



# SPRINGHILL LIMESTONE QUARRY MINING PLAN

Springhill, New Brunswick  
TA1985701

Prepared for:

**Graymont (NB) Inc.**  
Springhill, New Brunswick

31-Oct-19

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### **Prepared by:**

Wood Environment & Infrastructure Solutions,  
a Division of Wood Canada Limited

**31-Oct-19**

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## Executive Summary

Graymont (NB) Inc. (Graymont) is planning to develop a limestone quarry in their mineral claim areas located northwest of Havelock, New Brunswick (NB), hereinafter referred to as "the Project". Graymont is the leading producer of lime and limestone products in the Atlantic region, including the state of Maine. The product will be high calcium limestone used for the production of calcium oxide (quicklime) with a smaller portion being used for pulverized limestone products, agricultural lime and aggregates. Products are trucked into the Atlantic Provinces and Maine; some may be shipped from the Port of Halifax.

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood) was retained by Graymont to provide environmental consulting services and to prepare this Mining Plan in support of the Registration of the Project under the New Brunswick Environmental Impact Assessment (EIA) and Mine Approval processes.

Graymont currently plans to commence mining that will target and prepare for the extraction of approximately 300,000 tonnes per year (t/y) of high calcium limestone, for up to 20 years, the resource estimated to be 6.23 million tonnes (Mt) of proven and Probable Mineral Reserves at a grade of 96.43% calcium carbonate ( $\text{CaCO}_3$ ). The initial development area (Phase 1) is approximately 83 hectares (ha), but the potential final quarry footprint may be closer to 150 ha. The quarry will be developed in 4 to 15 metre (m) height benches, working northwards from the southern perimeter of the Phase 1 footprint. Quarrying will likely be seasonal (typically 8 months), clearing only the areas required for the next season's development. The initial quarry development area will be accessed via the existing Cross Road and Mineral Springs Road, which connects to Route 880 east.

A description of the existing environment in the Study Area has been presented based on available information. The potential impacts identified by issue scoping and pathway analysis for the proposed quarry include:

- Dust and noise;
- Blasting vibration at residences and private wells;
- Site runoff/discharges into local watercourses or ground water;
- Impacts on migratory birds and/or other wildlife;
- Accidental discovery of heritage and/or archaeological resources;
- Increased truck traffic on local roads; and
- Benefits to local economy (employment/spending), provincial fees and taxation.

This Plan includes measures to mitigate potential environmental concerns and comply with regulatory requirements during construction, operation, and decommissioning. Detailed mitigation and reclamation are addressed in the Environmental Management Plan & Reclamation Plan (under separate cover).

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## List of Acronyms

ACCDC	Atlantic Canada Conservation Data Centre
Aglime	Agricultural lime
AIA	Archaeological Impact Assessment
Al <sub>2</sub> O <sub>3</sub>	Aluminum oxide (alumina)
AQMS	Air Quality Management System
ASNB	Archaeological Services New Brunswick
BSC	Bird Studies Canada
CAAQs	Canadian Ambient Air Quality Standards
CaCO <sub>3</sub>	Calcium carbonate
CaO	Calcium oxide
CCME	Canadian Council of Ministers of the Environment
CO	Carbon monoxide
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
EIA	Environmental Impact Assessment
EMP&RP	Environmental Management Plan & Reclamation Plan
ESA	Environmentally Sensitive Area
FAL	Freshwater Aquatic Life
Fe <sub>2</sub> O <sub>3</sub>	Ferric oxide
GCDWQ	Guidelines for Canadian Drinking Water Quality
H <sub>2</sub> S	Hydrogen sulphide
IBA	Important Bird Area
M&NP	Maritimes & Northwest Pipeline
MAC	Maximum Acceptable Concentration
MBBA	Maritime Breeding Bird Atlas
MBCA	<i>Migratory Birds Convention Act</i>
MgCO <sub>3</sub>	Magnesium carbonate
MN	Magnitude
MnO	Manganese oxide
NB	New Brunswick
NBAQOs	New Brunswick Air Quality Objectives
NBDELG	New Brunswick Department of Environment and Local Government
NBDERD	New Brunswick Department of Energy and Resource Development
NBENV	New Brunswick Department of Environment
NBSRA	<i>New Brunswick Species at Risk Act</i>
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Nitrogen oxides
NRCan	Natural Resources Canada
NS	Nova Scotia
OWLS	Online Well Log System
PAR	Parish
PID	Property Identification Number
PM	Particulate Matter
PPE	Personal Protection Equipment



SAR	Species at Risk
SARA	<i>Canadian Species at Risk Act</i>
SiO <sub>2</sub>	Silicon oxide
SO <sub>2</sub>	Sulphur dioxide
SOCC	Species of Conservation Concern
the Project	Development and Operation of the Springhill Limestone Quarry
TSP	Total Suspended Particulate
VECs	Valued Environmental Components
WESP	Wetland Ecosystem Services Protocol
Wood	Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited
WQS	Water Quality Index





## List of Units

bgs	Below ground surface
dba	A-weighted decibels
ha	hectares
km	kilometres
km <sup>2</sup>	square kilometres
Lpm	Litres per minute
m	metres
m <sup>2</sup>	square metres
Ma	Million years ago
mg/L	milligrams per litre
Mt	million tonnes
NTU	nephelometric turbidity units
PM <sub>10</sub>	Particulate Matter less than 10 microns
PM <sub>2.5</sub>	Particulate Matter less than 2.5 microns
ppm	parts per million
ppb	parts per billion
µg/m <sup>3</sup>	micrograms per cubic metres
t/y	tonnes per year



## **PART 1 - BACKGROUND SURVEY**

### **1.0 Introduction**

Graymont (NB) Inc. (Graymont) (the Proponent) is planning to develop a limestone quarry in their mineral claim areas located northwest of Havelock, New Brunswick (NB), hereinafter referred to as “the Project” (Figure 1.1). The limestone produced from this quarry will be a high calcium- low manganese product that will be used in a vertical kiln to produce low manganese quicklime for the market. Any stone that is too small to be used in the kiln will be utilized in the Graymont Pulverized Limestone Plant or Agricultural Lime Plant for the production of agricultural and mining products. The Project will be located within a mineral claim area held by Graymont (No. 6827), and the development Site(s) owned by Graymont. Graymont plans to develop the quarry in phases beginning with the Phase 1 footprint and expanding outward within the defined Project Claim area, working northward from the southern boundary, targeting areas of concentrated high calcium limestone.

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood) was retained by Graymont to prepare this Mining Plan in support of the registration of the Project under the NB Environmental Impact Assessment (EIA) and Mine Approval processes. As part of this mining lease application, a separate Environmental Management Plan & Reclamation Plan (EMP&RP) has been developed in conjunction with the Mining Plan. The EMP&RP is a living document that will evolve during the mining operation and be reviewed annually and revised appropriately over time. The EMP&RP includes details related to protection of environmental features, emergency response, regulatory compliance, and final abandonment and site reclamation.

### **1.1 Company Information**

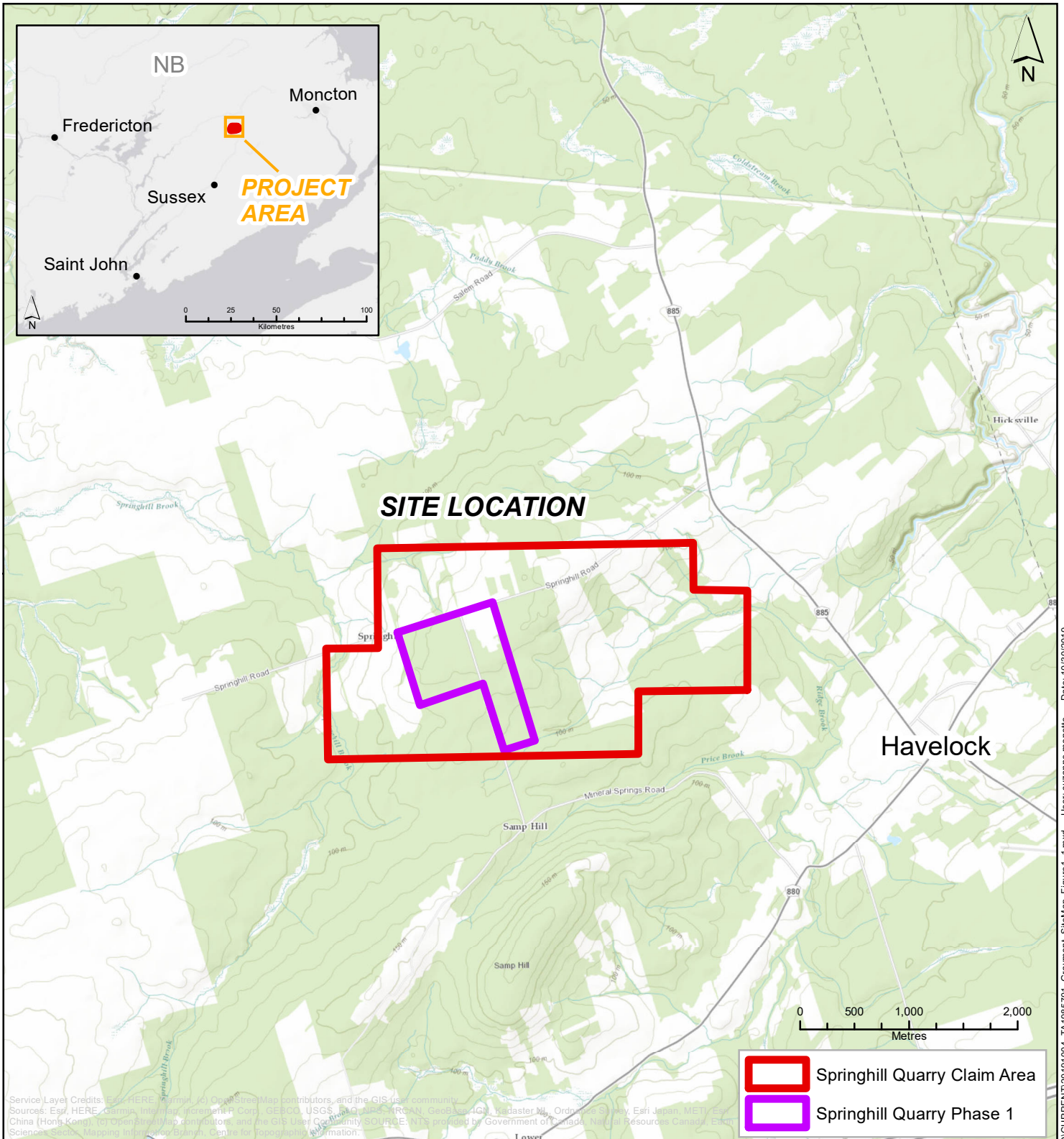
Graymont (NB) Inc. is an NB registered corporation, wholly owned by Graymont Inc. and headquartered in Richmond, British Columbia. Graymont is the leading supplier of lime and limestone products throughout Atlantic Canada and the State of Maine. Graymont has the capacity to produce more than 100,000 tonnes (t) of calcined lime products annually. In addition, over 100,000 t of limestone are processed each year into several products including agricultural lime (aglime), riprap, pulverized high calcium stone, screened high calcium stone, and hydra-lime+, a unique, blended agricultural liming material. The Company’s commitment to value added, product research and development assist in making it an aglime leader in Atlantic Canada’s agricultural community. Graymont’s history of limestone quarrying in the Havelock area goes back 80 years (since 1938), and the company is strongly rooted in the local community.

