	0.0073	0.0051	0.0073	0.079*	160	No criteria
Beryllium	mg/L	ND	ND	ND	ND	ND	0.000017	ND	ND	ND	ND	0.000444*	1.2	No criteria
Boron	mg/L	0.0031	0.0050	0.0034	0.0039	0.0048	0.0037	0.0054	0.0055	0.0042	0.0039	5	160	No criteria
Cadmium	mg/L	ND	ND	ND	ND	ND	0.000012	ND	ND	ND	0.0000067	0.00008*	0.13	No criteria
Chromium	mg/L	ND	ND	0.000073	ND	0.000085	0.000160	0.000098	0.000042	ND	0.00011	0.011*	9.4	No criteria
Cobalt	mg/L	0.000023	0.000015	0.000031	0.000030	0.000034	0.00011	0.00010	0.000072	0.000037	0.00010	0.1	No criteria	No criteria
Copper	mg/L	0.00059	0.00034	0.00069	0.00052	0.00099	0.0015	0.00097	0.00065	0.00070	0.00180	0.0024*	38	No criteria
Iron	mg/L	0.0095	0.0068	0.073	0.022	0.031	0.130	0.190	0.140	0.029	0.120	1.3	No criteria	No criteria
Manganese	mg/L	0.0045	0.0069	0.018	0.016	0.0073	0.010	0.012	0.018	0.0058	0.012	0.47*	59	No criteria
Mercury	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00091	0.0000018	0.0000013
Molybdenum	mg/L	0.00033	0.000084	0.000060	0.000030	0.000035	0.000084	0.000057	0.000092	0.000036	0.000085	3.2	10	No criteria
Nickel	mg/L	0.00012	0.00018	0.00066	0.00027	0.00035	0.00040	0.00039	0.00029	0.00032	0.00035	0.013*	4.6	No criteria
Lead	mg/L	ND	ND	ND	ND	0.000019	0.000051	0.000069	0.000024	0.000011	0.000027	0.00041*	0.19	No criteria
Selenium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	0.000060	ND	0.005	4.2	No criteria
Strontium	mg/L	0.016	0.026	0.051	0.017	0.019	0.011	0.016	0.024	0.017	0.016	2.1	No criteria	No criteria
Uranium	mg/L	0.0000079	0.000019	0.000019	0.0000071	0.000012	0.000017	0.000013	0.000013	0.000011	0.000019	0.014	No criteria	No criteria
Vanadium	mg/L	0.000063	0.000069	0.000086	ND	0.000057	0.00019	0.00019	0.00014	0.000066	0.00016	0.012	2.2	No criteria
Zinc	mg/L	0.00065	0.00062	0.00061	0.00079	0.001	0.0034	0.0016	0.0011	ND	0.0023	0.031*	26	No criteria

*Criteria is a function of total hardness

	Exceeding long-term Aquatic Life Protection Level[6]
	Exceeding Contamination Prevention Level (only aquatic organisms)[7]
	Exceeding Protection of Terrestrial Fauna[8]
	Exceeding multiple criteria

ND: Not detected
NA: Not available

6 Protection de la vie aquatique (effet chronique)
7 Prévention de la contamination (organisme aquatique seulement)
8 Protection de la Faune Terrestre Piscivore

Table 3.20 Concentration of Total Metals and Criteria Exceedances, June 2022.

Parameter	Units	Station										Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Aluminum	mg/L	0.026	0.014	0.025	0.022	0.026	0.11	0.045	0.039	0.033	0.084	0.33	No criteria	No criteria
Antimony	mg/L	0.000045	0.000019	0.000023	0.000022	0.000020	0.000025	0.000029	0.000025	0.000024	0.000032	0.24	0.64	No criteria
Silver	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000032	11.00	No criteria
Arsenic	mg/L	0.00013	ND	ND	0.000086	0.000098	0.00015	0.00015	0.00018	0.000099	0.00014	0.15	0.021	No criteria
Barium	mg/L	0.0046	0.0066	0.0063	0.0057	0.0052	0.0091	0.0061	0.0077	0.0048	0.0084	0.079*	160	No criteria
Beryllium	mg/L	ND	ND	ND	ND	ND	0.000013	ND	ND	ND	ND	0.000444*	1.2	No criteria
Boron	mg/L	0.0027	0.0044	0.0033	0.0035	0.0038	0.0042	0.0055	0.0056	0.0040	0.0043	5	160	No criteria
Cadmium	mg/L	ND	ND	ND	ND	ND	0.0000072	ND	ND	ND	ND	0.00008*	0.13	No criteria
Chromium	mg/L	0.000047	0.000044	0.00011	0.000051	0.000065	0.00019	0.00014	0.000083	0.000082	0.00017	0.011*	9.4	No criteria
Cobalt	mg/L	0.000025	0.000013	0.000027	0.000026	0.000042	0.00018	0.000081	0.00012	0.00006	0.00014	0.1	No criteria	No criteria
Copper	mg/L	0.00024	0.00024	0.00032	0.00024	0.00034	0.00075	0.00042	0.00043	0.00034	0.00072	0.0024*	38	No criteria
Iron	mg/L	0.0084	0.0076	0.050	0.016	0.031	0.29	0.22	0.28	0.034	0.23	1.3	No criteria	No criteria
Manganese	mg/L	0.004	0.0029	0.0092	0.0095	0.0063	0.021	0.012	0.028	0.011	0.016	0.47*	59	No criteria
Mercury	mg/L	ND	ND	ND	ND	ND	0.0000021	ND	ND	ND	0.0020	0.00091	0.0000018	0.0000013
Molybdenum	mg/L	0.000032	0.000082	0.000055	0.000035	0.000032	0.0001	0.00006	0.000088	0.000035	0.000097	3.2	10	No criteria
Nickel	mg/L	0.00013	0.00021	0.0006	0.00017	0.00032	0.00049	0.00045	0.00033	0.00032	0.00049	0.013*	4.6	No criteria
Lead	mg/L	0.000028	ND	0.000015	0.000021	0.000021	0.000088	0.000057	0.000071	0.000033	0.000064	0.00041*	0.19	No criteria
Selenium	mg/L	ND	ND	ND	ND	ND	ND	ND	0.058	ND	ND	0.005	4.2	No criteria
Strontium	mg/L	0.016	0.026	0.048	0.017	0.017	0.013	0.018	0.025	0.018	0.017	2.1	No criteria	No criteria
Uranium	mg/L	0.000009	0.000025	0.00002	0.0000086	0.00001	0.000023	0.000013	0.000018	0.000013	0.000025	0.014	No criteria	No criteria
Vanadium	mg/L	0.00005000	0.00006	ND	ND	ND	0.00018	0.00015	0.00015	0.000059	0.00017	0.012	2.2	No criteria
Zinc	mg/L	0.00074000	0.00052	0.00067	0.00063	0.00077	0.004	0.0016	0.0013	0.0013	0.0027	0.031*	26	No criteria

*Criteria is a function of total hardness

*Criteria is a function of total hardness

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.21 Concentration of Total Metals and Criteria Exceedances, July 2022.

Parameter	Units	Station											Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-LDORE	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Aluminum	mg/L	0.025	0.013	0.020	0.018	0.026	0.087	0.057	0.054	0.032	0.082	0.019	0.33	No criteria	No criteria
Antimony	mg/L	0.000041	0.000026	0.000026	0.000031	0.000031	0.000036	0.000034	0.000027	0.000029	0.000031	0.000035	0.24	0.64	No criteria
Silver	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000032	11.00	No criteria
Arsenic	mg/L	0.00019	0.00010	0.00012	0.000094	0.00011	0.00021	0.00023	0.00023	0.00011	0.00019	0.000110	0.15	0.021	No criteria
Barium	mg/L	0.0048	0.0071	0.0066	0.0060	0.0054	0.0110	0.0062	0.0100	0.0054	0.0099	0.0059	0.079*	160	No criteria
Beryllium	mg/L	ND	ND	ND	ND	ND	0.000013	0.000012	ND	ND	0.000014	ND	0.000444*	1.2	No criteria
Boron	mg/L	0.0035	0.0054	0.0043	0.0045	0.0042	0.0059	0.0070	0.0074	0.0053	0.0062	0.0043	5	160	No criteria
Cadmium	mg/L	0.0000073	ND	ND	ND	ND	ND	ND	ND	ND	0.0000092	ND	0.00008*	0.13	No criteria
Chromium	mg/L	0.00011	0.000057	0.00008	ND	0.000056	0.00017	0.00015	0.00013	0.000049	0.00018	0.000073	0.011*	9.4	No criteria
Cobalt	mg/L	0.000022	0.000013	0.00003	ND	0.000037	0.00021	0.00015	0.00019	0.000072	0.00024	0.000014	0.1	No criteria	No criteria
Copper	mg/L	0.00036	0.00034	0.00041	0.00036	0.00064	0.00072	0.00051	0.00045	0.00044	0.00068	0.00055	0.0024*	38	No criteria
Iron	mg/L	0.013	0.0082	0.079	0.011	0.039	0.450	0.430	0.630	0.045	0.400	0.033	1.3	No criteria	No criteria
Manganese	mg/L	0.00410	0.00270	0.01600	0.00800	0.00700	0.02800	0.02100	0.05100	0.01600	0.03300	0.0039	0.47*	59	No criteria
Mercury	mg/L	ND	ND	ND	ND	ND	0.0000024	ND	ND	ND	0.0000021	ND	0.00091	0.0000018	0.0000013
Molybdenum	mg/L	0.000045	0.0001	0.000061	0.000048	0.000046	0.00015	0.000065	0.0001	0.000056	0.00014	0.000057	3.2	10	No criteria
Nickel	mg/L	0.00019	0.00022	0.00035	0.00019	0.00035	0.00056	0.00056	0.00049	0.00034	0.00056	0.00029	0.013*	4.6	No criteria
Lead	mg/L	0.000023	ND	ND	0.000014	0.000014	0.00012	0.00014	0.00010	0.000042	0.00009	0.00002	0.00041*	0.19	No criteria
Selenium	mg/L	ND	ND	ND	ND	ND	ND	0.000091	ND	ND	0.000078	ND	0.005	4.2	No criteria
Strontium	mg/L	0.017	0.027	0.057	0.019	0.019	0.018	0.023	0.035	0.019	0.023	0.032	2.1	No criteria	No criteria
Uranium	mg/L	0.0000094	0.000027	0.000021	0.0000092	0.00001	0.000026	0.000019	0.00002	0.000012	0.000027	0.000028	0.014	No criteria	No criteria
Vanadium	mg/L	0.000059	0.000077	0.000062	ND	ND	0.00022	0.00027	0.00023	0.000075	0.00022	0.000061	0.012	2.2	No criteria
Zinc	mg/L	0.0016	0.00068	ND	0.00088	0.00087	0.003	0.0021	0.0018	0.00098	0.0031	0.00064	0.031*	26	No criteria

*Criteria is a function of total hardness

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.22 Concentration of Total Metals and Criteria Exceedances, August 2022.

Parameter	Units	Station											Criteria		
		WQ-L1	WQ-L2	WQ-L4	Q-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-L DORE	Aquatic life (long-term)	Contamination Prevention	Piscivorous Terrestrial Wildlife
Aluminum	mg/L	0.018	0.011	0.009	0.017	0.025	0.055	0.040	0.093	0.018	0.048	0.017	0.33	No criteria	No criteria
Antimony	mg/L	0.000046	0.000025	0.000028	0.000034	0.000033	0.000032	0.000031	0.000026	0.000029	0.000028	0.000035	0.24	0.64	No criteria
Silver	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000032	11.00	No criteria
Arsenic	mg/L	0.00013	0.000097	0.00011	ND	0.0001	0.00022	0.00023	0.00026	0.0001	0.0002	0.00012	0.15	0.021	No criteria
Barium	mg/L	0.0044	0.0069	0.0070	0.0054	0.0048	0.011	0.0058	0.014	0.0051	0.009	0.0057	0.079*	160	No criteria
Beryllium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000444*	1.2	No criteria
Boron	mg/L	0.0025	0.0041	0.0034	0.0032	0.0036	0.0046	0.0055	0.0059	0.0043	0.0046	0.0032	5	160	No criteria
Cadmium	mg/L	0.0000073	ND	ND	ND	ND	ND	ND	0.000012	ND	0.000012	ND	0.00008*	0.13	No criteria
Chromium	mg/L	0.000061	ND	0.000059	ND	0.000053	0.00015	0.00013	0.00015	0.000047	0.00014	0.000069	0.011*	9.4	No criteria
Cobalt	mg/L	0.000014	0.00001	0.000021	0.000019	0.00003	0.00024	0.00011	0.00048	0.000048	0.00015	0.000017	0.1	No criteria	No criteria
Copper	mg/L	0.00024	0.00022	0.00024	0.00023	0.00028	0.00039	0.00026	0.00031	0.00029	0.00041	0.00043	0.0024*	38	No criteria
Iron	mg/L	0.0074	0.0078	0.067	0.011	0.038	0.67	0.39	1.2	0.032	0.52	0.035	1.3	No criteria	No criteria
Manganese	mg/L	0.0049	0.0031	0.014	0.0076	0.0074	0.048	0.015	0.21	0.011	0.023	0.0065	0.47*	59	No criteria
Mercury	mg/L	ND	ND	ND	ND	ND	ND	0.0000021	ND	ND	ND	ND	0.00091	0.0000018	0.0000013
Molybdenum	mg/L	0.000044	0.000094	0.000057	0.000046	0.000042	0.00014	0.00005	0.000078	0.000052	0.00014	0.00006	3.2	10	No criteria
Nickel	mg/L	0.00017	0.00015	0.00016	0.00011	0.00025	0.00046	0.00039	0.00046	0.00029	0.00048	0.00024	0.013*	4.6	No criteria
Lead	mg/L	0.000023	0.00001	0.000015	0.000022	0.000027	0.00014	0.00013	0.0002	0.000036	0.000085	0.000027	0.00041*	0.19	No criteria
Selenium	mg/L	ND	ND	ND	ND	0.000056	ND	ND	ND	ND	0.000056	ND	0.005	4.2	No criteria
Strontium	mg/L	0.018	0.028	0.061	0.019	0.019	0.020	0.026	0.044	0.022	0.026	0.033	2.1	No criteria	No criteria
Uranium	mg/L	0.0000081	0.000029	0.000015	0.000008	0.000011	0.00002	0.000019	0.000031	0.00001	0.000024	0.000027	0.014	No criteria	No criteria
Vanadium	mg/L	0.000061	0.000092	0.000053	ND	0.000056	0.00021	0.00029	0.00034	0.000076	0.00019	0.000071	0.012	2.2	No criteria
Zinc	mg/L	0.0028	ND	ND	ND	ND	0.002	0.0011	0.0023	0.00067	0.0031	0.00058	0.031*	26	No criteria

*Criteria is a function of total hardness

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.23 Concentration of Total Metals and Criteria Exceedances, September 2022.

Parameter	Units	Station											Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-L DORE	**Aquatic life (long-term)**	**Contamination Prevention**	**Piscivorous Terrestrial Wildlife**
Aluminum	mg/L	0.021	0.015	0.025	0.019	0.031	0.099	0.043	0.032	0.05	0.13	0.022	0.33	No criteria	No criteria
Antimony	mg/L	0.000047	0.000032	0.000041	0.000074	0.000030	0.00003	0.00004	0.000031	0.000033	0.000037	0.000037	0.24	0.64	No criteria
Silver	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000032	11.00	No criteria
Arsenic	mg/L	0.00014	ND	0.00013	ND	ND	0.00022	ND	0.00018	ND	0.00022	ND	0.15	0.021	No criteria
Barium	mg/L	0.0044	0.007	0.0077	0.0055	0.005	0.012	0.0067	0.0079	0.0053	0.012	0.0059	0.079*	160	No criteria
Beryllium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000444*	1.2	No criteria
Boron	mg/L	0.0025	0.0039	0.0035	0.0032	0.0039	0.0049	0.0043	0.005	0.0039	0.0048	0.0031	5	160	No criteria
Cadmium	mg/L	ND	ND	ND	ND	ND	ND	ND	0.000031	0.000006	0.000013	ND	0.00008*	0.13	No criteria
Chromium	mg/L	ND	ND	ND	ND	0.000082	0.00019	0.00011	0.00013	0.000062	0.00018	ND	0.011*	9.4	No criteria
Cobalt	mg/L	0.000013	0.000013	0.000027	0.000024	0.000034	0.00023	0.000076	0.0001	0.000076	0.00036	0.000023	0.1	No criteria	No criteria
Copper	mg/L	0.00015	0.00017	0.00022	0.00016	0.00027	0.00043	0.00018	0.00035	0.00029	0.00058	0.00044	0.0024*	38	No criteria
Iron	mg/L	0.0067	0.013	0.086	0.015	0.03	0.62	0.28	0.31	0.058	0.68	0.043	1.3	No criteria	No criteria
Manganese	mg/L	0.0036	0.0027	0.012	0.011	0.0048	0.037	0.0085	0.021	0.017	0.049	0.0053	0.47*	59	No criteria
Mercury	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00091	0.0000018	0.0000013
Molybdenum	mg/L	0.000049	0.00011	0.000055	0.000053	0.00005	0.00013	0.000049	0.000063	0.00005	0.00014	0.00007	3.2	10	No criteria
Nickel	mg/L	0.00012	ND	ND	ND	0.00031	0.00064	0.00044	0.00037	0.00044	0.00067	0.0003	0.013*	4.6	No criteria
Lead	mg/L	0.000021	0.000016	0.000025	0.000029	0.000027	0.00015	0.000072	0.000058	0.000064	0.00017	0.000028	0.00041*	0.19	No criteria
Selenium	mg/L	ND	0.000052	0.000070	ND	ND	ND	ND	ND	ND	0.000086	ND	0.005	4.2	No criteria
Strontium	mg/L	0.017	0.028	0.059	0.019	0.019	0.021	0.021	0.028	0.020	0.023	0.034	2.1	No criteria	No criteria
Uranium	mg/L	0.000011	0.00003	0.00002	0.000009	0.000012	0.000024	0.00001	0.000015	0.000017	0.00003	ND	0.014	No criteria	No criteria
Vanadium	mg/L	0.000074	0.00012	0.00010	0.000081	0.000087	0.00027	0.00016	0.00016	0.00012	0.00033	0.0001	0.012	2.2	No criteria
Zinc	mg/L	ND	ND	ND	ND	ND	0.0027	0.0014	0.00089	0.00089	0.0036	0.00063	0.031*	26	No criteria

*Criteria is a function of total hardness

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Table 3.24 Concentration of Total Metals and Criteria Exceedances, December 2022.

Parameter	nits	Station											Criteria		
		WQ-L1	WQ-L2	WQ-L4	WQ-L5	WQ-L6	WQ-L7	WQ-S1	WQ-S3	WQ-S4	WQ-S7	WQ-L DORE	**Aquatic life (long-term)**	**Contamination Prevention**	**Piscivorous Terrestrial Wildlife**
Aluminum	mg/L	0.2	0.0081	0.079	0.007	0.023	0.18	0.036	0.045	0.021	0.12	0.02	0.33	No criteria	No criteria
Antimony	mg/L	0.000042	0.000024	0.000037	0.000025	0.000028	0.000034	0.000031	0.000030	0.000028	0.000030	0.000041	0.24	0.64	No criteria
Silver	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000032	11.00	No criteria
Arsenic	mg/L	0.00011	0.00010	0.00011	0.000085	ND	0.00012	0.000095	0.00011	0.000094	0.00011	ND	0.15	0.021	No criteria
Barium	mg/L	0.0065	0.0075	0.0074	0.0065	0.0060	0.0088	0.0058	0.0064	0.0056	0.0078	0.0061	0.079*	160	No criteria
Beryllium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000444*	1.2	No criteria
Boron	mg/L	0.0018	0.0048	0.0033	0.0037	0.0044	0.0036	0.0036	0.0041	0.0040	0.0035	0.0039	5	160	No criteria
Cadmium	mg/L	0.000013	ND	0.0000063	ND	ND	0.000021	ND	ND	ND	0.000011	ND	0.00008*	0.13	No criteria
Chromium	mg/L	0.000250	0.000047	0.00018	ND	ND	0.00023	0.000089	0.000095	0.000086	0.00018	0.000082	0.011*	9.4	No criteria
Cobalt	mg/L	0.00019	0.000025	0.000056	0.00002	0.000068	0.00023	0.00011	0.000069	0.000051	0.00014	0.00003	0.1	No criteria	No criteria
Copper	mg/L	0.00045	0.00023	0.00039	0.00023	0.00017	0.00066	0.00032	0.00033	0.00034	0.00064	0.0005	0.0024*	38	No criteria
Iron	mg/L	0.038	0.032	0.13	0.035	0.082	0.29	0.23	0.17	0.093	0.31	0.1	1.3	No criteria	No criteria
Manganese	mg/L	0.0054	0.024	0.013	0.024	0.041	0.019	0.023	0.013	0.021	0.013	0.036	0.47*	59	No criteria
Mercury	mg/L	0.0000024	ND	ND	ND	ND	0.0000027	ND	ND	ND	ND	ND	0.00091	0.0000018	0.0000013
Molybdenum	mg/L	0.000014	0.000075	0.000035	0.000030	0.000034	0.00014	0.000032	0.000058	0.000035	0.000074	0.000049	3.2	10	No criteria
Nickel	mg/L	0.00042	0.00028	0.00034	0.00022	0.00023	0.00043	0.00041	0.00033	0.00053	0.00042	0.00028	0.013*	4.6	No criteria
Lead	mg/L	0.0002	0.000021	0.00007	0.000021	0.000028	0.00015	0.000053	0.000079	0.000023	0.0001	0.000043	0.00041*	0.19	No criteria
Selenium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005	4.2	No criteria
Strontium	mg/L	0.012	0.024	0.043	0.017	0.017	0.011	0.015	0.024	0.017	0.015	0.033	2.1	No criteria	No criteria
Uranium	mg/L	0.000037	0.000022	0.000025	0.0000053	0.000009	0.000025	0.0000091	0.000015	0.000011	0.000021	0.000027	0.014	No criteria	No criteria
Vanadium	mg/L	0.00014	0.000058	0.000099	ND	0.000053	0.0002	0.000067	0.00011	ND	0.00015	0.000071	0.012	2.2	No criteria
Zinc	mg/L	0.0027	0.00064	0.0016	0.00050	0.00059	0.0046	0.0019	0.0015	0.00081	0.0041	0.00076	0.031*	26	No criteria

*Criteria is a function of total hardness

	Exceeding long-term Aquatic Life Protection Level
	Exceeding Contamination Prevention Level (only aquatic organisms)
	Exceeding Protection of Terrestrial Fauna
	Exceeding multiple criteria

ND: Not detected
NA: Not available

Most analytical results were below the Aquatic Life (long-term) criteria, with rare exceedances of total alkalinity in most water samples except in WQ-L7 in May, June and December. Total alkalinity in WQ-L7 were below the Aquatic Life (long-term) criteria during May, June and December. Nitrite was also slightly higher than the Aquatic Life (long-term) criteria in WQ-L4 and WQ-LDORE.

Variation in water quality parameters were classified into five groups for ease of illustration and shown for three selected stations (WQ_S3, WQ_S4 and WQ_L5). This comparison is presented in **Figure 3.19** and **Figure 3.20** for conventional parameters and metals. Comparing these grouped values shows an almost consistent trend of decreased concentrations during the wet season. While alkalinity remain almost constant during all monitoring events, it was detected in exceedance for the Aquatic life (long-term) criteria. Occasional values of Mercury concentration, slightly higher than the guideline for contamination prevention level for aquatic organisms, could be caused by disturbances in settled material or summer inversion of stratified water in lakes and ponds or even vegetation debris in stagnant water conditions. However, it should be insisted that Mercury exceedance was detected for “contamination prevention” criteria and acute aquatic life protection limits are considerably higher.

It should be noted that the long-term aquatic life protection thresholds for some metals are a function of Total Hardness and/or Dissolved Organic Carbon (e.g. Barium, Beryllium, Cadmium). However, the criteria limit mentioned in tables above is for the average condition. For example, in WQ_L7 during May, the Cadmium concentration criteria is approximately 0.000012 mg/L, and therefore concentrations are within acceptable range. The highlighted cells in tables above were flagged for average conditions.

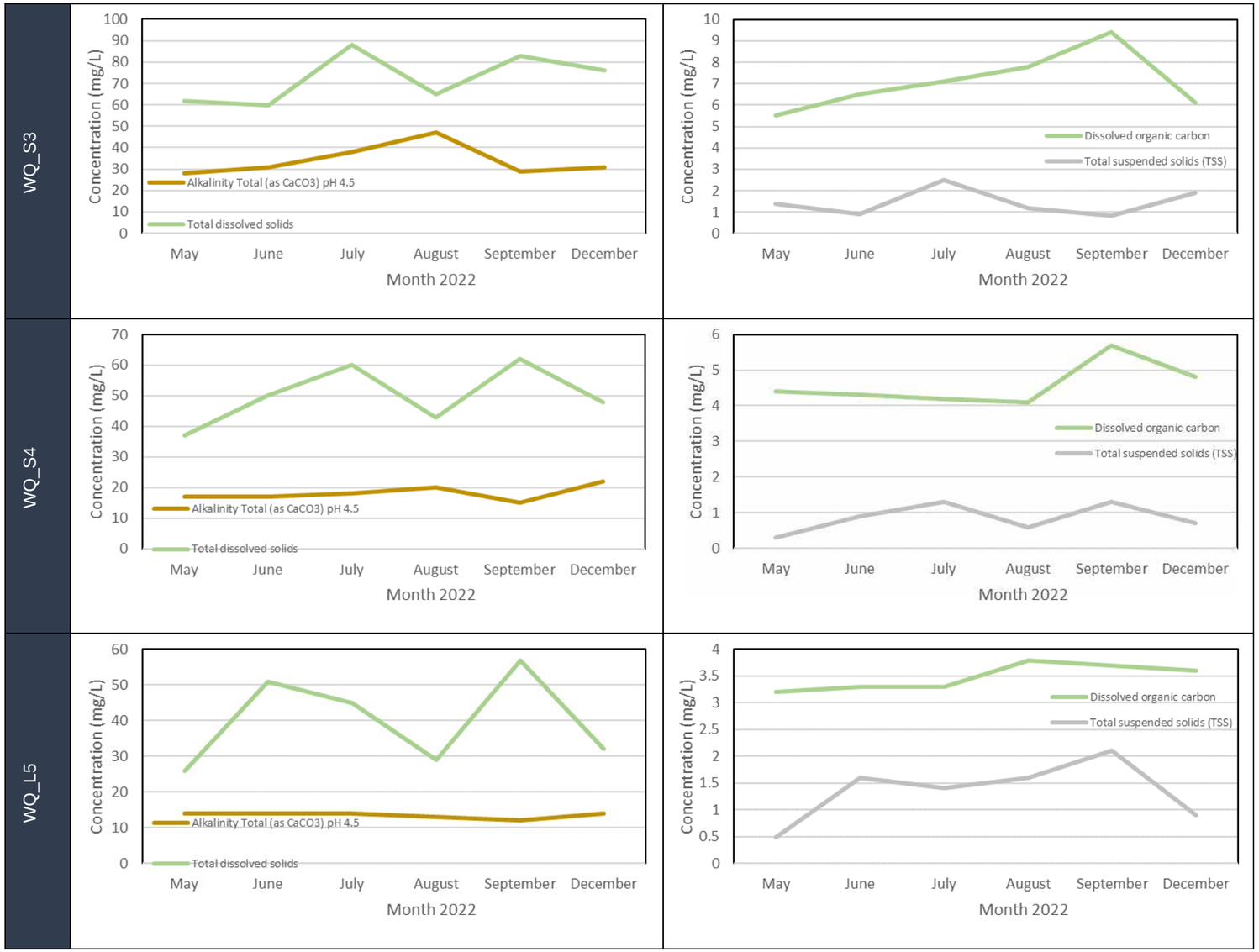
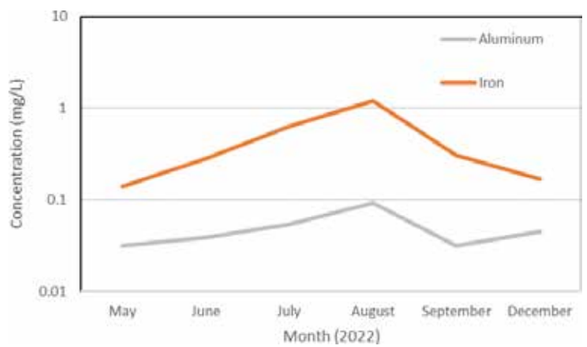
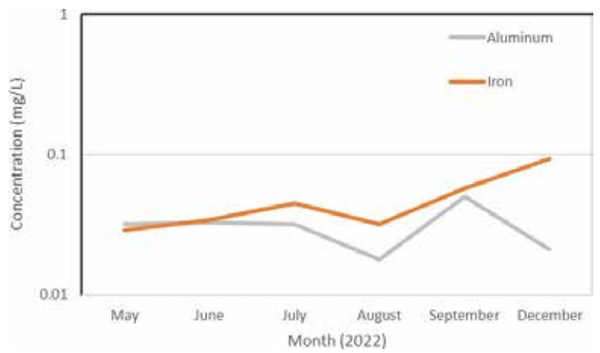
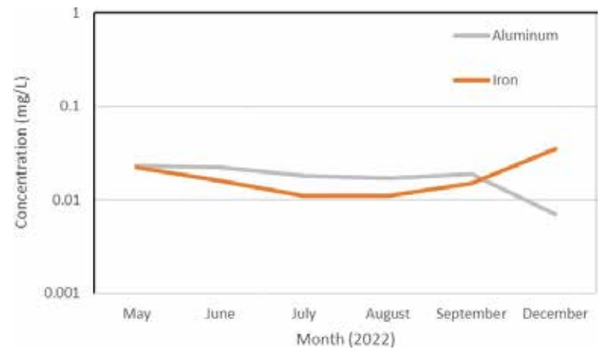
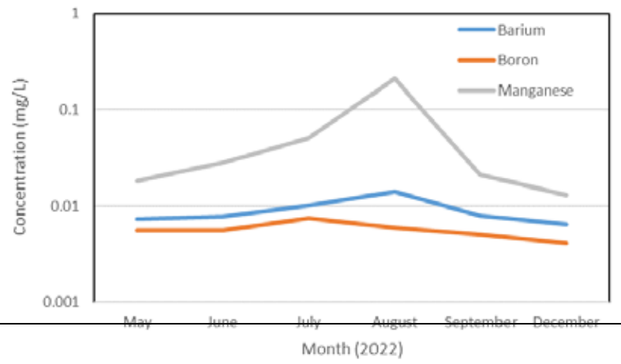
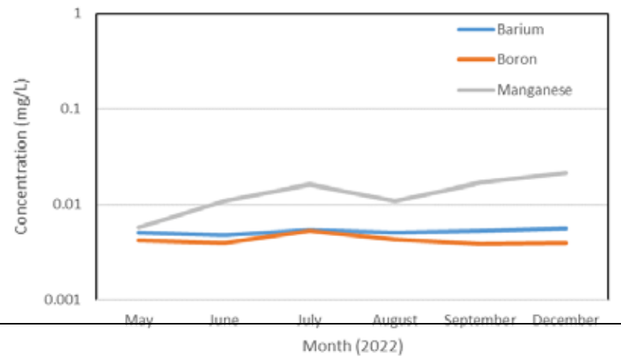
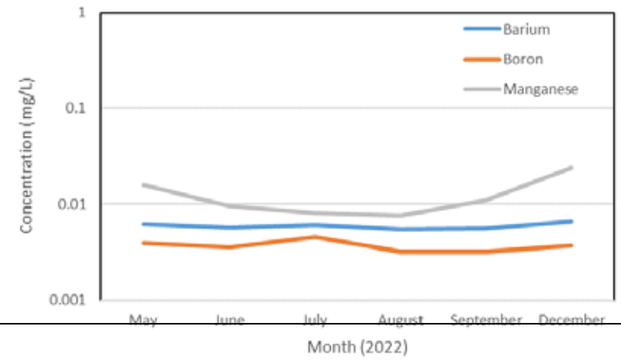
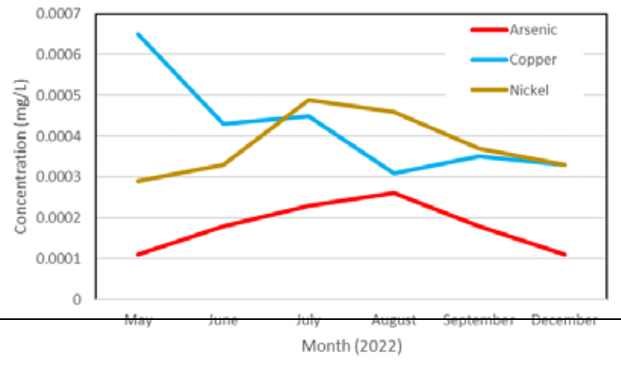
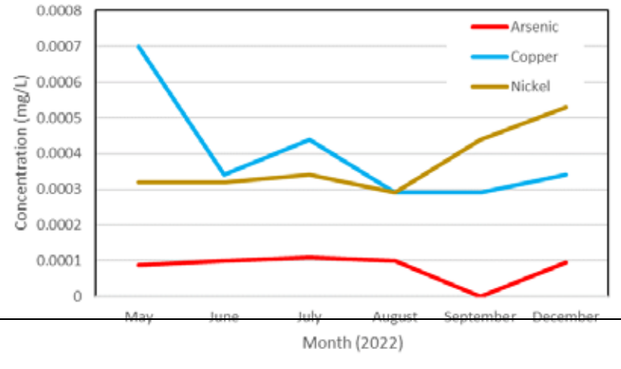
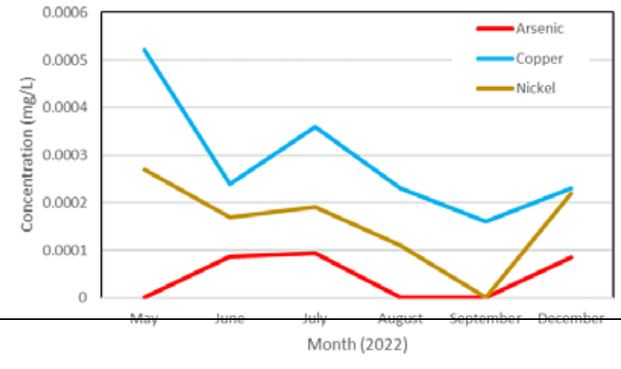


Figure 3.19 Variation of Conventional Parameters of Surface Water during the Sampling Period in Selected Stations

WQ_S3	WQ_S4	WQ_L5
		
		
		

* Note1: Arsenic was not detected in WQ_L5; Note2: Arsenic, Copper and Nickel were not detected in December.

Figure 3.20 Variation of Total Metals Concentrations during the Sampling Period in Selected Stations

Apart from the above-mentioned conventional parameters with exceedances of environmental criteria (aquaticlife long-term), mainly in total alkalinity and among some other parameters, most of the rest remain within an acceptable environmental level with slight fluctuations (most probably caused by dilution from incoming precipitation and runoff).

To provide a comprehensive baseline water quality assessment across the project footprint area, water quality monitoring and sampling should be completed for the whole 12 months period. Integrating water quality parameter measurements with discharge measurements and lake water level monitoring, a mass balance and mass transfer model could be developed, quantifying transport of metals and other substances within the hydrographic network.

3.3.5 Summary and Conclusions

Although there are no criteria for many of the conventional parameters of surface water quality, the results show that the concentrations fall in low ranges. For the parameters that have limiting criteria (such as alkalinity, chloride, fluoride, nitrate, ammonia nitrogen, total suspended solids, turbidity and total phosphorous), the concentrations at all stations during the monitoring period were below criteria, except for the Total alkalinity inalmost all the stations and events. However, both temporal and spatial variations in concentrations of this parameter were observed during the monitoring period (**Figure 3.19**) and would be related to background conditions. Variations of the concentrations in August, September and December could be indicative of temporally varying effect of sources throughout the year. Therefore, the water quality monitoring operations need to be continued at least over one year period and also to be investigated with further geochemical studies. For instance, although the concentration of dissolved organic carbon (DOC) at most stations falls in the rangeof natural surface waters (which is normally less than 5 mg/L), results for WQ-L7 and WQ-S1 show higher amounts. The recommended criterion for this parameter is usually calculated based on a certain percentage above or below the seasonally adjusted median background data. Similarly, Turbidity concentration has peaked during August at WQ-S3 station. To analyze the mechanism of these fluctuations and the dilution procedure, timeseries of concentrations during a full year should be recorded.

As depicted in **Figure 3.20**, the results of the extractable trace metals for most stations in the months of monitoring show that the concentrations were in the range of acceptable criteria. The concentrations of Iron and Manganese at WQ-3 station were below the long-term Aquatic Life Protection Level. Also, the concentration of Cadmium at WQ-L7 station is lower than the guideline for Aquatic life Log-term protection level. Mercury (at WQ_L7, WQ_S7 and WQ-S1) concentrations during June, July, August, and December sampling campaign, were slightly higher than the guideline for contamination prevention level for aquatic organisms. These slight exceedances deemed the importance of further monitoring water quality in the studyarea to determine the trace metals concentrations both temporally and spatially. Moreover, the water quality monitoring data will used as input in any future water quality modeling, geochemical modeling, and source term characterization to assess potential effects of the mine on the receiving environment.