### **1.2 Address and Principal Contacts**

The Applicant is the Graymont (NB) Inc. Additional inquiries regarding corporate information may be forwarded to:

Graymont (NB) Inc.  
Primary Contact: Rob Camm  
4634 Route 880  
Havelock, NB E4Z 5K8 Canada  
E-mail: rcamm@graymont.com  
Phone: (506) 534-2311





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TITLE:  <b>Project Location          Springhill Limestone Quarry          Springhill, New Brunswick</b>	DATE:  10/30/2019	PROJECT NO.:  TA1985701	
	DWN BY:  SM	DATUM:  NAD83 CSRS	
	CHK'D BY:  CD	PROJECTION  NB STEREOGRAPHIC	
CLIENT:  Graymont (NB) Inc.	REV.NO  B	SCALE  1:50,000	FIGURE NO.:  1.1

## 2.0 Site Location

### 2.1 Geographical Setting

The Project is located approximately 4.5 kilometres (km) northwest of Havelock, NB, on Springhill Road, 2.5 km west of Route 885 (Figure 1.1). The Project area is centred on a relatively gentle hill oriented north-south between Springhill Brook to the west and a tributary of Ridge Brook to the east. The local elevations range from about 75 metres (m) in the stream valleys; up to 140 m on the hill crest (Figure 2.1). The initial quarry development (the Phase 1 Site) will be located near the hilltop with elevations ranging from 110 to 140 m. The gradient along the hill crest is gentle, at 1 - 2% with the side slopes to the west increasing up to 5 - 9% at the extreme edges of the initial quarry boundary. Springhill Brook is approximately 500 m west of the Site, while the tributary to Ridge Brook approaches near the southeast corner of the perimeter. The Trans-Canada Highway (Route 2) is approximately 4.5 km south of the Project area. Graymont has an existing limestone quarry at Samphill, approximately 2 km south of the Site.

### 2.2 Land Use

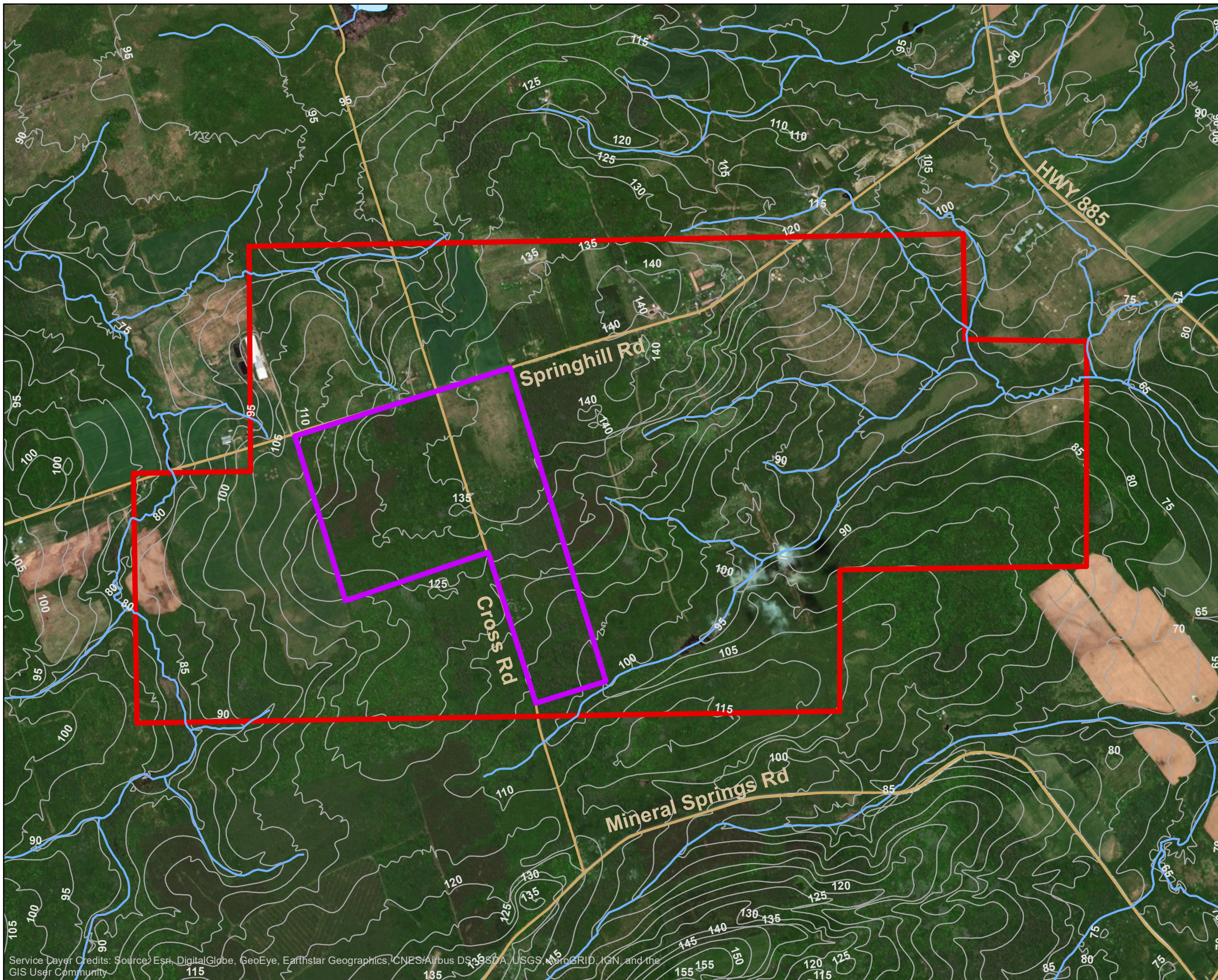
#### 2.2.1 Mine Site

The Project area (Figure 2.1) is covered mainly by forest and some agricultural land, with a few rural residences. The Project will be located within a mineral claim area held by Graymont (No. 6827), and the development Site(s) will be owned by Graymont. Graymont plans to develop the new quarry beginning in property identification (PID) numbers 00170431 and 0016925 within the Phase 1 footprint (Figure 2.1) and expanding outward within the defined Claim area (Figure 2.2).




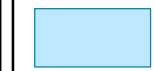


The Site includes two properties, separated by the Cross Road, a Crown Reserve dirt road that connects Springhill Road with Mineral Springs Road to the south (Figure 2.2). The northern half of Cross Road will be included within the development area and will be cut off to traffic. There are no residences or utilities located on this short connector road.

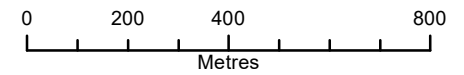
#### 2.2.2 Adjacent Land Use

Springhill Road lies immediately north of the initial proposed quarry development. The properties north, east and south are privately owned and predominantly forested, with one rural residence. The properties northwest and west are mainly agricultural pastureland, including a dairy farm facility and residence. The nearest residence is the single-family house directly north, approximately 100 m back from the road. The next nearest residence is approximately 300 m west, on the north side of Springhill Road. There are approximately 10 other residences along Springhill Road, all of which are greater than 800 m from the Site. Most land in the proposed mine lease to be developed in Phase 2 of the Project is woodland or previously harvested woodland.



### Legend

-  Watercourses
-  Roads
-  Contours (5m)
-  Waterbodies
-  Springhill Quarry Claim Area
-  Springhill Quarry Phase 1



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CLIENT:

**Graymont (NB) Inc.**



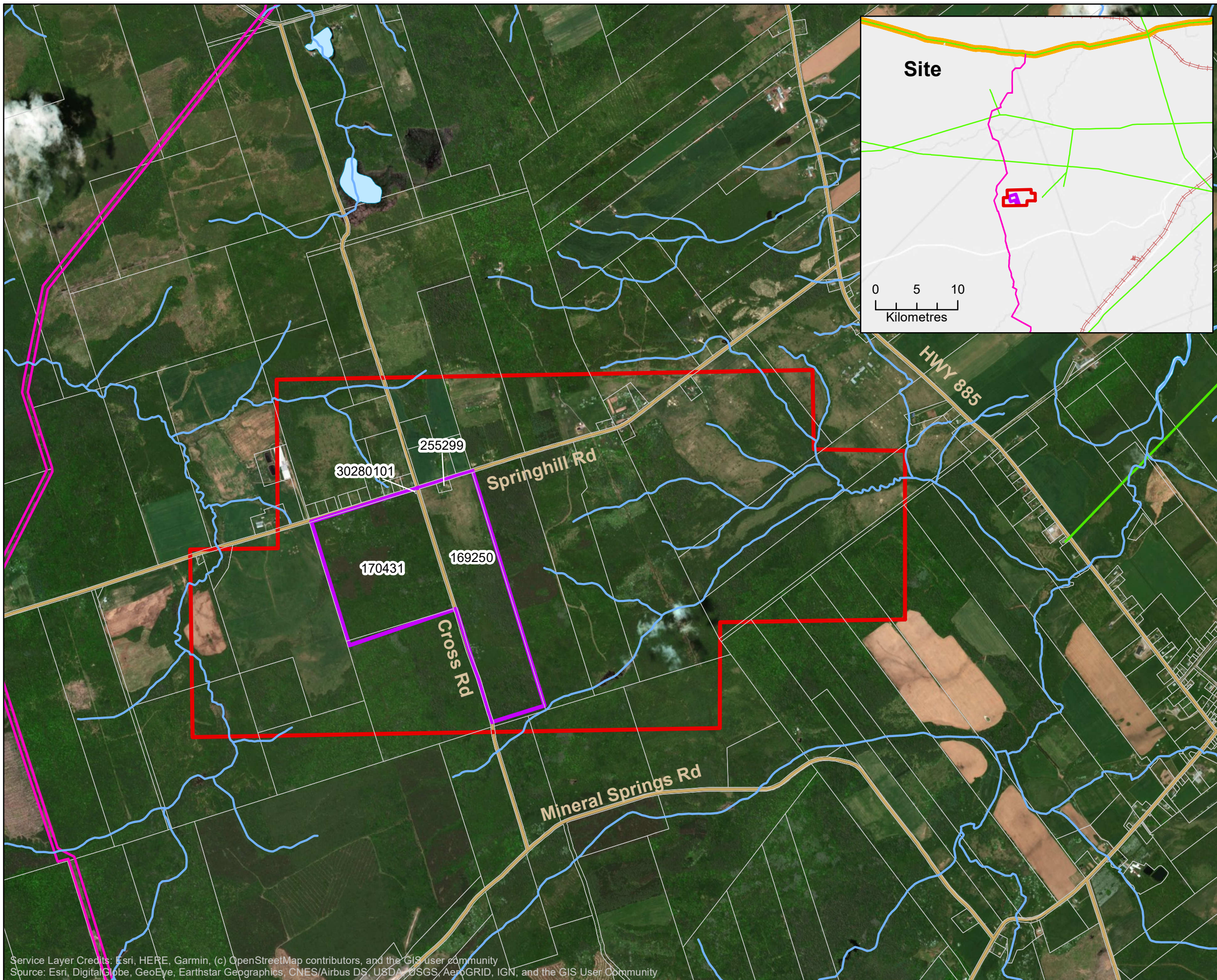
PROJECT:

**Springhill Limestone Quarry  
Springhill, New Brunswick**

TITLE:

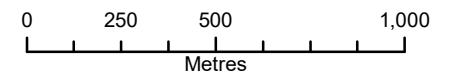
**Site Topography and Access**

DATUM:	DWN BY:	DATE:
NAD 83 CSRS	SM	10/30/2019
PROJECTION:	CHK'D BY:	SCALE:
NB Stereographic	CD	1:15,000
PROJECT NO:	REV NO:	FIGURE NO:
TA1985701	B	2.1



### Legend

- Watercourses
  - Roads
  - Corridor Resource Gas Pipeline
  - NB Power Transmission Line
  - Waterbodies
  - PIDs
  - Springhill Quarry Claim Area
  - Springhill Quarry Phase 1
- (inset unique features)
- Gas Pipeline
  - Railroad



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CLIENT:  
**Graymont (NB) Inc.**



PROJECT:  
**Springhill Limestone Quarry  
Springhill, New Brunswick**

TITLE:  
**Land Use / Ownership**

DATUM:	DWN BY:	DATE:
NAD 83 CSRS	SM	10/30/2019
PROJECTION:	CHK'D BY:	SCALE:
NB Stereographic	CD	1:20,000
PROJECT NO:	REV NO:	FIGURE NO:
TA1985701	C	2.2

### 2.2.3 Utility Corridors

- **Electricity**

There are no electrical generation facilities in or near the Project Area. There is an NB Power transmission corridor approximately 3 km east of the Site, terminating at a small substation on Route 885 (in Havelock), and there is a residential power line along Springhill Road, past the Site (Figure 2.2).

- **Water / Sewer**

Residential water and sewer services near the Site are provided by individual septic systems and domestic water wells, further described in Section 5.3. A public wastewater treatment system was installed in Havelock during 2018 and will service approximately 145 locations (mostly single-family residences).

- **Natural Gas Pipelines**

There is a natural gas transmission pipeline owned by Corridor Resources running north-south approximately 1.5 km west of the Site, and the Maritimes and Northeast Pipeline (M&NP) approximately 20 km north (Figure 2.2).

### 2.3 Access

There will be two permanent access ramps to provide access to the pit floor. All pit ramps enter the pit on the south and will tie into the main haulage route accessing the stockpiles and offsite crushing facility. The Site is bisected by Cross Road, whose northern end will be cut-off from traffic as part of the development area.

There are 2 routes for the transportation of materials, both currently being used for other mining operations, each being accessed by either the north or south end of Cross Road. The route from Mineral Springs Road to Route 880/885 and to the Graymont facility and/or the TransCanada Highway is already used for transporting product from the existing Samphill Quarry. The alternative route would use Springhill Road north of the Site eastward to Route 885, then southward to the Graymont processing facility, which is the route currently used to transport materials from Hicksville Quarry. The Route 880 / 885 intersection is located approximately 300 m west of the Graymont facility; 6 km from Route 2.

### 2.4 Ownership

The Project will be located within a mineral claim area held by Graymont (No. 6827), on private property (PID 00170431, and 00169250) owned by Graymont (Figure 2.1). The existing Samphill Quarry approximately 2 km south of the site is owned and operated by Graymont (PID 30077036). Graymont plans to develop the new quarry in phases, beginning with the Phase 1 footprint shown in Figure 2.2 and expanding outward through the Claim area over approximately 18 years of operation. It is Graymont's intention to purchase all lands to be developed. Graymont will contact potentially affected landowners during the required EIA process and commence negotiations to acquire the necessary lands in advance of future development.

## 3.0 Geology

Graymont (NB) Inc. holds thirty-one (31) contiguous units of Mineral Claims in the Springhill area, presently in good standing. The surface rights underlying these claims are held by private individuals and corporations. Permission from these surface rights holders is necessary to explore the various areas of the claims.

The Springhill area was the original site of limestone exploration in the Havelock area. Later Lafarge Inc. held claims and did extensive drilling in the area between 1988 and 2008. Graymont acquired the claims in 2013 and has done extensive drilling work on them to date.

### 3.1 Unconsolidated Geology

The Site is covered by a moderately well drained non-compact till. The overburden overlying the carbonate rocks, within the proposed pit area consists of glacial till, between 1.15 and 5.7 m thick, averaging 3.15 m. The soil is a coarse-grained silty loam.