4.0 Biological Environment

Lomiko hired Hemmera Envirochem Inc. (Hemmera now Ausenco) to conduct baseline studies of the La LoutreProperty which began in the summer of 2021. The baseline studies 2022 included assessing the current and historical conditions using a combination of publicly available data and documentation, field work, and laboratory tests, all addressing the geochemistry, hydrology, wetland, and hydric environments, as well as aquatic species and fish habitat for the La Loutre Property (Hemmera Envirochem Inc., 2021).

In the summer of 2022, Ausenco and Kilgour & Associates Ltd. (KAL) continued the collection of baseline studies started in 2021 for the area that Lomiko proposes for Project development. The data content in this report will advance the current understanding of the natural environment on site and will identify potential concerns and/or risks to be addressed with further studies as part of the environmental and social impact assessment (ESIA) process. This report focusses on the characterization of the terrestrial and aquatic environments as well as their associated flora and fauna.

4.1 Terrestrial Habitat Characterization

4.1.1 Approach

This section describes the terrestrial habitats and associated flora and fauna in the vicinity of the La Loutre Property. The focus of this section was to characterize the forest environment and to identify potential species at risk (SAR), habitat through desktop review of existing data, and focused field studies to fill in knowledge gaps. The approach involved an ecological land classification (ELC) to determine the habitats available to SAR, a desktop assessment of the SAR that have some likelihood to occur in the study area based on known occupational ranges and preferred habitat, and finally, field surveys to characterize the terrestrial habitats andto confirm the presence or absence of any SAR identified in the desktop review. The study area for this section focused on the terrestrial habitats that fall within the proposed mine footprints illustrated in **Figure 4.1**.

4.1.2 Methods

4.1.2.1 Desktop and Background Data Review

Ausenco ecologists conducted a desktop review to assess the existing vegetation communities using previous forestry, soils, and sensitive species data compiled from various data sources including the provincial Carte écoforestière (Ministère des Forêts, de la Faune et des Parcs (MFFP), 2022) and relevant ecological data collected and reported by WSP (2015). They also identified fifteen threatened, vulnerable, or potentially at-riskplant species within the study area using the following available existing sources of information:

- Carte écoforestrière (MFFP, 2022)
- WSP (2015)
- Centre de données sur le patrimoine naturel du Québec (CDPNQ, 2022)
- Liste des plantes menacées ou vulnérables selon la présence et le potentiel de présence dans lesrégions administratives (Ministère des Forêts, de la Faune et des Parcs (MFFP), 2022)
- Liste des espèces fauniques menacées ou vulnérables (Gouvernement du Québec, 2022)
- Species at Risk Public Registry (Government of Canada, 2022)

The list of rare plant species identified by the Ausenco ecologists is included in **Table 4.1**. Furthermore, using the MFFP detection system, we identified 23 invasive alien species (IAS; **Table 4.2**) that have the potential to be found on site. Thus, the field surveys for 2022 were designed to confirm their presence or absence in foresthabitats within the La Loutre Property, results are presented in **Section 4.1.3.**

Table 4.1 List of rare floral species identified during the desktop review conducted by Ausenco ecologists

Common Name	Scientific Name	Provincial Status	Federal Status
Small White Leek	*Allium tricoccum*	Vulnerable	—
Puttyroot	*Aplectrum hyemale*	Threatened	—
Calypso Orchid	*Calypso bulbosa var. americana*	Not listed	—
Elk thistle	*Cirsium scariosum var. scariosum*	Threatened	Endangered
Sparrow's-egg Lady's-slipper	*Cypripedium passerinum*	Threatened	—
Showy Lady's-slipper	*Cypripedium reginae*	Not listed	—
Ram's-head Lady's-slipper	*Cypripedium arietinum*	Vulnerable	—
Black Maple	*Acer nigrum*	Vulnerable	—
Victorin's Gentian	*Gentianopsis virgata subsp.macounii*	Threatened	Special Concern
Greater Fringed Gentian	*Gentianopsis crinita*	Not listed	—
Wild Crane's-bill	*Geranium maculatum*	Not listed	—
American Ginseng	*Panax quinquefolius*	Threatened	Endangered
Downy Rattlesnake-plantain	*Goodyera pubescens*	Vulnerable	—
Long-leaved Bluets	*Houstonia longifolia*	Not listed	—
Bluntleaf Waterleaf	*Hydrophyllum canadense*	Threatened	—
Pale-spike Lobelia	*Lobelia spicata*	Not listed	—
Horsemint	*Monarda punctata var. villicaulis*	Threatened	—
Showy Orchis	*Galearis spectabilis*	Not listed	—
Rock Elm	*Ulmus thomasii*	Threatened	—
Broad Beech Fern	*Phegopteris hexagonoptera*	Threatened	Special Concern
Sycamore	*Platanus occidentalis*	Not listed	—
Large Round-leaved Orchid	*Platanthera macrophylla*	Not listed	—
Woodland Pinedrops	*Pterospora andromedea*	Threatened	—
Narrow-leaved Vervain	*Verbena simplex*	Threatened	—
Blunt-lobe Woodsia	*Woodsia obtusa subsp. obtusa*	Threatened	Threatened

Table 4.2 List of invasive alien species pulled from the MFFP detection system

Common Name	Scientific Name
Garlic Mustard	*Alliaria petiolata*
Wild Chervil	*Anthriscus sylvestris*
Meadow Cow-parsnip	*Heracleum sphondylium*
Giant Hogweed	*Heracleum mantegazzianum*
Common Comfrey	*Symphytum officinale*
European Swallowwort	*Vincetoxicum rossicum*
Black Swallowwort	*Vincetoxicum nigrum*
Goutweed	*Aegopodium podagraria*
Norway Maple	*Acer platanoides*
Manitoba Maple	*Acer negundo*
Smooth Bedstraw	*Galium mollugo*
Himalayan Balsam	*Impatiens glandulifera*
Amur Silvergrass	*Miscanthus sacchariflorus*
Glossy Buckthorn	*Frangula alnus*
European Buckthorn	*Rhamnus carthartica*
Siberian Elm	*Ulmus pumila*
Wild Parsnip	*Pastinaca sativa*
Japanese Sweet Coltsfoot	*Petasites japonicus*
Bohemian Knotweed	*Reynoutria xbohemica*
Giant Knotweed	*Reynoutria sachalinensis*
Japanese Knotweed	*Reynoutria japonica*
Jerusalem Artichoke	*Helianthus tuberosus*
Common Valerian	*Valeriana officinalis*

4.1.2.2 KAL Field Surveys

4.1.2.2.1 Vegetation Studies: Ecological Types

from July 25 through July 29, 2022 KAL biologists conducted vegetation surveys and soil studies in the forest habitats found within the proposedmining footprints (Figure 4.1).To maximize the types of habitats surveyed, homogeneous areas with a radius of ~25 m were surveyed in the forestry habitat types. Floristic data collected included the following: dominant and abundant tree species, subcanopy, groundcover species with their relative abundance (percent cover), circumference at breast height (CBH) measurements (used to determinediameter at breast height (DBH)) for the largest of each dominant tree species, as well as general notes about the community (e.g., deciduous and coniferous composition, composition of different forest strata). Plant species of special concern and alien invasive species (listed in **Table 4.1** and **Table 4.2**) were noted if present. Additionally, tree cores were collected from four mature American Beech (*Fagus grandifolia*), Eastern Hemlock (*Tsuga canadensis*), Sugar Maple (*Acer saccharum*), and Yellow

Birch (*Betula alleghaniensis*) to determine their age and validate the use of predetermined growth factors (Nix, 2016; Waterloo Region District School Board, 2020) to estimate the age of the forest stand. Soil data was collected at each survey station including information on the type and thickness of surface deposits, presence and depth of organic material, soil profilecharacteristics and soil texture characteristics. Soil data was obtained through samples taken using a 120 cm long soil auger. All incidental observations (i.e., wildlife) were recorded while completing the vegetation surveys and while moving between survey points.

Following the field surveys and using both vegetation and soil data, the Ecological Type of each surveyed station was identified and classified using methodology provided in the *Guide de Reconnaissance des TypesÉcologiques* for Ecological Regions 3a and 3b (Gosselin, 2002). This method provides a consistent approachto identify, describe, name, and map vegetation communities or physiographic features on the landscape based on soils and plant species composition. This method results in a standardized description of each vegetation community to determine the natural diversity and variability of communities within a site, and to provide insight into available habitat and the type of species that may be present.

Representative photos of each ecological type were taken and are included with the community descriptions in **Section 4.1.3.**

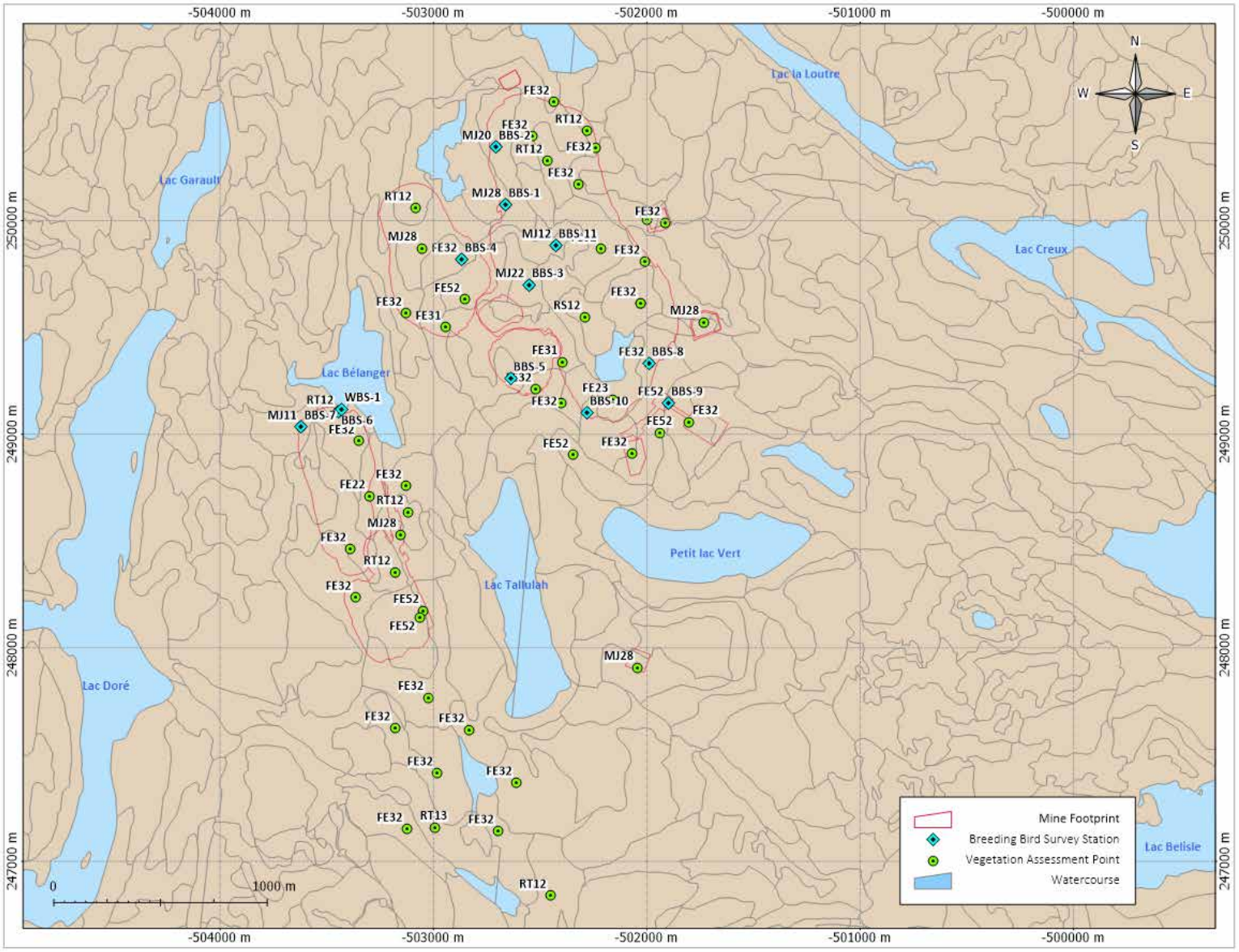


Figure 4.1 Map demonstrating the locations of the vegetation, soil, and avian fauna surveys conducted within the La Loutre Property, 2022

4.1.2.2.2 Avian Fauna

While conducting the vegetation surveys, we also performed morning breeding bird surveys through July 25 to July 29, 2022, using point counts following the methods described in the Atlas of the breeding Birds of Québec (2010). We conducted point-count surveys at ten stations located within the proposed mine footprint (**Figure 4.1**). Surveys were conducted on calm weather mornings with no precipitation between sunrise and five hours after sunrise. At each station, point counts were five minutes in duration with a two-minute habituation period preceding the surveys. Records at each point count location included birds observed and heard (i.e., direct visual observation or by song or call), and the estimated distance of birds from the observer.All incidental observations (i.e., birds) were recorded while completing the vegetation surveys and while moving between survey points. Additionally, if a survey station was in the vicinity of a waterbody, we conducted visualscans for five minutes and noted the presence of any waterfowl (loons, grebes, swans, geese, ducks, and wading birds).

4.1.2.3 Ausenco Field Surveys

Amphibian call surveys following the Protocol d'inventaire des anoures du Québec (MFFP, 2019) methodologyand validated by MFFP was conducted between April and June 2022. Surveys were required to be completedduring three seasonal timing windows, which are weather dependant, but in general occur during April, May, and June, respectively. Three sampling stations (AMPH 1, AMPH 2 and AMPH3) were located along edge of wetlands, or other appropriate habitat that is near existing roads, separated by approximately 800 m. Sampling time for each station will include a minimum of five minutes to a maximum of 15 minutes, depending on the amphibian calls detected.

4.1.2.4 External Field Data

Ausenco biologists undertook vegetation surveys and soil studies within the La Loutre Property from June 10 to June 18, 2022, following the same protocols described in Section 4.1.2.2.1. KAL biologists subsequently used this data to support the identification and classification of Ecological Types, using methodology providedin the *Guide de Reconnaissance des Types Écologiques* for Ecological Regions 3a and 3b (Gosselin, 2002).

Ausenco ecologists also conducted two distinct surveys to quantify avian species occurring in the La Loutre Property from June 7 to June 11, 2022. Ausenco performed time constrained stand watch surveys at seven locations to document the presence of waterbirds. At each location, all waterbirds seen or heard within 5 hours of sunrise were recorded for ten minutes. Additionally, Ausenco completed avian point counts at fourteen survey stations (**Figure 4.1**), following the methods described in the Atlas of the breeding Birds of Québec (2010), to document the presence of birds in the La Loutre Property. At each survey station, all birds seen or heard within 5 hours or sunrise were recorded for a period of five minutes. All bird surveys were conducted during calm weather conditions (i.e., low winds and no precipitation). Birds of prey and their potential nests were recordedfor consideration for future raptor specific surveys. All incidental birds were also recorded.

4.1.2.5 Forest Age Estimation

Using the CBH determined for the largest of each dominant tree species, we estimated the age of the forest stand by using the following equation:

$$Age\ of\ Tree = GF \times \left(\frac{CBH}{\pi}\right)$$

where *GF* is the growth factor of specific trees (see Appendix Table B.3) and the CBH is measured in inches. We then classified the resulting estimated age of the forest stand into different age classes (20-year intervals).We confirmed the use of the predetermined growth factor for specific tree species for this area by determiningthe age of four trees from four distinct species (American Beech, Eastern Hemlock, Sugar Maple, and YellowBirch), determined from the tree cores collected in the field, and then dividing that age value by the diameter at breast height of each tree. The growth rates determined for the four tree species from the La Loutre Propertywere similar to the predetermined growth rates from different regions in North America (Nix, 2016; Waterloo Region District School Board, 2020).

4.1.3 Results

4.1.3.1 Ecological Units and Vegetation Surveys

The Ecological Type classification encompassed terrestrial habitats within the study area of the graphite flakemine at the La Loutre Property. Nine distinct Ecological Types were delineated (**Figure 4.2**). Each Ecological Type and the dominant vegetation therein are described below. The vegetation species inventories and relevant information such as percent cover of tree species present, abiotic variables (e.g., drainage assessment, type, texture of surface deposits, and type of slope), and forest age estimation can be found in Appendix B. No floral species of special concern nor invasive alien species were identified during the 2022 baseline studies. It is important to mention however that some the forested area within the La Loutre Propertyhad already gone through extensive logging when the 2022 baseline studies were conducted. It is also to benoted that a wetland inventory was completed in 2021.

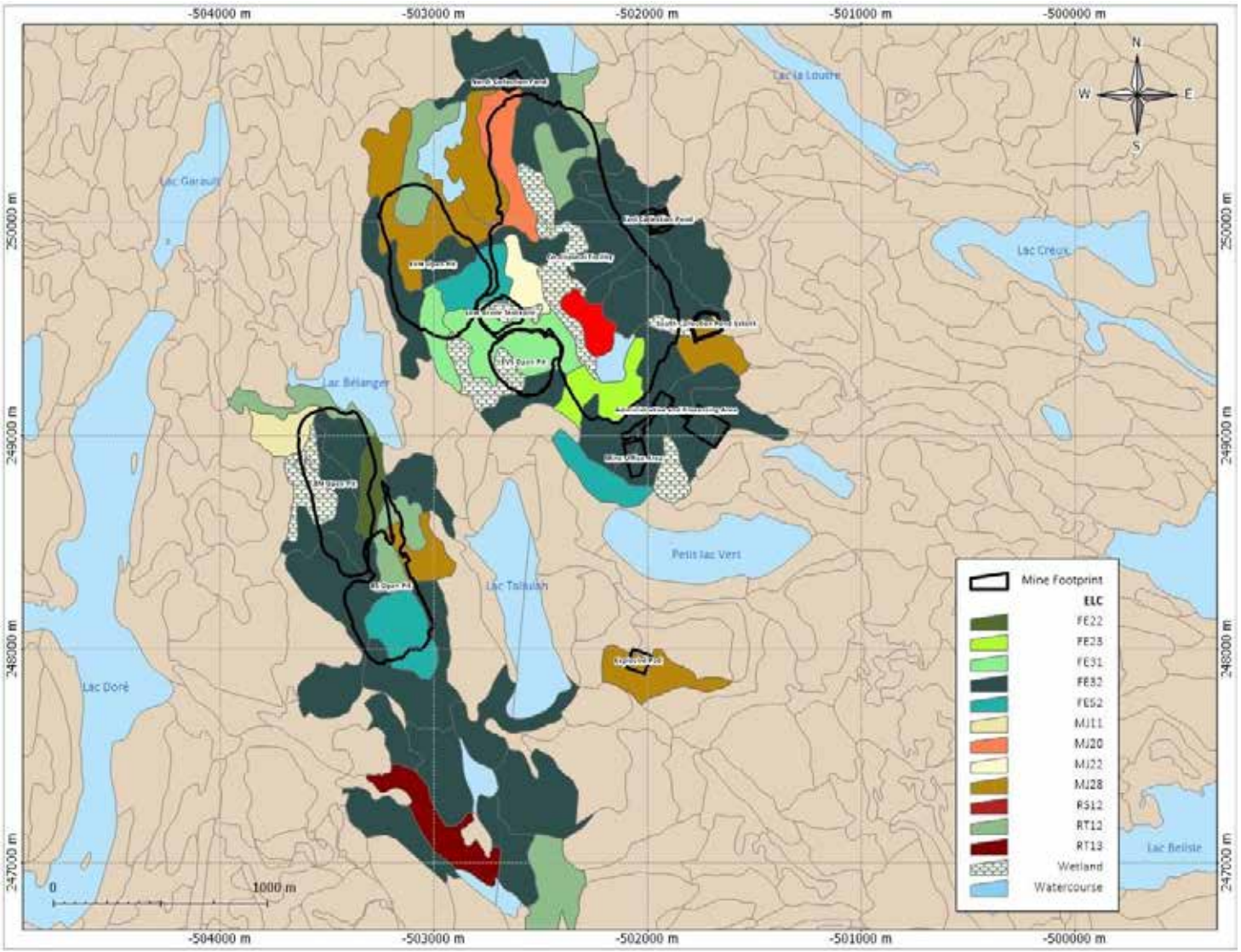


Figure 4.2 Map demonstrating the Ecological Land Classifications for the proposed mining footprints within the La Loutre Property, 2022

FE22 Maple - Basswood Forest on thin to thick, medium-textured, mesic-drained deposits

The FE22 Ecological Type was detected at three survey locations in the Study Area (**Photo 4.1**). It was characterized by a canopy dominated by Sugar Maple (*Acer saccharum*), with occasional American Basswood(*Tilia americana*) and American Beech (*Fagus grandifolia*). The subcanopy was characterized by American Beech, Sugar Maple, and Striped Maple (*Acer pensylvanicum*) saplings, with Hobblebush (*Viburnum lantanoides*). Groundcover comprised Ostrich Fern (*Matteuccia struthiopteris*), Marginal Wood Fern (*Dryopteris marginalis*) and Spinulose Wood Fern (*Dryopteris carthusiana*), with species of grasses and sedges, including Quackgrass (*Elymus repens*) and Fringed Sedge (*Carex crinita*).

Photo 4.1 FE22 Ecological Type, documented at ELC004 (Photo taken on July 25, 2022

FE31 Maple - Yellow Birch stand on thin to thick, coarse-textured deposits with xeric or mesic drainage

The FE31 Ecological Type was detected at two survey locations in the Study Area (**Photo 4.2**). It was characterized by a canopy dominated by Sugar Maple, with Yellow Birch and Striped Maple. The subcanopy was characterized by Hobblebush, with American Beech, Eastern Hemlock, and Balsam Fir (*Abies balsamea*) saplings. Groundcover was dominated by Intermediate Wood Fern (*Dryopteris intermedia*), with Red Trillium (*Trillium erectum*), Rose Twisted-stalk (*Streptopus lanceolatus*), and Canada Mayflower (*Maianthemum canadense*). One of the two locations surveyed had been subject to extensive logging and was not fully assessed as part of this exercise.

Photo 4.2 FE31 Ecological Type, documented at ELC017 (Photo taken on July 27, 2022

FE32 Maple – Yellow Birch stand on thin to thick, medium-textured, mesic-drained deposits

The FE32 Ecological Type was the most widespread type in the Study Area, encompassing 28 survey stations (**Photo 4.3**). It was characterized by a canopy dominated by American Beech and Sugar Maple, with Yellow Birch, Balsam Fir, Eastern Hemlock, and Ironwood (Ostrya virginiana) in varying amounts. The subcanopy was characterized by American Beech, Sugar Maple, and Striped Maple saplings, with Hobblebush and Common Blackberry (Rubus alleghaniensis). Groundcover was variable, but tended to be dominated by species of fern, including Intermediate Wood Fern, Common Lady Fern (Athyrium filix-femina), and Cinnamon Fern (Osmunda cinnamomea). Additional widespread groundcover species included Heartleaf Foamflower (Tiarella cordifolia), Wild Sarsaparilla (Aralia nudicaulis), American Spikenard (Aralia racemosa), and species of Trillium (Trillium sp.) and Clubmoss (Lycopodium sp.).

Photo 4.3 FE32 Ecological Type, documented at ELC025 (Photo taken on July 28, 2022)

FE52 Maple and Ironwood stand on thin to thick, medium-textured, mesic-drained deposits

The FE52 Ecological Type was detected at five survey locations in the Study Area (**Photo 4.4)**. It was characterized by a canopy dominated by Sugar Maple and Ironwood, with American Beech and Northern Red Oak (Quercus rubra) and occasional Yellow Birch and American Basswood. The subcanopy was dominated by saplings of Sugar maple, American Beech, Northern Red Oak, and Striped Maple, with Hobblebush. Groundcover comprised Wild Sarsaparilla, False Solomon's-seal (Maianthemum racemosum), Intermediate Wood Fern, as well as Sugar Maple saplings.

Photo 4.4 FE52 Ecological Type, documented at ELC028 (Photo taken on July 28, 2022

MJ11 Yellow Birch stand with Fir and Sugar Maple on thin to thick, coarse-textured deposits with xeric or mesic drainage

The MJ11 Ecological Type was detected at a single survey location (**Photo 4.5**). It was characterized by a mixed canopy of co-dominant Eastern Hemlock, Red Maple (Acer rubrum) and Yellow Birch, with occasional Balsam Fir and American Beech. The subcanopy was characterized by Hobblebush, with Striped Maple, Red Maple, and Balsam Fir saplings. Groundcover was relatively sparse and comprised Intermediate Wood Fern and Wild Sarsaparilla, with Interrupted Fern, Canada Mayflower and Bluebead Lily (Clintonia borealis).

Photo 4.5 MJ11 Ecological Type, documented at ELC024 (Photo taken on July 28, 2022

MJ12 Yellow Birch and Sugar Maple stand on thin to thick, medium-textured, mesic-drained deposits

The MJ12 Ecological Type was detected at a single survey location (**Photo 4.6**). It was characterized by a canopy of Eastern Hemlock and Sugar Maple, with Striped Maple, Balsam Fir, and Yellow Birch. The subcanopy was characterized by Hobblebush, with Striped Maple and Balsam Fir saplings. Groundcover was relatively sparse and comprised Wild Sarsaparilla and Intermediate Wood Fern, with Bluebead Lily and saplings of Sugar Maple, Striped Maple, and Hobblebush.

Photo 4.6 MJ12 Ecological Type, documented at ELC036 (Photo taken on July 29, 2022)

MJ28 – Yellow Birch stand with Fir on thin to thick mineral deposits or organic deposits, water drainage, minerotrophic

The MJ28 Ecological Type was detected at five survey locations in the Study Area (**Photo 4.7**). It was characterized by a canopy dominated by Sugar Maple, American Beech, Yellow Birch, and Eastern Hemlock, with occasional Balsam Fir and Eastern White Cedar (Thuja occidentalis). The subcanopy was characterized by Hobblebush and Alternate-leaved Dogwood (Cornus alternifolia), with saplings of American Beech, Yellow Birch and Sugar Maple. Groundcover comprised Common Lady Fern, Intermediate Wood Fern, Spinulose Wood Fern, Wild Sarsaparilla, Canada Mayflower, Three-leaf Goldthread (Coptis trifolia), and Hobblebush saplings. Portions of this Type were extensively disturbed from logging activity.

Photo 4.7 MJ28 Ecological Type, documented at ELC005 (Photo taken on July 26, 2022)

RT12 Hemlock stand on thin to thick, medium-textured deposits with mesic drainage

The RT12 Ecological Type was detected at eight survey locations in the Study Area (**Photo 4.8**). It was characterized by a canopy of Eastern Hemlock, with American Beech, Eastern White Cedar, Red Maple, and Yellow Birch. The subcanopy was characterized by American Beech, Striped Maple, Eastern Hemlock, and Balsam Fir saplings. Groundcover comprised Intermediate Wood Fern, Spinulose Wood Fern, Three-leaf Goldthread, Wild Sarsaparilla and Painted Trillium, with Dewberry (Rubus pubescens), Rose Twisted-stalk and Canada Mayflower.

Photo 4.8 RT12 Ecological Type, documented at ELC014 (Photo taken on July 27, 2022)

RS12 Cedar - Fir stand on thin to thick, medium-textured deposits with mesic drainage

The RS12 Ecological Type was detected at a single survey location in the study area (**Photo 4.9**). It was characterized by a canopy of Eastern White Cedar with Balsam Fir, Eastern Hemlock, and Yellow Birch. The subcanopy was characterized by Mountain Maple (Acer spicatum), Alternate-leaved Dogwood, and saplings of Sugar Maple, Striped Maple and Balsam Fir. Groundcover comprised Common Lady Fern, Naked Miterwort (Mitella nuda), Wild Sarsaparilla and Bunchberry (Cornus canadensis). The Site was characterized by a relatively abundant bryophyte layer, dominated by Big Red Stem (Pleurozium schreberi), Knight's-plume (Ptilium crista-castrensis), Stair-step Moss (Hylocomium splendens) and species of Mnium.

Photo 4.9 RS12 Ecological Type, documented at OH1 (Photo taken on June 18, 2022

4.1.3.2 Avian Fauna

Avian point counts were conducted by Ausenco ecologists at fourteen survey stations from June 7 until June 11, 2022, while KAL biologists conducted avian point count surveys at ten stations from July 25 until July 29, 2022 (**Figure 4.1)**. Additionally, Ausenco ecologists conducted seven-time constrained stand watch surveys (on June 8 and June 11, 2022) while we conducted a one-time constrained stand watch survey on July 28, 2022. Avian survey stations were no less than 300 m apart in varied habitats to document the presence of birds in the La Loutre Property. All surveys were performed during calm weather conditions (i.e., wind less than 3 on the Beaufort scale and no precipitation; **Table 4.3**) but the weather conditions during the surveys conducted by Ausenco ecologists are unknown.

Table 4.3 Weather conditions during the breeding bird surveys conducted in July 2022

Date	Wind (Beaufort Scale)	Air Temperature (°C)	Cloud Cover (%)	Precipitation
2022-07-26	3 to 2	21 to 22	25-30	None
2022-07-27	0 to 2	19 to 27	0-50	None
2022-07-28	0	22 to 22	60-90	None
2022-07-29	2 to 4	17 to 19	0-50	None

A total of 51 bird species and one individual from the *Fringillidae* and *Picidae* families (Finch and Woodpecker, respectively) were observed/heard during the avian point count surveys (**Table 4.4**). The most abundant species during the surveys were Red-eyed Vireo (*Vireo olivaceus*), Black-and-white Warbler (*Mniotilta varia*), and Eastern Wood-pewee (*Contopus virens*). The Canada Warbler (*Cardellina canadensis*) and Olive-sided Flycatcher (*Contopus cooperi*) are designated as species at risk and were observed/heard at two and four survey stations, respectively. Only two bird species were observed during the time constrained stand watch surveys which include the Common Loon (*Gavia immer*) and the Hooded Merganser (*Lophodytes cucullatus*).

Table 4.4 Summary of birds observed/heard during the avian point count surveys as well as birds observed/heard incidentally in June and July 2022

Common Name	Scientific Name	Survey Station(s) Observed	Nearest Survey Station(s) for IncidentalObservations	Date(s) Observed	Provincial Status	SARA Status
Alder Flycatcher	Empidonax alnorum	PC-YM2	—	2022-06-11	Not Listed	
American Crow	Corvus brachyrhynchos	BBS-1, BBS-2, BBS-3, BBS-4, BBS- 6	ELC-08, ELC-11, ELC-33	2022-07-26 2022-07-27 2022-07-28 2022-07-29	Not Listed	
American Goldfinch	Spinus tristis	—	ELC-05, ELC-12 ELC-18, ELC-20A, ELC- 24, ELC-29, ELC-36	2022-07-26 2022-07-27 2022-07-28 2022-07-29	Not Listed	
American Redstart	Setophaga ruticilla	PC-SR1, PC-SR2, PC-EV1	PC-YS1	2022-06-08* 2022-06-09* 2022-06-10*	Not Listed	
Blackburnian Warbler	Setophaga fusca	PC-SR3	—	2022-06-08*	Not Listed	
Black-and-white Warbler	Mniotilta varia	PC-YS2, PC-SR1, PC-SR2, PC- WR1, PC-WR2, PC-YS1, PC-EV1, PC-NR1, BBS-3, BBS-11	PC-SR3, PC-YM2	2022-06-07* 2022-06-08* 2022-06-09* 2022-06-10* 2022-06-11* 2022-07-27 2022-07-29	Not Listed	
Black-billed Cuckoo	Coccyzus erythropthalmus	—	ELC-05	2022-07-26	Not Listed	
Black-capped Chickadee	Poecile atricapillus	BBS-1, BBS-2, BBS-3, BBS-11	ELC-01, ELC-09	2022-07-26 2022-07-27 2022-07-29	Not Listed	

Common Name	Scientific Name	Survey Station(s) Observed	Nearest Survey Station(s) for IncidentalObservations	Date(s) Observed	Provincial Status	SARA Status
Black-throated Blue Warbler	Setophaga caerulescens	PC-YS2, PC-SR4, PC-YS1	PC-SR3, ELC-29	2022-06-07* 2022-06-08* 2022-06-09* 2022-07-28	Not Listed	
Black-throated GreenWarbler	*Setophaga virens*	PC-YS2, PC-WR1, PC-YM2	ELC-09	2022-07-26 2022-06-07* 2022-06-08* 2022-06-11*	Not Listed	Not Listed
Blue Jay	*Cyanocitta cristata*	PC-SR1, PC-SR4, PC-EV1, BBS-3,BBS-4	PC-WR2	2022-06-08* 2022-06-10* 2022-07-27	Not Listed	Not Listed
Blue-headed Vireo	*Vireo solitarius*	BBS-3, BBS-11	—	2022-07-27 2022-07-29	Not Listed	Not Listed
Broad-winged Hawk	*Buteo platypterus*	PC-EV1	—	2022-06-10*	Not Listed	Not Listed
Brown Creeper	*Certhia americana*	PC-SR3	—	2022-06-08*	Not Listed	Not Listed
Canada Warbler	*Cardellina canadensis*	PC-SR4, PC-YS1	—	2022-06-08* 2022-06-09*	Likely to be designated endangered or vulnerable	Special Concern
Cedar Waxwing	*Bombycilla cedrorum*	BBS-10	ELC-09, ELC-18, ELC-23	2022-07-26 2022-07-27 2022-07-28	Not Listed	Not Listed
Chestnut-sided Warbler	*Setophaga pensylvanica*	PC-SR2, PC-SR3, PC-SR4, PC- WR2, PC-WR3, PC-EV2, PC-NR1	—	2022-06-08* 2022-06-10* 2022-06-11*	Not Listed	Not Listed
Common Loon	*Gavia immer*	—	PC-YS1	2022-06-09*	Not Listed	Not Listed
Common Yellowthroat	*Geothlypis trichas*	PC-SR1, PC-SR2, PC-YM2, PC-NR1	ELC-36	2022-06-08* 2022-06-11* 2022-07-29	Not Listed	Not Listed

Common Name	Scientific Name	Survey Station(s) Observed	Nearest Survey Station(s) for IncidentalObservations	Date(s) Observed	Provincial Status	SARA Status
Downy Woodpecker	*Dryobates pubescens*	—	ELC-32	2022-07-29	Not Listed	Not Listed
Eastern Kingbird	*Tyrannus tyrannus*	PC-EV2, BBS-3	ELC-36	2022-06-10* 2022-07-27 2022-07-29	Not Listed	Not Listed
Eastern Wood-pewee	*Contopus virens*	PC-WR1, BBS-1, BBS-3, BBS-4,BBS-11	PC-SR4, ELC-06, ELC-08, ELC-09, ELC-20, ELC-28, ELC-23	2022-06-08* 2022-07-26 2022-07-27 2022-07-28 2022-07-29	Not Listed	Not Listed
Great Crested Flycatcher	*Myiarchus crinitus*	—	PC-YM2	2022-06-11*	Not Listed	Not Listed
Hairy Woodpecker	*Leuconotopicus villosus*	—	PC-EV1	2022-06-10*	Not Listed	Not Listed
Hermit Thrush	*Catharus guttatus*	PC-EV2, BBS-5, BBS-6, BBS-8,BBS-10	ELC-03, ELC-20, ELC-34, ELC-25, ELC-30	2022-06-10* 2022-07-25 2022-07-27 2022-07-28 2022-07-29	Not Listed	Not Listed
Magnolia Warbler	*Setophaga magnolia*	PC-NR1	PC-EV1, ELC-36	2022-06-11* 2022-07-29	Not Listed	Not Listed
Northern Cardinal	*Cardinalis cardinalis*	BBS-3	—	2022-07-27	Not Listed	Not Listed
Northern Parula	*Setophaga americana*	BBS-3	—	2022-07-27	Not Listed	Not Listed
Northern Waterthrush	*Parkesia noveboracensis*	PC-SR3, PC-WR3	—	2022-06-08*	Not Listed	Not Listed
Olive-sided Flycatcher	***Contopus cooperi***	**BBS-1, BBS-3, BBS-11**	**PC-EV2**	**2022-06-10* 2022-07-26 2022-07-27 2022-07-29**	**Likely to be designated endangered or vulnerable**	**Special Concern**

Common Name	Scientific Name	Survey Station(s) Observed	Nearest Survey Station(s) for IncidentalObservations	Date(s) Observed	Provincial Status	SARA Status
Ovenbird	*Seiurus aurocapilla*	PC-YS2, PC-SR3, PC-SR4, PC- WR1, PC-YS1, PC-EV1, PC-EV2, PC-NR1	PC-SR1	2022-06-07* 2022-06-08* 2022-06-09 2022-06-10 2022-06-11	Not Listed	Not Listed
Pine Warbler	*Setophaga pinus*	—	ELC-09, ELC-13, ELC-16	2022-07-26 2022-07-27	Not Listed	Not Listed
Red-breasted Nuthatch	*Sitta canadensis*	PC-NR1, BBS-3	—	2022-06-11* 2022-07-27	Not Listed	Not Listed
Red-crossbill	*Loxia curvirostra*	PC-EV1	—	2022-06-10*	Not Listed	Not Listed
Red-eyed Vireo	*Vireo olivaceus*	PC-G1, PC-WR1, PC-WR2, PC- WR3, PC-YS1, PC-NR1, BBS-1, BBS-2, BBS-4, BS-5, BBS-6, BBS-8,BBS-11	ELC-03, ELC-10, ELC-20, ELC-24, ELC-25, P9(ELC-27), ELC-28, ELC-29, ELC-30, ELC-32, ELC-34	2022-06-08* 2022-06-09* 2022-06-11* 2022-07-25 2022-07-26 2022-07-27 2022-07-28 2022-07-29	Not Listed	Not Listed
Red-tailed Hawk	*Buteo jamaicensis*	—	P8(ELC-26)	2022-07-28	Not Listed	Not Listed
Rose-breasted grosbeak	*Pheucticus ludovicianus*	PC-SR2, PC-WR1, PC-YS1, PC-NR1	—	2022-06-08* 2022-06-09* 2022-06-11	Not Listed	Not Listed
Ruffed Grouse	*Bonasa umbellus*	—	ELC-05, ELC-09	2022-07-26	Not Listed	Not Listed
Song Sparrow	*Melopiza melodia*	PC-EV2, PC-YM2	ELC-36	2022-06-10* 2022-07-29	Not Listed	Not Listed
Swamp Sparrow	*Melospiza georgiana*	PC-YM2	—	2022-06-11	Not Listed	Not Listed
Turkey Vulture	*Cathartes aura*	—	ELC-01	2022-07-25	Not Listed	Not Listed
Unknown Finch	Fringillidae Sp.	PC-EV2	—	2022-06-10	Not Listed	Not Listed

Common Name	Scientific Name	Survey Station(s) Observed	Nearest Survey Station(s) for IncidentalObservations	Date(s) Observed	Provincial Status	SARA Status
Unknown Woodpecker	Picidae *Sp.*	PC-G1, PC-YS1	—	2022-06-08 2022-06-09 2022-06-10 2022-06-11	Not Listed	Not Listed
Veery	*Catharus fuscescens*	PC-SR1, PC-SR2, PCV-EV1, PC-YM2, PC-NR1	PC-SR3	2022-06-08 2022-06-10 2022-06-11	Not Listed	Not Listed
White-breasted Nuthatch	*Sitta crolinensis*	BBS-11	ELC-12	2022-07-27 2022-07-29	No Listed	Not Listed
White-throated Sparrow	*Zonotrichia albicollis*	PC-NR1	PC-SR4, P8(ELC-26)	2022-06-08* 2022-06-11* 2022-07-28	Not Listed	Not Listed
Wild Turkey	*Meleagris gallopavo*	BBS-1	—	2022-07-26	Not Listed	Not Listed
Winter Wren	*Troglodytes hiemalis*	BBS-1, BBS-2	ELC-07	2022-07-26	Not Listed	Not Listed
Wood Duck	*Aix sponsa*	—	ELC-05	2022-07-26	Not Listed	Not Listed
Yellow-bellied Sapsucker	*Sphyrapicus varius*	PC-YM2	PC-NR1	2022-06-11	Not Listed	Not Listed
Yellow-rumped Warbler	*Setophaga coronata*	BBS-6	ELC-12	2022-07-27 2022-07-28	Not Listed	Not Listed

* Count surveys were conducted within the Nesting period (mid-April to late August (Government of Canada, 2018))

Table 4.5 Summary of birds observed during the time constrained stand watch surveys in June and July 2022

Common Name	Scientific Name	Survey Station(s) Observed	Date(s) Observed
Common Loon	*Gavia immer*	SW2	2022-06-08
Hooded Merganser	*Lophodytes cucullatus*	SW2, SWEV1, SWEV2, EWYM1	2022-06-08 2022-06-11
Unknown Waterbird	—	SW1, SWEV1	2022-06-08 2022-06-11

4.1.3.3 Anurans

Amphibian call surveys were conducted by Ausenco biologists following the Protocol d'inventaire des anoures du Québec (MFFP 2019) at three stations during three seasonal timing windows: April 30, May 1, and May 2; May24, 26, 29, and June 1; and July 3, 4, and 10. Each sampling station was located along the edge of wetlands near existing roads, separated by approximately 800 m. Sampling time for each station ranged from five to fifteen minutes, depending on the amphibian calls detected.