### 3.2 Bedrock

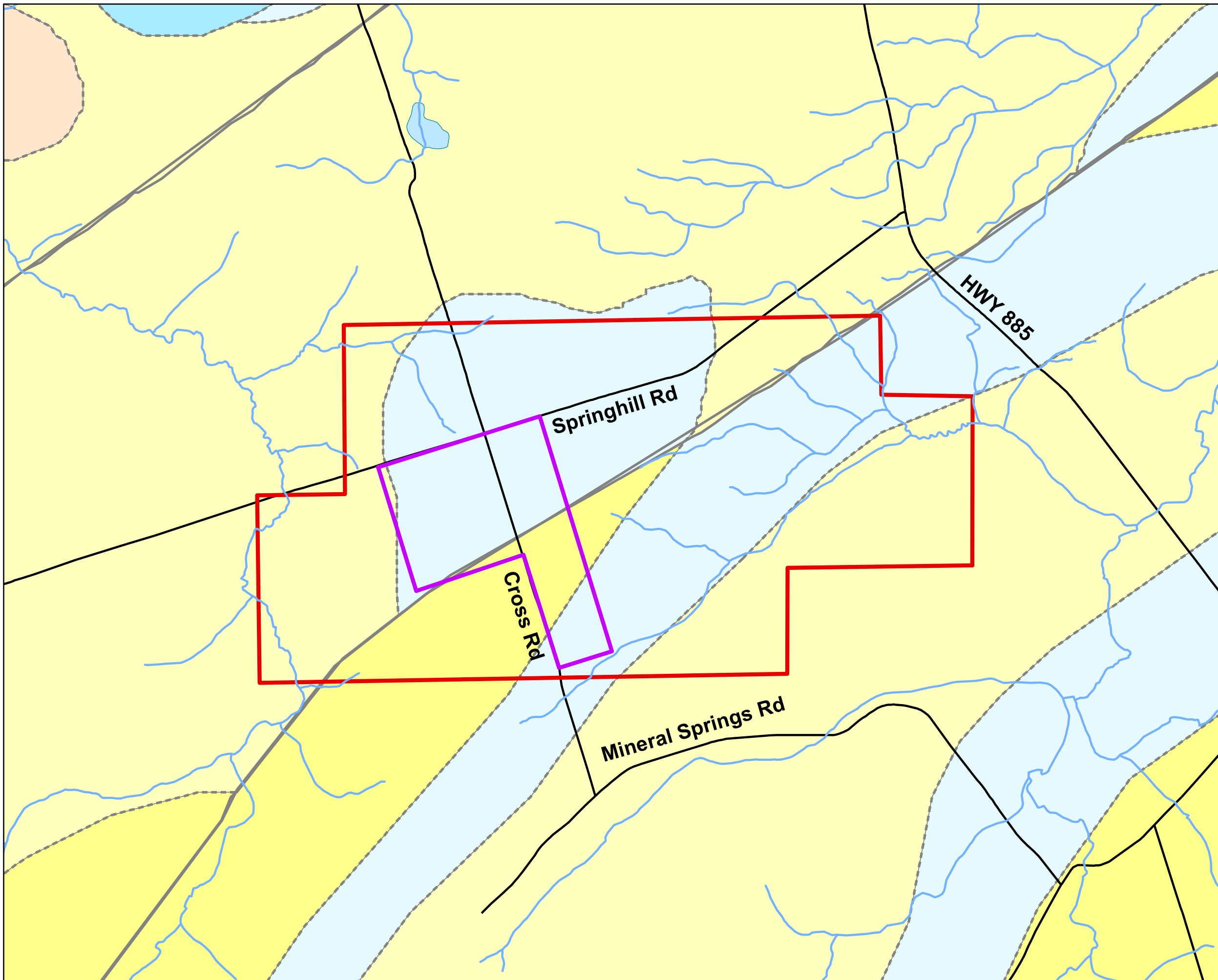
The bedrock (Figure 3.1) is described as mottled grey to light olive grey, medium to thick irregular bedded limestone (algal boundstone, with intercalated thin bedded wackestone and packstone) of the Gays River Formation. The bedding is sub-horizontal to moderately dipping (northwest to southeast), overlying thick sequences of carboniferous sandstone/conglomerate of the Hillsborough Formation.

The bedrock structure is broken by a series of sub-vertical faults which trend northeast-southwest, parallel with the general strike of the anticline-syncline sequences. The limestone units can pinch out along strike. Drilling results indicate relatively shallow overburden (generally 1.5 - 4 m) over a variable depth of limestone, in excess of 15 m (Webb, 1997).






### 3.3 Ore Geology

The Gays River Formation is economically the most important unit in the Havelock area as it hosts both the dolostone and high calcium limestone resources. The formation represents "a series of basement fringing or perhaps barrier algal build-ups deposited in a shallow sub littoral or low intertidal environment. In NB, the dominant and characteristic lithotype is grey to yellowish brown algal boundstone, in places dominated by bafflestone, wackestone and packstone. The limestone is locally interbedded with minor grey polymictic pebble conglomerate; grey, calcareous, fine-grained to pebbly lithic sandstone; sandy to pebbly (siliciclastic-clast) limestone, limestone breccia and dark grey mudstone." (McCutcheon, 1981). In the Havelock area the interbedded siliciclastic rocks mentioned above are absent.











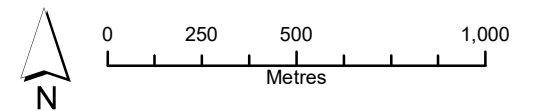


**Legend**

-  Watercourses
-  Roads
-  Springhill Quarry Claim Area
-  Springhill Quarry Phase 1
-  Waterbodies

**Bedrock Geology**

-  Watercourses
-  NR1\_Contacts
-  NR1\_Faults
-  Terrestrial Sediments, ECMATS
-  Terrestrial Sediments, ECSXTS
-  Terrestrial Sediments, ECWC
-  Deep Water Clastic, ESKDWC
-  Terrestrial Sediments, LCPTS



Wetland polygons compiled from aerial photography with attributes that indicate wetland type, vegetation, and year of photography. To support the WAWA program at Department of Environment and Local Government and alert primary users to the location of regulated wetlands and possible restrictions on land development.  
 The map shown here has been created with all due and reasonable care and is strictly for use with Wood Project: TE1985701. This map has not been certified by a licensed land surveyor, and any third party use of this map comes without warranties of any kind. Wood assumes no liability, direct or indirect, whatsoever for any such third party or unintended use.

CLIENT: **Graymont (NB) Inc.**

PROJECT: **Springhill Limestone Quarry  
Springhill, New Brunswick**

TITLE: **Geology**

DATUM:	NAD 83 CSRS	DWN BY:	SM	DATE:	10/30/2019
PROJECTION:	UTM Zone 20 North	CHK'D BY:	CD	SCALE:	1:20,000
PROJECT NO:	TA1985701	REV NO:	A	FIGURE NO:	3.1

In order to develop a robust geological model for the Springhill Quarry a smaller scale shallow drill hole program will be conducted, focusing on the limited area which may be mined in the next few years. The program will generate cuttings rather than core, to target the area in which good quality limestone outcrops occur, to define continuity with depth, and to provide samples for assays. Graymont's experience in the Samphill Quarry provides some insight on the 3-dimensional structure that can be expected, and as the new quarry advances additional data will become available to guide the optimum direction of future mining.

The associated limestone that does not meet the preferred calcium content can be marketed as common stone for aggregate; however, Graymont intends for the high calcium limestone to be the primary product. Very little "waste rock" is anticipated, since most quarried material will have a potential market.

### 3.4 Seismicity

New Brunswick is within the Northern Appalachians Seismic Zone, which contains low level seismic activity, with values ranging from 1.0 - 6.0 magnitude (MN) on the Richter Scale (average ~3.0 MN). The largest recording was 5.7 MN in Miramichi (1982). The most recently "felt" event occurred in Grand-Bay Westfield in January 2019, approximately 25 km north of Saint John, recorded by Earthquakes Canada at 3.8 MN. The epicentres for earthquakes in NB are generally very shallow, the January 2019 event occurring just 2 km below ground, which makes them easily "felt" (Natural Resources Canada (NRCan), 2019).

### 3.5 Acid Rock Drainage

The geology associated with the quarry area, including limestone, sandstone, and conglomerate, has a very low potential to generate acid rock drainage. Relatively little waste rock is expected to be produced, since the associated gabbro and non-high calcium limestone is also marketable. Any waste rock that is generated will be used on-site to the extent possible for grading or stored within the quarry for use in final contouring during site reclamation. Water treatment will be limited to settling of site run-off by a sump pit and infiltration to the ground. Considering the generally basic chemistry of the target geology, there is little to no risk of acid rock drainage.

## 4.0 Air Quality and Noise

### 4.1 Ambient Air Quality

Air quality in NB is routinely monitored by the provincial and federal governments at various stations, usually located in or near population centres. Both the air quality standards under Schedule B of the *NB Clean Air Act* and the NB Air Quality Objectives (NBAQOs) established by the Province under the same Act provide Guidelines and Objectives that apply to various components, including Total Suspended Particulate (TSP): 120 micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ) per 24-hour averaging period and  $70 \mu\text{g}/\text{m}^3$  per 1-year averaging period. Table 4.1 lists the NBAQOs established under the New Brunswick Department of Environment and Local Government (NBDELG) *Clean Air Act*.

**Table 4.1 Air Quality Guidelines in New Brunswick**

Pollutant	Averaging Period			
	1-hour	8-hour	24-hour	1 year
Carbon monoxide (CO)	30 ppm <sup>1</sup>	13 ppm		
Hydrogen sulphide (H <sub>2</sub> S)	11 ppb <sup>2</sup>		3.5 ppb	
Nitrogen dioxide (NO <sub>2</sub> )	210 ppb		105 ppb	52 ppb
Sulphur dioxide (SO <sub>2</sub> ) <sup>***</sup>	339 ppb		113 ppb	23 ppb
Total Suspended Particulate			120 $\mu\text{g}/\text{m}^3$	70 $\mu\text{g}/\text{m}^3$

Source: NBDELG, 2015

<sup>1</sup>ppm – parts per million

<sup>2</sup>ppb – parts per billion

$\mu\text{g}/\text{m}^3$  – micrograms per cubic metre

\*\* The standards for SO<sub>2</sub> are 50% lower in Saint John, Charlotte, and Kings Counties.