During the call surveys, a total of five amphibian species were observed (**Table 4.6**). Because overlapping songs do not allow observers to distinguish individual males, no counts are provided. None of the species observedare listed under the Species at Risk Public Registry (Government of Canada, 2022) or the Liste des espèces fauniques menacées ou vulnérables (Gouvernement du Québec, 2022).

Table 4.6 Summary of amphibians heard during the amphibian call surveys in April, May, June and July 2022

Common Name	Scientific Name	Survey Station(s) Observed	Dates Observed	Provincial Status	SARA Status
Spring Peeper	*Pseudacris crucifer*	AMPH1, AMPH2	2022-04-30 2022-05-02 2022-05-24 2022-05-29 2022-06-01	Not listed	Not listed
Pickerel Frog	*Lithobates palustris* (formerly *Rana palustris*)	AMPH1	2022-05-24 2022-07-03	Not listed	Not listed
Gray Treefrog	*Dryophytes versicolor*	AMPH1, AMPH2	2022-05-29	Not listed	Not listed
Green Frog	*Lithobates clamitans*	AMPH1, AMPH2	2022-06-01 2022-07-03 2022-07-04 2022-07-10	Not listed	Not listed
Bullfrog	*Lithobates catesbeianus*	AMPH2	2022-07-03 2022-07-04	Not listed	Not listed

4.1.3.4 Incidental Observations

This section provides additional species observations from within or from areas in the vicinity of the proposed mine footprint. These species were either observed incidentally as part of other survey efforts for the study program or while travelling between survey stations. During the 2022 fieldwork, five species of herptiles and mammals were observed.

Herpetofauna

Five species of herptiles were incidentally observed within or in the vicinity of the proposed mine footprint (**Table 4.7**). These species include American Toad (*Anaxyrus americanus*), Common Gartner Snake (*Thamnophis sirtalis*), Common Snapping Turtle (*Chelydra serpentina*), Green Frog (*Lithobates clamitans*), and Wood Frog (*Lithobates sylvaticus*). Of the species observed incidentally, the Common Snapping Turtle is listed as Special Concern under SARA (Government of Canada, 2022).

Mammals

Five mammal species have been incidentally observed within the study area (Table 4.7). Eastern Chipmunk (Tamias striatus), Moose (Alces alces), North American Beaver (Castor canadensis), Stoat (Mustela erminea), and Whitetail Deer (Odocoileus virginianus) were directly observed while we observed Black Bear (Ursus americanus), moose, and deer tracks as well as scat while travelling between survey stations. Additionally, we observed a bear hunter remove his tree stand and bear bait from the area and discovered that he was successful during the 2022 bear hunting season. No SAR mammals were observed incidentally during the 2022 baseline studies.

Table 4.7 Summary of wildlife observed incidentally during the 2022 baseline studies

Common Name	Scientific Name	Provincial Status	SARA Status
Herpetofauna			
American Toad	*Anaxyrus americanus*	—	—
Common Garter Snake	*Thamnophis sirtalis*	—	—
Common Snapping Turtle	*Chelydra serpentina*	—	Special Concern
Green Frog	*Lithobates clamitans*	—	—
Wood Frog	*Lithobates sylvaticus*	—	—
Mammals			
American Black Bear (track & scat)	*Ursus americanus*	—	—
Eastern Chipmunk	*Tamias striatus*	—	—
Stoat	*Mustela erminea*	—	—
Moose	*Alces alces*	—	—
North American Beaver	*Castor canadensis*	—	—
White Tailed Deer	*Odocoileus virginianus*	—	—

4.1.4 Discussion

4.1.4.1 At-risk Bird Species

The 2022 terrestrial baseline study documented two small, forest-dwelling at-risk bird species (Canada Warbler and Olive-sided Flycatcher) within or in the vicinity of the proposed mine footprint. While there are subtle differences in the finer details of optimal nest-site location for each of the species, both species could nest within any of the adjacent forest ecosites. The Canada Warbler and Olive-sided Flycatcher are not provincially listed but they are listed as Special Concern under the Species at Risk Act (SARA;

Government of Canada, 2022). Furthermore, both birds are also protected under the Migratory Bird Convention Act (MBCA) since they are migratory species.

Canada Warbler is a small, ground nesting, migratory songbird with slate-blue back, a bright yellow breast, and a characteristic black necklace pattern over its throat (Committee on the status of Endangered Wildlife in Canada (COSEWIC), 2020). It is generally most common in wet, mixed deciduous-coniferous forest types having a well-developed subcanopy layer. The Canada Warbler breeding territories are often clumped near one another in high-quality breeding habitats.

Olive-sided Flycatcher is a medium- sized, tree-nesting, migratory songbird with the feathers along its sides and back a deep brownish olive-gray colour against a white front (COSEWIC, 2018). They are most often associated with forest edges (especially along wetlands) and other natural forest openings where they requirehabitat heterogeneity along high-contrast edges of two distinct habitats (e.g., along the edges of harvest forests).

To reduce the likelihood of direct at-risk bird species interaction during the development of the proposed minefootprints, clear cutting and/or developing access roads through the forest should be conducted outside of thebreeding bird window (from mid-April to late August for the Outaouais region; Government of Canada, 2018) to minimize the impacts to nesting birds. New access roads developed through the forest should generally belimited to the fullest practical extent.

4.2 Aquatic Habitat Characterization

4.2.1 Previous Baseline Studies

In 2021, Hemmera ecologists conducted a fish habitat characterization in homogeneous segments of three watercourses located within the proposed mining footprint (Hemmera Envirochem Inc., 2022). This was one of the early baseline studies undertaken by Hemmera on behalf of Lomiko to understand the status of the natural environment and to provide an overview of the existing conditions of the areas that are proposed to beimpacted by the development of the graphite flake mine. The segments were selected based on their proximityto the proposed mine footprint, morphology of the streams, nature of the substrate, and the presence and distribution of plant communities prevalent in the stream (i.e., aquatic vegetation) and banks. Each segment was characterized following the *Guide de normalisation des méthodes d'inventaire ichtyologique en eaux intérieures* (Service de la faune aquatique, 2011).

Fish community surveys were conducted via electrofishing or with minnow traps when electrofishing was not possible, to support the fish habitat assessments of the three watercourses. Additionally, the fish community of a watercourse outside of the mining footprint was also assessed to understand the community more accurately in the area. Fish were captured, identified, measured, and then released back into the same watercourse in which they were captured from. A total of 280 fish were captured representing eight species, seven of which were species of minnows including Bluntnose Minnow (*Pimephales notatus*), Creek Chub (*Semotilus atromaculatus*), Fathead Minnow (*Pimephales promelas*), Finescale Dace (*Phoxinus neogaeus*), Mimic Shiner (*Notropis volucellus*), Northern Redbelly Dace (Chrosomus eos), and Sand Shiner (*Notropis stramineus*), as well as one species of sucker (White Sucker, *Catostomus commersonii*). Additionally, six unidentified cyprinids were captured during the fish community surveys. Of the captured species, Northern Redbelly Dace was the most frequently captured, representing 82% of the fish caught. No SAR were capturedduring the fish community assessments.

4.2.2 Methods

4.2.2.1 Benthic Community

4.2.2.1.1 Sampling Design

Benthic invertebrate communities were sampled by KAL biologists from August 28 to September 6, 2022, in six watercourses found within the La Loutre Property as well as two lakes (i.e., Lac Bélanger and an unnamed lake; **Figure 4.3**). The six watercourses were chosen based on the fish community assessment and habitat characterization previously conducted in the fall of 2021 as part of the Early Baseline Studies (Hemmera Envirochem Inc., 2022) as three of the six watercourses were previously assessed by Hemmera ecologists. All surface water features consisted of slow-moving water and soft substrate; therefore, the field and laboratory methodology described by Moisan & Pelletier (2011) were followed for the collection of benthic samples and supporting habitat parameters as well as determining the benthic community habitat quality index (HQI). For each watercourse and lake, we targeted the three most biogenic habitats (i.e., the banks, woody debris (trunksand branches), and submerged part of macrophytes) for the collection of benthic community samples within a100 m reach using a 30 cm diameter D-net with a 600 µm mesh. These three habitats are selected based of their stability and productivity (Stark et al., 2001; US Environmental Protection Agency, 1997). Each benthic sample consisted of 20 'net shots' in these three targeted habitats, in proportion to the area they occupy within the reach. For example, if tree debris represented 50% of the stable habitats, then the benthic sample would consist of ten 'net shots' targeting tree debris found within the 100 m reach. We collected three benthos samplesfrom each of the two lakes and single benthos samples from each watercourse. Samples were stored in labelled plastic jars and preserved using concentrated denatured ethanol.

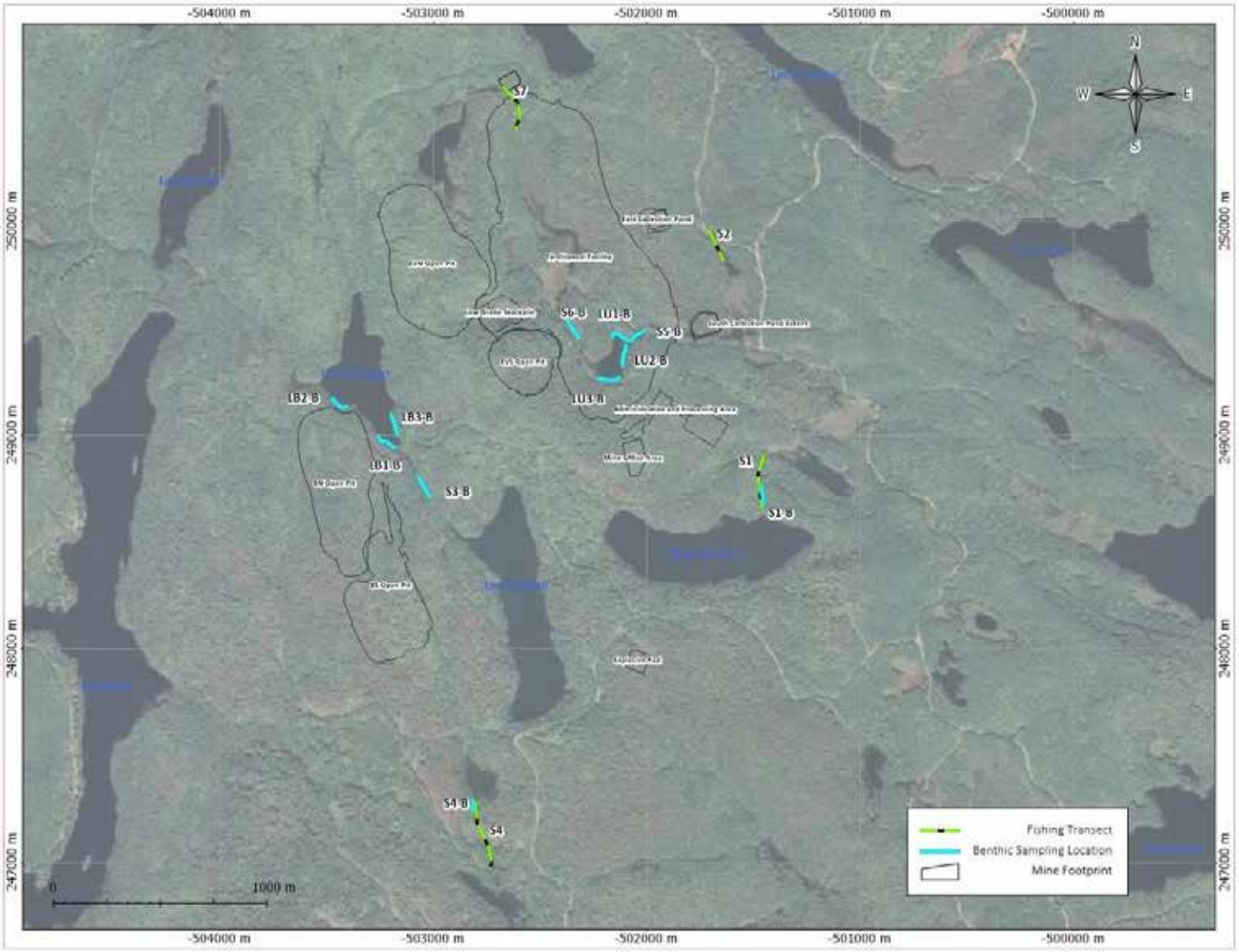


Figure 4.3 **Map showing the locations of the benthic and fish community assessments conducted along watercourses within the La Loutre Property, 2022**

4.2.2.1.2 Supporting Variables

Supporting benthic habitat assessments using the field sheets (for levels 2 and 3 monitoring) outlined and described in Moisan & Pelletier (2011) were conducted at each surface water feature where benthic samples were collected. The general habitat was described by recording the average bank width and wetted width, current velocity (using a Swoffer 2100 Current Meter), water transparency, composition of the banks, and substrate type. Additionally, a multi-probe YSI was used to record in-situ water temperature, pH, conductivity, and dissolved oxygen concentrations. Site photographs were taken to document the view of each sampling station in the following ways: (1) upstream; (2) downstream; and (3) across. Finally, using the calculation form for the HQI (levels 2 and 3) outlined in Moisan & Pelletier (2011), the habitat was evaluated by giving the surface water feature a score between 0 and 200; a score of 200 representing a habitat optimal to support benthic invertebrates.

4.2.2.1.3 Laboratory Protocol

Benthic samples were submitted to Cordillera Consulting (Summerland, British Columbia) for sorting and identification to the lowest taxonomic level. All organisms were enumerated following the methodology described by Moisan & Pelletier (2011). Briefly, the collected samples were subsampled with a target number of 200 organisms. The Caton fractionator (Caton, 1991) is used, and sorting is done in "Bogorov" sorting traysunder a stereomicroscope. The remainder of the sample is inspected with the naked eye to remove rare and large taxa not collected in the subsample.

4.2.2.1.4 Data Analysis

As described in section 5 of the *Guide de surveillance biologique basée sur les macroinvertébrés benthiquesd'eau douce du Québec* (Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP), 2013), the simple variable method was used to assess the biological integrity of benthic macroinvertebrate communities. This method consists of calculating indices of composition expressing variousaspects of benthic community structure which include measurement of taxonomic richness, measurement of taxonomic diversity, measurement of taxonomic composition, and environmental tolerance.

Taxonomic richness is described as the number of taxa present in a sample, a reflection of the health of thecommunity. Generally, a high taxon richness indicates a healthy surface water feature. Taxon richness was determined by calculating the Ephemeroptera index, the Plecoptera index, the Trichoptera index as well asthe EPT index (number of taxa belonging to the orders Ephemeroptera, Plecoptera, and Trichoptera orders) as these orders are generally considered to be the most sensitive to pollution and disturbance (Barbour et al.,1999; Klemm et al., 1990; Resh et al., 1995). Generally, low numbers of EPT taxa are indicative of increased disturbances.

Taxonomic diversity is described as the number of species and the regularity with which individuals are distributed among these species. The Shannon-Wiener diversity index (H') is the most used which considers the number of individuals of each taxon:

$$H' = -3.322 \sum_{i}^{s} p_i \log (p_i)$$

where p_i is the proportion of the i^{th} taxon in the total number of organisms and s is the total number of taxa inthe sample. The Shannon-Wiener diversity index for a typical ecological dataset usually ranges from 1.5 to

3.5, where a high value corresponds to a community composed of several taxa with similar densities, which usually corresponds to favourable environmental conditions. Conversely, a low value reflects difficult living conditionsthat allow few species to establish themselves. As recommended by Moisan & Pelletier (2011), the Shannon-Wiener index was calculated using the binary (base-2) logarithm.

Taxonomic composition represents the percentage abundance of a taxon or group of taxa out of the total abundance of organism present in a station. Table 4 from the *Guide de surveillance biologique basée sur lesmacroinvertébrés benthiques d'eau douce du Québec* (MDDEFP, 2013) lists different variables used in the measurement of taxonomic composition.

Environmental degradation tolerance or intolerance is determined by considering the percentage of one or two dominant taxa within the station. Hence, a community strongly dominated by a few taxa may indicate the presence of stress. Variables or indices based on the degree of tolerance to environmental degradation are also frequently used and are listed in table 4 in the *Guide de surveillance biologique basée sur les macroinvertébrés benthiques d'eau douce du Québec* (MDDEFP, 2013). Tolerance scores (varying on a scaleof 0 to 10) have been previously assigned to different taxa (species and genera; Hilsenhoff, 1987, 1988; Bodeet al. 1996; Bode et al. 2002) where taxa tolerant to environmental degradation have high scores while intolerant taxa have low scores. The variables calculated can be the percentage of tolerant taxa (score > 6), the percentage of intolerant taxa (score < 4), the number of intolerant taxa (score < 4), and the Hilsenhoff Index(HBI; variant, family identification, family tolerance rating). The HBI considers the tolerance scores of each organism in the community and only taxa that have tolerance ratings are included in the calculation. At a givenstation, HBI is calculated by using the following equation:

$$HBI = \sum x_i \, t_i / n$$

where x_i is the number of individuals of the $i^{th,}$ t_i is the tolerance of the i^{th} taxon, and n is the number of individuals in the sample. The higher the HBI score, the more likely the environment is affected by stress. Thescale for interpreting the results for HBI is described in (Hilsenhoff, 1988).

4.2.2.2 Fish Community and Habitat Assessment

To complement the fish community assessments conducted by Hemmera ecologists in 2021 (Hemmera Envirochem Inc., 2022), one KAL biologist and one Hemmera technician conducted fish community assessments via electrofishing and minnow trapping during the fall of 2022 in the three watercourses sampledfor benthic invertebrates where fish communities had not been surveyed in 2021 (**Figure 4.3**). An additional fish community survey was conducted in an unnamed open water wetland East of the PEA proposed East Collection Pond. Before conducting any fieldwork, we obtained an SEG permit from the MFFP (PM_22-07-GP-019-GR-0 and PM_22-07-GP-019-GR-1). When feasible, non-lethal backpack electrofishing (effective at depths of up to approximately 1 m) were used, where the watercourses were subdivided into ~20 m reaches. Baited Gee-style minnow traps were used in the watercourses where water levels were too deep (i.e., S2 and S4 watercourses). The minnow traps were positioned off the shoreline at depths of 1 to 2 m adjacent to habitats that fish may use throughout the day (i.e., shaded areas, under tree trunks/branches, etc.) and retrieved within24 hours of being set.

Sampling took place over the course of four days in late August and early September 2022 and avoided periods of heavy precipitation and increased flow events. Captured fish were enumerated and identified to species before being returned to the same water they were captured from. Effort was recorded and used to estimate the catch per unit effort (CPUE).

Supporting information collected during the fish surveys included in situ water quality parameters recorded using a handheld meter (YSI Pro Plus; temperature, dissolved oxygen, and specific conductivity). Furthermore, using the field sheets (for levels 2 and 3 benthic community monitoring) outlined and described in Moisan & Pelletier (2011), the general habitat was described by recording average bank width, wetted width, current velocity, water transparency, composition of the banks, and substrate. Site photographs were also taken to document the view of each sampling station in the following ways: (1) upstream; (2) downstream; and (3) across.

4.2.3 Results

4.2.3.1 Physio-chemical Conditions of the Surveyed Watercourses

Water temperatures recorded in the surveyed watercourses within the La Loutre Property in 2022 ranged from 16.4 to 22.9 °C (**Table 4.8**). The pH values of the surveyed watercourses were on average 6.8 ± 1.0 (±SD, n=12) where the unnamed watercourse S2 was the most acidic watercourse (pH value of 4.2) and one of the surveyed sections of the unnamed watercourse LU was the most basic (pH value of 8.0). Dissolved oxygen levels in the surveyed watercourses ranged from 2.3 to 7.7 mg/L while specific conductivity ranged from 48 to61 µS/cm (n=12).

Table 4.8 Water quality parameters (field) measured for each La Loutre Property watercourse surveyed in 2022

Watercourse	Date Surveyed	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)
S1	2022-08-28	22.8	7.8	7.2	61
S2	2022-08-29	16.4	4.2	2.3	55
S3	2022-08-29	18.2	7.1	6.8	49
S4	2022-08-30	19.1	6.3	3.2	50
S5	2022-08-30	22.9	7.0	7.1	56
S6	2022-09-01	17.3	6.4	4.1	57
S7	2022-09-06	17.5	6.3	7.7	63
LB1	2002-08-29	22.0	7.3	5.3	50
LB2	2002-08-29	22.0	6.6	4.7	54
LB3	2002-08-29	22.0	7.6	5.5	48
LU1	2022-08-31	22.0	7.4	5.0	57
LU2	2022-08-31	20.8	7.1	5.2	56
LU3	2022-08-31	22.4	8.0	6.1	46

4.2.3.2 Aquatic Habitat

4.2.3.2.1 Unnamed Watercourse 1 (S1)

Unnamed watercourse S1 is a ~300 m long shallow stream with soft substrate that flows north from the outletof Petit lac Vert to the inlet of an unnamed wetland (identified as MH7 during the 2021 baseline studies; Hemmera Envirochem Inc., 2022) located east of the PEA proposed Administrative and Processing Area (**Figure 4.3**). An off-road trail cuts across the watercourse where a culvert was installed to allow the water to flow into the MH7 marsh. Watercourse morphology varies along the reach, primarily due to changes in naturaltopography, and can be split into three homogenous sections (discussed below). The watercourse likely functions as habitat supporting the full life cycle of resident fish species and could function as a migration corridor between Petit lac Vert and the unnamed wetland during spring high flows. However, S1 is unlikely spawning habitat for salmonid species as the required habitat characteristics (e.g., sufficient depth, substrate,no physical barriers, etc.) were not present in sufficient quantity within the watercourse.

Downstream of the Petit lac Vert outlet, there is a homogeneous section approximately 180 m long, consisting of primarily riffles (50%) compared to runs (30%) and pools (20%) (**Photo 4.10**). The dominant substrate of this reach was sand (60%) and also included gravel (0.2-2 cm; 20%), pebbles (2-20 cm; 10%) and larger rocks (> 20 cm; 10%). At the time of the survey (August 28, 2022), the mean wetted width and depth was on average roughly 1.5 m wide and 0.15 m deep, respectively. The bankfull width averaged 2.5 m. Prior minor rain events may have resulted in a deeper watercourse and could have contributed to faster flow velocity, averaging to be 0.3 m/s. The banks are low-lying, sloping gently from the waterline where the riparian vegetation (a mixture of deciduous coniferous and shrub species) and fallen trees provided instream cover to approximately 70% of the watercourse.

Few macrophytes (submerged and emerged) were observed in the watercourse but some of the larger rocks were covered by moss. The downstream end of this segment terminates in a flat gradient where the riparian vegetation is dominated by grass species (mainly Reed Canary Grass, Phalaris arundinacea). Following the habitat evaluation procedure described in Moisan & Pelletier (2011), the unnamed watercourse S1 has an HQI value of 141, representing a suboptimal benthic community habitat. A benthic community sample was collected from this section of the watercourse on August 28, 2022. Of the three targeted habitats described in the Moisan & Pelletier (2011) protocol, 50% of the sampling effort was focused on wooden debris, while 45% and 5% of sampling effort was focused on the banks and submerged macrophytes, respectively. Results from the benthic community assessment in this watercourse is presented in Section of 4.2.3.3 of this report.

Downstream, the next homogeneous section of the watercourse flows North for approximately 30 m until it reaches a man-made off-road vehicle trail with a culvert (perpendicular to Chemin du Lac la Rouge). Downstream of the culvert, the watercourse continues to flow North for approximately 80 m until it reaches the inlet of the MH7 wetland. The habitat characteristics of this homogeneous section was similar to the upstream portion of this watercourse, but the substrate contained a higher proportion of gravel and cobble. Furthermore, a higher amount of sedimentation (dominated by sand) was observed in this section of the watercourse compared to upstream homogeneous section. A fish community assessment of the entire watercourse (encompassing the three homogeneous section) was conducted on August 28, 2022, which is further discussed in Section 4.2.3.4.

Photo 4.10 Photograph of the upstream section of the unnamed watercourse S1 (photo taken on August 28, 2022)

4.2.3.2.2 Unnamed Watercourse 2 (S2)

The unnamed watercourse S2 is located southeast of the PEA proposed East Collection Pond and northwestof the MH7 marsh previously characterized in the early baseline studies report (**Figure 4.3**; HemmeraEnvirochem Inc., 2022). Water from MH7 flows east for approximately 160 m into an unnamed open water wetland (not previously characterized) which eventually flows north for approximately 150 m into a marsh where the dominant vegetation species included Mannagrass (*Glyceria* Spp.), Bulrush (*Typha latifolia*), Sedges (Cyperaceae family), Reed Canary Grass (*Phalaris arundinacea*), and Drooping Woodreed (*Cinna latifolia*). The water level in the marsh was relatively high during the time of survey (August 29, 2022) where the vegetation on the banks of the main channel were submerged (depth in the channel was roughly 1.2 m). Water from the marsh eventually flows north into the uncharacterized open water wetland S2 (**Photo 4.11**). The wetland was within a coniferous forest where the dominant riparian vegetation included Eastern White Cedar, Balsam Fir, Eastern Hemlock, Golden Rod, Jewelweed (*Impatiens capensis*), and Grass Spp. A benthic community sample was not collected from the S2 watercourse as it was an open water wetland, but minnow traps were placed in the open water wetland to determine the resident species of fish. Minnow traps were also set in the smaller open water wetland located just north of S2, on the other side of the unnamed access road(Photo 4.12). Both open water wetlands were separated by the unnamed access road and thus are not hydrologically linked. Results from the fish community assessment are presented in Section 4.2.3.4.

Photo 4.11 Photograph of the upstream view of the open water wetland S2 (photo taken on August 28, 2022)

Photo 4.12 Photograph of the small open water wetland located north (downstream) of S2, on the other side of the unnamed access road (photo taken on August 28, 2022)

4.2.3.2.3 Unnamed Watercourse 3 (S3)

Unnamed watercourse S3 (**Photo 4.13**) is a shallow stream with soft substrate that flows from the outlet of LacTallulah to the inlet of Lac Bélanger (**Figure 4.3**). The approximately 400 m watercourse was previously surveyed and characterized in 2021 during the early baseline studies conducted by Hemmera ecologists (identified as Unnamed Watercourse #1; Hemmera Envirochem Inc., 2022). A fish community assessment was also conducted by Hemmera ecologists where 25 Northern Redbelly Dace were captured via a combination of backpack electrofishing and minnow traps. This watercourse was described as a potentially important habitat supporting the full life cycle of resident cyprinid species but unlikely functions as spawning habitat for salmonid species as the required habitat characteristics (e.g., sufficient depth, substrate, no barriersto migration, etc.) were not present in sufficient quantity within the watercourse. More details on this water course is provided in **Section 4.1.3.** of the early baseline report (Hemmera Envirochem Inc., 2022).

A fishcommunity assessment was not conducted in 2022, but a benthic community sample was collected on August 28, 2022. Of the three targeted habitats described in the Moisan & Pelletier (2011) protocol, 60% of the sampling effort was focused on wooden debris, while 30% and 10% of sampling effort was focused on the submerged macrophytes and banks, respectively. Results from the benthic community assessment is presented in Section 4.2.3.3 of this report. Additionally, following the habitat evaluation procedure described in Moisan & Pelletier (2011), the unnamed watercourse S3 has an HQI value of 137, representing a suboptimalbenthic community habitat.

Photo 4.13 Photograph of the upstream homogenous section of the unnamed watercourse S3 (photo taken on August 29, 2022)

4.2.3.2.4 Unnamed Watercourse 4 (S4)

The ~50 m long unnamed watercourse S4 (**Photo 4.14**) is located in between an unnamed lake and a marsh (**Photo 4.15**), roughly 250 m southwest of Lac Tallulah. During the time of the survey (August 30, 2022), we could not determine if the unnamed lake upstream of S4 is hydrologically linked to Lac Tallulah and it is not apparent from looking at overhead imagery if both water bodies are linked. A beaver dam restricts the flow ofwater (0.07 m/s) from the unnamed lake into the unnamed watercourse S4. There is another beaver dam located downstream of S4, also restricting the flow of water, resulting in slight flooding and elevated water levels in S4. Downstream of S4, the water flows south for roughly 160 m through a marsh, eventually reachingan open water wetland just north of an unnamed access road. The S4 watercourse likely functions as habitat supporting the full life cycle of resident fish species but it unlikely functions as a spawning habitat for salmonidspecies as the required habitat characteristics were not present in sufficient quantity within the watercourse. Furthermore, beaver dams present in this watercourse likely prevents fish species from using this watercourseas a migration corridor.

The S4 watercourse can be described as two homogeneous sections where the upstream section of the watercourse (~30 m) is a marsh area where water flows down a single main channel. Water levels were elevated during the time of survey resulting in adjacent grass species being submerged (no clearly defined banks). The water level in the main channel was roughly 1 m deep and the flow further downstream of the beaver dam was negligible (~0 m/s). Riffles were not observed within the watercourse. The adjacent grass species included different species of sedges (Cyperaceae family), Reed Canary Grass, Bulrush, Sweetgale (*Myrica gale*), and Reedgrass (*Calamagrostis* Spp.). The emergent macrophytes included Water Lilies (*Nymphaeaceae* Spp.) and Pondweed (*Potamogeton* Spp.), covering roughly 80% of the watercourse. The shoreline was dominated by the grass species but transitioned to shrubs and eventually a coniferous forest (dominated by Eastern White Cedar, Balsam Fir, and Eastern Hemlock), providing little shade to the S4 watercourse.

The downstream section of the watercourse (~20 m) included an open water wetland that was roughly 2 m deep. The grass species identified in the upstream section of the watercourse were less prevalentdue to deeper waters. The same emergent macrophytes were also identified in the downstream section of the watercourse but were less prevalent. There was also more wooden debris in this section of the watercourse. The substrate throughout the watercourse was consistent and was composed of clay/silt and organics with a little bit of sand and gravel. Following the habitat evaluation procedure described in Moisan & Pelletier (2011),the unnamed watercourse S3 has an HQI value of 139, representing a suboptimal benthic community habitat.

A benthic community sample from this section of the watercourse was collected on August 30, 2022. Of the three targeted habitats described in the Moisan & Pelletier (2011) protocol, 80% of the sampling effort was focused on emergent macrophytes with the remaining sampling effort (20%) was focused on the woody debrispresent in the watercourse. Results from the benthic community assessment in this watercourse are presented in Section 4.2.3.3 of this report. A fish community assessment of the entire watercourse (encompassing the two homogeneous section of S4 as well as downstream of S4 all the way to the unnamedaccess road) was also conducted using minnow traps (deployed on August 30 and retrieved on August 31, 2022), which is further discussed in Section 4.2.3.4.

Photo 4.14 **Photograph of the downstream view of watercourse S4 (photo taken on Augsut 30, 2022)**

Photo 4.15 **Photograph of the upstream view (left photo capturing the unnamed lake) and the downstream view (right photo capturing the marsh) of watercourse S4 (both photos taken on August 30, 2022)**

4.2.3.2.5 Unnamed Watercourse 5 (S5)

Unnamed watercourse S5 flows east from the unnamed lake LU towards the access road, draining into a largepermanent wetland approximately 30 m west of the access road (**Figure 4.3**). This ~150 m shallow stream withsoft substrate was previously surveyed and characterized by Hemmera ecologists in 2021 during the early baseline studies (identified as Unnamed Watercourse #2; Hemmera Envirochem Inc., 2022). A fish communityassessment was also conducted by Hemmera ecologists where seven Mimic Shiners, four Creek Chubs, andten Northern Redbelly Dace were captured while backpack electrofishing. A beaver dam located at the outlet of the unnamed lake LU and steep gradient prevents this watercourse from functioning as a migration corridorfor fish to navigate (**Photo 4.16**), even if permanent flow was observed within the watercourse at the time of the survey (August 30, 2022). This watercourse also does not function as a spawning habitat for salmonid species or any other large game fish as the required habitat characteristics (e.g., sufficient depth, substrate, no barriers to migration) were not present. However, watercourse S5 likely functions as an important habitat supporting the full life cycle of resident species of fish. More details on this watercourse are provided in **Section 4.2.3** of the early baseline report (Hemmera Envirochem Inc., 2022).

A fish community assessment was not conducted in 2022 but a benthic community sample was collected on August 30, 2022. Of the three targeted habitats described in the Moisan & Pelletier (2011) protocol, 65% of the sampling effort was focused on wooden debris,while 20% and 15% of sampling effort was focused on the submerged macrophytes and banks, respectively. Results from the benthic community assessment in this watercourse is presented in Section 4.2.3.3 of this report. Following the habitat evaluation procedure described in Moisan & Pelletier (2011), the unnamed watercourse S5 has an HQI value of 108 representing a marginal benthic community habitat.

Photo 4.16 Photograph of the upstream view of the unnamed watercourse S5 (photo taken on August 30, 2022)

4.2.3.2.6 Unnamed Watercourse 6 (S6)

Unnamed watercourse S6 flows southeast from a wetland previously assessed during the 2021 baseline studies (identified as MH4) towards the unnamed watercourse LU (previously identified as MH15 during the 2021 baseline studies; Hemmera Envirochem Inc., 2022) (**Figure 4.3**). This approximately 250 m long shallowstream with soft substrate was previously surveyed and characterized by Hemmera ecologists in 2021 duringthe early baseline studies (identified as Unnamed Watercourse #3; Hemmera Envirochem Inc., 2022).