In October 2012, most jurisdictions, with the exception of Quebec, agreed to begin implementing a new federal air quality management system (AQMS). AQMS is a comprehensive approach for improving air quality in Canada and is the product of collaboration by the federal, provincial and territorial governments and stakeholders. It includes:

- New Canadian Ambient Air Quality Standards (CAAQS) to set the bar for outdoor air quality management across the country.
- Industrial emissions requirements to set a performance base for major industries.
- A framework for air zone management within the provinces and territories that enables action tailored to specific sources of air emissions in a given area.
- Regional air sheds that facilitate coordinated action where air pollution crosses a border.
- Improved intergovernmental collaboration to reduce emissions from the transportation sector.

The CAAQS are currently under development as objectives under the *Canadian Environmental Protection Act 1999*, and will replace the existing Canada-Wide Standards under the Canadian Council of Ministers of the Environment (CCME). Standards for fine particulate matter, ground-level ozone, NO<sub>2</sub> and SO<sub>2</sub> have been developed so far.

The following sections describe each air contaminant for which NBAQOs, Canada-Wide Standards and/or CAAQS are set, and ambient air quality monitoring results for 2016 (NBDELG, 2019). The most recent data published by CCME reports that NB met all CAAQs in 2015 (CCME, 2019).

#### 4.1.1 Carbon Monoxide (CO)

CO is formed from the incomplete combustion of carbon compounds. The NBDELG has set an air quality guideline for CO of 30 parts per million (ppm) for a 1-hour averaging period. NBDELG monitors CO at three locations throughout the Province: Saint John, Moncton and Fredericton. Due to the relatively small size and density of the population in NB, there were no exceedances of NBAQOs for carbon monoxide in Moncton (the monitoring station located closest to Springhill) or any of the other provincial monitoring sites in 2016.

#### 4.1.2 Hydrogen Sulphide (H<sub>2</sub>S)

This component is used by the Provincial mobile air quality trailer to measure total reduced sulphur (TRS) in industrial areas such as Saint John and the AV Nackawic Mill, where TRS odour is a concern. The NBDELG has set an air quality guideline for H<sub>2</sub>S 11 parts per billion (ppb) for a 1-hour averaging period and 3.5 ppb for a 24-hour averaging period. Both averaging periods were exceeded several times at Saint John East and Saint John West during 2016.

#### 4.1.3 Nitrogen Oxides (NO and NO<sub>2</sub>)

Nitric oxide (NO) is released in the exhaust of internal combustion engines and furnaces. NO is an unstable compound and is readily converted to NO<sub>2</sub>, which contributes to the formation of acid rain and is a primary precursor pollutant in the formation of smog. NBDELG has set an air quality guideline of 210 ppb, 105 ppb and 52 ppb per 1-hour, 24-hour and 1-year averaging periods, respectively. NBDELG monitors for NO<sub>x</sub> at four locations throughout the Province: Saint John, Moncton, Fredericton and Bathurst. No exceedances to the NO<sub>2</sub> standards were recorded during 2016 at the closest monitoring location to Springhill (Moncton) or at any other station in the Province (NBDELG, 2019).

#### 4.1.4 Sulphur Dioxide (SO<sub>2</sub>)

Sulphur dioxide is produced by burning oil and coal for energy production and space heating; each containing sulphur as an impurity in various concentrations. Other potential sources include oil refineries, pulp and paper mills, and vehicles. NBDELG monitors for SO<sub>2</sub> at four locations in Saint John: Forest Hills, Customs Building, Champlain Heights, and Hillcrest. Industries such as Irving Oil also perform monitoring in Saint John at four locations: Midwood, Grandview West, Forest Products and Silver Falls. In 2016, the one hour objective for the NBAQO was exceeded on 3 occasions, including once at the Grandview West monitoring station. This exceedance was associated with a short interruption of the operation of the sulphur plant at the refinery (NBDELG, 2019).

#### 4.1.5 Particulate Matter (PM)

Particulate matter (PM) refers to those particulates in the air, such as smoke, soot, and dust that do not settle readily and thereby remain suspended. PM is a broad class of chemically and physically diverse substances that can either be in a solid or liquid state, or in a combination of these two states. PM greater than 10 micrometres (µm) in size creates problems such as visibility reduction, soiling, material damage, and vegetation damage.



Particulate matter becomes a potential human health hazard when the particle size is equal to, or less than, 10 µm in diameter (PM<sub>10</sub>) (NBDELG, 2001). These particles are typical of dust granules that are invisible to the naked eye as individual specks. Such particles are commonly generated from building materials, combustion, human activities and outdoor sources, including atmospheric dust and combustion emissions from mobile and stationary sources.

Particles of 2.5 µm or less (PM<sub>2.5</sub>) are small enough to inhale into the lungs and are believed to cause respiratory and cardiovascular problems. These particles are visible as clouds of smoke and are typically high in sulphates, nitrates, carbon and heavy metals, being produced by fossil fuel combustion, vehicle exhaust and industrial emissions (NBDELG, 2001).

As part of the AQMS approach, CCME has also created an Air Zone Management Framework which categorizes provincial regions by existing air quality and management goals. The Project Study Area lies within the Central Air Zone of NB, which is considered “yellow” and whose mandate with respect to PM<sub>2.5</sub> levels is to prevent air quality deterioration (CCME, 2012b). In this Zone, threshold values of >10 to 19 µg/m<sup>3</sup> for daily average and >4 to 6.4 µg/m<sup>3</sup> for annual average PM<sub>2.5</sub> have been established, which are lower than the CAAQs (NBDELG, 2015).

In 2016 the annual average value for PM<sub>2.5</sub> in Moncton was 5.2 µg/m<sup>3</sup>. The daily average was 12 µg/m<sup>3</sup>. Both values were below both the CAAQs of 28 µg/m<sup>3</sup> for a 24-hour averaging period and 10 µg/m<sup>3</sup> for an annual averaging period (NBDELG, 2019).

#### 4.1.6 Ozone

Ozone is invisible and odourless at typical ground level concentrations. It is formed through chemical reactions between a variety of “ozone precursor” pollutants, which are released by industrial facilities and motor vehicles. Most of NB’s ozone is carried here by air masses originating in the United States and central Canada.

CAAQs has set an air quality standard for ground-level ozone of 63 ppb for an 8 hour averaging periods. NBDELG monitors ground-level ozone at thirteen stations throughout the Province, including Moncton. There were no exceedances to the ground-level ozone 8 hour objective at any of these locations in 2016 (NBDELG, 2017).

#### 4.1.7 Noise

The surrounding landscape is nominally rural residential, with some farming, few transportation corridors and the existing Samphill Quarry. Typical noise levels in rural areas range from 45 to 65 A-weighted decibels (dBA) in the day and 35 to 45 dBA at night. The nearest residences to the north of the site are located on the opposite side of Springhill Road, within approximately 100 - 300 m, and may experience higher daytime and night-time ambient noise levels. The nearest residents to the east, about 2 km away, likely experience typical rural sound levels when the quarry is not operating. They have been exposed to the noise emanating from the Samphill Quarry (approximately 2 km south), which would include standard quarry operations with heavy equipment and blasting.

## 5.0 Hydrology

### 5.1 Climate

The climate of NB is typically continental. This is due to the westerly air flows, dominant in the region, having passed over the interior of the continent and not over a temperature-moderating ocean (Hinds, 2000). The coastal areas of NB experience a large amount of fog that often moves far inland as a result of the abutment of the warm Gulf Stream with the cold Labrador Current (Environment Canada, 1990; Hinds, 2000).

#### 5.1.1 Climate Normals for the Project Area

The climate of the Project area is best characterized by long-term meteorological data collected by Environment and Climate Change Canada (ECCC). The station nearest the Project with substantial available climate data is Moncton Airport (Moncton A), with Climate Normals based on data collected between 1981 and 2010 (ECCC, 2019). Moncton A is at an elevation of 70.7 m and is located approximately 45 km northeast of the Project area.

Average temperatures are relatively mild, ranging from 18.8°C in July to -8.9°C in January. The highest daily temperature recorded was 37.2°C and the lowest was -32.2°C. Total precipitation averages 1200.4 millimetres (mm) per year. There is rainfall in every month, ranging from 28.4 mm in February to 112.1 mm in October. The highest daily rainfall on record was 131.8 mm in April of 1962. Average wind speed is moderate, typically ranging from 13.2 kilometres per hour (km/h) in August up to 19.2 km/h in January and March, and maximum hourly wind speeds from 64 km/h in May up to 103 km/h in September.

### 5.2 Surface Water

The Study Area falls within the Canaan River watershed and is located between two major tributaries, Springhill Brook to the west and Ridge Brook to the East. Two small tributaries of Ridge Brook extend into the Phase 1 Project foot print; which are described in detail in Section 6.4, below. The Canaan River drains into Washademoak Lake, which drains into the Saint John River and then into the Bay of Fundy. There are no protected watersheds located within the Study Area (NBDELG, 2019a). Although satellite imagery from ArcGIS World Imagery depicts tributaries within the Claim footprint, GeoNB data does not, and their absence within the footprint was verified during Summer 2019 field visits by Wood scientists (June 6 & 7; August 19 & 20, 2019).