A beaver dam at the upstream extent of the watercourse likely prevents fish from using the watercourse as a migration corridor and the watercourse does not provide enough spawning habitat characteristics for salmonids and game fish species. However, watercourse S6 likely functions as habitat supporting the full life cycle of resident species of fish. A fish community assessment was also conducted by Hemmera ecologists where sixdistinct species of fish were caught (Fathead Minnow, Bluntnose Minnow, Creek Chub, Northern Redbelly Dace, Mimic Shiner, and White Sucker) as well as minnows identified as *Cyprinid* Sp. More details on this watercourse is provided in **Section 4.2.3** of the early baseline report (Hemmera Envirochem Inc., 2022).

The stream could be described as two separate homogeneous sections where the upstream section (~40 m long) flowed through an alder thicket (Alder, Sedges, Jewel Weed, Reed Canary Grass, Grass Spp.;(**Photo 4.17**). This section of the watercourse encompassed a steeper gradient, resulting in a faster flowvelocity (average of 0.11 ± 0.11 m/s; ±SD, n=5) compared to the downstream section (0 m/s) where the mainchannel flows through a marsh for roughly 210 m (**Photo 4.18**). The dominant substrate in the upstream section was composed sand, clay/silt, and gravel while the dominant substrate in the downstream section was mainlycomposed of clay/silt with a little bit of sand. The dominant riparian vegetation in the marsh were Sedges, Drooping Woodreed, Mannagrass, Bulrush, Sweetgale, and some Speckled Alder (*Alnus incana*) shrubs where the grass species closest to the main channel were partly submerged by the elevated water levels during the time of the survey (September 1, 2022). Following the habitat evaluation procedure described in Moisan & Pelletier (2011), the unnamed watercourse S6 has an HQI value of 172, representing an optimal benthic community habitat.

A fish community assessment was not conducted in 2022, but a benthic community sample was collected on September 1, 2022. Benthic sampling encompassed the 40 m upstream section and 60 m of the downstreamsection that represents more of a marsh area. Of the three targeted habitats described in the Moisan & Pelletier(2011) protocol, 40% of the sampling effort was focused on wooden debris, while 45% and 15% of sampling effort was focused on the submerged macrophytes and banks, respectively. Results from the benthiccommunity assessment in this watercourse is presented in Section 4.2.3.3 of this report.

Photo 4.17 Photograph of the upstream section of the watercourse S6 (photo taken on September 1, 2022)

Photo 4.18 Photograph of the downstream section of the watercourse S6 (photo taken on September 1, 2022)

4.2.3.2.7 Unnamed Watercourse 7 (S7)

Unnamed watercourse S7 is a ~700 m long shallow stream with soft substrate flowing through the proposed North Collection Pond and Co-Disposal Facility (**Figure 4.3**). The watercourse flows from the outlet of an unnamed lake, located roughly 600 m northeast of Lac Bélanger, and flows into a marsh previously assessedduring the 2021 baseline studies (identified as MH2, Hemmera Envirochem Inc., 2022). Ppermanent flow was observed within the watercourse during the time of the survey (September 9, 2022) but it was impeded by a beaver dam located at the outlet of the unnamed lake. Watercourse morphology varies along the reach, primarily due to changes in natural topography, and can be split into two homogenous sections.

Downstream of the dam located at the outlet of the unnamed lake, there is a homogeneous section approximately 400 m long, where the main channel of the watercourse consists of an even proportion of riffles(40%), runs (30%), and pools (30%) (**Photo**). Sedimentation was observed across the pools, especially inareas of the watercourse where the flow velocity was elevated. The flow velocity ranged from 0.06 to 0.40 m/s(n=5) where undercut banks were formed in the areas with faster flows. The banks themselves were clearly defined, steep, and slopping quickly but were covered with soil where the riparian vegetation consisted of an alder thicket (not as dense as S6 and included Speckled Alder, Sugar Maple, Yellow Birch, Common Lady Fern, Sensitive Fern, Coltsfoot, and Gooseberry), providing roughly 80% canopy cover to the reach. Woody debris scattered throughout the reach also contributed cover to the reach.

Little macrophytes (submerged and emerged) were observed in the watercourse but some of the larger rocks were covered by moss. The dominant substrate of the upstream section of the reach was sand (75%) and included gravel (10%), pebbles (10%) and larger rocks (5%). At the time of the survey, the mean wetted width and depth were on average roughly 2 m wide and 0.15 m deep, respectively, while the bankfull width was on average 3 m. Within this section of the watercourse, there are multiple braided channels that fish could use as migratory channels, especially in the areas of the watercourse where permanent barriers to upstream fish migration exists (e.g., miniature waterfall; Photo 4.20). Just downriver of the beaver dam at the outlet of the unnamed lake, there is a braided channel that flows North into a lower lying area where water pools into a treed swamp, eventually flowing back into the main channel. At the time of survey, It could not be determined if this area is permanently flooded, but if that were the case, resident fish species could potentially use it as spawning habitat. The upstream section of the watercourse is sloped but eventually flattens out moving downstream (for roughly 300m), transitioning into a wetland where the riparian vegetation shifts to grasses. Following the habitat evaluationprocedure described in Moisan & Pelletier (2011), the unnamed watercourse S7 has an HQI value of 120, representing a suboptimal benthic community habitat.

Abenthic community sample was collected from this section of the watercourse on September 9, 2022. Of thethree targeted habitats described in the Moisan & Pelletier (2011) protocol, 55% and 45% of the sampling effort was focused on wooden debris and banks, respectively. Results from the benthic community assessment in this watercourse is presented in Section 4.2.3.3 of this report. Fish community and habitat characterization of the watercourse was conducted following the collection of the benthic community sample. The watercourse likely functions as an important habitat supporting the full life cycle of resident species of fish and could function as a migration corridor between Petit lac Vert and the unnamed wetland. However, it is unlikely functions as a spawning habitat for salmonid species as the required habitat characteristics (e.g., sufficient depth, substrate,etc.) were not present in sufficient quantity within the watercourse.

Photo 4.19 Photograph of the upstream section of the watercourse S7 (photo taken on September 9, 2022)

Photo 4.20 Photograph of one of the miniature waterfalls in the unnamed watercourse S7 (photo taken September 9, 2022

4.2.3.2.8 Lac Bélanger (LB)

Lac Bélanger (LB) is one of the major lakes where both intermittent and perennial tributaries within the La Loutre Property flow into or out of. It is located in between the PEA proposed Graphene Resource Limit and EV Resource Limit mine footprints (**Figure 4.3**). It was previously surveyed by WSP (2015) and Hemmera (Ausenco (2021) and was identified as a thermally stratified oligotrophic lake. LB likely supports the full life cycle of resident fish species as the required habitat (e.g., vegetation as well as woody debris and rocks alongthe littoral zone for spawning and cover, etc.). Ausenco conducted a fish community assessment as part of their survey of LB where they caught Pearl Dace (*Semotilus margarita*), Northern Redbelly Dace (*Chrosomus eos*), and Fathead minnow (*Pimephales promelas*). On August 29, 2022, three benthic community samples were collected along the shorelines up to 1 m in depth from the bay located in the south portion of the lake (Figure 4.3). In general, the surveyed shorelines of LB are consistent in terms of substrate composition which was composed of clay/silt with small amounts of sand and gravel.

The surrounding mixed forest was consistent along the south portion of LB which had a tree layer consisting of Eastern Hemlock (dominant tree layer species), Eastern White Cedar, Red Maple, Yellow Birch, and Balsamfir. The surrounding subcanopy layer species consisted of Hobblebush, Wild Sarsaparilla, and Striped Maple,while the surrounding groundcover species consisted of Intermediate wood fern, Mountain Woodsorrel (*Oxalismontana*), and Canada Mayflower.

Three benthic community samples were collected from Lac Bélanger on August 29, 2022, one of which was located along the southwest shoreline of the south bay, starting adjacent to the outlet of LB (**Figure 4.3** and **Photo 4.21**). The shoreline of this section of Lac Bélanger (LB1) was not well defined (i.e., nobanks) and mainly consisted of a dense forest compose of trees (40%), shrubs (20%), and herbaceous species (20%). Emergent macrophytes (Bulrush and Water Lilies) and woody debris were abundantly present in the bay, resulting in the benthic sample being mainly collected from the submerged section of the macrophytes (70%) and woody debris (30%).

Photo 4.21 Photograph of one of the miniature waterfalls in the unnamed watercourse S7 (photo taken September 9, 2022

The second benthic community sample was collected northwest of LB1, along the shoreline within the small bay located on the west side of LB (Figure 4.3 and Photo 4.22). The shoreline of this section of LB (LB2) was also not well defined (no banks) but the surrounding mixed forest was less dense compared to what wasobserved at LB1. This section of LB had more woody debris compared to LB1 which was the main targeted habitat for benthic sampling (65% of the sample effort). The remaining sampling effort was focused on the submerged portion of the macrophytes (35%) which was also composed of Bulrush and Water Lilies.

Photo 4.22 Photograph of the section of the Lac Bélanger where a benthic sample (LB2) was

The third sample was collected on the east shoreline of the southern bay of LB (**Figure 4.3** and **Photo 4.23**). The shoreline of this section of LB (LB3) was mainly emergent macrophytes and woody debris with no clear banks, resulting in the benthic sample being mainly collected from the submerged sections of the macrophyte (75%) and the remaining sampling effort on the woody debris (25%).

Photo 4.23 Photograph of the section of the Lac Bélanger where a benthic sample (LB3) was collected (photo taken on August 29, 2022)

4.2.3.2.9 Unnamed Watercourse 8 (LU)

The unnamed watercourse LU was previously assessed by Hemmera ecologists in 2021 (identified as MH15,Hemmera Envirochem Inc., 2022). It was identified as a forested swamp with a poor drainage and shallow organic hydromorphic soils (less than 30 cm thick). The surrounding mixed hardwoods forest had a tree layerconsisting of Black Ash (*Fraxinus nigra* – dominant tree layer species), Yellow Birch, Red Maple, and BalsamFir. The surrounding subcanopy layer species consisted of Red-Osier Dogwood (C*ornus sericea* – dominant subcanopy layer species), Swamp Holly (*Ilex mucronata*), and Speckled Alder (*Alnus incana*), while the surrounding herbaceous species consisted of Sensitive Fern (*Onoclea sensibilis*), Dwarf raspberry (*Rubus pubescens*), Sedges (Cyperaceae family), Bugleweed (*Lycopus* spp.), *Osmunda* spp., and *Araceae* spp. Moredetails on this watercourse is provided in Section 4.1.3 of the early baseline report (Hemmera Envirochem Inc.,2022).

Fish habitat and community assessments of the unnamed watercourse LU were not collected in 2022, but it likely supports the full life cycle of resident fish species as the required habitat (e.g., vegetation as well as woody debris and rocks along the littoral zone for spawning and cover, etc.) is present in sufficient quantity. However, three benthic community samples were collected from the shoreline (up to 1 m in depth) of the unnamed watercourse LU on August 31, 2022, one of which was located along the shoreline of the small northern bay, west of the swamp's outlet (**Figure 4.3** and **Photo 4.24**). The shoreline of this section of the unnamed lake (LU1) was not well defined (i.e., no banks) and was mainly composed of herbaceous species (35%) and trees (30%) with some shrubs present (15%). Emergent macrophytes (mainly water lilies and Bulrush) woody debris were abundantly present in the bay, resulting in the benthic sample being mainly collected from the submerged section of the macrophytes (55%) and woody debris (40%). The substrate wasmainly composed of clay and silt with small amounts of sand and gravel.

Photo 4.24 Photograph of the section of the unnamed watercourse LU where a benthic sample (LU1) was collected (photo taken on August 31, 2022.

The second benthic community sample was collected just east of the watercourses' outlet along the east shoreline (**Figure 4.3** and **Photo 4.25**). The shoreline of this section of the unnamed lake (LU2) was steep and well defined, composed of a hardwoods forest with much less grass species compared to the section LU1 and significantly less emergent macrophytes. Of the three targeted habitats described in the Moisan & Pelletier (2011) protocol, 55% and 45% of the sampling effort was focused on wooden debris and the submerged portion of the macrophytes, respectively, while the remaining sampling effort focused on the banks (10%). Like LU1, the substrate was mainly composed of clay and silt with small amounts of sand and gravel.

Photo 4.25 Photograph of the section of the unnamed watercourse LU where a benthic sample (LU2) was collected (photo taken on August 31, 2022)

The third sample was collected on the south shoreline, just east of the watercourse's inlet (**Figure 4.3** and **Photo 4.26**). The shoreline of this section of the unnamed lake (LU3) was mainly composed of emergent grasses and woody debris with no clear banks, resulting in the benthic sample being mainly collected from the woody debris (65%) and the remaining sampling effort on the submerged portion of the macrophytes (35%). The abundance of wooden debris at LU3 made it difficult to walk around the shoreline. The substrate was consistent with LU1 and LU2 where it was mainly composed of clay and silt with small amounts of sand and gravel.

Photo 4.26 Photograph of the section of the unnamed watercourse LU where a benthic sample (LU3) was collected (photo taken on August 31, 2022)

4.2.3.3 Benthic Community Composition

Benthic community sampling was carried out during late August and early September 2022 in six watercourses (single sample per watercourse) and two lakes (three samples per lake). A total of 65 families were identified from the 12 samples collected (**Table 4.9**). Additionally, eight unidentified families (identified to class or order) are also included in the dataset. Total numbers of benthic invertebrates collected in the assessed watercourses within the La Loutre Property varied between 2,034 (LB3) and 8,190 (LU1) organisms per site, with an average of 4,450 ± 1,781 (±SD, n=12) organisms (see Appendix Table C.2.). The relative abundance of taxa representing the benthic communities of the streams and lakes surveyed are provided in Table 4.9. The benthic community of the watercourses were dominated by Chironomidae, ranging from 15 to 56% of total abundance across samples.

The second most dominant taxa were Leptophlebiidae, ranging from 1.8% to 23% of total abundance, while the third most abundant taxa were Hyalellidae, ranging from 0% (not present in S1, S5, and S7) to 26% of total abundance. Taxa unique to the streams included the Leuctridae (stonefly), Nemouridae (stonefly), and Perlidae (stonefly), Hydropsychidae (caddisfly), Lepidostomatidae (caddisfly), Haliplidae (water beetle),

Ptilodactylidae (water beetle), Dixidae (aquatic nematoceran fly), Simuliidae (blackfly), Tabanidae (horsefly), Tipulidae (Crane fly), Corixidae (Water boatmen), Veliidae (riffle bug), Corydalidae (fishfly), Corduliidae (dragonfly), Hydryphantidae (mite), and Limnesiidae (mite). Taxa unique to the lakes included the Chaoboridae (phantom midge), Crambidae (grass moth), Sialidae (alderfly), Lestidae (damselfly), Unionicolidae (mite), Hydrozetidae (mite), Crangonyctidae (amphipod), Ancylidae (snail), Erpobdellidae (leech), Glossiphoniidae (leech), and Philopotamidae (caddisfly).

Table 4.9 Relative (percent) abundance of benthic families collected from the streams and lakes within the La Loutre Property in 2022

Order	Family	Streams						Lakes					
		S1	S3	S4	S5	S6	S7	LB1	LB2	LB3	LU1	LU2	LU3
Ephemeroptera	Baetidae	0.4	0.3	0.9	0	2.2	0	4.5	0.4	0.4	2.9	0.6	1.2
Ephemeroptera	Caenidae	0	0	3.9	0	9.7	0	2.4	0.4	0	32.8	3.7	14.8
Ephemeroptera	Ephemerellidae	0	2.8	0	0	0	5.7	0.6	1.8	1.6	0.2	7.2	0.4
Ephemeroptera	Heptageniidae	2.9	0	0	2.0	0	0	0	0	0.4	0.2	0.7	0
Ephemeroptera	Leptophlebiidae	3.3	20.5	1.8	8.1	15.3	21.8	10.7	8.5	15.7	4.5	23.1	4.3
Plecoptera	Chloroperlidae	0.4	0	0	0	0	2.0	0	0	0	0.2	0	0
Plecoptera	Leuctridae	1.5	0	0	0	0	5.7	0	0	0	0	0	0
Plecoptera	Nemouridae	0	0	0	0	0	1.0	0	0	0	0	0	0
Plecoptera	Perlidae	0.9	0	0	0.5	0	0	0	0	0	0	0	0
Trichoptera	Unidentified	0	0	0	0	0	0	0	0	0	0	1.2	0
Trichoptera	Hydropsychidae	28.0	8.0	0	1.3	2.6	0.7	0	0	0	0	0	0
Trichoptera	Hydroptilidae	0	0.7	0	0	1.1	0	0	0	0	0.8	0	0
Trichoptera	Lepidostomatidae	2.6	1.4	0	0.3	0	6.4	0	0	0	0	0	0
Trichoptera	Leptoceridae	0.7	0	0.3	0.3	4.1	0	2.4	0.9	3.1	1.2	0.9	0.8
Trichoptera	Limnephilidae	0	0	0	0	0.4	0	0.3	0	0	0.2	0.3	0.4
Trichoptera	Molannidae	0	0.3	0	0	0.4	0.7	0	0.4	0	0	0	0
Trichoptera	Philopotamidae	27.3	1.0	0	12.5	0	9.7	0	0	0	0	0	0
Trichoptera	Phryganeidae	0	0.7	0	0	3.0	0	1.5	0.4	0	0.4	0.3	0.4
Trichoptera	Polycentropodidae	0	0.7	0.3	2.0	0.4	1.0	0	0	0	0.2	0.6	0.4
Trichoptera	Rhyacophilidae	0	0.3	0	0.3	0	0.7	0	0	0	0.2	0	0
Coleoptera	Elmidae	0.4	0.3	0	4.3	0	0	0	0.4	2	0.6	8.4	0
Coleoptera	Haliplidae	0	0	0.3	0	0	0	0	0	0	0	0	0

Order	Family	Streams						Lakes					
		S1	S3	S4	S5	S6	S7	LB1	LB2	LB3	LU1	LU2	LU3
Coleoptera	Psephenidae	0.4	0	0	0	0	0	0	0	0.8	0	0	0
Coleoptera	Ptilodactylidae	2.3	0	0	0	0	0	0	0	0	0	0	0
Diptera	Ceratopogonidae	1.1	3.1	3.3	22.2	2.2	1.7	1.2	2.2	1.2	2.5	0.6	4.7
Diptera	Chaoboridae	0	0	0	0	0	0	0	0	0	0	0.3	0
Diptera	Chironomidae	15.4	41.0	56.2	23.8	32.9	28.8	14.7	52.2	51.1	36.6	21.8	42.1
iptera	Culicidae	0	0	1.2	0	0	0	0	0	0	0	0	0.4
Diptera	Dixidae	0.7	0	0	0	0	0	0	0	0	0	0	0
Diptera	Empididae	1.8	1.4	0	1	0	0	0	0	0	0.2	0	0
Diptera	Simuliidae	1.1	4.9	0	3.8	0.4	0	0	0	0	0	0	0
Diptera	Tabanidae	0	0	0	0	0	0.4	0	0	0	0	0	0
Diptera	Tipulidae	7	1.0	0	10.4	0	3.2	0	0	0	0	0	0
Hemiptera	Unidentified	0	0	0	0	0.4	0	0	0	0	0	0	0
Hemiptera	Corixidae	0	0	0.3	0	0.4	0	0	0	0	0	0	0
Hemiptera	Notonectidae	0	0	0	0	0.4	0	0	0	0	0.2	0	0.4
Hemiptera	Veliidae	0.4	0	0	0	0	0	0	0	0	0	0	0
Lepidoptera	Unidentified	0	0	0	0	0	0	0.3	0	0	0	0	0.4
Lepidoptera	Crambidae	0	0	0	0	0	0	0.3	0	0	0	0	0
Megaloptera	Corydalidae	0.1	0.4	0	0	0	0	0	0	0	0	0	0
Megaloptera	Sialidae	0	0	0	0	0	0	0	0	1.2	0	0	0
Odonata	Unidentified	0	0	0	0	0	0.3	1.8	0.4	0	0	0	0
Odonata	Aeshnidae	0.2	0.1	0.1	1.1	0	0.1	0	0.1	0	0	0	0.2
Odonata	Coenagrionidae	0	0	5.1	0	1.9	0	5.1	4.5	2.8	2.3	1.6	1.2
Odonata	Corduliidae	0	0	0	0	0.1	0	0	0	0	0	0	0

Order	Family	Streams						Lakes					
		S1	S3	S4	S5	S6	S7	LB1	LB2	LB3	LU1	LU2	LU3
Odonata	Gomphidae	0.4	0.4	0	0.3	0.5	0	0	0.5	0.8	0	0	0
Odonata	Lestidae	0	0	0	0	0	0	0	0	0	0.4	0	0
Odonata	Libellulidae	0	0	0.1	0	0	0	0.6	1.1	0.9	0	0.3	0
Trombidiformes	Unidentified	0	1.4	0	0	0	0	0	0	0	0	0	0
Trombidiformes	Hydrodromidae	0	0	0.3	0	0	0	0	0.4	0	0.4	0	0
Trombidiformes	Hydryphantidae	0	0	0	0.3	0	0	0	0	0	0	0	0
Trombidiformes	Limnesiidae	0	0	0.6	0	0	0	0	0	0	0	0	0
Trombidiformes	Unionicolidae	0	0	0	0	0	0	0	0	0	3.7	0.9	2.3
Oribatida	Unidentified	0	0	0	0	0	0.3	0	0	0	0	0	0
Oribatida	Hydrozetidae	0	0	0	0	0	0	0	0	0.4	0	0	0
Amphipoda	Unidentified	0	0	1.8	0	2.6	0	20.6	6.7	5.1	2.7	1.2	5.8
Amphipoda	Crangonyctidae	0	0	0	0	0	0	1.9	0	0	0	1.1	0
Amphipoda	Hyalellidae	0	0.3	6.3	0	13.9	0	26.3	14.8	5.5	3.2	2.5	9.0
Veneroida	Pisidiidae	0.7	8.0	8.1	1.5	1.5	5.7	2.4	2.8	4.7	0.1	4.5	1.3
Unidentified*	Unidentified	0	0	1.2	0	0.8	0.3	0	0.4	0.4	0.6	0.4	1.6
Basommatophora	Ancylidae	0	0	0	0	0	0	0.3	0	0.8	0.4	3.1	0.4
Basommatophora	Physidae	0	0	0	0	0.4	0	0	0	0	0.1	0	0.1
Basommatophora	Planorbidae	0	0	1.3	0	0	0	0	0	0	1.2	12.9	1.6
Littorinimorpha	Hydrobiidae	0	0	0	0	1.1	0	0	0	0	0.2	0	0
Arhynchobdellida	Erpobdellidae	0	0	0	0	0	0	0	0	0	0	0.3	0
Rhynchobdellida	Glossiphoniidae	0	0	0	0	0	0	0	0	0	0	0	0.4
Oligochaeta	Unidentified	0	0.7	6.6	4.3	1.1	3.7	2.1	0.4	1.2	0.6	1.2	5.5

* Unidentified order from the Gastropoda class

4.2.3.3.1 Taxonomic Richness

The taxon richness was determined in each sample collected from the watercourses found within the La LoutreProperty using the taxonomic families identified as well as the individuals only identified to the taxonomic orderor class. Taxonomic richness ranged from 20 and 37, with the highest taxonomic richness identified in one ofthe samples collected from the unidentified lake (LU1) and the lowest taxonomic richness in the S5 stream as well as one of the samples collected from Lac Bélanger (LB3) (**Table 4.10**). The samples with the lowest EPT(*Ephemeroptera, Trichoptera, and Plecoptera*) index were S4 and LB3 (EPT index of 5) while the samples withthe highest EPT index was LU1 (EPT index of 12).

The sample location with the lowest *Ephemeroptera* Indexwas S5 and S7 (E index of 2) and the sample location with the highest *Ephemeroptera* Index were LU1 and LU2 (E index of 5). The sample locations with the highest *Plecoptera* Index were S1 and S7 (P index of 3) while sample locations S3, S4, S6, LB1, LB2, LB3, LU2, and LU3 had no identified *Plecoptera*. The sample location with the lowest and highest *Trichoptera* index were LB3 (T index of 1) and S3 (T index of 8), respectively. Finally, the sample location with the lowest POET *(Plecoptera, Odonata, Ephemeroptera,* and *Trichoptera)* index were S4 and LB3 (POET values of 5) while the sample location with the highest POET indexwas LU1 (POET value of 12).

Table 4.10 Taxonomic richness of the watercourses from the La Loutre Property

Site	Taxonomic Richness	EPT Index	Ephemeroptera Index	Plecoptera Index	Trichoptera Index	POET Index
S1	25	10	3	3	4	10
S3	25	11	3	0	8	11
S4	25	5	3	0	2	5
S5	20	9	2	1	6	9
S6	30	11	3	0	8	11
S7	24	11	2	3	6	11
LB1	26	8	4	0	4	8
LB2	23	7	4	0	3	7
LB3	20	5	4	0	1	5
LU1	37	12	5	1	6	12
LU2	27	10	5	0	5	10
LU3	29	8	4	0	4	8

Table notes: EPT Index: Number of Ephemeroptera, Trichoptera and Plecoptera taxaEphemeroptera Index: Number Ephemeroptera taxa

Plecoptera Index: Number of Plecoptera taxa Trichoptera Index: Number of Trichoptera taxa

POET Index: Number of Plecoptera, Odonata, Ephemeroptera, and Trichoptera taxa

4.2.3.3.2 Taxonomic Diversity

The Shannon-Wiener diversity index was calculated using the identified taxon families as well as the identified order or class for samples where family level identification was not possible (**Table 4.11**). The Shannon-Wiener diversity index ranged from 2.5 to 3.5 with the lowest diversity detected in one of the samples collected from Lake Bélanger (LB2) and the highest diversity detected in one of the samples collected from the unidentified lake (LU2)

Table 4.11 The Shannon-Wiener diversity index for the benthic samples collected in the watercourses from the La Loutre Property

Site	S1	S3	S4	S5	S6	S7	LB1	LB2	LB3	LU1	LU2	LU3
Shannon-Wiener Index	3.1	2.9	2.5	3.2	3.3	3.2	3.2	2.5	2.7	2.8	3.5	3.0

4.2.3.3.3 Taxonomic Composition

The percentage abundance of a taxon or a group of taxa in relation to the total abundance of organisms or a group of taxa is presented in Table 4.12. For all watercourses, the benthic community was dominated by the Insecta class, representing on average 80 ± 14% (±SD, n=12) of the total abundance. Only one sample (LB1) was comprised of less than 50% Insecta. The relative abundance of EPT taxa compared to the number of organisms for a watercourse ranged from 7.2% (S4) to 67.9% (S1) where in general, the relative abundance of the *Ephemeroptera* order was higher than the relative abundance of the Plecoptera and Trichoptera orders except for S1 and S5. The relative abundance of Trichoptera for these watercourses was higher than the relative abundance of *Ephemeroptera*. *Hydropsychidae* was not detected in the samples collected from the lakes and as a result, we could not calculate its relative abundance compared to *Trichoptera* (*caddisflies*). Hydropsychidae also was not found in the S4 watercourse which, as previously mentioned in Section 4.2.3.2.4, can be described as a marsh or open water wetland instead of a stream. The relative abundance of Baetidae in the surveyed watercourses ranged from 1.8% (LU2) to 4.5% (LB1) and were not present in the samples collected from S4 and S7. Finally, the relative abundance of Oligochaeta ranged from 0.4% (LB2) to 6.6% (S4) and were not present in the samples collected from the S1 watercourse.

Table 4.12 Relative (percent) abundance of taxonomic groups and indices of benthic community composition in the surveyed watercourses within the La Loutre Property in 2022

Site	Site Abundance	Insects	Non-Insects	EPT	Ephemeroptera	Plecoptera	Trichoptera	EPT without Hydropsychidae	Hydropsychidae	Hydropsychidae/Trichoptera	Baetidae	Baetidae/Ephemeroptera	Oligochaeta
S1	4359	99.3	0.7	67.9	6.6	2.7	58.6	39.9	28.0	47.8	0.4	5.6	0
S3	4603	89.6	10.4	36.9	23.6	0	13.2	28.9	8.0	60.4	0.3	1.5	0.7
S4	5332	73.7	26.3	7.2	6.6	0	0.6	7.2	0	0	0.9	13.6	6.6
S5	6343	93.9	6.1	27.2	10.1	0.5	16.6	25.9	1.3	7.7	0	0	4.3
S6	2137	78.6	21.4	39.4	27.3	0	12.0	36.7	2.6	21.8	2.2	8.2	1.1
S7	4774	89.9	10.1	55.4	27.5	8.7	19.2	54.7	0.7	3.7	0	0	3.7
LB1	5361	46.3	53.7	22.4	18.2	0	4.2	22.4	0	0	4.5	24.6	2.1
LB2	3589	74.4	25.6	12.9	11.1	0	1.8	12.9	0	0	0.4	4.0	0.4
LB3	2034	81.9	18.1	21.2	18.1	0	3.1	21.2	0	0	0.4	2.2	1.2
LU1	8188	86.7	13.3	43.8	40.6	0.2	2.9	43.8	0	0	2.9	7.2	0.6
LU2	2568	71.8	28.2	38.7	35.3	0	3.4	38.7	0	0	0.6	1.8	1.2
LU3	4108	71.9	28.1	22.6	20.6	0	1.9	22.6	0	0	1.2	5.7	5.5

Table notes: Number of EPT Taxa: Number of Ephemeroptera, Trichoptera, and Plecoptera taxa

4.2.3.3.4 Degraded Conditions Tolerance or Intolerance

Table 4.13 summarises the variables and indices based on the degree of the taxa's tolerance to degraded environmental conditions. These indices are calculated from the tolerance scores of different taxa and are presented in Table C.3 (located in Appendix C). The dominant taxa (previously discussed in Section 4.2.3.3) represented on average 36 ± 13% (n=12) of the total abundance in the related sample while the two dominanttaxa represented on average 54 ± 12% (n=12) of the total abundance in the related sample. The number of intolerant taxa (taxa with a tolerance score less than four) ranged from 2 (LU2 and LB3) to 10 (S1 and S7), representing on average 20 ± 13% (±SD, n=12) of the total abundance in the respective sample.

The relativeabundance of tolerant taxa (taxa with a tolerance score greater than six) was lower (12 ± 6%; ±SD, n=12) thanthe relative abundance of intolerant taxa for the watercourses surveyed. The average percentage of tolerant taxa in relations to the total number of organisms identified in the sample was on average 43 ± 19% (±SD, n=12) while the average percentage of intolerant taxa was 21 ± 17% (±SD, n=12). The number of EPT taxa with a tolerance score smaller than four ranged from 1 (S4) to 8 (S7). Finally, the HBI ranged from 2.5 (LB1) to 6.0 (LU1) where HBI scores ranging from 0 to 3.75 is indicative of an "Excellent" system (i.e., no degradedconditions), 3.51 to 4.50 is indicative of an "Very Good" system (i.e., slight degraded conditions possible), 4.51 to 5.50 is indicative of an "Good" system (i.e., degraded conditions probable), and 5.51 to 6.5 is indicative of an "Average" system (i.e., fairly substantial degraded conditions).

Table 4.13 The variables and indices based on the degree of the tolerance to degraded conditions for the taxa identified in the samples collected from the La Loutre Property watercourses in 2022

Site	Site Abundance	Dominant Taxon	Second Dominant Taxon	Dominant Taxon (%)	Two DominantTaxon (%)	Number of Intolerant Taxa	Tolerant Taxa(%)	Intolerant Taxa(%)	Tolerant Organisms (%)	Intolerant Organisms (%)	Number of ModifiedEPT Taxa*	HBI
S1	4359	Hydropsychidae	Philopotamidae	28.0	55.3	10	4.0	40.0	15.4	43.9	6	4.0
S3	4603	Chironomidae	Leptophlebiidae	41.0	61.5	8	4.0	32.0	41.0	27.6	5	4.8
S4	5332	Chironomidae	Coenagrionidae	56.2	61.3	3	20.0	12.0	66.4	1.9	1	5.7
S5	6343	Chironomidae	Ceratopogonidae	23.8	46.0	7	5.0	35.0	23.8	33.1	5	4.9
S6	2137	Chironomidae	Leptophlebiidae	32.9	48.3	3	13.3	10.0	44.6	15.4	2	4.6
S7	4774	Chironomidae	Leptophlebiidae	28.8	50.6	10	4.2	41.7	28.8	56.3	8	3.5
LB1	5361	Chironomidae	Leptophlebiidae	14.7	25.4	3	15.4	11.5	22.7	11.4	3	2.5
LB2	3589	Chironomidae	Leptophlebiidae	52.2	60.7	3	17.4	13.0	58.1	10.3	2	5.2
LB3	2034	Chironomidae	Leptophlebiidae	51.1	66.9	2	15.0	10.0	54.8	17.3	2	5.2
LU1	8188	Chironomidae	Caenidae	36.6	69.4	5	10.8	13.5	71.8	5.1	4	6.0
LU2	2568	Leptophlebiidae	Chironomidae	23.1	44.9	2	18.5	7.4	27.8	30.3	2	3.3
LU3	4108	Chironomidae	Caenidae	42.1	56.9	3	17.2	10.3	58.5	4.9	2	5.1

Table notes: * Number of Modified EPT Taxa: Number of Ephemeroptera, Plecoptera, and Trichoptera taxa with a tolerance rating < 4Hilsenhoff Biotic Index (HBI)

4.2.3.4 Fish Community Composition

A fish community assessment was conducted in the three watercourses sampled for benthic community in which fish community assessments were not conducted in 2021. A fish community assessment was also conducted in the two open water wetlands located at S2. A total of 614 fish were caught, representing six species including Creek Chub (Semotilus atromaculatus), Fathead Minnow, Finescale Dace (Chrosomus neogaeus), Northern Redbelly Dace, Pumpkinseed (Lepomis gibbosus), and Sand Shiner (Notropis stramineus) (**Table 4.14**). Of these species, the Northern Redbelly Dace was the most frequently caught species, representing 51% of the total fish caught. A summary of fishing effort (electrofishing minutes) for the transects sampled are also presented in **Table 4.14** while electrofishing transects and minnow trap locations are illustrated in **Figure 4.3**.

Table 4.14 Fish species captured in the watercourses within the La Loutre Property during the fish community assessments conducted by Kilgour & Associates in August and September 2022

MFFP Code	Common Name	Scientific Name	S1	S2	S4	S7
			Electrofishing	Minnow Traps	Minnow Traps	Electrofishing
SEAT	Creek Chub	*Semotilus atromaculatus*	6	26	2	24
PHNE	Finescale Dace	*Chrosomus neogaeus*	1	108	0	0
PIPR	Fathead Minnow	*Pimephales promelas*	1	127	0	1
LEGI	Pumpkinseed	*Lepomis gibbosus*	6	0	0	0
NOST	Sand Shiner	*Notropis stramineus*	1	0	0	0
PHEO	Northern Redbelly Dace	*Chrosomus eos*	0	257	43	11
Total Number of species			5	4	2	3
Total Fish Catch			15	518	45	36
Total Effort (minutes)			9.62	720	1200	8.90
Catch Per Unite Effort (CPUE; fish/minute)			1.56	0.72	0.04	4.04

The location and habitat characterization of S1 is presented in Section 4.2.3.2.1. On August 28, 2022, a fish community assessment was conducted via backpack electrofishing where the watercourse was dividedinto three reaches (**Figure 4.3**). One Pumpkin seed was caught in the first reach; Creek Chub, Pumpkinseed,and Sand Shiner in the second reach; and Creek Chub, Fathead Minnow, Finescale Dace, and Pumpkinseed in the third reach, resulting in a total of fifteen fish caught (**Table 4.14**). The CPUE for the fishcommunity assessment was 1.56 fish/minute. Creek Chub and Pumpkinseed were the dominant species in this watercourse (six individuals of each species caught), each representing 40% (80% total) of the totalcatch. All fish captured at this site are warm water tolerable but only the Fathead Minnow, Pumpkinseed, and Sand Shiner prefer warm waters, both belonging to the warmwater thermal class (**Table 4.15**).

The location and habitat characterization of S2 is presented in Section 4.2.3.2.2. On August 29, 2022, a fish community assessment was conducted using Gee Minnow Traps in the two ponds located at S2 (**Figure 4.3**). Traps were set at 07:00 and retrieved them on the same day at 16:44. The same four species of fish were caught in the two ponds including Creek Chub, Fathead Minnow, Finescale Dace, and Northern Redbelly Dace, resulting in 518 fish caught (**Table 4.14**).The CPUE for the fish community assessment was 0.72 fish/minute. Northern Redbelly Dace was the dominant species in these wetlands, representing 50% of the total catch. All fish captured at this site are warm water tolerable but only the Fathead Minnow prefer warm waters, both belonging to the warmwater thermal class (**Table 4.15**).

The location and habitat characterization of S4 is presented in Section 4.2.3.2.4. On August 31, 2022, a fish community assessment was conducted using Gee Minnow Traps in the small pond where the benthic community assessment was conducted as well as further downstream to characterize the entire watercourse (**Figure 4.3**). The traps were set at 11:15 on August 30, 2022, and retrieved them on August 31, 2022, at 07:15. Two different fish species were caught including Creek Chub and Norther Redbelly Dace, where the later was the dominant species in the watercourse, representing 96% of the total catch. The CPUE for the fish community assessment was 0.04 fish/minute. The two species of fish captured are warmwater tolerable but prefer cooler waters (**Table 4.15**). Additionally, several crayfish and tadpoles (not identified to species) were captured in the minnow traps set in this watercourse.