The average annual precipitation in the Study Area is 1200.4 mm, of which approximately 325.3 centimetres (cm) is in the form of snowfall (ECCC, 2019). High seasonal water flows are generally experienced in April and May as a result of snowmelt. The stream flow typically decreases through the summer as a result of high evaporation and depleting groundwater storage. Flow typically increases in the fall due to lower temperature and reduced evaporation.

Surface water quality in the Study Area is dependent primarily on geology, watershed size, topography and vegetation. The chemical quality of NB watercourses is generally excellent for human consumption. Calcium bicarbonate-type waters predominate, although mixed chemical influences are known to occur in the Province (Environment Canada, 1989).

A water quality survey was conducted within the Canaan River watershed from 1996 - 2006. Survey results are interpreted using the Water Quality Index (WQI). The WQI classifies water quality categories based on CCME Guidelines for Freshwater Aquatic Life (FAL), using a number between 0 and 100, with zero

representing poor quality and 100 representing excellent quality. Water quality within the watershed ranges between excellent (95-100) and fair (65-79), with poorer (0-44) water quality reported in areas with a higher degree of surrounding development. In general, water quality met the guideline for key indicators such as dissolved oxygen, coliforms, nitrates, and pH (NBDELG, 2007).

## 5.3 Groundwater

This subsection describes the groundwater (hydrogeology) characteristics of the Study Area. An overall discussion of the Project location geology is provided along with information on the availability, use and quality of groundwater in the general vicinity of the Project.

### 5.3.1 Project Location Physiography and Groundwater Geology

The Project is located within the Caledonian Highlands of the NB Physiographic Regions, near the sub-region transition between the Central Plateau and the Anagance Ridges. Generally, this region is underlain by undifferentiated stony morainal and colluvial deposits, described as a blanket of stony lodgment till up to 3 m in thickness. Morainal sediments, veneer and glaciofluvial deposits are found as well as occasional bedrock outcrops. Ice contact deposits, greater than 2 m in thickness, can also be found along rivers (Rampton et al., 1984).

The Caledonian Highlands are remnants of an older mountain-forming episode. The underlying rocks are of metamorphic, sedimentary and igneous origin and range in age from Pre-Cambrian to Silurian. The landscape has experienced several cycles of uplift and erosion and, as such, it is an old landscape (Pronk & Allard, 2003). Closer to the Project area, the underlying bedrock ranges in age from stratified rocks associated with the Mississippian age (320 to 360 million years ago (Ma)); to intrusive rocks associated with the Hadrynian age (548 to 1000 Ma); to the stratified rocks associated to the Helikian age (more than 1000 Ma) - the Province's oldest rocks (McLeod, M.J., Johnson, S.C.; Ruitenburg, A.A., 1994).

The thin overburden layer above the indured rocks provide irregular surface relief and hilly to mountainous topography. Geologic structure forces the main drainage to follow a northeast-southwest direction.

### 5.3.2 Groundwater Availability and Well Yields

As a generalization, groundwater availability in this region is significantly higher in unconsolidated sands and gravels (found along the major rivers) than in the bedrock (Saint John Planning Region, 1977). Available information suggests yields suitable for one or two-family dwellings are anticipated. Higher yields may be available when drilled wells intersect favorable geologic structures such as faulted or highly fractured zones.

The geology in the immediate vicinity of the Project includes thin morainal deposits at the surface and an absence of deep sand and gravel deposits, which suggests that groundwater will be limited to bedrock aquifers. Well yields will be low, unless flow from fractured bedrock connected to productive aquifers can be found.

Mandatory drill reports including borehole records and testing for water quality of all newly drilled or redrilled domestic water wells in NB was introduced under the "Potable Water Regulation" of the *Clean Water Act* in September of 1994. A searchable database with compiled results is accessible on the Government of NB (GNB) website, referred to the Online Well Log System (OWLS). The database can be searched by region in NB, providing results in aggregate form which do not identify individual well records, but queries can be submitted to view results for specific areas. It should be noted that most of the buildings with potential wells are located beyond a radius of 2.5 km from the central coordinates used in the search, though there are up to ten buildings that potentially have wells within 1 km of the Project.

The search of the OWLS well data base for a radius of 3.5 km from the proposed Project provided information for 22 wells. Using the reported well log information, the wells were mainly categorized as sedimentary rock (such as sandstone, shale, and limestone). Well depths range from 15.85 to 123.44 m. The average bedrock level is 2.30 m with the well drillers' logs commonly recording clays, sands, mud, and gravels as the overburden types; limestone, shales, conglomerates, sandstones and shale being the common bedrock types encountered in the subsurface Study Area (NBDELG, 2019c). The wells show a maximum yield of 114 litres per minute (Lpm), and an average of 38.6 Lpm. The average bedrock level is 2.30 m below ground surface (bgs) (NBDELG, 2019c).

The largest user of groundwater in the immediate area of the Project is the Town of Havelock. The nearest Protected Wellfield is Springdale which supplies Penobscis (NBDELG, 2019b) along Route 1 between Petitcodiac and Sussex, approximately 25 km south of the Project. Wellfield protection areas were legislated in June 2016.

### 5.3.3 Groundwater Quality

The "Potable Water Regulation" also requires that drinking water be collected from all new and redrilled wells and that standard laboratory analyses be performed for both inorganic and bacteriological substances to assess water quality. The Province maintains these results in the OWLS database as well and produced the NB Groundwater Chemistry Atlas in 2008 (NBDELG, 2008) using 10,500 samples analysed between 1994 and 2007. Although the OWLS search described in Section 5.3.2 displayed 22 drill records, groundwater quality data was available for only 10 samples collected from wells within the Study Area (NBDELG, 2019c).

The NB Department of Health has adopted the use of Guidelines for Canadian Drinking Water Quality (GCDWQ) established by Health Canada (Health Canada, 2019) to assess groundwater quality. The percentage of samples in compliance with the GCDWQ compared against the provincial database is presented in Table 5.1. Table 5.1 lists only those parameters with health-based maximum allowable concentrations (MACs). It should be noted that the GCDWQ values have changed since the NB Groundwater Chemistry Atlas was published; our current results for the Study Area have been compared to the current water quality guidelines, June 2019.



**Table 5.1 Summary of Selected Groundwater Quality Parameters**

Parameter	MAC (mg/L)	*Percentage Samples in Compliance in New Brunswick	**Percentage Samples in Compliance Within Study Area
Arsenic	0.010	94.1	100
Boron	5	100	100
Barium	1.0	98.6	100
Cadmium	0.005	99.9	100
Copper	2	99.9	100
Chromium	0.05	99.8	100
Fluoride	1.5	95.0	100
Manganese	0.12	60.2	90
Nitrate	45 as nitrate; 10 as nitrate-nitrogen	99.4	100
Lead	0.005	97.3	100
Selenium	0.05	98.9	100
Uranium	0.02	97.9	90

mg/L: milligrams per litre

Sources: \*NBENV, 2008.

\*\*NBDELG, 2019c

Comparison of Study Area results against those for the Province as a whole show that the water chemistry in the Study Area is quite good for those with wells drilled since 1994. The average well depth is 41 m, with a range from 15.85 to 123.44 m.

In 2006, NBDELG launched a program called "Know Your H<sub>2</sub>O" to promote drinking water quality awareness. During the period of July 2006 to November 2007, all private well owners could submit a water test for total coliform bacteria and *E. coli* at no cost. It was determined during this program that one third (35.6%) of the private wells sampled yielded results above the GCDWQ for coliform while 4.4% had *E. coli* (NBDELG, 2009). According to OWLS for the 10 wells with analytical results within the 3.5 km area studied, the results were very comparable: 30% of the newly drilled wells had Total Coliform and 10% of them had *E. coli*. Turbidity, which can harbour bacteria, was above the 1.0 nephelometric turbidity units (NTU) Guideline in 20% of those wells (NBDELG, 2019c).



## 6.0 Biology

The following sections describe the terrestrial and aquatic habitats in the Study Area. Vegetation communities, wetlands, and waterbodies are illustrated in Figure 6.1.

### 6.1 Vegetation Communities

The supplementary biophysical field surveys were conducted on June 6th and 7th and on August 19th & 20th, 2019. The total footprint of the Springhill Quarry Phase 1 is approximately 83 hectares (ha). Much of the area has been previously disturbed, including:

- old agricultural fields (Appendix C, Photos Veg1 to Veg3);
- logging activity (Appendix C, Photos Veg6 to Veg7);
- old Jack Pine (*Pinus banksiana*) plantation (Appendix C, Photos Veg4 to Veg5); as well as
- old Apple Orchard and cleared access routes for borehole test sites (Appendix C, Photo Veg8).

The majority of the area is regenerated forest, with patches of immature hardwood and mature softwood/hardwood throughout the Phase 1 footprint. All forest areas showed signs of past timber harvesting, including old stumps and overgrown roads. Some old fields and roads have become wet but would not be considered viable wetlands. Older hardwood trees were observed in the southwest section of Phase 1 (Figure 6.1) with a smaller section of over-mature hardwood.