The location and habitat characterization of S7 is presented in Section 4.2.3.2.7. On September 6, 2022, a fish community assessment was conducted via backpack electrofishing where the fish community assessment was divided into five reaches (**Figure 4.3**). Creek Chub were caught, Northern Redbelly Dace, and Fathead Minnows, resulting in a total of 36 fish caught and a CPUE of 4.04 fish/minute (Table 4.14). Creek Chub was the dominant species in this watercourse, representing 67% of the total catch. All fish captured at this site are warm water tolerable but only the Fathead Minnow prefer warm waters, both belonging to the warmwater thermal class (**Table 4.15**).

Table 4.15 Thermal preference and thermals tolerance of fish species captured in watercourses in the La Loutre Property

Fish Species (*Taxonomic name*)	Thermal Class	Thermal Tolerance	
		Final Temperature Preferendum (FTP)	Upper Incipient Lethal Temperature (UILT)
Creek Chub (Semotilus atromaculatus)	Cool	24.9	29.1
Fathead Minnow (Pimephales promelas)	Warm	26.6	31.3
Finescale Dace (Phoxinus neogaeus)	Cool	24.1	30.3
Northern Redbelly Dace (Phoxinus eos)	Cool-Warm	25.3	29.2
Pumpkinseed (Lepomis gibbosus)	Warm	27.7	31.7
Sand Shiner (Notropis stramineus)	Warm	—	—

Table notes: Temperature preferendas and upper incipient lethal temperatures are from Hasnain et al. 2010

4.2.4 Discussion

4.2.4.1 Aquatic Habitats

The aquatic habitat characterization of the watercourses within the La Loutre Property revealed that all watercourses assessed in 2022 can support benthic invertebrate communities and provide optimal or suboptimal habitats. Additionally, all watercourses assessed in 2021 (by Hemmera ecologists) and in 2022 by KAL, likely function as habitat supporting the full life cycle of resident fish species. This is further supported by the physio-chemical conditions detected during the time of the survey where pH and dissolved oxygen for most watercourses (except for the unnamed watercourses S2) were within accepted water quality standards for surface water for the protection of aquatic life. In S2, dissolved oxygen (2.3 mg/L) and pH (4.2) were below the provincial water quality standards which are set at 5 mg/L (for cold water biota) or 4 mg/L (for warm water biota) for dissolved oxygen when water temperatures are at 20 °C (average water temperatures during the time of the surveys) and pH range of 6.5 to 8.5 (MELCC, 2022a).

Unnamed watercourses S4, S5, and S7 had pH values (6.3, 6.4, and 6.3, respectively) slightly below the provincial water quality standards but unlikely to be detrimental to resident fish species. Beaver dams present in mostwatercourses assessed (unnamed watercourses S4, S5, S6, and S7) restrict the flow and present barriersto upstream fish migration. Furthermore, all watercourses assessed are unlikely to provide spawning habitat for salmonid species as the required habitat characteristics (e.g., sufficient depth, substrate, no barriers, flow, etc.) were not present in sufficient quantity within the watercourse.

4.2.4.2 Benthic Community Composition

Benthic community assessment can help indicate if a system/watercourse is under stress or presents favourable environmental conditions. For example, high taxon richness and diversity are usually indicative of a healthy watercourse that allow a large diversity of several taxa to thrive. Of the watercourses within the La Loutre Property that were assessed, the unnamed watercourses with the highest taxon richness and diversity are S6 and a section of the unnamed lake LU (LU2) while the watercourses with the lowest taxon richness and diversity are S5 and a shoreline section of Lac Bélanger (LB2). Additionally, the taxonomic richness of the EPT group (*Ephemeroptera*, *Plecoptera*, and *Trichoptera* orders) can also be indicative of

the watercourse's health as the three orders listed are considered to be the most sensitive to degraded conditions (Barbour et al., 1999; Klemm et al., 1990; Resh et al., 1995). The watercourses with the highest EPT index are S1 and S7 while the watercourses with the lowest EPT index are S4 and LB1.

Unnamed watercourse S4 also had the highest proportion of Chironomids (taxa considered to be tolerant to stress; Barbour et al., 1999; Bode et al., 2002) which is generally an indication of poor stream health. However, caution must be taken when interpreting taxonomic composition and relating it to watercourse health as LB1 had a low proportion of Chironomids and a low EPT index value compared to the other watercourses assessed in 2022. Species richness and diversity should therefore be used in conjunction with other benthic community metrics, such as HBI, which can also be used to interpret the watercourse's health as it considers the tolerance scores of each organism identified in the sample. The unnamed watercourse S4 had the lowest HBI value, indicating that this watercourse is an "average" system and further supports the general conclusion that S4 provides poor environmental conditions drawn from its relatively low EPT index and high proportion of chironomids found in this watercourse. It is important to mention that the benthic community assessments produced benthic communities typical for freshwater ecosystems. Commonly used variables when interpreting benthic community composition as a measurement of a watercourse's general health are found in Table 4 of the Moisan & Pelletier (2011) guide and should be used to compare benthic community composition reported in this baseline studies with benthic community compositions reported in future monitoring studies and/or a reference system(s).

4.2.4.3 Fish Community Assessments

The fish community assessments conducted in fall 2022 found no invasive fish species, sport fish, nor fish species that are currently listed under the *liste des espèces fauniques menacées ou vulnérables* (Gouvernement du Québec, 2022) or the Species at Risk Act (Government of Canada, 2022). All fish captured are common baitfish to the Outaouais region and are all tolerant to warm waters. Furthermore, all fish caught in 2022 were the same fish species caught during the 2021 baseline studies conducted by Hemmera (Hemmera Envirochem Inc., 2022). The most captured fish species in the watercourses on the La Loutre Property were Northern Red Belly Dace, Fathead Minnow, and Finescale Dace, all of which are common baitfish.

5.0 References

Ausenco Engineering Canada. (2021). La Loutre Graphite Project: N.I. 43-101 technical report & preliminary economic assessment.

Ayalew, T., Krajewski, W., Mantilla, R., & Small, S. (2014). Exploring the effects of hillslope-channel link dynamics and excess rainfall properties on the scaling structure of peak-discharge. Advances in Water Resources, 64, 9-20.

CEAEQ. (2019). Sampling Guide for Environmental Analysis: Book 3 - Flow Measurement Methods.

Centre d'expertise en analyse environnementale du Quebec. Ministère de l'Environnement et dela Lutte Contre les Changement Climatiques. Retrieved Dece,ber 2021, from http://www.ceaeq.gouv.qc.ca/documents/publications/echantillonnage/debit_conduit_ouvC7.pdf

Consul-Teck. (2019). 2019 Drilling Report.

Creager, W., Justin, J., & Hinds, J. (1944). Engineering for dams (Vol. 1). New York: John Wiley andSons.

Hemmera. (2021a). Waste rock risk assessment.

Hemmera. (2021b). La Loutre Geochemistry Update: Kinetic testing confirmation and preliminary results. InnovExplo. (2016). Technical report and mineral resource estimate for the La Loutre property .

ISO. (2010). In I. O. Standardization, Hydrometry – Measurement of Liquid Flow in Open Channels - Part2: Determination of the Stage-Discharge Relationship (Third Edition ed.).

Lide, D. R. (2008). CRC Handbook of Chemistry and Physics, 89th Edition. CRC Press.

MELCC. (2008). Guide d’échantillonnage à des fins d’analyses environnementales. Centre d’expertise en analyse environnementale du Québec, Ministère de l'Environnement et de la Lutte contre les changements climatiques (anciennement MINISTÈRE DU DÉVELOPPEMENT DURABLE, DE L’ENVIRONNEMENT ET DES PARCS DU QUÉBEC). Retrieved December 2021, from https://www.ceaeq.gouv.qc.ca/documents/publications/echantillonnage/generalitesC1.pdf

MELCC. (2017). Guide de caractérisation physicochimique de l’état initial du milieu aquatique avant l’implantation. Ministère de l'Environnement et de la Lutte contre les changements climatiques, anciennement Ministère du Développement durable, de l’Environnement et de la Lutte contre les changements. Retrieved Dece,ber 2021, from https://www.environnement.gouv.qc.ca/Eau/oer/Guide_physico-chimique.pdf

MELCC. (2021, December). Critère de qualité de l'eau de surface. Retrieved from Gouvernement du Québec: https://www.environnement.gouv.qc.ca/eau/criteres_eau/index.asp

Ministère des Ressources naturelles et de la Faune. (2021). Guide de normalisation des méthodes d'inventaire ichtyologique en eaux intérieures.

Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques. (2014). Identification et délimitation des milieux humides du Québec méridonal.

Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques. (2015). La Politique de protection des rives, du littoral et des plaines inondables.

Ministère du Développement Durable, de l'Environnement et des Parcs (MDDEP). (2006). Guide d'analyse des projets d'intervention dans les écosyèmes aquatiques, humides et riverains assujettis à l'article 22 de la Loi sur la qualité de l'environnement. Québec: Publications duQuébec.

MoE. (2018). Manual of British Columbia Hydrometric Standards. Ministry of Environment and Climate Change Strategy Knowledge Manaement Branch, Resources Information Standards Committee. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/man_bc_hydrometric_stand_v2.pdf

Natural Resources Canada. (2019, March 1). Open Government Canada. Retrieved November 2021,from https://open.canada.ca/data/en/dataset/9d96e8c9-22fe-4ad2-b5e8-94a6991b744b

O'Connell, P. (1868). On the relation of the freshwater floods of rivers to the areas and physical features of their basins and on a method of classifying rivers and streams with reference to the magnitude of their floods. Minutesnnnn, 27, 204-217.

Rainville, F., Hutchinson, D., Stead, A., Moncur, D., & Elliott, D. (2016). Hydrometric Manual - Data Computations: Stage-Discharge Model Development and Maintenance. Water Survey of Canada.

Rantz, S. E. (1982). Measurement and computation of streamflow (Vol. 2175). US Department of the Interior, Geological Survey.

Searcy, J. K. (1959). Flow-duration curves (Vol. No. 1542). US Government Printing Office.

USGS. (2010). Discharge measurements at gaging stations. Turnipseed, D. Phil, and Vernon B. Sauer. .

US Geological Survey.

Health Canada. 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise.

Ministry of the Environment, the Fight Against Climate Change, Wildlife and Parks. 2006. Handling noise complaints and requirements for companies that generate it.

Atlas of the Breeding Birds of Québec. (2010). Guide for Atlassers (version 1) (p. 88). QuébecOiseaux, Canadian Wildlife Service (Environment Canada). https://www.atlas-oiseaux.qc.ca/download/guide_en.pdf

Ausenco Engineering Canada. (2021). La Loutre Graphite Project (Technical Report & Preliminary Economic Assessment N.I. 43-101; p. 253). https://lomiko.com/wp-content/uploads/2021/09/PEA-La-Loutre-2021-09-10.pdf

Barbour, M. T., Gerritsen, J., Snyder, B. D., & Stribling, J. B. (1999). Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish (EPA 841-B-99-002; p. 337). U.S. Environmental Protection Agency; Office of Water. https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1164.pdf

Bode, R.W., Novak, M.A., & Abele, L.E. 1996. Quality Assurance Work Plan for Biological Stream Monitoring in New York State, Albany (New York), NYS Department of Environmental Conservation, 89 p

Bode, R.W., Novak, M. A., Abele, L.E., Heitzman, D.L., & Smith, A.J. 2002. Quality Assurance Work Plan for Biological Stream Monitoring in New York State, Albany (New York), Stream Biomonitoring Unit Bureau of Water Assessment and Management Division of Water, NYS Department of Environmental Conservation, 41 p. 13 annexes, [http://www.dec.state.ny.us/website/dow/bwam/sbuqa02.pdf]

Caton, L. W., 1991. Improving subsampling methods for the EPA “Rapid Bioassessment” benthic protocols, Bulletin of the North America Benthological Society, vol. 8, no 3, p. 317-319

Centre de données sur le patrimoine naturel du Québec (CDPNQ). (2022). Données sur les espèces en situation précaire. Données Sur Les Espèces En Situation Précaire. https://www.quebec.ca/gouvernement/gouvernement-ouvert/transparence-performance/indicateurs-statistiques/donnees-especes-situation-precaire

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). (2018). COSEWIC Assessment and Status Report on the Olive-sided Flycatcher (Contopus cooperi) in Canada 2018. Species at Risk Act: COSEWIC Assessments and Status Reports. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/olive-sided-flycatcher-2018.html#toc6

Committee on the status of Endangered Wildlife in Canada (COSEWIC). (2020). COSEWIC Assessment and Status Report on the Canada Warbler Cardellina canadensis in Canada 2020. Species at Risk Act: COSEWIC Assessments and Status Reports. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/canada-warbler-2020.html

Gosselin, J. (2002). Guide de reconnaissance des types écologiques: Région écologique 3a : collines de l’Outaouais et du Témiscamingue : région écologique 3b : collines du lac Nominingue (Direction des inventaires forestiers. Direction de la planification et des communications). Ministère des Ressources naturelles du Québec, Forêt Québec, Direction des inventaires forestiers, Division de la classification écologique et de la productivité des stations. https://mffp.gouv.qc.ca/documents/forets/inventaire/guide-ecologique-3ab.pdf

Gouvernement du Québec. (2022). Liste des espèces fauniques menacées ou vulnérables. Liste Des Espèces Fauniques Menacées Ou Vulnérables. https://www.quebec.ca/agriculture-environnement-et-ressources-naturelles/faune/gestion-faune-habitats-fauniques/especes-fauniques-menacees-vulnerables/liste

Government of Canada. (2018). Nesting Periods. General Nesting Periods of Migratory Birds. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html

Government of Canada. (2022). Species at Risk Public Registry. Species at Risk Public Registry. http://www.registrelep-sararegistry.gc.ca/sar/index/default_e.cfm

Hasnain, S. S., Minns, C. K., & Shuter, B. J. (2010). Key Ecological Temperature Metrics for Canadian Freshwater Fishes. Ontario Forest Research Institute.

Hemmera Envirochem Inc. (2022). Early Baseline Studies (No. 106235–01; p. 65). Lomiko Metals Inc. https://lomiko.com/wp-content/uploads/2022/04/Early-Baseline-Studies-Report-09-03-2022.pdf

Hilsenhoff, W. L. (1987). An Improved Biotic Index of Organic Stream Pollution. 20(1), 31–39.

Hilsenhoff, W. L. (1988). Rapid Field Assessment of Organic Pollution with a Family-Level Biotic Index. Journal of the North American Benthological Society, 7(1), 65–68. https://doi.org/10.2307/1467832

Klemm, D. J., Lewis, P. A., Fulk, F., & Lazorchak, J. M. (1990). Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters (EPA/600/4-90/030; p. 256). U.S. Environmental Protection Agency, Office of Research and Development, Environmental monitoring systems laboratory. https://nepis.epa.gov/Exe/ZyNET.exe/30000VCE.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1986+Thru+1990&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C86thru90%5CTxt%5C00000005%5C30000VCE.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL#

Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP). (2022a). Critères de qualité de l'eau de surface. Critères de qualité de l'eau de surface. https://www.environnement.gouv.qc.ca/eau/criteres_eau/

Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP). (2022b). Liste des espèces floristiques désignées menacées ou vulnérables ou susceptibles de l'être. Liste Des Espèces Floristiques Désignées Menacées Ou Vulnérables Ou Susceptibles de l'être. https://www.environnement.gouv.qc.ca/biodiversite/especes-designees-susceptibles/index.htm

Ministère des Forêts, de la Faune et des Parcs (MFFP). (2022). Carte écoforestière à jour. Partenariat Données Québec. https://www.donneesquebec.ca/recherche/dataset/carte-ecoforestiere-avec-perturbations

Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP). (2013). Guide de surveillance biologique basée sur les macroinvertébrés benthiques d'eau douce du Québec – Cours d'eau peu profonds à substrat grossie (2e édition). Direction du suivi de l'état de l'environnement.

Moisan, J., & Pelletier, L. (2011). Protocole d'échantillonnage des macroinvertébrés benthiques d'eau douce du Québec cours d'eau peu profonds à substrat meuble. Direction du suivi de l'état de l'environnement, ministère du Développement durable, de l'Environnement et des Parcs,.

Nix, S. (2016). Estimate Tree Age. The Intown Hawk. https://intownhawk.com/estimate-tree-age/

Resh, V. H., Norris, R. H., & Barbour, M. T. (1995). Design and implementation of rapid assessment approaches for water resource monitoring using benthic macroinvertebrates. Austral Ecology, 20(1), 108–121. https://doi.org/10.1111/j.1442-9993.1995.tb00525.x

Service de la faune aquatique (Ed.). (2011). Guide de normalisation des méthodes d'inventaire ichtyologique en eaux intérieures. ministère des Ressources naturelles et de la Faune, Québec. https://mffp.gouv.qc.ca/documents/faune/normalisation-inventaire-ichtyologique.pdf

Stark, J. D., Boothroyd, I. K. G., Harding, J. S., Maxted, J. R., & Scarsbrook, M. R. (2001). Protocols for Sampling Macroinvertebrates in Wadeable Streams (No. 5103; Sustainable Management Fund Project, p. 57). New Zealand Ministry for the Environment. https://docs.niwa.co.nz/library/public/ProtocolsManual.pdf

US Environmental Protection Agency. (1997). Field and Laboratory Methods for Macroinvertebrate and Habitat Assessment of Low Gradient, Nontidal Streams (p. 23 pages with appendices). Mid-Atlantic Coastal Streams Workgroup, Environmental Services Division, Region 3. http://www.krisweb.com/biblio/gen_usepa_xxxx_1997_macrohabitatassmnt.pdf

Waterloo Region District School Board. (2020). Results – Table (Size/Age by Species). Outdoor and Environmental Education. https://schools.wrdsb.ca/environmental-education/citizen-science/monstertrees/results-table-size-age-by-species/

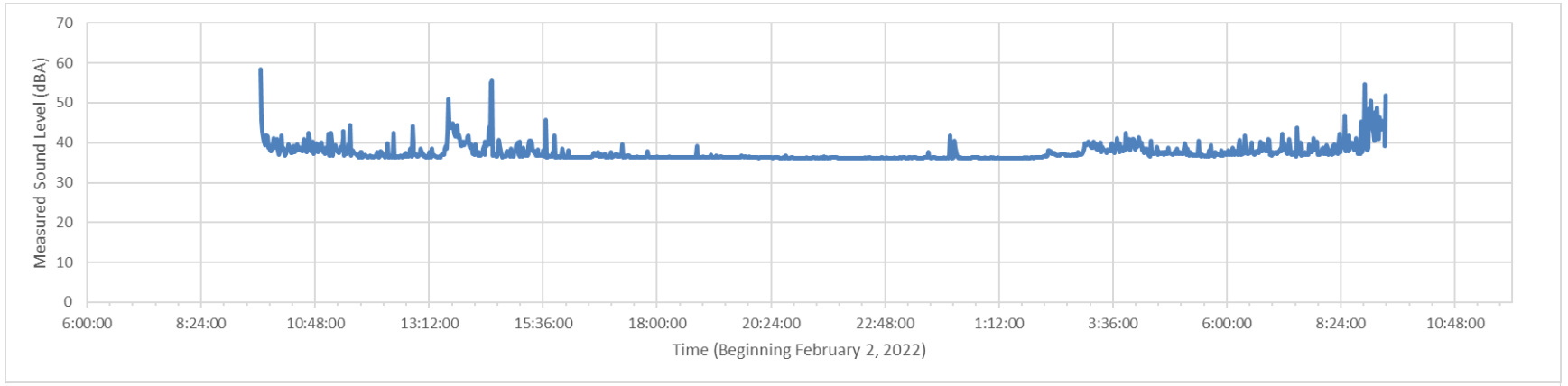
WSP Canada Inc., 2015. Étude environnementale de base de sommaire. Document prepared for Canada Strategic Metals. 95 pages

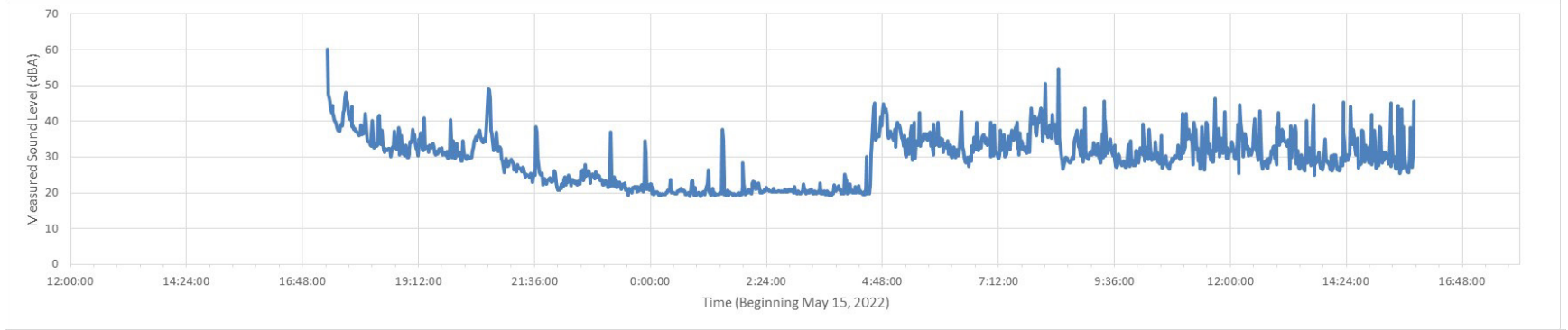
Appendix A

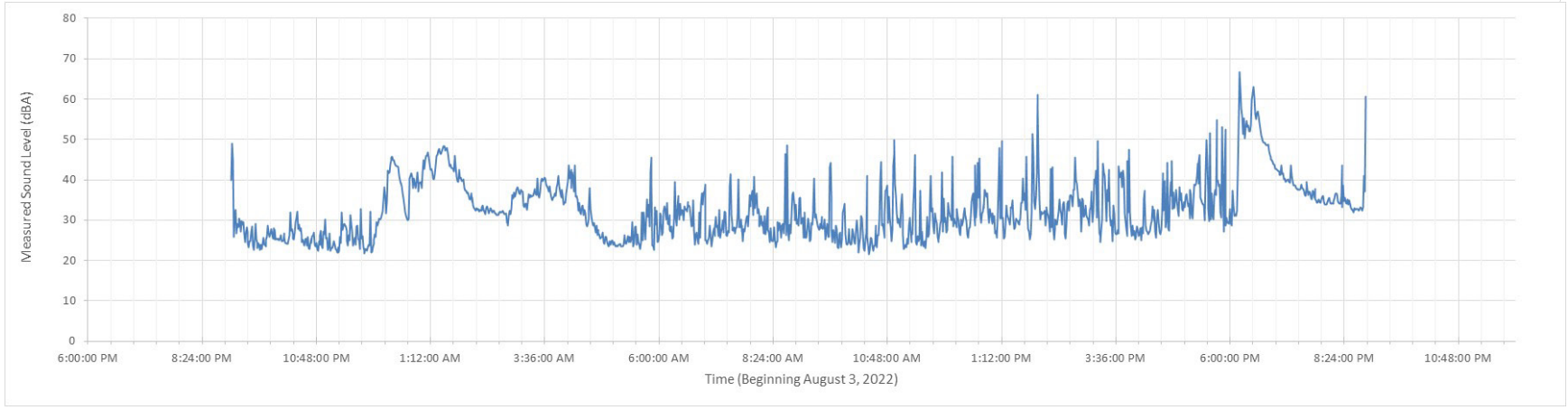
Baseline Noise Monitoring Data

1.0 LAC DORE COTTAGE COMMUNITY

Date	Season	Daytime Sound Level, L_d	Evening Sound Level, L_e	Nighttime Sound Level, L_n	Day-Night Sound Level, L_{dn}
Feb 2-3, 2022	Winter	44.4	36.3	37.4	45.4
May 15-16, 2022	Spring	38.0	34.6	31.5	39.4
Aug 3-4, 2022	Summer	45.5	36.6	37.7	46.1


Measured Sound Level (dBA)
70
60
50
40
30
20
10
0
6:00:00
8:24:00
10:48:00
13:12:00
15:36:00
18:00:00
20:24:00
22:48:00
1:12:00
3:36:00
6:00:00
8:24:00
10:48:00
Time (Beginning February 2, 2022)


Measured Sound Level (dBA)
70
60
50
40
30
20
10
0
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
Time (Beginning May 15, 2022)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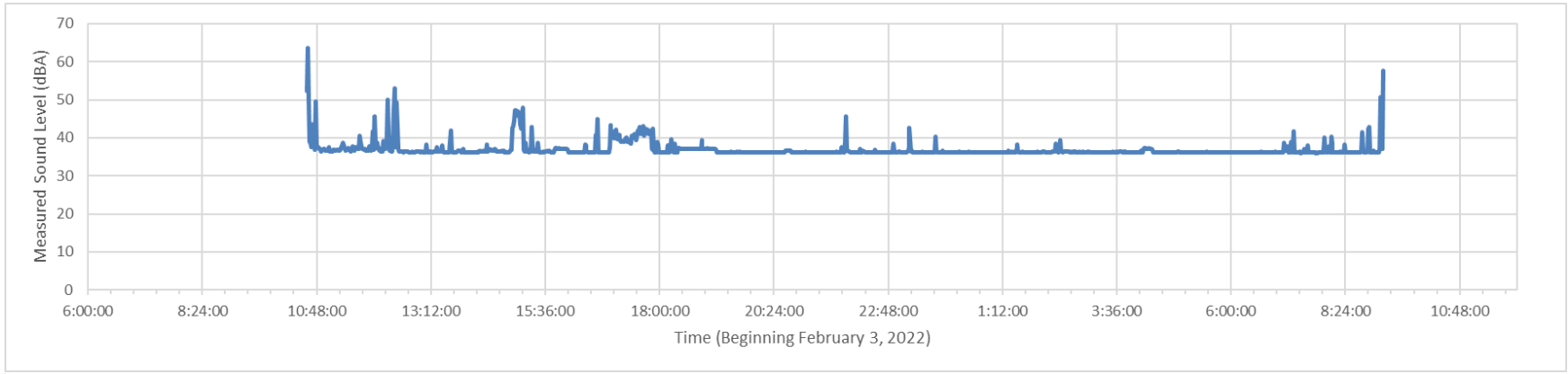
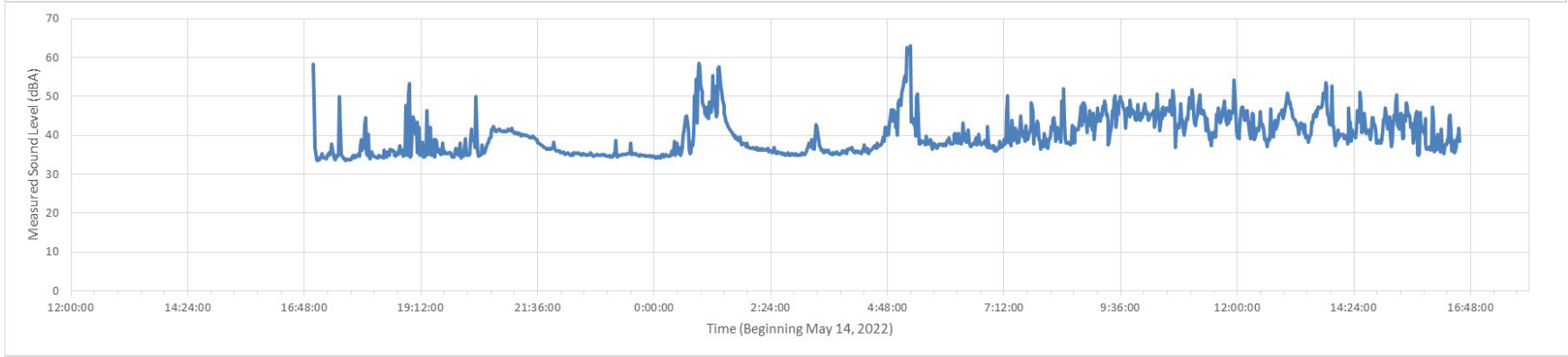
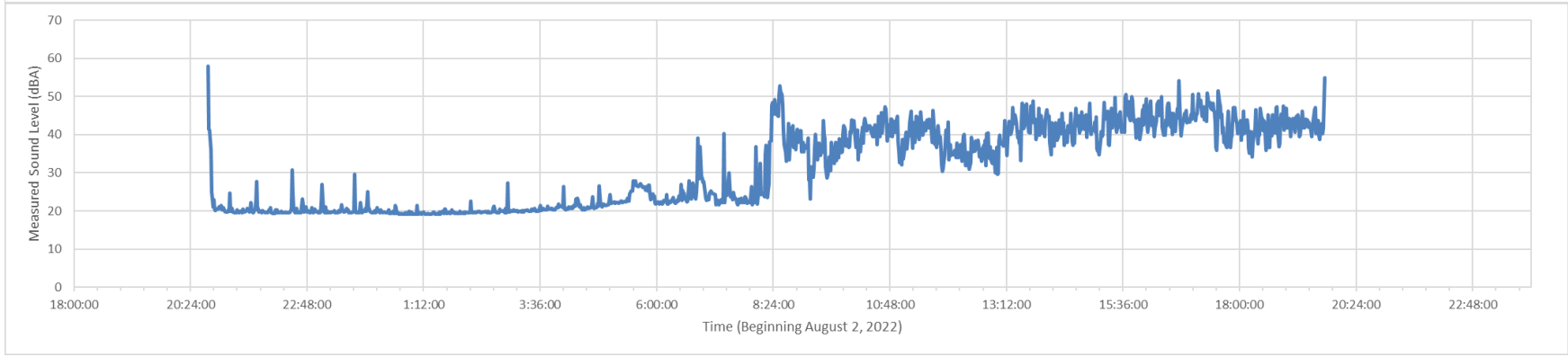
80
70
60
50
40
30
20
10
0
6:00:00 PM
8:24:00 PM
10:48:00 PM
1:12:00 AM
3:36:00 AM
6:00:00 AM
8:24:00 AM
10:48:00 AM
1:12:00 PM
3:36:00 PM
6:00:00 PM
8:24:00 PM
10:48:00 PM
Time (Beginning August 3, 2022)

2.0 POURVOIRIE CLUB DES DOUZES

Date	Season	Daytime Sound Level, L_d	Evening Sound Level, L_e	Nighttime Sound Level, L_n	Day-Night Sound Level, L_{dn}
Feb 3-4, 2022	Winter	41.3	36.5	36.3	43.6
May 14-15, 2022	Spring	44.0	39.2	45.8	52.0
Aug 2-3, 2022	Summer	42.7	42.4	22.5	40.9

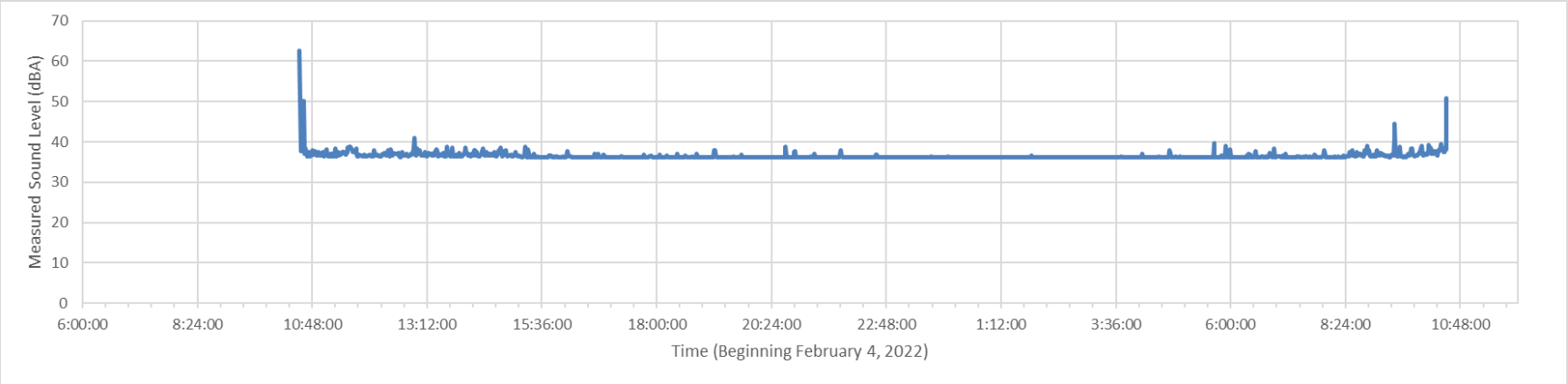

Measured Sound Level (dBA)
70
60
50
40
30
20
10
0
6:00:00
8:24:00
10:48:00
13:12:00
15:36:00
18:00:00
20:24:00
22:48:00
1:12:00
3:36:00
6:00:00
8:24:00
10:48:00
Time (Beginning February 3, 2022)

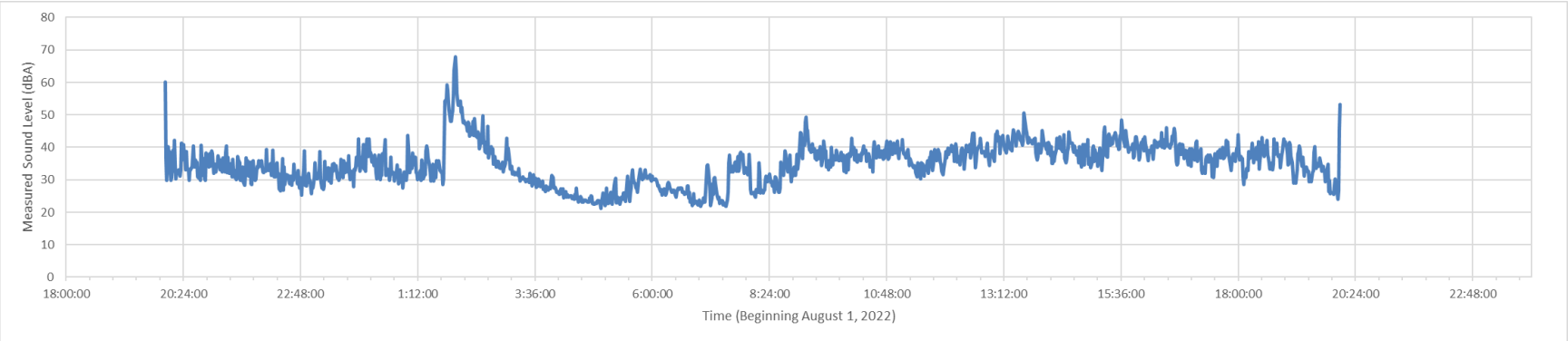

Measured Sound Level (dBA)
70
60
50
40
30
20
10
0
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
Time (Beginning May 14, 2022)


Measured Sound Level (dBA)
70
60
50
40
30
20
10
0
18:00:00
20:24:00
22:48:00
1:12:00
3:36:00
6:00:00
8:24:00
10:48:00
13:12:00
15:36:00
18:00:00
20:24:00
22:48:00
Time (Beginning August 2, 2022)

3.0 SITE

Date	Season	Daytime Sound Level, L_d	Evening Sound Level, L_e	Nighttime Sound Level, L_n	Day-Night Sound Level, L_{dn}
Feb 4-5, 2022	Winter	38.4	36.3	36.3	43.0
Aug 1-2, 2022	Summer	39.2	39.5	45.3	51.2


Measured Sound Level (dBA)
70
60
50
40
30
20
10
0
6:00:00
8:24:00
10:48:00
13:12:00
15:36:00
18:00:00
20:24:00
22:48:00
1:12:00
3:36:00
6:00:00
8:24:00
10:48:00
Time (Beginning February 4, 2022)


Measured Sound Level (dBA)
80
70
60
50
40
30
20
10
0
18:00:00
20:24:00
22:48:00
1:12:00
3:36:00
6:00:00
8:24:00
10:48:00
13:12:00
15:36:00
18:00:00
20:24:00
22:48:00
Time (Beginning August 1, 2022)

Appendix B

Terrestrial Environment Species Lists and Data

Appendix B

Table B.1 Terrestrial Component Waypoints

Survey	Plot Number	ELC Code	UTM Zone	UTM E	UTM N
Vegetation & ELC	ELC-01	MJ28	18 T	500565	5096407
Vegetation & ELC	ELC-02	MJ28	18 T	500725	5098045
Vegetation & ELC	ELC-03	FE32	18 T	500503	5098491
Vegetation & ELC	ELC-04	FE22	18 T	500418	5098500
Vegetation & ELC	ELC-05	MJ28	18 T	499751	5098508
Vegetation & ELC	ELC-06	MJ20	18 T	499681	5098773
Vegetation & ELC	ELC-07	FE32	18 T	499846	5098838
Vegetation & ELC	ELC-08	RT12	18 T	499926	5098731
Vegetation & ELC	ELC-09	RT12	18 T	500099	5098888
Vegetation & ELC	ELC-10	FE32	18 T	500081	5098634
Vegetation & ELC	ELC-11	FE32	18 T	500216	5098343
Vegetation & ELC	ELC-12	MJ22	18 T	499894	5098144
Vegetation & ELC	ELC-13	FE32	18 T	499570	5098235
Vegetation & ELC	ELC-14	RT12	18 T	499335	5098455
Vegetation & ELC	ELC-15	MJ28	18 T	499378	5098270
Vegetation & ELC	ELC-16	FE32	18 T	499335	5097960
Vegetation & ELC	ELC-17	FE31	18 T	499524	5097911
Vegetation & ELC	ELC-18	FE52	18 T	499601	5098049
Vegetation & ELC	ELC-20	FE32	18 T	499972	5097661
Vegetation & ELC	ELC-20A	FE32	18 T	500097	5097610
Vegetation & ELC	ELC-21	FE31	18 T	500082	5097800
Vegetation & ELC	ELC-22	FE32	18 T	500487	5097829
Vegetation & ELC	ELC-23	RT12	18 T	499058	5097472
Vegetation & ELC	ELC-24	MJ11	18 T	498892	5097385
Vegetation & ELC	ELC-25	FE32	18 T	499175	5096837
Vegetation & ELC	ELC-26	FE32	18 T	499220	5096613
Vegetation & ELC	ELC-27	FE52	18 T	499541	5096581
Vegetation & ELC	ELC-28	FE52	18 T	499526	5096549
Vegetation & ELC	ELC-29	RT12	18 T	499393	5096748
Vegetation & ELC	ELC-30	FE32	18 T	500445	5097402
Vegetation & ELC	ELC-31	FE52	18 T	500569	5097511
Vegetation & ELC	ELC-32	FE52	18 T	500594	5097653
Vegetation & ELC	ELC-33	FE32	18 T	500150	5098810
Vegetation & ELC	ELC-34	FE32	18 T	500424	5098302
Vegetation & ELC	ELC-35	FE32	18 T	499934	5099008