Two small wetlands were discovered in the southeast corner of the Site; which are described in detail in Section 6.2 below. Following is a detailed description of each major vegetation community within the Site.

#### Old hay field (9 ha)

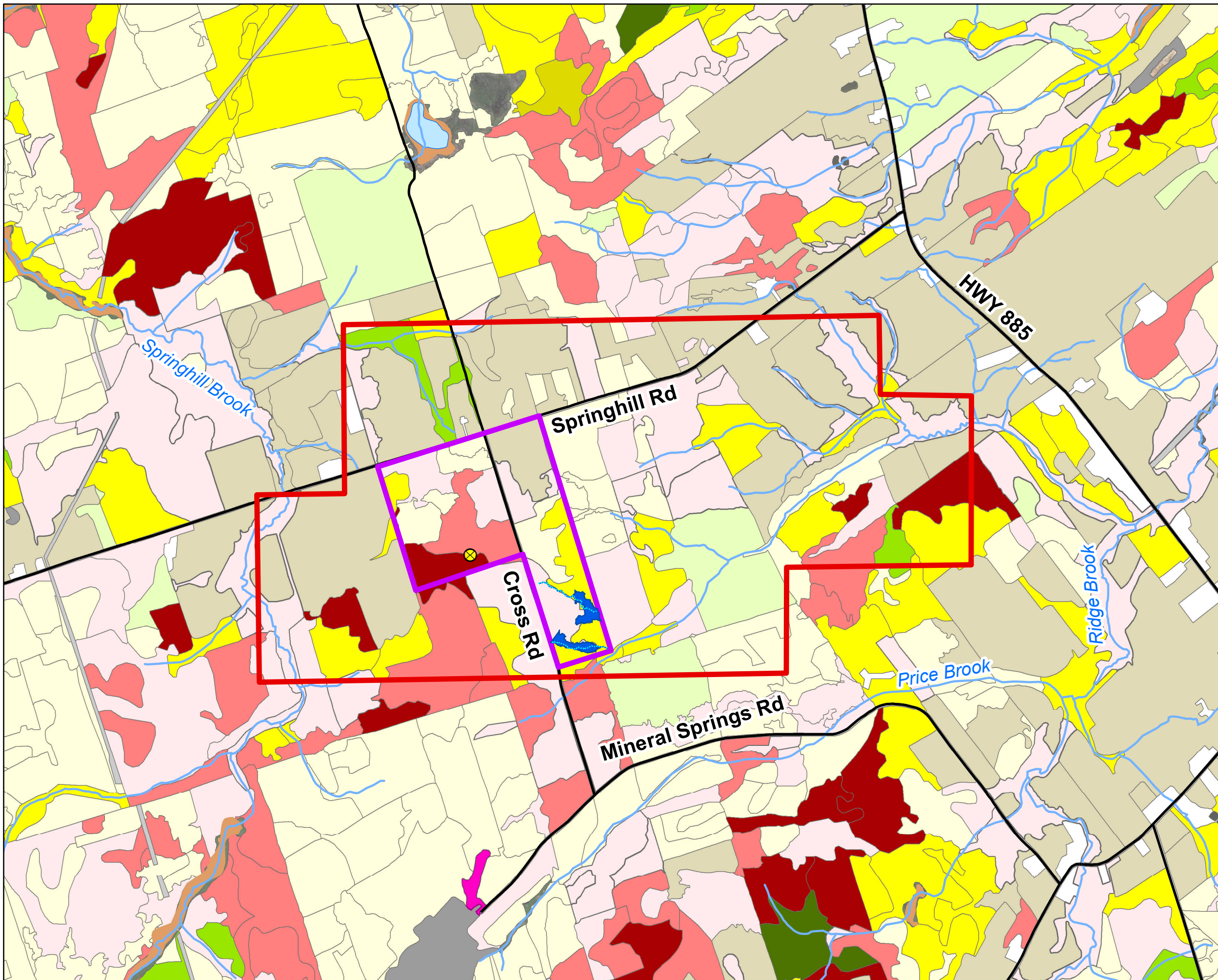
The old hay field consisted of a small number of young mix wood trees, including; White Birch (*Betula papyrifera*), Balsam Fir (*Abies balsamea*), White Spruce (*Picea glauca*), White Pine (*Pinus strobus*), and Pin Cherry (*Prunus pensylvanica*). The vegetation was typical of what would be found in an old hay field that has been left to regenerate. Dominant flora included; Smooth Bedstraw (*Cruciata laevipes*), Red Clover (*Trifolium pratense*), Cow Vetch (*Vicia cracca*), Redtop Grass (*Agrostis gigantea*) and varieties of Goldenrod. Refer to Appendix C, Table C-1 for the full flora list.

Regenerating vegetation present within the old hay field included:

- small sapling presence of White Birch, Balsam Fir, White Spruce, White Pine, and Pin Cherry; as well as
- dense shrubs including Red-osier Dogwood (*Cornus sericea*), White Meadowsweet (*Spirea alba*) and American Raspberry (*Rubus lacustre*).

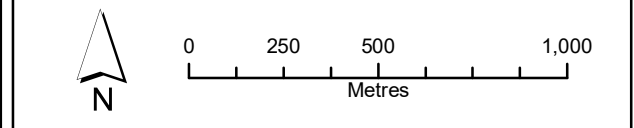
#### Old field and old apple orchard regenerated forest (18 ha)

The old hay field transitions into a regenerated old field and apple orchard consisting of young to mature coniferous trees, including; White Birch, Balsam Fir, White Spruce, Tamarack (*Larix laricina*), Eastern White Cedar (*Thuja occidentalis*), various species of Apples (*Malus spp.*) and Trembling Aspen (*Populus tremuloides*). The vegetation was typical of what would be found in an old regenerated forest/field. Dominant flora included; American Raspberry, Goldenrod spp., Large-leaved Avens (*Geum macrophyllum*), Rough Bedstraw (*Galium asperellum*), Speckled Alder (*Alnus incana*) and Tall Meadow Rue (*Thalictrum pubescens*). Refer to Appendix C, Table C-1 for the full flora list.



**Legend**

- Possible Raptor Nest
  - Field Verified Watercourses
  - Watercourse
  - Field Verified Wetlands
  - Waterbody
  - Springhill Quarry Claim Area
  - Regulated Wetlands
  - Springhill Quarry Phase 1
  - PIDs
  - Road
- Aged Forest**
- Young Hardwood
  - Mature Hardwood
  - Overmature Hardwood
  - Young Softwood
  - Mature Softwood
  - Overmature Softwood
  - Young Mixedwood
  - Mature/Immature Mixedwood
  - Overmature Mixedwood
- Land Cover/Use**
- Agriculture
  - Industrial
  - Recreation
  - Residential



Wetland polygons compiled from aerial photography with attributes that indicate wetland type, vegetation, and year of photography. To support the WAWA program at Department of Environment and Local Government and alert primary users to the location of regulated wetlands and possible restrictions on land development.

The map shown here has been created with all due and reasonable care and is strictly for use with Wood Project: TE1985701. This map has not been certified by a licensed land surveyor, and any third party use of this map comes without warranties of any kind. Wood assumes no liability, direct or indirect, whatsoever for any such third party or unintended use.

CLIENT:  
**Graymont (NB) Inc.**



PROJECT:  
**Springhill Limestone Quarry  
Springhill, New Brunswick**

TITLE:  
**Vegetation, Wetlands and Waterbodies**

DATUM:	NAD 83 CSRS	DWN BY:	SM	DATE:	10/30/2019
PROJECTION:	NB Stereographic	CHK'D BY:	CD	SCALE:	1:20,000
PROJECT NO:	TA1985701	REV NO:	A	FIGURE NO:	6.1

### **Mature softwood (cedar dominant) forest (12 ha)**

The mature softwood area was dominated by Eastern White Cedar with other coniferous, such as; White Spruce, Black Spruce, White Pine and Red Pine (*Pinus resinosa*). The vegetation was typical of a coniferous forest and dominant flora included; Speckled Alder, Starflower (*Trientalis borealis*), Threeleaf Goldentthread (*Coptis trifolia*), and Wood Ferns (*Dryopteris spp.*). Refer to Appendix C, Table C-1 for the full flora list. Immature and mature hardwood forest (36 ha)

The hardwood stands, both immature and mature are dispersed amongst the Phase 1 Project footprint and primarily consist of; American Beech (*Fagus grandifolia*), Ironwood (*Ostrya virginiana*), Large-toothed Aspen (*Populus grandidentata*), Red Maple (*Acer rebrum*), Striped Maple (*Acer pensylvanicum*), Sugar Maple (*Acer saccharum*), Trembling Aspen (*Populus tremuloides*), White Ash (*Fraxis americana*), White Birch and Yellow Birch (*Betula alleghaniensis*). The vegetation was typical of a cool moist hardwood forest and dominant species included; Dwarf Raspberry (*Rubus pubescens*), Alternant-leaved Dogwood (*Cornus alterniflora*), American Raspberry, Beaked Hazelnut (*Carylus cornuta*), Blue Bead Lily (*Clintonia borelais*), Cinnamon Fern (*Osmundastrum cinnamomeum*), False Lilly of the Valley, Interrupted Fern (*Osmunda claytoniana*), Large-leaved Avens, Northern Bush Honeysuckle (*Dierygilla lonicera*), Starflower (*Trientalis borealis*), White Baneberry (*Actaea pachypoda*), Wild Sarsparilla (*Aralia nudicaulis*) and Wood ferns (*Dryopteris spp.*). Refer to Appendix C, Table C-1 for the full flora list.