Appendix B

Table B.1 Terrestrial Component Waypoints

Survey	Plot Number	ELC Code	UTM Zone	UTM E	UTM N
Vegetation & ELC	ELC-36	MJ12	18 T	500002	5098339
Vegetation & ELC	YB6	FE32	18 T	499557	5095555
Vegetation & ELC	M10	FE22	18 T	499242	5097092
Vegetation & ELC	M11	FE32	18 T	499168	5097344
Vegetation & ELC	M8	FE32	18 T	499600	5096178
Vegetation & ELC	OH1	RT12	18 T	499427	5097034
Vegetation & ELC	YB1	FE32	18 T	499407	5097155
Vegetation & ELC	M1	MJ28	18 T	499403	5096925
Vegetation & ELC	T1	RS12	18 T	500169	5098018
Vegetation & ELC	M2	FE32	18 T	500425	5098106
Vegetation & ELC	YB2	FE32	18 T	499804	5096044
Vegetation & ELC	M9	FE32	18 T	500048	5095818
Vegetation & ELC	YB3	FE32	18 T	499984	5095585
Vegetation & ELC	YB4	FE32	18 T	500261	5095059
Vegetation & ELC	OH2	RT12	18 T	500256	5095306
Vegetation & ELC	YB5	RT13	18 T	499684	5095576
Vegetation & ELC	M7	FE32	18 T	499458	5096021
Vegetation & ELC	M6	FE32	18 T	499675	5095830
Vegetation & ELC	M2	FE32	18 T	500425	5098106
Vegetation & ELC	M5	FE52	18 T	500173	5097370
Vegetation & ELC	M4	FE23	18 T	500334	5097645
Vegetation & ELC	M3	FE32	18 T	500701	5097574
Avian Point Count Survey	PCS-1	—	18 T	499751	5098508
Avian Point Count Survey	PCS-2	—	18 T	499681	5098773
Avian Point Count Survey	PCS-3	—	18 T	499894	5098144
Avian Point Count Survey	PCS-4	—	18 T	499570	5098235
Avian Point Count Survey	PCS-5	—	18 T	499848	5097701
Avian Point Count Survey	PCS-6	—	18 T	499058	5097472
Avian Point Count Survey	PCS-7	—	18 T	498892	5097385
Avian Point Count Survey	PCS-8	—	18 T	500487	5097829
Avian Point Count Survey	PCS-9	—	18 T	500594	5097653
Avian Point Count Survey	PCS-10	—	18 T	500219	5097573
Time Constrained Stand Watch Avian Survey	TCS-1	—	18 T	499072	5097486

Appendix B

Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-1	Tree	Sugar Maple	*Acer saccharum*	40	23,32,36
ELC-1	Tree	American Beech	*Fagus grandifolia*	30	79, 33, 19
ELC-1	Tree	Yellow Birch	*Betula alleghaniensis*	5	10, 17, 11
ELC-2	Tree	Eastern Hemlock	*Tsuga canadensis*	30	–
ELC-2	Tree	Yellow Birch	*Betula alleghaniensis*	30	–
ELC-2	Tree	Sugar Maple	*Acer saccharum*	20	–
ELC-2	Tree	Striped Maple	*Acer pensylvanicum*	1	–
ELC-2	Tree	Paper Birch	*Betula papyrifera*	1	–
ELC-2	Tree	American Beech	*Fagus grandifolia*	1	–
ELC-2	Tree	Eastern White Cedar	*Thuja occidentalis*	1	–
ELC-3	Tree	American Beech	*Fagus grandifolia*	50	35, 15, 29
ELC-3	Tree	Eastern Hemlock	*Tsuga canadensis*	5	46, 36, 37
ELC-3	Tree	Sugar Maple	*Acer saccharum*	25	12, 31, 15
ELC-3	Tree	Yellow Birch	*Betula alleghaniensis*	5	23, 11, 18
ELC-3	Tree	Striped Maple	*Acer pensylvanicum*	2	14, 13, 8
ELC-4	Tree	Sugar Maple	*Acer saccharum*	70	29. 14, 28
ELC-4	Tree	American Basswood	*Tilia americana*	15	33,30, 28
ELC-4	Tree	American Beech	*Fagus grandifolia*	5	14, 20, 16
ELC-5	Tree	Eastern Hemlock	*Tsuga canadensis*	20	49, 19, 49
ELC-5	Tree	American Beech	*Fagus grandifolia*	40	25, 24, 17
ELC-5	Tree	Sugar Maple	*Acer saccharum*	30	21, 30, 32
ELC-5	Tree	Striped Maple	*Acer pensylvanicum*	5	NA
ELC-5	Tree	Yellow Birch	*Betula alleghaniensis*	1	30
ELC-6	Tree	American Beech	*Fagus grandifolia*	20	17, 16, 22
ELC-6	Tree	Sugar Maple	*Acer saccharum*	20	40, 23, 38
ELC-6	Tree	Striped Maple	*Acer pensylvanicum*	1	–
ELC-6	Tree	Black Ash	*Fraxinus nigra*	1	–
ELC-6	Tree	American Basswood	*Tilia americana*	1	–
ELC-6	Tree	Eastern Hemlock	*Tsuga canadensis*	1	–
ELC-7	Tree	Eastern Hemlock	*Tsuga canadensis*	35	21, 35, 33
ELC-7	Tree	American Beech	*Fagus grandifolia*	20	22, 25, 26
ELC-7	Tree	Sugar Maple	*Acer saccharum*	20	36, 20, 83
ELC-7	Tree	Striped Maple	*Acer pensylvanicum*	5	<10
ELC-8	Tree	Eastern Hemlock	*Tsuga canadensis*	75	39, 18, 32
ELC-8	Tree	Eastern White Cedar	*Thuja occidentalis*	7	30, 38, 47
ELC-8	Tree	Red Maple	*Acer rubrum*	7	14, 33, 27
ELC-8	Tree	American Beech	*Fagus grandifolia*	1	21
ELC-8	Tree	Striped Maple	*Acer pensylvanicum*	1	NA
ELC-8	Tree	Yellow Birch	*Betula alleghaniensis*	1	37
ELC-8	Tree	Paper Birch	*Betula papyrifera*	1	18
ELC-9	Tree	Eastern Hemlock	*Tsuga canadensis*	60	23, 32, 30
ELC-9	Tree	American Beech	*Fagus grandifolia*	20	15, 20, 30, 14
ELC-9	Tree	Striped Maple	*Acer pensylvanicum*	5	<10
ELC-9	Tree	Sugar Maple	*Acer saccharum*	5	38, 16
ELC-9	Tree	Yellow Birch	*Betula alleghaniensis*	1	22
ELC-9	Tree	Paper Birch	*Betula papyrifera*	1	24
ELC-10	Tree	Sugar Maple	*Acer saccharum*	30	35, 35, 18
ELC-10	Tree	American Beech	*Fagus grandifolia*	30	31, 39, 34
ELC-10	Tree	Striped Maple	*Acer pensylvanicum*	10	<10
ELC-10	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	10	21, 24
ELC-10	Tree	Yellow Birch	*Betula alleghaniensis*	2	26
ELC-10	Tree	Northern Red Oak	*Quercus rubra*	2	39
ELC-11	Tree	American Beech	*Fagus grandifolia*	15	-
ELC-11	Tree	Striped Maple	*Acer pensylvanicum*	10	NA

Appendix B

Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-11	Tree	Red Maple	*Acer rubrum*	5	59
ELC-11	Tree	Yellow Birch	*Betula alleghaniensis*	1	14, 18, 25
ELC-11	Tree	Eastern Hemlock	*Tsuga canadensis*	5	27, 31
ELC-11	Tree	American Basswood	*Tilia americana*	1	31
ELC-11	Tree	Sugar Maple	*Acer saccharum*	–	29, 31, 16
ELC-12	Tree	Yellow Birch	*Betula alleghaniensis*	75	8, 9, 11
ELC-12	Tree	Eastern Hemlock	*Tsuga canadensis*	4	20, 9, 4
ELC-12	Tree	Sugar Maple	*Acer saccharum*	1	14, 34, 8
ELC-12	Tree	Eastern White Cedar	*Thuja occidentalis*	1	1
ELC-12	Tree	Striped Maple	*Acer pensylvanicum*	1	9, 6
ELC-13	Tree	Sugar Maple	*Acer saccharum*	40	22, 10, 22, 48
ELC-13	Tree	American Beech	*Fagus grandifolia*	30	11, 10
ELC-13	Tree	Striped Maple	*Acer pensylvanicum*	–	4, 9
ELC-13	Tree	Yellow Birch	*Betula alleghaniensis*	1	10
ELC-13	Tree	Eastern Hemlock	*Tsuga canadensis*	10	38, 15
ELC-13	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	1	17
ELC-14	Tree	Eastern Hemlock	*Tsuga canadensis*	75	44, 15, 30
ELC-14	Tree	American Beech	*Fagus grandifolia*	8	14, 4, 6, 2
ELC-14	Tree	Striped Maple	*Acer pensylvanicum*	6	5, 2, 26
ELC-14	Tree	Yellow Birch	*Betula alleghaniensis*	1	19, 14, 29
ELC-14	Tree	Northern Red Oak	*Quercus rubra*	2	37, 28, 29
ELC-16	Tree	Sugar Maple	*Acer saccharum*	30	13, 17, 39
ELC-16	Tree	American Beech	*Fagus grandifolia*	30	16, 34, 9, 25
ELC-16	Tree	White Ash	*Fraxinus americana*	10	29, 15, 33
ELC-16	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	5	8
ELC-16	Tree	White Spruce	*Picea glauca*	1	6
ELC-16	Tree	Striped Maple	*Acer pensylvanicum*	10	3, 5
ELC-16	Tree	Northern Red Oak	*Quercus rubra*	1	27
ELC-16	Tree	Eastern Hemlock	*Tsuga canadensis*	10	40, 55, 46
ELC-18	Tree	Trembling Aspen	*Populus tremuloides*	2	29
ELC-18	Tree	American Basswood	*Tilia americana*	3	15, 49
ELC-18	Tree	Sugar Maple	*Acer saccharum*	20	29, 35, 37
ELC-18	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	20	33, 11, 7, 17
ELC-18	Tree	American Beech	*Fagus grandifolia*	18	14, 11
ELC-18	Tree	Northern Red Oak	*Quercus rubra*	20	11, 8, 5, 22
ELC-20	Tree	Sugar Maple	*Acer saccharum*	65	–
ELC-20	Tree	American Beech	*Fagus grandifolia*	6	–
ELC-20	Tree	Striped Maple	*Acer pensylvanicum*	2	–
ELC-20	Tree	Yellow Birch	*Betula alleghaniensis*	3	–
ELC-20A	Tree	Sugar Maple	*Acer saccharum*	80	59, 8, 47
ELC-20A	Tree	American Beech	*Fagus grandifolia*	14	34, 5, 11, 48
ELC-20A	Tree	Yellow Birch	*Betula alleghaniensis*	3	24, 17, 8
P5(ELC-21)	Tree	Yellow Birch	*Betula alleghaniensis*	25	6, 15, 19, 12, 11
P5(ELC-21)	Tree	Eastern Hemlock	*Tsuga canadensis*	5	60, 36, 29
P5(ELC-21)	Tree	Striped Maple	*Acer pensylvanicum*	10	4, 6, 85
P5(ELC-21)	Tree	American Beech	*Fagus grandifolia*	3	5, 2, 6
P5(ELC-21)	Tree	Sugar Maple	*Acer saccharum*	45	35, 48, 32
P5(ELC-21)	Tree	American Basswood	*Tilia americana*	3	39, 37
ELC-22	Tree	Sugar Maple	*Acer saccharum*	20	34
ELC-22	Tree	American Beech	*Fagus grandifolia*	20	3, 13, 29
ELC-22	Tree	Striped Maple	*Acer pensylvanicum*	15	4, 11
ELC-22	Tree	Yellow Birch	*Betula alleghaniensis*	20	5, 14, 28
ELC-22	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	5	11, 15, 19
ELC-22	Tree	American Basswood	*Tilia americana*	5	9, 15

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-22	Tree	Black Ash	*Fraxinus nigra*	2	7, 9
ELC-22	Tree	Paper Birch	*Betula papyrifera*	1	28, 13
ELC-23	Tree	Eastern Hemlock	*Tsuga canadensis*	30	5, 13, 51, 30
ELC-23	Tree	Red Maple	*Acer rubrum*	10	3, 24, 10
ELC-23	Tree	Black Cherry	*Prunus serotina*	2	45
ELC-23	Tree	Red Spruce	*Picea rubens*	2	33
ELC-23	Tree	Yellow Birch	*Betula alleghaniensis*	10	32, 24, 18
ELC-23	Tree	Paper Birch	*Betula papyrifera*	3	35, 28
ELC-23	Tree	Sugar Maple	*Acer saccharum*	2	30
ELC-23	Tree	American Beech	*Fagus grandifolia*	1	8
ELC-23	Tree	Striped Maple	*Acer pensylvanicum*	5	4, 2
ELC-23	Tree	Eastern White Cedar	*Thuja occidentalis*	5	33, 20
ELC-24	Tree	Red Maple	*Acer rubrum*	15	37, 55, 22, 10
ELC-24	Tree	Yellow Birch	*Betula alleghaniensis*	15	19, 29, 4, 26, 10
ELC-24	Tree	Eastern White Cedar	*Thuja occidentalis*	1	5
ELC-24	Tree	Eastern Hemlock	*Tsuga canadensis*	15	46, 37, 19, 71
ELC-24	Tree	Striped Maple	*Acer pensylvanicum*	10	3
ELC-24	Tree	American Beech	*Fagus grandifolia*	5	4, 7, 2
ELC-24	Tree	Sugar Maple	*Acer saccharum*	2	20
ELC-24	Tree	Paper Birch	*Betula papyrifera*	2	9
ELC-25	Tree	American Beech	*Fagus grandifolia*	15	5, 3, 7, 2
ELC-25	Tree	Sugar Maple	*Acer saccharum*	40	33, 31, 27
ELC-25	Tree	Eastern Hemlock	*Tsuga canadensis*	10	64, 12, 30
ELC-25	Tree	Yellow Birch	*Betula alleghaniensis*	2	10
P8(ELC-26)	Tree	Sugar Maple	*Acer saccharum*	–	–
P8(ELC-26)	Tree	Yellow Birch	*Betula alleghaniensis*	–	–
P8(ELC-26)	Tree	American Beech	*Fagus grandifolia*	–	–
ELC-27	Tree	American Beech	*Fagus grandifolia*	25	31, 25, 5, 11, 12, 9
ELC-27	Tree	American Basswood	*Tilia americana*	3	26, 8
ELC-27	Tree	Yellow Birch	*Betula alleghaniensis*	5	4, 38, 10
ELC-27	Tree	Sugar Maple	*Acer saccharum*	30	29, 29, 47, 3
ELC-27	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	20	14, 9, 12
ELC-27	Tree	Striped Maple	*Acer pensylvanicum*	5	2, 2.5
ELC-27	Tree	Northern Red Oak	*Quercus rubra*	1	5
P9(ELC-27)	Tree	American Beech	*Fagus grandifolia*	–	–
P9(ELC-27)	Tree	Striped Maple	*Acer pensylvanicum*	–	–
P9(ELC-27)	Tree	Sugar Maple	*Acer saccharum*	–	–
ELC-28	Tree	Yellow Birch	*Betula alleghaniensis*	1	33
ELC-28	Tree	Striped Maple	*Acer pensylvanicum*	5	9, 13, 7
ELC-28	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	20	4, 3, 14
ELC-28	Tree	Sugar Maple	*Acer saccharum*	60	25, 23, 15
ELC-28	Tree	American Beech	*Fagus grandifolia*	1	28
ELC-28	Tree	Black Cherry	*Prunus serotina*	1	19
ELC-29	Tree	Eastern Hemlock	*Tsuga canadensis*	55	14, 32, 17, 26, 24
ELC-29	Tree	American Beech	*Fagus grandifolia*	15	13, 25, 3, 38, 40
ELC-29	Tree	Striped Maple	*Acer pensylvanicum*	7	3, 5, 10
ELC-29	Tree	Yellow Birch	*Betula alleghaniensis*	10	35, 28, 30
ELC-29	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	1	47
ELC-30	Tree	Sugar Maple	*Acer saccharum*	87	52, 8, 15, 7
ELC-30	Tree	Yellow Birch	*Betula alleghaniensis*	1	10
ELC-30	Tree	Bigtooth Aspen	*Populus grandidentata*	1	16
ELC-30	Tree	American Beech	*Fagus grandifolia*	1	37
ELC-31	Tree	American Beech	*Fagus grandifolia*	10	7, 10, 8
ELC-31	Tree	Yellow Birch	*Betula alleghaniensis*	30	28, 11, 19

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-31	Tree	American Basswood	*Tilia americana*	20	16, 10, 6
ELC-31	Tree	Sugar Maple	*Acer saccharum*	20	46, 18, 23
ELC-31	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	10	11
ELC-32	Tree	Sugar Maple	*Acer saccharum*	40	4, 17, 36
ELC-32	Tree	American Beech	*Fagus grandifolia*	20	17, 12, 5
ELC-32	Tree	Yellow Birch	*Betula alleghaniensis*	10	8, 12, 22
ELC-32	Tree	Eastern Hop-Hornbeam	*Ostrya virginiana*	20	9, 9, 4, 12
ELC-32	Tree	American Basswood	*Tilia americana*	2	6
ELC-33	Tree	American Beech	*Fagus grandifolia*	38	5, 10, 26, 20, 3, 41
ELC-33	Tree	Sugar Maple	*Acer saccharum*	35	41, 44, 38
ELC-33	Tree	Eastern Hemlock	*Tsuga canadensis*	5	40, 41, 37
ELC-33	Tree	Striped Maple	*Acer pensylvanicum*	15	15, 7, 9
ELC-34	Tree	American Beech	*Fagus grandifolia*	55	12, 14, 27
ELC-34	Tree	Sugar Maple	*Acer saccharum*	20	40, 30, 22
ELC-34	Tree	Yellow Birch	*Betula alleghaniensis*	15	14, 20, 17
ELC-34	Tree	Striped Maple	*Acer pensylvanicum*	5	9
ELC-35	Tree	Sugar Maple	*Acer saccharum*	–	22
ELC-35	Tree	American Beech	*Fagus grandifolia*	–	15
ELC-36	Tree	Eastern Hemlock	*Tsuga canadensis*	35	33, 13, 42, 36
ELC-36	Tree	Sugar Maple	*Acer saccharum*	25	37, 15, 23, 39
ELC-36	Tree	Yellow Birch	*Betula alleghaniensis*	5	13, 3
ELC-36	Tree	Northern Red Oak	*Quercus rubra*	1	17
ELC-36	Tree	American Beech	*Fagus grandifolia*	1	11, 5
ELC-36	Tree	Striped Maple	*Acer pensylvanicum*	10	8
ELC-1	Subcanopy	American Beech	*Fagus grandifolia*	2	–
ELC-1	Subcanopy	Yellow Birch	*Betula alleghaniensis*	2	–
ELC-1	Subcanopy	Sugar Maple	*Acer saccharum*	2	–
ELC-1	Subcanopy	Red Spruce	*Picea rubens*	1	–
ELC-1	Subcanopy	Hobblebush	*Viburnum lantanoides*	1	–
ELC-2	Subcanopy	Striped Maple	*Acer pensylvanicum*	2	–
ELC-2	Subcanopy	Sugar Maple	*Acer saccharum*	2	–
ELC-2	Subcanopy	American Beech	*Fagus grandifolia*	1	–
ELC-2	Subcanopy	Hobblebush	*Viburnum lantanoides*	10	–
ELC-2	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	1	–
ELC-2	Subcanopy	Balsam Fir	*Abies balsamea*	1	–
ELC-3	Subcanopy	Striped Maple	*Acer pensylvanicum*	7.5	–
ELC-3	Subcanopy	Hobblebush	*Viburnum lantanoides*	15	–
ELC-3	Subcanopy	American Beech	*Fagus grandifolia*	7.5	–
ELC-4	Subcanopy	American Beech	*Fagus grandifolia*	50	–
ELC-4	Subcanopy	Sugar Maple	*Acer saccharum*	10	–
ELC-4	Subcanopy	Hobblebush	*Viburnum lantanoides*	10	–
ELC-4	Subcanopy	Rose Twisted-stalk	*Streptopus lanceolatus*	1	–
ELC-4	Subcanopy	Wild Sarsaparilla	*Aralia nudicaulis*	1	–
ELC-4	Subcanopy	Black Ash	*Fraxinus nigra*	1	–
ELC-4	Subcanopy	Striped Maple	*Acer pensylvanicum*	5	–
ELC-5	Subcanopy	Hobblebush	*Viburnum lantanoides*	10	–
ELC-5	Subcanopy	Sugar Maple	*Acer saccharum*	7	–
ELC-5	Subcanopy	Striped Maple	*Acer pensylvanicum*	7	–
ELC-6	Subcanopy	Striped Maple	*Acer pensylvanicum*	10	–
ELC-6	Subcanopy	Sugar Maple	*Acer saccharum*	10	–
ELC-6	Subcanopy	Red Raspberry	*Rubus idaeus*	10	–
ELC-6	Subcanopy	Pin Cherry	*Prunus pensylvanica*	1	–
ELC-6	Subcanopy	American Beech	*Fagus grandifolia*	2	–
ELC-7	Subcanopy	Balsam Fir	*Abies balsamea*	10	–

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-7	Subcanopy	Striped Maple	*Acer pensylvanicum*	10	–
ELC-7	Subcanopy	Pin Cherry	*Prunus pensylvanica*	1	–
ELC-7	Subcanopy	Northern Red Oak	*Quercus rubra*	1	–
ELC-7	Subcanopy	Whorled Wood Aster	*Oclemena acuminata*	2	–
ELC-7	Subcanopy	Hobblebush	*Viburnum lantanoides*	10	–
ELC-7	Subcanopy	Red Maple	*Acer rubrum*	5	–
ELC-8	Subcanopy	American Beech	*Fagus grandifolia*	10	–
ELC-8	Subcanopy	Sugar Maple	*Acer saccharum*	7	–
ELC-8	Subcanopy	Striped Maple	*Acer pensylvanicum*	15	–
ELC-8	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	7	–
ELC-8	Subcanopy	Hobblebush	*Viburnum lantanoides*	3	–
ELC-8	Subcanopy	Eastern White Cedar	*Thuja occidentalis*	3	–
ELC-8	Subcanopy	Wild Sarsaparilla	*Aralia nudicaulis*	3	–
ELC-9	Subcanopy	Striped Maple	*Acer pensylvanicum*	15	–
ELC-9	Subcanopy	American Beech	*Fagus grandifolia*	15	–
ELC-9	Subcanopy	Sugar Maple	*Acer saccharum*	7	–
ELC-9	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	7	–
ELC-9	Subcanopy	Red Maple	*Acer rubrum*	10	–
ELC-10	Subcanopy	Sugar Maple	*Acer saccharum*	20	–
ELC-10	Subcanopy	Striped Maple	*Acer pensylvanicum*	10	–
ELC-10	Subcanopy	American Beech	*Fagus grandifolia*	20	–
ELC-10	Subcanopy	Common Blackberry	*Rubus allegheniensis*	5	–
ELC-10	Subcanopy	Red Elderberry	*Sambucus racemosa*	2	–
ELC-10	Subcanopy	Spreading Dogbane	*Apocynum androsaemifolium*	2	–
ELC-11	Subcanopy	Hobblebush	*Viburnum lantanoides*	20	–
ELC-11	Subcanopy	American Beech	*Fagus grandifolia*	10	–
ELC-11	Subcanopy	Sugar Maple	*Acer saccharum*	5	–
ELC-11	Subcanopy	Striped Maple	*Acer pensylvanicum*	5	–
ELC-12	Subcanopy	Sugar Maple	*Acer saccharum*	5	–
ELC-12	Subcanopy	American Beech	*Fagus grandifolia*	5	–
ELC-12	Subcanopy	Balsam Fir	*Abies balsamea*	5	–
ELC-13	Subcanopy	Hobblebush	*Viburnum lantanoides*	10	–
ELC-13	Subcanopy	Striped Maple	*Acer pensylvanicum*	10	–
ELC-13	Subcanopy	American Beech	*Fagus grandifolia*	5	–
ELC-13	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	3	–
ELC-13	Subcanopy	Balsam Fir	*Abies balsamea*	3	–
ELC-13	Subcanopy	Sugar Maple	*Acer saccharum*	3	–
ELC-14	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	7	–
ELC-14	Subcanopy	Balsam Fir	*Abies balsamea*	2	–
ELC-14	Subcanopy	Striped Maple	*Acer pensylvanicum*	7	–
ELC-14	Subcanopy	American Beech	*Fagus grandifolia*	5	–
ELC-14	Subcanopy	Sugar Maple	*Acer saccharum*	5	–
ELC-14	Subcanopy	Hobblebush	*Viburnum lantanoides*	4	–
ELC-16	Subcanopy	Hobblebush	*Viburnum lantanoides*	5	–
ELC-16	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	2	–
ELC-16	Subcanopy	Striped Maple	*Acer pensylvanicum*	10	–
ELC-16	Subcanopy	American Beech	*Fagus grandifolia*	10	–
ELC-18	Subcanopy	American Beech	*Fagus grandifolia*	5	–
ELC-18	Subcanopy	Sugar Maple	*Acer saccharum*	15	–
ELC-18	Subcanopy	Northern Red Oak	*Quercus rubra*	5	–
ELC-18	Subcanopy	Striped Maple	*Acer pensylvanicum*	5	–
ELC-20	Subcanopy	American Spikenard	*Aralia racemosa*	–	–
ELC-20	Subcanopy	Striped Maple	*Acer pensylvanicum*	–	
ELC-20	Subcanopy	Red Elderberry	*Sambucus racemosa*	–	

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-20A	Subcanopy	American Spikenard	*Aralia racemosa*	5	–
P5(ELC-21)	Subcanopy	Balsam Fir	*Abies balsamea*	3	–
P5(ELC-21)	Subcanopy	Hobblebush	*Viburnum lantanoides*	15	–
P5(ELC-21)	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	5	–
P5(ELC-21)	Subcanopy	American Beech	*Fagus grandifolia*	7	–
ELC-22	Subcanopy	Hobblebush	*Viburnum lantanoides*	10	–
ELC-22	Subcanopy	Striped Maple	*Acer pensylvanicum*	10	–
ELC-22	Subcanopy	Sugar Maple	*Acer saccharum*	5	–
ELC-23	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	6	–
ELC-23	Subcanopy	Balsam Fir	*Abies balsamea*	5	–
ELC-23	Subcanopy	Hobblebush	*Viburnum lantanoides*	6	–
ELC-23	Subcanopy	Mountain Maple	*Acer spicatum*	1	–
ELC-23	Subcanopy	Yellow Birch	*Betula alleghaniensis*	2	–
ELC-23	Subcanopy	Striped Maple	*Acer pensylvanicum*	6	–
ELC-23	Subcanopy	Wild Sarsaparilla	*Aralia nudicaulis*	6	–
ELC-23	Subcanopy	Sugar Maple	*Acer saccharum*	2	–
ELC-23	Subcanopy	Red Maple	*Acer rubrum*	4	–
ELC-23	Subcanopy	Eastern White Cedar	*Thuja occidentalis*	1	–
ELC-23	Subcanopy	Northern Red Oak	*Quercus rubra*	1	–
ELC-24	Subcanopy	Hobblebush	*Viburnum lantanoides*	10	–
ELC-24	Subcanopy	Balsam Fir	*Abies balsamea*	5	–
ELC-24	Subcanopy	Striped Maple	*Acer pensylvanicum*	7	–
ELC-24	Subcanopy	Red Maple	*Acer rubrum*	2	–
ELC-24	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	2	–
ELC-25	Subcanopy	Hobblebush	*Viburnum lantanoides*	15	–
ELC-25	Subcanopy	American Fly Honeysuckle	*Lonicera canadensis*	2	–
ELC-25	Subcanopy	Sugar Maple	*Acer saccharum*	15	–
P8(ELC-26)	Subcanopy	Hobblebush	*Viburnum lantanoides*	–	–
P8(ELC-26)	Subcanopy	Striped Maple	*Acer pensylvanicum*	–	–
P8(ELC-26)	Subcanopy	American Beech	*Fagus grandifolia*	–	–
ELC-27	Subcanopy	American Beech	*Fagus grandifolia*	30	–
ELC-27	Subcanopy	Sugar Maple	*Acer saccharum*	20	–
ELC-27	Subcanopy	White Ash	*Fraxinus americana*	1	–
P9(ELC-27)	Subcanopy	Hobblebush	*Viburnum lantanoides*	–	–
P9(ELC-27)	Subcanopy	American Beech	*Fagus grandifolia*	–	–
ELC-28	Subcanopy	Hobblebush	*Viburnum lantanoides*	5	–
ELC-28	Subcanopy	Striped Maple	*Acer pensylvanicum*	3	–
ELC-28	Subcanopy	Eastern Hop-Hornbeam	*Ostrya virginiana*	7	–
ELC-29	Subcanopy	Hobblebush	*Viburnum lantanoides*	3	–
ELC-29	Subcanopy	American Beech	*Fagus grandifolia*	3	–
ELC-29	Subcanopy	Striped Maple	*Acer pensylvanicum*	5	–
ELC-29	Subcanopy	Eastern Hemlock	*Tsuga canadensis*	4	–
ELC-29	Subcanopy	Sugar Maple	*Acer saccharum*	2	–
ELC-31	Subcanopy	Striped Maple	*Acer pensylvanicum*	3	–
ELC-31	Subcanopy	Sugar Maple	*Acer saccharum*	5	–
ELC-31	Subcanopy	American Basswood	*Tilia americana*	1	–
ELC-31	Subcanopy	Hobblebush	*Viburnum lantanoides*	5	–
ELC-31	Subcanopy	American Beech	*Fagus grandifolia*	2	–
ELC-32	Subcanopy	Striped Maple	*Acer pensylvanicum*	2	–
ELC-32	Subcanopy	American Beech	*Fagus grandifolia*	3	–
ELC-32	Subcanopy	Sugar Maple	*Acer saccharum*	3	–
ELC-32	Subcanopy	Hobblebush	*Viburnum lantanoides*	2	–
ELC-32	Subcanopy	American Basswood	*Tilia americana*	1	–
ELC-33	Subcanopy	American Beech	*Fagus grandifolia*	10	–

Appendix B

Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-33	Subcanopy	Striped Maple	*Acer pensylvanicum*	4	–
ELC-34	Subcanopy	American Beech	*Fagus grandifolia*	15	–
ELC-34	Subcanopy	Sugar Maple	*Acer saccharum*	10	–
ELC-34	Subcanopy	Striped Maple	*Acer pensylvanicum*	4	–
ELC-34	Subcanopy	Hobblebush	*Viburnum lantanoides*	4	–
ELC-35	Subcanopy	Striped Maple	*Acer pensylvanicum*	–	–
ELC-35	Subcanopy	Hobblebush	*Viburnum lantanoides*	–	–
ELC-35	Subcanopy	American Beech	*Fagus grandifolia*	–	–
ELC-36	Subcanopy	Striped Maple	*Acer pensylvanicum*	10	–
ELC-36	Subcanopy	Balsam Fir	*Abies balsamea*	5	–
ELC-36	Subcanopy	American Beech	*Fagus grandifolia*	3	–
ELC-36	Subcanopy	Red Maple	*Acer rubrum*	1	–
ELC-36	Subcanopy	Hobblebush	*Viburnum lantanoides*	20	–
ELC-36	Subcanopy	Yellow Birch	*Betula alleghaniensis*	2	–
ELC-1	Groundcover	Lady Fern	*Athyrium filix-femina*	10	–
ELC-1	Groundcover	Drooping Woodreed	*Cinna latifolia*	1	–
ELC-1	Groundcover	Eastern Woodland Sedge	*Carex blanda*	1	–
ELC-1	Groundcover	American Spikenard	*Aralia racemosa*	1	–
ELC-1	Groundcover	Jack-in-the-pulpit	*Arisaema triphyllum*	2	–
ELC-1	Groundcover	Sweet White Violet	*Viola blanda*	1	–
ELC-1	Groundcover	Red Raspberry	*Rubus idaeus*	1	–
ELC-1	Groundcover	Sugar Maple	*Acer saccharum*	1	–
ELC-1	Groundcover	Whorled Wood Aster	*Oclemena acuminata*	5	–
ELC-1	Groundcover	Canada Mayflower	*Maianthemum canadense*	1	–
ELC-1	Groundcover	Common Blue Violet	*Viola sororia*	1	–
ELC-1	Groundcover	Bladder Sedge	*Carex intumescens*	1	–
ELC-1	Groundcover	Sensitive Fern	*Onoclea sensibilis*	1	–
ELC-2	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	10	–
ELC-2	Groundcover	Indian Cucumber root	*Medeola virginiana*	2	–
ELC-2	Groundcover	Canada Mayflower	*Maianthemum canadense*	5	–
ELC-2	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-2	Groundcover	Intermediate Wood Fern	*Dryopteris intermedia*	10	–
ELC-2	Groundcover	Dwarf Red Blackberry	*Rubus pubescens*	2	–
ELC-2	Groundcover	Eastern Woodland Sedge	*Carex blanda*	1	–
ELC-2	Groundcover	Fowl Bluegrass	*Poa palustris*	1	–
ELC-2	Groundcover	Bluebead Lily	*Clintonia borealis*	2	–
ELC-2	Groundcover	Shining Firmoss	*Huperzia lucidula*	3	–
ELC-2	Groundcover	Sweet White Violet	*Viola blanda*	2	–
ELC-2	Groundcover	Northern Red Oak	*Quercus rubra*	1	–
ELC-2	Groundcover	Mountain Woodsorrel	*Oxalis montana*	1	–
ELC-3	Groundcover	Intermediate Wood Fern	*Dryopteris intermedia*	10	–
ELC-3	Groundcover	Prickly Tree-clubmoss	*Dendrolycopodium dendroideum*	3	–
ELC-3	Groundcover	Prickly Tree-clubmoss	*Dendrolycopodium dendroideum*	3	–
ELC-3	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	1	–
ELC-3	Groundcover	Sugar Maple	*Acer saccharum*	3	–
ELC-3	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-3	Groundcover	American Beech	*Fagus grandifolia*	10	–
ELC-4	Groundcover	Whorled Wood Aster	*Oclemena acuminata*	3	–
ELC-4	Groundcover	American Beech	*Fagus grandifolia*	10	–
ELC-4	Groundcover	Ostrich Fern	*Matteuccia struthiopteris*	40	–
ELC-4	Groundcover	Marginal Wood Fern	*Dryopteris marginalis*	30	–
ELC-4	Groundcover	Quackgrass	*Elymus repens*	10	–
ELC-4	Groundcover	Fringed Sedge	*Carex crinita*	10	–
ELC-4	Groundcover	Tall Meadow-rue	*Thalictrum pubescens*	1	–

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-4	Groundcover	Sugar Maple	*Acer saccharum*	1	–
ELC-4	Groundcover	Dwarf Red Blackberry	*Rubus pubescens*	1	–
ELC-4	Groundcover	Fragrant Bedstraw	*Galium triflorum*	1	–
ELC-4	Groundcover	Northern Bugleweed	*Lycopus uniflorus*	1	–
ELC-4	Groundcover	Rough-stemmed Goldenrod	*Solidago rugosa*	1	–
ELC-4	Groundcover	Heartleaf Foamflower	*Tiarella cordifolia*	1	–
ELC-4	Groundcover	Sensitive Fern	*Onoclea sensibilis*	1	–
ELC-4	Groundcover	Touch-me-nots	Genus *Impatiens*	1	–
ELC-4	Groundcover	Eastern Rough Sedge	*Carex scabrata*	1	–
ELC-5	Groundcover	Threeleaf Goldthread	*Coptis trifolia*	10	–
ELC-5	Groundcover	Canada Mayflower	*Maianthemum canadense*	15	–
ELC-5	Groundcover	Indian Cucumber root	*Medeola virginiana*	5	–
ELC-5	Groundcover	Woodsorrel	Family Oxalidaceae	5	–
ELC-5	Groundcover	Interrupted Club-moss	*Spinulum annotinum*	5	–
ELC-5	Groundcover	Painted Trillium	*Trillium undulatum*	1	–
ELC-5	Groundcover	Balsam Fir	*Abies balsamea*	3	–
ELC-5	Groundcover	Hay-scented Fern	*Dennstaedtia punctilobula*	5	–
ELC-5	Groundcover	Northern Coralroot	*Corallorhiza trifida*	1	–
ELC-5	Groundcover	Bladder Sedge	*Carex intumescens*	1	–
ELC-5	Groundcover	Hobblebush	*Viburnum lantanoides*	15	–
ELC-5	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	1	–
ELC-6	Groundcover	Eastern Hay-scented Fern	*Dennstaedtia punctilobula*	–	–
ELC-6	Groundcover	Canada Mayflower	*Maianthemum canadense*	–	–
ELC-6	Groundcover	Sugar Maple	*Acer saccharum*	2	–
ELC-6	Groundcover	Bristle-stalk Sedge	*Carex leptelea*	5	–
ELC-6	Groundcover	Awl-fruit Sedge	*Carex stipata*	–	–
ELC-6	Groundcover	Painted Trillium	*Trillium undulatum*	1	–
ELC-6	Groundcover	Slender Path Rush	*Juncus tenuis*	1	–
ELC-6	Groundcover	Interrupted Club-moss	*Spinulum annotinum*	1	–
ELC-7	Groundcover	Flat-branched Tree Clubmoss	*Dendrolycopodium obscurum*	3	–
ELC-7	Groundcover	Indian Cucumber root	*Medeola virginiana*	–	–
ELC-7	Groundcover	Painted Trillium	*Trillium undulatum*	3	–
ELC-7	Groundcover	Sweet White Violet	*Viola blanda*	2	–
ELC-7	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	3	–
ELC-7	Groundcover	Bluebead Lily	*Clintonia borealis*	1	–
ELC-7	Groundcover	Bristle-stalk Sedge	*Carex leptelea*	3	–
ELC-7	Groundcover	Red Raspberry	*Rubus idaeus*	4	–
ELC-7	Groundcover	Partridgeberry	*Mitchella repens*	3	–
ELC-7	Groundcover	Pink Lady's Slipper	*Cypripedium acaule*	5	–
ELC-7	Groundcover	Sugar Maple	*Acer saccharum*	5	–
ELC-7	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-8	Groundcover	Threeleaf Goldthread	*Coptis trifolia*	7	–
ELC-8	Groundcover	Whorled Wood Aster	*Oclemena acuminata*	3	–
ELC-8	Groundcover	Red Maple	*Acer rubrum*	5	–
ELC-8	Groundcover	Canada Mayflower	*Maianthemum canadense*	3	–
ELC-8	Groundcover	Bluebead Lily	*Clintonia borealis*	3	–
ELC-8	Groundcover	Painted Trillium	*Trillium undulatum*	3	–
ELC-8	Groundcover	Black Cherry	*Prunus serotina*	1	–
ELC-9	Groundcover	American Fly Honeysuckle	*Lonicera canadensis*	1	–
ELC-9	Groundcover	Painted Trillium	*Trillium undulatum*	5	–
ELC-9	Groundcover	Indian Cucumber root	*Medeola virginiana*	3	–
ELC-9	Groundcover	Eastern Hemlock	*Tsuga canadensis*	2	–
ELC-9	Groundcover	Red Maple	*Acer rubrum*	3	–
ELC-9	Groundcover	Canada Mayflower	*Maianthemum canadense*	2	–

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-9	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	5	–
ELC-9	Groundcover	American Beech	*Fagus grandifolia*	5	–
ELC-10	Groundcover	Canada Mayflower	*Maianthemum canadense*	1	–
ELC-10	Groundcover	Sugar Maple	*Acer saccharum*	2	–
ELC-10	Groundcover	American Beech	*Fagus grandifolia*	2	–
ELC-10	Groundcover	Northern Red Oak	*Quercus rubra*	1	–
ELC-10	Groundcover	Eastern Hay-scented Fern	*Dennstaedtia punctilobula*	5	–
ELC-10	Groundcover	Red Raspberry	*Rubus idaeus*	2	–
ELC-10	Groundcover	Bladder Sedge	*Carex intumescens*	2	–
ELC-10	Groundcover	Drooping Woodreed	*Cinna latifolia*	2	–
ELC-10	Groundcover	Slender Path Rush	*Juncus tenuis*	2	–
ELC-10	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-11	Groundcover	Sugar Maple	*Acer saccharum*	2	–
ELC-11	Groundcover	Mapleleaf Viburnum	*Viburnum acerifolium*	2	–
ELC-11	Groundcover	Balsam Fir	*Abies balsamea*	2	–
ELC-11	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	2	–
ELC-11	Groundcover	Alpine Enchanter's Nightshade	*Circaea alpina*	2	–
ELC-11	Groundcover	Long Beech Fern	*Phegopteris connectilis*	5	–
ELC-11	Groundcover	Heartleaf Foamflower	*Tiarella cordifolia*	10	–
ELC-11	Groundcover	Jack-in-the-pulpit	*Arisaema triphyllum*	2	–
ELC-11	Groundcover	Unknown Sedge	Family Cyperaceae	2	–
ELC-11	Groundcover	Bluebead Lily	*Clintonia borealis*	2	–
ELC-11	Groundcover	Northern Bush Honeysuckle	*Diervilla lonicera*	3	–
ELC-11	Groundcover	Rattlesnake Roots	Genus *Nabalus*	2	–
ELC-12	Groundcover	Canadian Bunchberry	*Cornus canadensis*	5	–
ELC-12	Groundcover	Northern Starflower	*Lysimachia borealis*	4	–
ELC-12	Groundcover	Threeleaf Goldthread	*Coptis trifolia*	5	–
ELC-12	Groundcover	Ghost Pipe	*Monotropa uniflora*	2	–
ELC-12	Groundcover	Bluebead Lily	*Clintonia borealis*	4	–
ELC-12	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	1	–
ELC-12	Groundcover	Canada Mayflower	*Maianthemum canadense*	5	–
ELC-12	Groundcover	Painted Trillium	*Trillium undulatum*	4	–
ELC-12	Groundcover	Prickly Tree-clubmoss	*Dendrolycopodium dendroideum*	2	–
ELC-12	Groundcover	Prickly Tree-clubmoss	*Dendrolycopodium dendroideum*	2	–
ELC-13	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	2	–
ELC-13	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	1	–
ELC-13	Groundcover	Indian Cucumber root	*Medeola virginiana*	4	–
ELC-13	Groundcover	Northern Red Oak	*Quercus rubra*	5	–
ELC-13	Groundcover	American Fly Honeysuckle	*Lonicera canadensis*	3	–
ELC-13	Groundcover	Hobblebush	*Viburnum lantanoides*	6	–
ELC-13	Groundcover	American Beech	*Fagus grandifolia*	6	–
ELC-13	Groundcover	Red Raspberry	*Rubus idaeus*	2	–
ELC-13	Groundcover	Whorled Wood Aster	*Oclemena acuminata*	2	–
ELC-13	Groundcover	Clayton's Sweetroot	*Osmorhiza claytonii*	1	–
ELC-13	Groundcover	Selkirk's Violet	*Viola selkirkii*	3	–
ELC-13	Groundcover	Long Beech Fern	*Phegopteris connectilis*	3	–
ELC-13	Groundcover	Eastern White Pine	*Pinus strobus*	1	–
ELC-13	Groundcover	Red Spruce	*Picea rubens*	1	–
ELC-13	Groundcover	Eastern Rough Sedge	*Carex scabrata*	2	–
ELC-14	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	5	–
ELC-14	Groundcover	Sugar Maple	*Acer saccharum*	2	–
ELC-14	Groundcover	Striped Maple	*Acer pensylvanicum*	2	–
ELC-14	Groundcover	American Fly Honeysuckle	*Lonicera canadensis*	5	–
ELC-14	Groundcover	Painted Trillium	*Trillium undulatum*	1	–

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-14	Groundcover	Bluebead Lily	*Clintonia borealis*	2	–
ELC-14	Groundcover	Canadian Bunchberry	*Cornus canadensis*	1	–
ELC-14	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-14	Groundcover	Prickly Tree-clubmoss	*Dendrolycopodium dendroideum*	2	–
ELC-14	Groundcover	Prickly Tree-clubmoss	*Dendrolycopodium dendroideum*	2	–
ELC-14	Groundcover	Indian Cucumber root	*Medeola virginiana*	2	–
ELC-14	Groundcover	Northern Red Oak	*Quercus rubra*	1	–
ELC-14	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	3	–
ELC-16	Groundcover	Canada Mayflower	*Maianthemum canadense*	2	–
ELC-16	Groundcover	Red Trillium	*Trillium erectum*	5	–
ELC-16	Groundcover	Indian Cucumber root	*Medeola virginiana*	5	–
ELC-16	Groundcover	Hobblebush	*Viburnum lantanoides*	2	–
ELC-16	Groundcover	Flat-branched Tree Clubmoss	*Dendrolycopodium obscurum*	5	–
ELC-16	Groundcover	Sugar Maple	*Acer saccharum*	5	–
ELC-16	Groundcover	Partridgeberry	*Mitchella repens*	4	–
ELC-18	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	5	–
ELC-18	Groundcover	Whorled Wood Aster	*Oclemena acuminata*	3	–
ELC-18	Groundcover	Canada Mayflower	*Maianthemum canadense*	3	–
ELC-18	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	2	–
ELC-18	Groundcover	Sugar Maple	*Acer saccharum*	5	–
ELC-18	Groundcover	Unknown Sedge	Family Cyperaceae	3	–
ELC-20	Groundcover	Silvery Glade Fern	*Deoaria acrostichoides*	–	–
ELC-20	Groundcover	Sugar Maple	*Acer saccharum*	–	–
ELC-20	Groundcover	Selkirk's Violet	*Viola selkirkii*	–	–
ELC-20A	Groundcover	Red Trillium	*Trillium erectum*	3	–
ELC-20A	Groundcover	Clayton's Sweetroot	*Osmorhiza claytonii*	1	–
ELC-20A	Groundcover	Jack-in-the-pulpit	*Arisaema triphyllum*	1	–
ELC-20A	Groundcover	American Beech	*Fagus grandifolia*	2	–
ELC-20A	Groundcover	Sugar Maple	*Acer saccharum*	2	–
P5(ELC-21)	Groundcover	Red Trillium	*Trillium erectum*	4	–
P5(ELC-21)	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	4	–
P5(ELC-21)	Groundcover	Canada Mayflower	*Maianthemum canadense*	2	–
ELC-22	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	2	–
ELC-22	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	2	–
ELC-22	Groundcover	Sweet White Violet	*Viola blanda*	2	–
ELC-22	Groundcover	Clayton's Sweetroot	*Osmorhiza claytonii*	1	–
ELC-22	Groundcover	American Spikenard	*Aralia racemosa*	5	–
ELC-22	Groundcover	Eastern Woodland Sedge	*Carex blanda*	2	–
ELC-22	Groundcover	Meadow Horsetail	*Equisetum pratense*	1	–
ELC-22	Groundcover	Three-leaved Rattlesnake Root	*Nabalus trifoliolatus*	2	–
ELC-22	Groundcover	Canada Mayflower	*Maianthemum canadense*	4	–
ELC-22	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-22	Groundcover	Partridgeberry	*Mitchella repens*	1	–
ELC-22	Groundcover	Sugar Maple	*Acer saccharum*	4	–
ELC-22	Groundcover	Shinleaf	*Pyrola elliptica*	2	–
ELC-22	Groundcover	Interrupted Fern	*Osmunda claytoniana*	2	–
ELC-23	Groundcover	Canadian Bunchberry	*Cornus canadensis*	2	–
ELC-23	Groundcover	Bluebead Lily	*Clintonia borealis*	4	–
ELC-23	Groundcover	Mountain Woodsorrel	*Oxalis montana*	5	–
ELC-23	Groundcover	Heartleaf Foamflower	*Tiarella cordifolia*	2	–
ELC-23	Groundcover	Canada Mayflower	*Maianthemum canadense*	5	–
ELC-23	Groundcover	Painted Trillium	*Trillium undulatum*	2	–
ELC-23	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	2	–
ELC-23	Groundcover	Indian Cucumber root	*Medeola virginiana*	2	–

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Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-23	Groundcover	Threeleaf Goldthread	*Coptis trifolia*	2	–
ELC-24	Groundcover	Partridgeberry	*Mitchella repens*	1	–
ELC-24	Groundcover	Bluebead Lily	*Clintonia borealis*	5	–
ELC-24	Groundcover	Red Trillium	*Trillium erectum*	3	–
ELC-24	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-24	Groundcover	Canada Mayflower	*Maianthemum canadense*	6	–
ELC-24	Groundcover	Indian Cucumber root	*Medeola virginiana*	2	–
ELC-24	Groundcover	American Fly Honeysuckle	*Lonicera canadensis*	3	–
ELC-24	Groundcover	Canadian Bunchberry	*Cornus canadensis*	2	–
ELC-24	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	7	–
ELC-24	Groundcover	Sugar Maple	*Acer saccharum*	2	–
ELC-24	Groundcover	Interrupted Fern	*Osmunda claytoniana*	5	–
ELC-24	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	1	–
ELC-24	Groundcover	Sweet White Violet	*Viola blanda*	2	–
ELC-24	Groundcover	Eastern Woodland Sedge	*Carex blanda*	2	–
ELC-25	Groundcover	Sugar Maple	*Acer saccharum*	5	–
ELC-25	Groundcover	Heartleaf Foamflower	*Tiarella cordifolia*	3	–
ELC-25	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	1	–
ELC-25	Groundcover	Intermediate Wood Fern	*Dryopteris intermedia*	15	–
ELC-25	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	10	–
ELC-25	Groundcover	Bluebead Lily	*Clintonia borealis*	3	–
ELC-25	Groundcover	Canadian Bunchberry	*Cornus canadensis*	2	–
ELC-25	Groundcover	Dwarf Red Blackberry	*Rubus pubescens*	2	–
P8(ELC-26)	Groundcover	Sugar Maple	*Acer saccharum*	30	–
ELC-27	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	1	–
ELC-27	Groundcover	Sugar Maple	*Acer saccharum*	10	–
ELC-27	Groundcover	Common Blackberry	*Rubus allegheniensis*	2	–
ELC-27	Groundcover	Northern Dewberry	*Rubus flagellaris*	1	–
ELC-27	Groundcover	Red Trillium	*Trillium erectum*	1	–
P9(ELC-27)	Groundcover	Hobblebush	*Viburnum lantanoides*	–	–
P9(ELC-27)	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	–	–
P9(ELC-27)	Groundcover	Canada Mayflower	*Maianthemum canadense*	–	–
ELC-28	Groundcover	Eastern Hay-scented Fern	*Dennstaedtia punctilobula*	25	–
ELC-28	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	15	–
ELC-28	Groundcover	Canada Mayflower	*Maianthemum canadense*	5	–
ELC-28	Groundcover	American Fly Honeysuckle	*Lonicera canadensis*	2	–
ELC-28	Groundcover	Sugar Maple	*Acer saccharum*	5	–
ELC-28	Groundcover	Hobblebush	*Viburnum lantanoides*	4	–
ELC-28	Groundcover	Bladder Sedge	*Carex intumescens*	2	–
ELC-28	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	3	–
ELC-28	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-28	Groundcover	Painted Trillium	*Trillium undulatum*	1	–
ELC-28	Groundcover	Eastern Hop-Hornbeam	*Ostrya virginiana*	2	–
ELC-29	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-29	Groundcover	Bluebead Lily	*Clintonia borealis*	3	–
ELC-29	Groundcover	Northern Red Oak	*Quercus rubra*	2	–
ELC-29	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	5	–
ELC-29	Groundcover	American Fly Honeysuckle	*Lonicera canadensis*	2	–
ELC-29	Groundcover	Painted Trillium	*Trillium undulatum*	2	–
ELC-29	Groundcover	Marginal Wood Fern	*Dryopteris marginalis*	1	–
ELC-29	Groundcover	Rock Polypody	*Polypodium virginianum*	1	–
ELC-30	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	4	–
ELC-30	Groundcover	Rattlesnake Fern	*Botrypus virginianus*	2	–
ELC-30	Groundcover	Sweet White Violet	*Viola blanda*	3	–

Appendix B

Table B.2 Plant Inventories

Site	Canopy Layer	Common Name	Scientific Name	Rough Cover (%)	CBH (cm)
ELC-30	Groundcover	Jack-in-the-pulpit	*Arisaema triphyllum*	1	–
ELC-30	Groundcover	Clayton's Sweetroot	*Osmorhiza claytonii*	2	–
ELC-30	Groundcover	Eastern Woodland Sedge	*Carex blanda*	2	–
ELC-30	Groundcover	American Beech	*Fagus grandifolia*	1	–
ELC-30	Groundcover	Cinnamon Fern	*Osmundastrum cinnamomeum*	4	–
ELC-30	Groundcover	Red Elderberry	*Sambucus racemosa*	1	–
ELC-30	Groundcover	Northern Maidenhair Fern	*Adiantum pedatum*	1	–
ELC-31	Groundcover	Rose Twisted-stalk	*Streptopus lanceolatus*	4	–
ELC-31	Groundcover	Sugar Maple	*Acer saccharum*	5	–
ELC-31	Groundcover	Purple Trillium	*Trillium recurvatum*	2	–
ELC-31	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	3	–
ELC-31	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-31	Groundcover	Three-leaved Rattlesnake Root	*Nabalus trifoliolatus*	1	–
ELC-31	Groundcover	Marginal Wood Fern	*Dryopteris marginalis*	5	–
ELC-31	Groundcover	Northern Maidenhair Fern	*Adiantum pedatum*	1	–
ELC-31	Groundcover	Sweet White Violet	*Viola blanda*	1	–
ELC-31	Groundcover	Hobblebush	*Viburnum lantanoides*	3	–
ELC-32	Groundcover	Long-stalked Sedge	*Carex pedunculata*	2	–
ELC-32	Groundcover	Painted Trillium	*Trillium undulatum*	3	–
ELC-32	Groundcover	Red Trillium	*Trillium erectum*	3	–
ELC-32	Groundcover	Broad-leaved Helleborine	*Epipactis helleborine*	1	–
ELC-32	Groundcover	American Spikenard	*Aralia racemosa*	3	–
ELC-32	Groundcover	American Beech	*Fagus grandifolia*	4	–
ELC-32	Groundcover	Rattlesnake Fern	*Botrypus virginianus*	1	–
ELC-32	Groundcover	Whorled Wood Aster	*Oclemena acuminata*	2	–
ELC-33	Groundcover	Hobblebush	*Viburnum lantanoides*	5	–
ELC-33	Groundcover	American Beech	*Fagus grandifolia*	5	–
ELC-33	Groundcover	Sugar Maple	*Acer saccharum*	3	–
ELC-33	Groundcover	Indian Cucumber root	*Medeola virginiana*	3	–
ELC-33	Groundcover	Painted Trillium	*Trillium undulatum*	1	–
ELC-33	Groundcover	Red Trillium	*Trillium erectum*	1	–
ELC-34	Groundcover	American Beech	*Fagus grandifolia*	6	–
ELC-34	Groundcover	Sugar Maple	*Acer saccharum*	5	–
ELC-34	Groundcover	Hobblebush	*Viburnum lantanoides*	4	–
ELC-34	Groundcover	Striped Maple	*Acer pensylvanicum*	3	–
ELC-34	Groundcover	Hay-scented Fern	*Dennstaedtia punctilobula*	4	–
ELC-34	Groundcover	Red Trillium	*Trillium erectum*	1	–
ELC-34	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-34	Groundcover	Balsam Fir	*Abies balsamea*	1	–
ELC-35	Groundcover	Whorled Wood Aster	*Oclemena acuminata*	–	–
ELC-35	Groundcover	Red Maple	*Acer rubrum*	–	–
ELC-36	Groundcover	Hobblebush	*Viburnum lantanoides*	4	–
ELC-36	Groundcover	Wild Sarsaparilla	*Aralia nudicaulis*	5	–
ELC-36	Groundcover	Indian Cucumber root	*Medeola virginiana*	1	–
ELC-36	Groundcover	Bluebead Lily	*Clintonia borealis*	4	–
ELC-36	Groundcover	Northern Starflower	*Lysimachia borealis*	2	–
ELC-36	Groundcover	Sugar Maple	*Acer saccharum*	4	–
ELC-36	Groundcover	Striped Maple	*Acer pensylvanicum*	4	–
ELC-36	Groundcover	Canadian Bunchberry	*Cornus canadensis*	3	–
ELC-36	Groundcover	Mountain Woodsorrel	*Oxalis montana*	2	–
ELC-36	Groundcover	Goldthread	Genus *Coptis*	2	–
ELC-36	Groundcover	Ghost Pipe	*Monotropa uniflora*	1	–
ELC-36	Groundcover	Robin Runaway	*Rubus repens*	1	–

Appendix B

Table B.3 Tree Species Growth Factors

Tree Species	Growth Factor
American Beech	6
Ash	4
Balsam Poplar	2
Basswood	3
Black Cherry	5
Black Walnut	4.5
Blue Spruce	4.5
Butternut	4.5
Bur Oak	5
Eastern Cottowood	2
Eastern Hemlock	7
Elm	4
Horse Chestnut	8
Large-toothed Aspen	2
Locust	3
Manitoba Maple	2
Northern Catalpa	2.5
Norway Maple	4.5
Paper Birch	5
Red Maple	4.5
Red Oak	4
Red Pine	5.5
Silver Maple	3
Sugar Maple	5.5
Sycamore	4
Tamarack	3.9
Tulip Tree	3
White Cedar	1.6
White Oak	5
White Pine	5
White Spruce	1.9
Willow	2
Yellow Birch	3.5

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Table B.4 Forest Age

Site	Common Name	Scientific Name	Growth Factor	CBH (cm)	DBH (cm)	Tree Age	Min Forest Age	Max Forest Age	Age Clase Code	Notes
ELC-01	Sugar Maple	*Acer saccharum*	5.5	23	7	15.9	4.4	59.4	3 (41-60 Years)	
				32	10	22.1				
				36	11	24.8				
	American Beech	*Fagus grandifolia*	6.0	79	25	59.4				
				33	11	24.8				
				19	6	14.3				
	Yellow Birch	*Betula alleghaniensis*	3.5	10	3	4.4				
				17	5	7.5				
				11	4	4.8				
ELC-03	American Beech	*Fagus grandifolia*	6.0	35	11	26.3	4.8	31.7	2 (21-40 Years)	
				15	5	11.3				
				29	9	21.8				
	Sugar Maple	*Acer saccharum*	5.5	46	15	31.7				
				36	11	24.8				
				37	12	25.5				
	Yellow Birch	*Betula alleghaniensis*	3.5	23	7	10.1				
				11	4	4.8				
				18	6	7.9				
ELC-04	Sugar Maple	*Acer saccharum*	5.5	29	9	20.0	9.6	20.0	1 (1-20 Years)	
				14	4	9.6				
				28	9	19.3				
	American Beech	*Fagus grandifolia*	6.0	14	4	10.5				
				20	6	15.0				
				16	5	12.0				
ELC-05	American Beech	*Fagus grandifolia*	6.0	25	8	18.8	12.8	22.1	2 (21-40 Years)	
				24	8	18.0				
				17	5	12.8				
	Sugar Maple	*Acer saccharum*	5.5	21	7	14.5				
				30	10	20.7				
				32	10	22.1				
	Yellow Birch	*Betula alleghaniensis*	3.5	30	10	13.2				
ELC-06	American Beech	*Fagus grandifolia*	6.0	17	5	12.8	12.0	27.6	2 (21-40 Years)	
				16	5	12.0				
				22	7	16.5				
	Sugar Maple	*Acer saccharum*	5.5	40	13	27.6				
				23	7	15.9				
				38	12	26.2				
ELC-07	American Beech	*Fagus grandifolia*	6.0	22	7	16.5	13.8	57.2	3 (41-60 Years)	
				25	8	18.8				
				26	8	19.5				
	Sugar Maple	*Acer saccharum*	5.5	36	11	24.8				
				20	6	13.8				
				83	26	57.2				

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Table B.4 Forest Age

Site	Common Name	Scientific Name	Growth Factor	CBH (cm)	DBH (cm)	Tree Age	Min Forest Age	Max Forest Age	Age Clase Code	Notes
ELC-08	American Beech	*Fagus grandifolia*	6.0	21	7	15.8	7.9	18.6	1 (1-20 Years)	
	Red Maple	*Acer rubrum*	4.5	14	4	7.9				
				33	11	18.6				
				27	9	15.2				
	Yellow Birch	*Betula alleghaniensis*	3.5	27	9	11.8				
ELC-09	Yellow Birch	*Betula alleghaniensis*	3.5	22	7	9.6	9.6	26.2	2 (21-40 Years)	
	American Beech	*Fagus grandifolia*	6.0	15	5	11.3				
				20	6	15.0				
				30	10	22.6				
				25	8	18.8				
	Sugar Maple	*Acer saccharum*	5.5	38	12	26.2				
				16	5	11.0				
ELC-10	Sugar Maple	*Acer saccharum*	5.5	35	11	24.1	11.4	29.3	2 (21-40 Years)	
				35	11	24.1				
				18	6	12.4				
	American Beech	*Fagus grandifolia*	6.0	31	10	23.3				
				39	12	29.3				
				34	11	25.6				
	Yellow Birch	*Betula alleghaniensis*	3.5	26	8	11.4				
ELC-11	Red Maple	*Acer rubrum*	4.5	59	19	33.3	6.1	33.3	2 (21-40 Years)	
	Yellow Birch	*Betula alleghaniensis*	3.5	14	4	6.1				
				18	6	7.9				
				25	8	11.0				
ELC-12	Sugar Maple	*Acer saccharum*	5.5	14	4	9.6	3.5	23.4	2 (21-40 Years)	
				34	11	23.4				
				8	3	5.5				
	Yellow Birch	*Betula alleghaniensis*	3.5	8	3	3.5				
				9	3	3.9				
				11	4	4.8				
ELC-13	Sugar Maple	*Acer saccharum*	5.5	22	7	15.2	4.4	33.1	2 (21-40 Years)	
				10	3	6.9				
				22	7	15.2				
				48	15	33.1				
	American Beech	*Fagus grandifolia*	6.0	11	4	8.3				
				10	3	7.5				
	Yellow Birch	*Betula alleghaniensis*	3.5	10	3	4.4				
ELC-14	American Beech	*Fagus grandifolia*	6.0	14	4	10.5	1.5	12.7	1 (1-20 Years)	
				4	1	3.0				
				6	2	4.5				
				2	1	1.5				
	Yellow Birch	*Betula alleghaniensis*	3.5	19	6	8.3				
				14	4	6.1				
				29	9	12.7				

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Table B.4 Forest Age

Site	Common Name	Scientific Name	Growth Factor	CBH (cm)	DBH (cm)	Tree Age	Min Forest Age	Max Forest Age	Age Clase Code	Notes
ELC-16	Sugar Maple	*Acer saccharum*	5.5	13	4	9.0	6.8	26.9	2 (21-40 Years)	
				17	5	11.7				
				39	12	26.9				
	American Beech	*Fagus grandifolia*	6.0	16	5	12.0				
				34	11	25.6				
				9	3	6.8				
				25	8	18.8				
ELC-18	Sugar Maple	*Acer saccharum*	5.5	29	9	20.0	8.3	25.5	2 (21-40 Years)	
				35	11	24.1				
				37	12	25.5				
	American Beech	*Fagus grandifolia*	6.0	14	4	10.5				
				11	4	8.3				
ELC-19	—	—	—	—	—	—	—	—	—	Area significantly disturbed/logged.
ELC-20A	Sugar Maple	*Acer saccharum*	5.5	59	19	40.7	3.5	40.7	3 (41-60 Years)	
				8	3	5.5				
				47	15	32.4				
	American Beech	*Fagus grandifolia*	6.0	34	11	25.6				
				5	2	3.8				
				11	4	8.3				
				48	15	36.1				
	Yellow Birch	*Betula alleghaniensis*	3.5	24	8	10.5				
				17	5	7.5				
				8	3	3.5				
ELC-21	Yellow Birch	*Betula alleghaniensis*	3.5	6	2	2.6	1.5	33.1	2 (21-40 Years)	Area significantly disturbed/logged.
				15	5	6.6				
				19	6	8.3				
				12	4	5.3				
				11	4	4.8				
	American Beech	*Fagus grandifolia*	6.0	5	2	3.8				
				2	1	1.5				
				6	2	4.5				
	Sugar Maple	*Acer saccharum*	5.5	35	11	24.1				
				48	15	33.1				
				32	10	22.1				
ELC-22	Sugar Maple	*Acer saccharum*	5.5	34	11	23.4	2.2	23.4	2 (21-40 Years)	
	American Beech	*Fagus grandifolia*	6.0	3	1	2.3				
				13	4	9.8				
				29	9	21.8				
	Yellow Birch	*Betula alleghaniensis*	3.5	5	2	2.2				
				14	4	6.1				
				28	9	12.3				
ELC-23	Red Maple	*Acer rubrum*	4.5	3	1	1.7	1.7	14.0	1 (1-20 Years)	
				24	8	13.5				
				10	3	5.6				
	Yellow Birch	*Betula alleghaniensis*	3.5	32	10	14.0				
				24	8	10.5				
				18	6	7.9				

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Table B.4 Forest Age

Site	Common Name	Scientific Name	Growth Factor	CBH (cm)	DBH (cm)	Tree Age	Min Forest Age	Max Forest Age	Age Clase Code	Notes
ELC-24	Red Maple	*Acer rubrum*	4.5	37	12	20.9	1.5	31.0	2 (21-40 Years)	
				55	18	31.0				
				22	7	12.4				
				10	3	5.6				
	Yellow Birch	*Betula alleghaniensis*	3.5	19	6	8.3				
				29	9	12.7				
				4	1	1.8				
				26	8	11.4				
				10	3	4.4				
	American Beech	*Fagus grandifolia*	6.0	4	1	3.0				
				7	2	5.3				
				2	1	1.5				
ELC-25	American Beech	*Fagus grandifolia*	6.0	5	2	3.8	1.5	238.4	8 (141-250 Years)	
				317	101	238.4				
				2	1	1.5				
	Sugar Maple	*Acer saccharum*	5.5	33	11	22.7				
				31	10	21.4				
				27	9	18.6				
	Yellow Birch	*Betula alleghaniensis*	3.5	10	3	4.4				
ELC-26	—	—	—	—	—	—	—	—	—	Area significantly disturbed/logged.
ELC-27	American Beech	*Fagus grandifolia*	6.0	31	10	23.3	1.8	32.4	2 (21-40 Years)	
				25	8	18.8				
				5	2	3.8				
				11	4	8.3				
				12	4	9.0				
				9	3	6.8				
	Yellow Birch	*Betula alleghaniensis*	3.5	4	1	1.8				
				38	12	16.7				
				10	3	4.4				
	Sugar Maple	*Acer saccharum*	5.5	29	9	20.0				
				29	9	20.0				
				47	15	32.4				
				3	1	2.1				
ELC-28	Yellow Birch	*Betula alleghaniensis*	3.5	33	11	14.5	10.3	21.1	2 (21-40 Years)	
	Sugar Maple	*Acer saccharum*	5.5	25	8	17.2				
				23	7	15.9				
				15	5	10.3				
	American Beech	*Fagus grandifolia*	6.0	28	9	21.1				
ELC-29	American Beech	*Fagus grandifolia*	6.0	13	4	9.8	2.3	30.1	2 (21-40 Years)	
				25	8	18.8				
				3	1	2.3				
				38	12	28.6				
				40	13	30.1				
	Yellow Birch	*Betula alleghaniensis*	3.5	35	11	15.4				
				28	9	12.3				
				30	10	13.2				

Appendix B

Table B.4 Forest Age

Site	Common Name	Scientific Name	Growth Factor	CBH (cm)	DBH (cm)	Tree Age	Min Forest Age	Max Forest Age	Age Clase Code	Notes
ELC-30	Sugar Maple	*Acer saccharum*	5.5	52	17	35.8	4.4	35.8	2 (21-40 Years)	
				8	3	5.5				
				15	5	10.3				
				7	2	4.8				
	Yellow Birch	*Betula alleghaniensis*	3.5	10	3	4.4				
	American Beech	*Fagus grandifolia*	6.0	37	12	27.8				
ELC-31	American Beech	*Fagus grandifolia*	6.0	7	2	5.3	4.8	31.7	2 (21-40 Years)	
				10	3	7.5				
				8	3	6.0				
	Yellow Birch	*Betula alleghaniensis*	3.5	28	9	12.3				
				11	4	4.8				
				19	6	8.3				
	Sugar Maple	*Acer saccharum*	5.5	46	15	31.7				
				18	6	12.4				
				23	7	15.9				
ELC-32	Sugar Maple	*Acer saccharum*	5.5	4	1	2.8	2.8	24.8	2 (21-40 Years)	
				17	5	11.7				
				36	11	24.8				
	American Beech	*Fagus grandifolia*	6.0	17	5	12.8				
				12	4	9.0				
				5	2	3.8				
	Yellow Birch	*Betula alleghaniensis*	3.5	8	3	3.5				
				12	4	5.3				
				22	7	9.6				
ELC-33	American Beech	*Fagus grandifolia*	6.0	5	2	3.8	3.8	30.8	2 (21-40 Years)	
				10	3	7.5				
				26	8	19.5				
				20	6	15.0				
				5	2	3.8				
				41	13	30.8				
	Sugar Maple	*Acer saccharum*	5.5	41	13	28.3				
				44	14	30.3				
				38	12	26.2				
ELC-34	American Beech	*Fagus grandifolia*	6.0	12	4	9.0	6.1	27.6	2 (21-40 Years)	
				14	4	10.5				
				27	9	20.3				
	Sugar Maple	*Acer saccharum*	5.5	40	13	27.6				
				30	10	20.7				
				22	7	15.2				
	Yellow Birch	*Betula alleghaniensis*	3.5	14	4	6.1				
				20	6	8.8				
				17	5	7.5				
ELC-35	American Beech	*Fagus grandifolia*	6.0	15	5	11.3	11.3	11.3	1 (1-20 Years)	Area significantly disturbed/logged.

Appendix B

Table B.4 Forest Age

Site	Common Name	Scientific Name	Growth Factor	CBH (cm)	DBH (cm)	Tree Age	Min Forest Age	Max Forest Age	Age Clase Code	Notes
ELC-36	Sugar Maple	*Acer saccharum*	5.5	37	12	25.5	1.3	26.9	2 (21-40 Years)	
				15	5	10.3				
				23	7	15.9				
				39	12	26.9				
	Yellow Birch	*Betula alleghaniensis*	3.5	13	4	5.7				
				3	1	1.3				
	American Beech	*Fagus grandifolia*	6.0	11	4	8.3				
				5	2	3.8				
YB6	—	—	—	—	—	—	50	80	4 (61-80 Years)	
M10	—	—	—	—	—	—	50	80	4 (61-80 Years)	Highly fragmented area, old and new roads, area currently being logged.
M11	—	—	—	—	—	—	30	60	3 (40-60 Years)	
M8	—	—	—	—	—	—	50	80	4 (61-80 Years)	
OH1	—	—	—	—	—	—	80	80	4 (61-80 Years)	
YB1	—	—	—	—	—	—	50	50	3 (40-60 Years)	
M1	—	—	—	—	—	—	50	80	4 (61-80 Years)	
T1	—	—	—	—	—	—	20	200	8 (141-250 Years)	
M2	—	—	—	—	—	—	30	30	2 (21-40 Years)	
YB2	—	—	—	—	—	—	50	50	3 (40-60 Years)	
M9	—	—	—	—	—	—	40	150	8 (141-250 Years)	
YB3	—	—	—	—	—	—	80	150	8 (141-250 Years)	
YB4	—	—	—	—	—	—	50	150	8 (141-250 Years)	
OH2	—	—	—	—	—	—	50	150	8 (141-250 Years)	
YB5	—	—	—	—	—	—	50	200	8 (141-250 Years)	
M7	—	—	—	—	—	—	80	100	5 (81-100 Years)	Forest fragmentation at this site.
M6	—	—	—	—	—	—	50	80	4 (61-80 Years)	
M2	—	—	—	—	—	—	30	30	2 (21-40 Years)	
M5	—	—	—	—	—	—	80	100	5 (81-100 Years)	
M3	—	—	—	—	—	—	20	100	5 (81-100 Years)	

APPENDIX B

Table B.5 Soil Data

Plot Number	UTM Zone	UTM E	UTM N	Date	Field Crew	Organic Deposit Thickness (cm)	Wet Mold Test	Sand %	Ribboning Test (mm)	Slope %	Slope form	% Stones	Upslope length (m)	Slope Position	Notes
ELC-01	18	500565	5096407	25/07/2022	JS + SK	60	Moderate	<50%	10-15	33	Uniform	1	—	Mid-slope	Low-lying area it wetland environment (not open water but wetland veg present). Hit water table at about 60cm. Hit clay soil at 50cm.
ELC-02	18	500725	5098045	25/07/2022	JS + SK	40	Strong	<50%	15-20	17	Concave	1	15	Mid-slope	Hit bedrock ~50 cm deep but not exposed. Near swamps, no sand.
ELC-03	18	500503	5098491	25/07/2022	JS + SK	10	Moderate	<50%	10-25	33	Uniform	<5	60	Mid-slope	
ELC-04	18	500418	5098500	25/07/2022	JS + SK	10	Moderate	<50%	20-30	—	Concave	<5	>150	Mid-slope	Low-lying area indicating wetland - dried watercourse, small pools of water.
ELC-05	18	499751	5098508	26/07/2022	JS + SK	10	Low	<50%	15-20	0	Flat	<5	—	—	Three soil profile: Hit bedrock ~20 cm deep North of mid-plot and ~40 cm deep South of mid-plot.
ELC-06	18	499681	5098773	26/07/2022	JS + SK	>10	Weak	<50%	—	—	Uniform	5	>150	Mid-slope	Hit bedrock ~10 cm deep. Not enough deposit to conduct ribonning test.
ELC-07	18	499846	5098838	26/07/2022	JS + SK	10	Moderate	<50%	30-50	42-50	Uniform	<5	>150	Mid-slope	Hit bedrock on this site.
ELC-08	18	499926	5098731	26/07/2022	JS + SK	20	Moderate	<50%	20-40	53	Uniform	<5	70	Mid-slope	Site was on the side of hill.
ELC-09	18	500099	5098888	26/07/2022	JS + SK	15	Moderate	<50%	20-40	43-60	Uniform	5	60	Mid-slope	Site was on the side of hill.
ELC-10	18	500081	5098634	26/07/2022	JS + SK	10	Low	<50%	20-30	27.5	Concave	<5	—	Top-slope	Hit bedrock ~20 cm deep east of plot and hit cobbles ~40 cm deep West of plot. Some boulders present.
ELC-11	18	500216	5098343	26/07/2022	JS + SK	10	Strong	<50%	20-40	17	Uniform	0	40	Mid-slope	No bedrock noticed.
ELC-12	18	499894	5098144	27/07/2022	JS + SK	15	Very low	<50%	—	<5	Flat	<5	—	—	No ribbons formed during ribbon test. Hit bedrock ~40 cm deep for one soil profile but did not hit bedrock for the other (see notes). No bedrock exposed.
ELC-13	18	499570	5098235	27/07/2022	JS + SK	10	Strong	<50%	30-50	—	Uniform	<5	40	Mid-slope	Hit bedrock ~25 cm deep at mid-slope. No bedrock hit on top-slope. Bottom slope same as mid-slope but less sandy.
ELC-14	18	499335	5098455	27/07/2022	JS + SK	10	Weak	<50%	20-30	55	Convex	5	>150	Mid-slope	Hit bedrock ~40 cm deep at mid-slope. Hit bedrock ~30 cm deep at lower and upper section of the hill.
ELC-15	18	499378	5098270	27/07/2022	JS + SK	>60	—	<50%	—	—	—	<5	—	—	
ELC-16	18	499335	5097960	27/07/2022	JS + SK	30	Low	<50%	30-45	0	Flat	<5	110	—	See drawing from notes. Hit bedrock ~30 cm deep. Wetland area (not open water) downhill of site.
ELC-17	18	499524	5097911	27/07/2022	JS + SK	20	Low	<50%	20-25	38	Uniform	<5	40	Mid-slope	Very little visible bedrock.
ELC-18	18	499601	5098049	27/07/2022	JS + SK	20	Very low	<50%	—	62	Uniform	<5	>150	Mid-slope	Could not conduct ribboning test. Hit bedrock ~40 cm deep at top of the hill, hit bedrock ~20 cm (See field notes).
ELC-19	18	499848	5097701	27/07/2022	JS + SK	—	—	—	—	—	—	—	—	—	Area significantly logged, could not conduct ELC. Group it with ELC-20.
ELC-20	18	499972	5097661	27/07/2022	JS + SK	15	Strong	<50%	15-30	58	Uniform	0	>150	Mid-slope	Hit bedrock ~20 cm deep.
ELC-20A	18	500097	5097610	27/07/2022	JS + SK	>30	Strong	<50%	20-30	65	Uniform	<5	>150	Mid-slope	Hit bedrock ~40 cm deep.
P5(ELC-21)	18	500082	5097800	27/07/2022	JS + SK	15	Low	<50%	20-30	50-67	Uniform	<5	60	Mid-slope	Conducted ELC at P5(ELC-21) which was a good representation of ELC-21 (heavily logged/disturbed) and the general area. P4(ELC-21) was also a good representation. Hit bedrock ~25 cm (mid). Top of hill was not sandy.
ELC-22	18	500487	5097829	29/07/2022	JS + SK	10	Moderate	<50%	20-30	0	Flat	<5	—	—	Hit bedrock ~35cm deep.
ELC-23	18	499058	5097472	28/07/2022	JS + SK	10	Low	>50%	10-20	42	Uniform	<5	45	Mid-slope	Very hard to form shape for ribboning test, almost not able to do it. Never hit bedrock.
ELC-24	18	498892	5097385	28/07/2022	JS + SK	15	Strong	<50%	30-60	48	at/Concave+M	0	10	Mid-slope	Slope was from 48% to flat, see notes for more details. No bedrock.
ELC-25	18	499175	5096837	28/07/2022	JS + SK	25	Strong	<50%	20-55	0	Flat	0	—	—	Wet soil, sticky and strong, can flatten out a lot. Never hit bedrock.
P8(ELC-26)	18	499220	5096613	28/07/2022	JS + SK	25-40	Very low	<50%	—	0	—	—	—	—	ELC-26 is very disturbed/logged. P8 (same polygon) was also very disturbed. Conducted high-level ELC. Never hit bedrock. Very little area not disturbed so could not get % covers.
ELC-27	18	499364	5096339	28/07/2022	JS + SK	15	Weak	<50%	—	55	Uniform	<5	30	Mid-slope	Could not conduct ribboning test, crumbled when pressed. Hit bedrock ~45 cm deep.
ELC-28	18	499526	5096549	28/07/2022	JS + SK	10	Strong	<50%	10-25	0	Flat	<5	—	Flat	Conducted survey on flat area, eventual downslope. Hit bedrock ~30 cm deep.
ELC-29	18	499393	5096748	28/07/2022	JS + SK	20	Low	<50%	10-25	52	Uniform	5	30	Mid-slope	More visible rocks/bedrock at this site, still not very prominent.
ELC-30	18	500445	5097402	28/07/2022	JS + SK	15	Moderate	<50%	20-30	45	Concave	<5	20	Mid-slope	Some sand in soil, hit bedrock ~40 cm deep.

APPENDIX B

Table B.5 Soil Data

Plot Number	UTM Zone	UTM E	UTM N	Date	Field Crew	Organic Deposit Thickness (cm)	Wet Mold Test	Sand %	Ribboning Test (mm)	Slope %	Slope form	% Stones	Upslope length (m)	Slope Position	Notes
ELC-31	18	500569	5097511	28/07/2022	JS + SK	15	Moderate	<50%	20-40	67	Concave	<5	40	Mid-slope	Hit bedrock at mid-slope ~40 cm deep. Hit bedrock at bottom-slope ~40 cm deep. Hit bedrock at top of hill ~20 cm deep.
ELC-32	18	500594	5097653	29/07/2022	JS + SK	10	Moderate	<50%	20-30	42	Concave	<5	55	Mid-slope	Hit bedrock ~30 cm deep. Soil profiles taken upslope and downslope very similar to midslope soil profiles, deposit depth for both was ~ 25cm.
ELC-33	18	500150	5098810	29/07/2022	JS + SK	15	Strong	<50%	20-40	38	Uniform	<5	>150	Bottom-mid-slope	Hit bedrock ~35 cm deep. Two other soil profiles same as first.
ELC-34	18	500424	5098302	29/07/2022	JS + SK	10	Strong	<50%	20-40	0	Flat	<5	—	—	Hit bedrock ~30 cm deep. Site is flat and no hill in the vicinity.
ELC-35	18	499934	5099008	29/07/2022	JS + SK	10	Very low	<50%	—	0	Flat	<5	—	—	Hit bedrock ~30 cm deep. Soil very sandy and area is very disturbed/logged.
ELC-36	18	500002	5098339	29/07/2022	JS + SK	10	Moderate	<50%	10-17	0	Flat	<5	—	—	No bedrock visible, site is close in proximity to a wetland. A lot of moose droppings around site.
P9(ELC-27)	18	499541	5096581	28/07/2022	JS + SK	—	—	—	—	—	—	—	—	—	Site very similar to ELC-27 in regards to canopy cover and vegetation species. Deciduous dominant. Easy to walk through. Full ELC not completed at this site.
P7(ELC-30/31)	18	500230	5097569	29/07/2022	JS + SK	—	—	—	—	—	—	—	—	—	Site very similar to ELC-30 and 31. Deciduous dominant. Soil profile similar. Full ELC not completed at this site.
YB6	18	499557	5095555	14/06/2022	MA + JB	22	Moderee	>50%	7	47	regular	20	>150	mid slope	
YB6	18	499557	5095555	14/06/2022	MA + JB	4	Faible	>50%	8	47	regular	50	>150	mid slope	
M10	18	499242	5097092	14/06/2022	MA + JB	12	Moderee	>50%	10	27	irregular	20	40	mid slope	Highly fragmented area, old and new roads, area currently being logged.
M10	18	499242	5097092	14/06/2022	MA + JB	8	Moderee	>50%	8	27	irregular	10	40	mid slope	Highly fragmented area, old and new roads, area currently being logged.
M11	18	499168	5097344	14/06/2022	MA + JB	12	Faible	>50%	11	53	irregular	10	30	upper slope	
M8	18	499600	5096178	13/06/2022	MA + JB	25	Forte	<50%	10	18	irregular	35	40	upper slope	Rocky site, bedrock at 25-35 cm.
M8	18	499600	5096178	13/06/2022	MA + JB	13	Forte	<50%	10	18	irregular	35	40	upper slope	Rocky site, bedrock at 25-35 cm.
OH1	18	499427	5097034	18/06/2022	MA + JB	20	Faible	<50%	0	22	convex	5-10	2	upper slope	
YB1	18	499407	5097155	10/06/2022	MA + JB	15	Forte	<50%	15	17	concave	0	5	upper slope	
M1	18	499403	5096925	10/06/2022	MA + JB	>40	N/A	N/A	N/A	0	convex	0	40	valley	Small creek valley.
T1	18	500169	5098018	11/06/2022	MA + JB	20	Moderee	>50%	0	2	irregular	0	NA	flat	Lots of moose winter scat in plot.
M2	18	500425	5098106	11/06/2022	MA + JB	3-5	Moderee	<50%	10	5-30	concave	15	10	mid slope	
YB2	18	499804	5096044	13/06/2022	MA + JB	3/6	Forte	<50%	9/30	—	regular	0	150	mid slope	Lots of blowdown, small Road in plot.
M9	18	500048	5095818	13/06/2022	MA + JB	25/10	Moderee	>50%	5/7	15	irregular	50/30	150	mid slope	
YB3	18	499984	5095585	13/06/2022	MA + JB	7/10	Faible	>50%/>50%	4/8	18	regular	30/10	200	mid slope	
YB4	18	500261	5095059	14/06/2022	MA + JB	7/5	Faible	>50%	4/5	18	regular	>50	80	mid slope	West aspect.
OH2	18	500256	5095306	14/06/2022	MA + JB	12/18	Faible/Moderee	>50%/~50%	6/7	0-5	irregular	0-50	80	flat	Water table at ~30cm, wet/hummocky terrain, wood frog seen in plot.
YB5	18	499684	5095576	14/06/2022	MA + JB	23/6	Faible/Moderee	>50%	6/8	4	regular	10/5	60	mid slope	
M7	18	499458	5096021	14/06/2022	MA + JB	12/7	Forte	<50%	10	35	regular	10	60	mid slope	Slope aspect: SW, Lots of blowdown due to forest fragmentation (between 2 roads), more shrubs than would potentially occur.
M6	18	499675	5095830	13/06/2022	MA + JB	8/11, <40	Faible	>50%	0	16	irregular	10/30	30	upper slope	Deer scat in plot.
M2	18	500425	5098106	11/06/2022	MA + JB	3-5	Moderee	<50%	10	5-30	concave	15	10	mid slope	
M5	18	500173	5097370	12/06/2022	MA + JB	10/8	Moderee/Faible	<50%/>50%	10/4	18	irregular	20/30	30	upper slope	
M4	18	500334	5097645	12/06/2022	MA + JB	7/25	Moderee/ Tres Forte	>50%/<50%	7/25	8	regular	10	150	mid slope	Slope is variable.
M3	18	500701	5097574	12/06/2022	MA + JB	10	Moderee	<50%	7	8	irregular	18	30	mid slope	

Appendix C

Aquatic Environment Species Lists and Data

APPENDIX C

Table C.1 Aquatics Waypoints

Survey	GPS Label	Map Label	Zone	Easting	Northing	Notes
Benthos	S1-B-S	S1-B	18 T	501058	5097312	Start of S1 benthos survey
Benthos	S1-B-E	S1-B	18 T	501076	5097229	End of S1 benthos survey
Benthos	S3-B-S	S3-B	18 T	499458	5097208	Start of S3 benthos survey
Benthos	S3-B-E	S3-B	18 T	499520	5097120	End of S3 benthos survey
Benthos	S4-B-S	S4-B	18 T	499853	5095722	Start of S4 benthos survey
Benthos	S4-B-E	S4-B	18 T	499852	5095674	End of S4 benthos survey
Benthos	S5-B-S	S5-B	18 T	500455	5097983	Start of S5 benthos survey
Benthos	S5-B-E	S5-B	18 T	500394	5097928	End of S5 benthos survey
Benthos	S6-B-S	S6-B	18 T	500151	5097920	Start of S6 benthos survey
Benthos	S6-B-E	S6-B	18 T	500083	5098010	End of S6 benthos survey
Benthos	S7-B-S	S7-B	18 T	499767	5098926	Start of S7 benthos survey
Benthos	S7-B-E	S7-B	18 T	499852	5095674	End of S7 benthos survey
Benthos	LB1-B-S	LB1-B	18 T	499337	5097332	Lac Bélanger: Start of LB1 benthos survey
Benthos	LB1-B-E	LB1-B	18 T	499258	5097378	Lac Bélanger: Start of LB1 benthos survey
Benthos	LB2-B-S	LB2-B	18 T	499097	5097501	Lac Bélanger: Start of LB2 benthos survey
Benthos	LB2-B-E	LB2-B	18 T	499028	5097538	Lac Bélanger: Start of LB2 benthos survey
Benthos	LB3-B-S	LB3-B	18 T	499345	5097396	Lac Bélanger: Start of LB3 benthos survey
Benthos	LB3-B-E	LB3-B	18 T	499306	5097486	Lac Bélanger: Start of LB3 benthos survey
Benthos	LU1-B-S	LU1-B	18 T	500304	5097941	Unnamed Lake LU: Start of LU1 benthos survey
Benthos	LU1-B-E	LU1-B	18 T	500379	5097930	Unnamed Lake LU: Start of LU1 benthos survey
Benthos	LU2-B-S	LU2-B	18 T	500367	5097812	Unnamed Lake LU: Start of LU2 benthos survey
Benthos	LU2-B-E	LU2-B	18 T	500374	5097907	Unnamed Lake LU: Start of LU2 benthos survey
Benthos	LU3-B-S	LU3-B	18 T	500355	5097756	Unnamed Lake LU: Start of LU3 benthos survey
Benthos	LU3-B-E	LU3-B	18 T	500257	5097742	Unnamed Lake LU: Start of LU3 benthos survey
Fish	S1-E1-S	S1	18 T	501048	5097322	Start of e-fishing transect 1 of S1 fish survey
Fish	S1-E1-E	S1	18 T	501074	5097213	End of e-fishing transect 1 of S1 fish survey
Fish	S1-E2-S	S1	18 T	501042	5097364	Start of e-fishing transect 2 of S1 fish survey
Fish	S1-E2-E	S1	18 T	501052	5097320	End of e-fishing transect 2 of S1 fish survey
Fish	S1-E3-S	S1	18 T	501063	5097453	Start of e-fishing transect 3 of S1 fish survey
Fish	S1-E3-E	S1	18 T	501065	5097406	End of e-fishing transect 3 of S1 fish survey

APPENDIX C

Table C.1 Aquatics Waypoints

Survey	GPS Label	Map Label	Zone	Easting	Northing	Notes
Fish	S2-MT1-S	S2	18 T	500763	5098392	Start of minnow trap section of S2 fish survey
Fish	S2-MT1-E	S2	18 T	500791	5098346	End of minnow trap section of S2 fish survey
Fish	S2-MT2	S2	18 T	500716	5098474	Minnow traps set in the pond North of S2 watercourse
Fish	S4-MT-1	S4	18 T	499883	5095655	Minnow trap location in S4 watercourse
Fish	S4-MT-2	S4	18 T	499869	5095688	Minnow trap location in S4 watercourse
Fish	S4-MT-3	S4	18 T	499873	5095713	Minnow trap location in S4 watercourse
Fish	S4-MT-4	S4	18 T	499859	5095716	Minnow trap location in S4 watercourse
Fish	S4-MT-5	S4	18 T	499875	5095684	Minnow trap location in S4 watercourse
Fish	S4-MT-6	S4	18 T	499887	5095611	Minnow trap location in S4 watercourse
Fish	S4-MT-7	S4	18 T	499950	5095511	Minnow trap location in S4 watercourse
Fish	S4-MT-8	S4	18 T	499958	5095423	Minnow trap location in S4 watercourse
Fish	S4-MT-9	S4	18 T	499948	5095429	Minnow trap location in S4 watercourse
Fish	S4-MT-10	S4	18 T	499974	5095433	Minnow trap location in S4 watercourse
Fish	S7-E1-S	S7	18 T	499771	5098863	Start of e-fishing transect 1 of S7 fish survey
Fish	S7-E1-E	S7	18 T	499770	5098886	End of e-fishing transect 1 and start of e-fishing transect 2 of S7 fish survey
Fish	S7-E2-E	S7	18 T	499781	5098918	End of e-fishing transect 2 and start of e-fishing transect 3 of S7 fish survey
Fish	S7-E3-E	S7	18 T	499778	5098945	End of e-fishing transect 3 and start of e-fishing transect 4 of S7 fish survey
Fish	S7-E4-E	S7	18 T	499768	5098991	End of e-fishing transect 4 and start of e-fishing transect 5 of S7 fish survey
Fish	S7-E5-E	S7	18 T	499693	5099057	End of e-fishing transect 5 of S7 fish survey

APPENDIX C

Table C.2 Benthic Invertebrates Data

Class	Order	Family	S1	S3	S4	S5	S6	S7	LB1	LB2	LB3	LU1	LU2	LU3
Amphibia	Unidentified	Unidentified	0	0	2	0	0	0	1	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	16	16	48	0	48	0	240	16	8	240	16	48
Insecta	Ephemeroptera	Caenidae	0	0	208	0	208	0	128	16	0	2688	96	608
Insecta	Ephemeroptera	Ephemerellidae	0	128	0	0	0	272	32	64	32	16	184	16
Insecta	Ephemeroptera	Heptageniidae	128	0	0	128	0	0	0	0	8	16	17	0
Insecta	Ephemeroptera	Leptophlebiidae	144	944	96	512	328	1040	576	304	320	368	593	176
Insecta	Plecoptera	Chloroperlidae	16	0	0	0	0	96	0	0	0	16	0	0
Insecta	Plecoptera	Leuctridae	64	0	0	0	0	272	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	0	0	0	0	0	48	0	0	0	0	0	0
Insecta	Plecoptera	Perlidae	39	0	0	34	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Unidentified	0	0	0	0	0	0	0	0	0	0	32	0
Insecta	Trichoptera	Hydropsychidae	1220	368	0	81	56	34	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	0	32	0	0	24	0	0	0	0	64	0	0
Insecta	Trichoptera	Lepidostomatidae	112	64	0	16	0	304	0	0	0	0	0	0
Insecta	Trichoptera	Leptoceridae	32	0	16	16	88	0	128	32	64	96	24	32
Insecta	Trichoptera	Limnephilidae	0	0	0	0	8	0	16	0	0	16	8	16
Insecta	Trichoptera	Molannidae	0	16	0	0	8	32	0	16	0	0	0	0
Insecta	Trichoptera	Philopotamidae	1190	48	0	795	0	465	0	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	0	33	0	0	64	0	80	16	0	32	8	16
Insecta	Trichoptera	Polycentropodidae	0	32	16	128	8	48	0	0	0	16	16	16
Insecta	Trichoptera	Rhyacophilidae	0	16	0	16	1	32	1	0	0	16	0	0
Insecta	Coleoptera	Carabidae	0	0	0	0	0	1	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	16	16	0	272	0	0	0	16	40	48	216	0
Insecta	Coleoptera	Gyrinidae	0	0	0	0	0	0	0	0	0	0	0	1
Insecta	Coleoptera	Haliplidae	0	0	16	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Hydrophilidae	0	0	0	0	0	1	0	0	0	0	0	0
Insecta	Coleoptera	Psephenidae	17	0	0	0	0	0	0	0	16	0	0	0
Insecta	Coleoptera	Ptilodactylidae	100	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	48	144	176	1408	48	80	64	80	24	208	16	192
Insecta	Diptera	Chaoboridae	0	0	0	0	0	0	0	0	0	0	8	0
Insecta	Diptera	Chironomidae	672	1888	2994	1507	704	1376	787	1873	1040	2994	560	1729
Insecta	Diptera	Culicidae	0	0	64	0	0	0	0	0	0	0	0	16
Insecta	Diptera	Dixidae	32	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	80	64	0	64	0	0	0	0	0	16	0	0
Insecta	Diptera	Simuliidae	48	224	0	241	8	0	0	0	0	0	0	0
Insecta	Diptera	Tabanidae	0	0	0	0	0	17	0	0	0	1	0	0
Insecta	Diptera	Tipulidae	304	48	0	657	0	151	0	0	0	0	0	0
Insecta	Hemiptera	Unidentified	0	0	0	0	8	0	0	0	0	0	0	0
Insecta	Hemiptera	Belostomatidae	0	0	1	0	0	0	0	0	0	1	0	0
Insecta	Hemiptera	Corixidae	0	0	16	0	8	0	0	0	0	0	0	0

APPENDIX C

Table C.2 Benthic Invertebrates Data

Class	Order	Family	S1	S3	S4	S5	S6	S7	LB1	LB2	LB3	LU1	LU2	LU3
Insecta	Hemiptera	Notonectidae	0	0	0	0	8	0	0	1	0	16	0	16
Insecta	Hemiptera	Veliidae	16	0	0	0	0	0	0	0	0	0	0	0
Insecta	Lepidoptera	Unidentified	0	0	0	0	0	0	16	0	0	0	0	16
Insecta	Lepidoptera	Crambidae	0	0	0	0	0	0	16	0	0	0	0	0
Insecta	Megaloptera	Corydalidae	6	17	1	0	0	0	0	0	0	0	0	0
Insecta	Megaloptera	Sialidae	0	0	0	0	0	0	1	0	24	0	0	0
Insecta	Odonata	Unidentified	0	0	0	0	0	16	96	16	0	0	0	0
Insecta	Odonata	Aeshnidae	7	4	3	68	1	7	0	2	0	1	0	8
Insecta	Odonata	Calopterygidae	1	0	0	0	0	0	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	0	0	274	0	40	0	272	160	56	192	41	48
Insecta	Odonata	Corduliidae	0	2	0	0	2	0	0	0	0	1	0	0
Insecta	Odonata	Gomphidae	19	19	0	16	10	2	0	19	16	3	1	0
Insecta	Odonata	Lestidae	0	0	0	0	0	0	0	0	0	33	0	0
Insecta	Odonata	Libellulidae	0	0	3	0	1	0	31	38	18	3	8	1
Arachnida	Trombidiformes	Unidentified	0	64	0	0	0	0	0	0	0	0	0	0
Arachnida	Trombidiformes	Hydrodromidae	0	0	16	0	0	0	0	16	0	32	0	0
Arachnida	Trombidiformes	Hydryphantidae	0	0	0	16	0	0	0	0	0	0	0	0
Arachnida	Trombidiformes	Limnesiidae	0	0	32	0	0	0	0	0	0	0	0	0
Arachnida	Trombidiformes	Unionicolidae	0	0	0	0	0	0	0	0	0	304	24	96
Arachnida	Oribatida	Unidentified	0	0	0	0	0	16	0	0	0	0	0	0
Arachnida	Oribatida	Hydrozetidae	0	0	0	0	0	0	0	0	8	0	0	0
Malacostraca	Amphipoda	Unidentified	0	0	96	0	56	0	1105	240	104	225	32	240
Malacostraca	Amphipoda	Crangonyctidae	0	0	0	0	0	0	101	1	0	3	28	1
Malacostraca	Amphipoda	Hyalellidae	0	16	336	0	296	0	1409	531	112	259	64	368
Malacostraca	Decapoda	Cambaridae	0	0	0	0	0	0	0	0	0	0	0	1
Bivalvia	Veneroida	Pisidiidae	32	368	432	96	32	272	129	100	96	12	115	52
Gastropoda	Unidentified	Unidentified	0	0	64	0	17	16	2	16	8	48	10	67
Gastropoda	Basommatophora	Ancylidae	0	0	0	0	0	0	16	0	16	32	80	16
Gastropoda	Basommatophora	Physidae	0	0	1	0	8	0	0	0	0	9	0	5
Gastropoda	Basommatophora	Planorbidae	0	0	69	0	1	0	1	0	0	99	331	67
Gastropoda	Littorinimorpha	Hydrobiidae	0	0	0	0	24	0	0	0	0	16	0	0
Clitellata	Arhynchobdellida	Erpobdellidae	0	0	0	0	0	0	1	0	0	0	8	0
Clitellata	Rhynchobdellida	Glossiphoniidae	0	0	0	0	0	0	0	0	0	0	0	16
Clitellata	Oligochaeta	Unidentified	0	32	352	272	24	176	112	16	24	48	32	224
Total	—	—	**4359**	**4603**	**5332**	**6343**	**2137**	**4774**	**5361**	**3589**	**2034**	**8188**	**2568**	**4108**

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Table C.3 Benthos Tolerance Scores

Code	Phyllum	Class	Order	Family	Tolerance
Ameldae	Arthropoda	Insecta	Ephemeroptera	Ameletidae	0
Baetidae	Arthropoda	Insecta	Ephemeroptera	Baetidae	4
Bascidae	Arthropoda	Insecta	Ephemeroptera	Baetiscidae	3
Canidae	Arthropoda	Insecta	Ephemeroptera	Caenidae	7
Epheldae	Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	1
Ephedae	Arthropoda	Insecta	Ephemeroptera	Ephemeridae	4
Heptdae	Arthropoda	Insecta	Ephemeroptera	Heptageniidae	4
Arthplea	Arthropoda	Insecta	Ephemeroptera	Arthropleidae	5
Isondae	Arthropoda	Insecta	Ephemeroptera	Isonychiidae	2
Lephdae	Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	2
Metrdae	Arthropoda	Insecta	Ephemeroptera	Metretopodidae	2
Oligdae	Arthropoda	Insecta	Ephemeroptera	Oligoneuriidae	2
Potaman	Arthropoda	Insecta	Ephemeroptera	Potamanthidae	4
Siphdae	Arthropoda	Insecta	Ephemeroptera	Siphlonuridae	7
Tricdae	Arthropoda	Insecta	Ephemeroptera	Tricorythidae	4
Apatidae	Arthropoda	Insecta	Trichoptera	Apataniidae	3
Bracdae	Arthropoda	Insecta	Trichoptera	Brachycentridae	1
Dipsdae	Arthropoda	Insecta	Trichoptera	Dipseudopsidae	5
Glosdae	Arthropoda	Insecta	Trichoptera	Glossosomatidae	0
Goerdae	Arthropoda	Insecta	Trichoptera	Goeridae	3
Helidae	Arthropoda	Insecta	Trichoptera	Helicopsychidae	3
Hysydae	Arthropoda	Insecta	Trichoptera	Hydropsychidae	4
Hyptdae	Arthropoda	Insecta	Trichoptera	Hydroptilidae	4
Lepidae	Arthropoda	Insecta	Trichoptera	Lepidostomatidae	1
Lecedae	Arthropoda	Insecta	Trichoptera	Leptoceridae	4
Limndae	Arthropoda	Insecta	Trichoptera	Limnephilidae	4
Neoylax	Arthropoda	Insecta	Trichoptera	Uenoidae	3
Moladae	Arthropoda	Insecta	Trichoptera	Molannidae	6
Odondae	Arthropoda	Insecta	Trichoptera	Odontoceridae	0
Phildae	Arthropoda	Insecta	Trichoptera	Philopotamidae	3
Phrydae	Arthropoda	Insecta	Trichoptera	Phryganeidae	4
Polydae	Arthropoda	Insecta	Trichoptera	Polycentropodidae	6
Psymdae	Arthropoda	Insecta	Trichoptera	Psychomyiidae	2
Rhyadae	Arthropoda	Insecta	Trichoptera	Rhyacophilidae	0

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Code	Phyllum	Class	Order	Family	Tolerance
Capndae	Arthropoda	Insecta	Plecoptera	Capniidae	1
Chlodae	Arthropoda	Insecta	Plecoptera	Chloroperlidae	1
Leucdae	Arthropoda	Insecta	Plecoptera	Leuctridae	0
Nemodae	Arthropoda	Insecta	Plecoptera	Nemouridae	2
Peltodae	Arthropoda	Insecta	Plecoptera	Peltoperlidae	0
Perldae	Arthropoda	Insecta	Plecoptera	Perlidae	1
Pelodae	Arthropoda	Insecta	Plecoptera	Perlodidae	2
Pterdae	Arthropoda	Insecta	Plecoptera	Pteronarcyidae	0
Taendae	Arthropoda	Insecta	Plecoptera	Taeniopterygidae	2
Athedae	Arthropoda	Insecta	Diptera	Athericidae	2
Blepdae	Arthropoda	Insecta	Diptera	Blephariceridae	0
Chaodae	Arthropoda	Insecta	Diptera	Chaoboridae	8
Ceradae	Arthropoda	Insecta	Diptera	Ceratopogonidae	6
Chirdae	Arthropoda	Insecta	Diptera	Chironomidae	8
Culidae	Arthropoda	Insecta	Diptera	Culicidae	8
Dixidae	Arthropoda	Insecta	Diptera	Dixidae	1
Dolidae	Arthropoda	Insecta	Diptera	Dolichopodidae	4
Empidae	Arthropoda	Insecta	Diptera	Empididae	6
Ephydae	Arthropoda	Insecta	Diptera	Ephydridae	6
Muscdae	Arthropoda	Insecta	Diptera	Muscidae	6
Phordae	Arthropoda	Insecta	Diptera	Phoridae	4
Nymidae	Arthropoda	Insecta	Diptera	Nymphomyiidae	4
Psycdae	Arthropoda	Insecta	Diptera	Psychodidae	10
Sciodae	Arthropoda	Insecta	Diptera	Sciomyzidae	4
Scatdae	Arthropoda	Insecta	Diptera	Scathophagidae	6
Simudae	Arthropoda	Insecta	Diptera	Simuliidae	6
Stradae	Arthropoda	Insecta	Diptera	Stratiomyidae	7
Syrpdae	Arthropoda	Insecta	Diptera	Syrphidae	10
Tabadae	Arthropoda	Insecta	Diptera	Tabanidae	6
Tipudae	Arthropoda	Insecta	Diptera	Tipulidae	3
Caradae	Arthropoda	Insecta	Coleoptera	Carabidae	4
Chrydae	Arthropoda	Insecta	Coleoptera	Chrysomelidae	4
Curcdae	Arthropoda	Insecta	Coleoptera	Curculionidae	5
Dryodae	Arthropoda	Insecta	Coleoptera	Dryopidae	5

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Table C.3 Benthos Tolerance Scores

Code	Phyllum	Class	Order	Family	Tolerance
Dytidae	Arthropoda	Insecta	Coleoptera	Dytiscidae	5
Elmidae	Arthropoda	Insecta	Coleoptera	Elmidae	4
Gyridae	Arthropoda	Insecta	Coleoptera	Gyrinidae	4
Halidae	Arthropoda	Insecta	Coleoptera	Haliplidae	5
Heteroc	Arthropoda	Insecta	Coleoptera	Heteroceridae	—
Hydraen	Arthropoda	Insecta	Coleoptera	Hydraenidae	—
Hydrdae	Arthropoda	Insecta	Coleoptera	Hydrophilidae	5
Lampydae	Arthropoda	Insecta	Coleoptera	Lampyridae	—
Psepdae	Arthropoda	Insecta	Coleoptera	Psephenidae	4
Scirtid	Arthropoda	Insecta	Coleoptera	Scirtidae	5
Stapdae	Arthropoda	Insecta	Coleoptera	Staphylinidae	—
Aeshdae	Arthropoda	Insecta	Odonata	Aeshnidae	3
Corddae	Arthropoda	Insecta	Odonata	Cordulegastridae	3
Colidae	Arthropoda	Insecta	Odonata	Corduliidae	5
Gompdae	Arthropoda	Insecta	Odonata	Gomphidae	4
Libedae	Arthropoda	Insecta	Odonata	Libellulidae	9
Macrdae	Arthropoda	Insecta	Odonata	Macromiidae	3
Calodae	Arthropoda	Insecta	Odonata	Calopterygidae	5
Coendae	Arthropoda	Insecta	Odonata	Coenagrionidae	9
Lestdae	Arthropoda	Insecta	Odonata	Lestidae	6
Belodae	Arthropoda	Insecta	Hemiptera	Belostomatidae	—
Coridae	Arthropoda	Insecta	Hemiptera	Corixidae	5
Gerrdae	Arthropoda	Insecta	Hemiptera	Gerridae	—
Herbiae	Arthropoda	Insecta	Hemiptera	Hebridae	—
Mesodae	Arthropoda	Insecta	Hemiptera	Mesoveliidae	—
Nepidae	Arthropoda	Insecta	Hemiptera	Nepidae	—
Notodae	Arthropoda	Insecta	Hemiptera	Notonectidae	—
Pleidae	Arthropoda	Insecta	Hemiptera	Pleidae	—
Salddae	Arthropoda	Insecta	Hemiptera	Saldidae	—
Velldae	Arthropoda	Insecta	Hemiptera	Veliidae	—
Naucidae	Arthropoda	Insecta	Hemiptera	Naucoridae	5
Lepidop	Arthropoda	Insecta	Lepidoptera	—	5
Sisydae	Arthropoda	Insecta	Neuroptera	Sisyridae	5
Corydae	Arthropoda	Insecta	Megaloptera	Corydalidae	0

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Table C.3 Benthos Tolerance Scores

Code	Phyllum	Class	Order	Family	Tolerance
Sialdae	Arthropoda	Insecta	Megaloptera	Sialidae	4
Crandae	Arthropoda	Crustacea	Amphipoda	Crangonyctidae	6
Gammdae	Arthropoda	Crustacea	Amphipoda	Gammaridae	4
Hausdae	Arthropoda	Crustacea	Amphipoda	Haustauridae	—
Hyaldae	Arthropoda	Crustacea	Amphipoda	Hyalellidae	8
Talidae	Arthropoda	Crustacea	Amphipoda	Talitridae	8
Cladoce	Arthropoda	Crustacea	Cladocera	—	8
Copepoda	Arthropoda	Crustacea	Copepoda	—	8
Cambdae	Arthropoda	Crustacea	Decapoda	Cambaridae	6
Aseldae	Arthropoda	Crustacea	Isopoda	Asellidae	8
Ostracod	Arthropoda	Crustacea	Ostracoda	—	8
Acari	Arthropoda	Arachnida	Acari	—	6
Dreidae	Mollusca	Pelecypoda	Veneroida	Dreisseinidae	8
Sphadae	Mollusca	Pelecypoda	Veneroida	Sphaeriidae	6
Margdae	Mollusca	Pelecypoda	Unionoida	Margaritiferidae	—
Uniodae	Mollusca	Pelecypoda	Unionoida	Unionidae	6
Ancydae	Mollusca	Gastropoda	Pulmonata	Ancylidae	6
Lymndae	Mollusca	Gastropoda	Pulmonata	Lymnaeidae	6
Physdae	Mollusca	Gastropoda	Pulmonata	Physidae	8
Plabdae	Mollusca	Gastropoda	Pulmonata	Planorbidae	6
Bithdae	Mollusca	Gastropoda	Prosobranchia	Bithyniidae	8
Hybidae	Mollusca	Gastropoda	Prosobranchia	Hydrobiidae	8
Pleudae	Mollusca	Gastropoda	Prosobranchia	Pleuroceridae	6
Valvdae	Mollusca	Gastropoda	Prosobranchia	Valvatidae	8
Vividae	Mollusca	Gastropoda	Prosobranchia	Viviparidae	6
Hirunea	Annellida	Clitellata Clitellata	Hirudinea	—	8
Oligoch	Annellida	—	Oligochaeta	—	8
Polycha	Annellida	Polychaeta	—	—	6
Nematod	Nematoda	—	—	—	5
Nemerte	Nemertea	—	—	—	6
Platyhe	Platyhelminthes	—	—	—	6
Hydrozo	Cnidaria	Hydrozoa	—	—	5
Porifera	Porifera	—	—	—	—
Tardigr	Tardigrada	—	—	Tardigrada	—

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