### **Former softwood plantation (4.5 ha)**

This plantation had nearly all Jack Pine (*Pinus banksiana*), with a few White Birch. The edges of the stand also had sparse vegetation and consisted primarily of shrubs such as; Northern Bush Honeysuckle and Red-osier Dogwood. Refer to Appendix C, Table C-1 for the full flora list.

### **Overall Vegetation Diversity and Plant Species at Risk**

A report of Species at Risk (SAR) known to occur in the Study Area was obtained from the Atlantic Canada Conservation Data Centre (ACDC) (Data Report 6386, 2019), and is included in Appendix A. According to the report, there is one plant species listed as Endangered under the federal *Species at Risk Act* (SARA) within the 5 km Study Area: Butternut (*Juglans cinerea*). Recorded observations of this species are located in a Provincially listed Environmentally Sensitive Area (ESA) approximately 1.5 km northwest of Havelock: the Havelock Ridge ESA. Havelock Ridge is a rich hardwood forest that was once referred to as "Butternut Ridge" and has small populations of Blue Cohosh (*Caulophyllum thalictroides*) (S4 in NB) (ACDC, 2019).

Ninety-one species of flora in total had been observed from the biophysical field surveys, with no SAR observed. The data report received from ACDC on April 8, 2019, showed only 4 species of flora within a 5 km radius of the Site that were of special concern. Only one, Butternut (*Juglans cinea*) is listed as Endangered by the SARA. Table 6.1 provides a summary list of ACDC flora data.

**Table 6.1 Species At Risk Reported Within 5 kms of the Site**

Common Name	Scientific Name	SARA Status	Prov Rank	Typical Habitat
<i>Juglans cinerea</i>	Butternut	Endangered	At Risk	Anthropogenic, floodplain (river or stream floodplains), forests
<i>Anomodon minor</i>	Blunt-leaved Anomodon Moss		May Be At Risk	Tree bases and rocks
<i>Anomodon viticulosus</i>	a Moss		May Be At Risk	Well drained, lightly shaded, calcareous rocks
<i>Carex sterillis</i>	Sterile Sedge		May Be At Risk	Fens, meadows and fields, shores of rivers or lakes, swamps
<i>Eragrostis pectinacea</i>	Tufted Lovegrass		Secure	Anthropogenic, meadows and fields, shores of rivers or lakes

## 6.2 Wetlands

NB wetlands have been given specific protection under both the *Clean Environment Act* and the *Clean Water Act*. NBDELG requires a permit for any alteration within 30 m of the bank of a watercourse or wetland. Provincially-regulated wetlands nearest the Study Area are illustrated on Figure 6.1 (SNB, 2018). A wetland survey was conducted onsite during the 19th and 20th of August 2019, by Garrett Bell and Lyle Vicaire, both experienced field biologists and trained wetland delineators. The weather was variably cloudy and warm, following 24 hours of rain. All vegetation was identifiable to species. Two previously unmapped wetlands (WL1 & WL2) were discovered in the southeast corner of the proposed Phase 1 footprint (Figure 6.1). Both wetlands are associated with small watercourses (described in Section 6.5, below).

### Methodology

The wetland delineation was conducted using the methodology developed by the US Army Corps of Engineers; which has been generally adopted by Canadian regulators and practitioners. This method uses paired data points (one in the wetland and one outside the wetland) to establish the vegetative boundary; which is then used to mark the edge of the wetland. The wetland determination is based on a three-part test that requires the presence of wetland vegetation, hydric soil, and signs of wetland hydrology. The wetland boundary was recorded in the field using a Global Positioning System (GPS) accurate within about 5 m. The completed wetland data forms and wetland photos are presented in Appendix D, including a large-scale map. A Wetland Functional Assessment was also completed according to the Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC). The completed Assessment forms and calculation score sheets are also included in Appendix D. The following sections summarize the results of the wetland surveys and Functional Assessments for each wetland. An enlarged map and wetland boundary coordinates are included in Appendix D (Figure D-1 and Table D-1).

Wetland Functional Assessments were completed for each wetland using the Wetland Ecosystem Services Protocol -Atlantic Canada (WESP) wetland evaluation technique. The WESP process involves the completion of three forms: a desktop review portion that examines the landscape level aerial conditions within which the wetland is situated, and two field forms. The process serves as a rapid method for assessing individual wetland functions and benefits. WESP addresses 17 specific functions that wetlands may provide (WESP Table 2.1). The specific wetland functions are individually allocated into grouped wetland functions and measured for "Function" and "Benefit" scores. Wetland function relates to what a wetland does naturally through physical, chemical, and/or biological processes (i.e., water storage). Wetland benefits relate to the importance of the functions, whether it be ecological, social, or economic importance.

The highest functioning wetlands are those that have both high 'Function' and 'Benefit' scores for a given function. WESP enables us to compare individual wetlands within a region to gain a sense of the importance each has in providing ecosystem services.

In addition to the grouped wetland functions described, WESP also measures the following groups; however these are only evaluated by their benefit scores:

- Wetland Condition; and
- Wetland Risk.

The following individual functions are assessed to determine the benefit scores associated with these groups:

- Public Use & Recognition;
- Wetland Sensitivity;
- Wetland Ecological Condition; and
- Wetland Stressors.

For each wetland evaluated, the WESP process calculates the overall score for the seven grouped wetland functions and the 17 specific wetland functions listed in Table 6.2. One score each is provided for function and benefit. Scores are ranked as 'Lower', 'Moderate', or 'Higher', allowing for analysis of the wetland as compared to baseline wetland scores in Nova Scotia (NS). A 'Higher' WESP score means that wetland has a greater capacity to support those processes as compared to other wetlands in the Province. A 'Higher' WESP score in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services potentially important to society. For example, a 'Higher' function and benefit score in the specific wetland function 'Surface Water Storage' means the wetland effectively slows water running off from the landscape while at the same time providing flood control to communities downstream.

**Table 6.2 Wetland Function Parameters**

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Aquatic Support	Aquatic Invertebrate Habitat
	Stream Flow Support
	Organic Nutrient Export
	Water Cooling
Water Quality	Sediment Retention & Stabilization
	Phosphorus Retention
	Nitrate Removal & Retention
	Carbon Sequestration
Aquatic Habitat	Anadromous Fish Habitat
	Resident Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian and Turtle Habitat
Terrestrial Habitat	Songbird, Raptor, & Mammal Habitat
	Pollinator Habitat
	Native Plant Habitat

### 6.2.1 Wetland 1

Wetland 1 (WL1) is a drainageway shrub swamp dominated by Speckled Alder (*Alnus incana*). It is approximately 1.0 ha in total area and is located on former old field along an intermittent stream at the low (southeast) end of the site. The wetland is bounded at the west end by Cross Road, where a culvert drains into the wetland. The wetland receives intermittent runoff from the upgradient stream and from the ditch along the side of Cross Road and may also be a groundwater discharge area. One paired sampling site was recorded. The wetland was determined to have normal site conditions/hydrology within it, although the historic land condition appears to have been pasture or subsistence agriculture. The upland area around the wetland is partly mature mixed forest and advanced regeneration on old field.

In the wetland, the dominant vegetation is tall shrubs, mainly speckled alder with a lush herb cover of Yellow Avens (*Geum palustre*), Fowl Manna-grass (*Glyceria striata*), Dwarf Raspberry (*Rubus pubescens*), with lesser amounts of Blue Joint (*Calamagrostis Canadensis*) and sedges (*Carex intumescens*, *C. crinita*). The transition zone around the perimeter of the wetland is marked by a transition from alder dominance to Choke Cherry (*Prunus virginiana*) and Dogwood (*Cornus sp.*) as well as the increasing abundance of mature trees. The topography is variable with a fairly sharp rise north and south but quite subtle along the axis of the watercourse. The Prevalence Index (PI) was observed to be 2.29. A silty/clay soil was present with depleted matrix (F3) and was saturated to the surface.

The immediately adjacent upland is low to moderately sloping (occasionally steep) with frequently outcropping bedrock. The forest is mature and shows signs of past selective timber harvesting (old cut stumps) and agricultural activity (stone piles and old barbed wire fencing). The dominant vegetation is Red and White Spruce (*Picea rubens*, *P. glauca*) and Balsam Fir (*Abies balsamea*) with some Trembling Aspen (*Populus tremuloides*) and Red Maple (*Acer rubrum*). The understory and herb layer is sparsely vegetated including Beaked Hazelnut (*Corylus cornuta*), and Bunch Berry (*Cornus canadensis*). The PI was observed to be 3.7, with only 25% of dominant species with wetland indicator status (i.e., OBL, FACW, FAC).



The wetland boundary was established utilizing changes in vegetation within a sometimes-broad transition zone, often along the base of the slope north and south of the wetland and abruptly at the road edge.

WL1 has both surface inflow and outflow but intermittently; the stream was dry during the site visit in mid-August. There may also be some groundwater inflow and outflow. Some sedimentation was observed in the wetland at the small culvert in Cross Road. The channel through the wetland is sometimes braided and discontinuous, but there are signs of seasonal flooding within the entire wetland, likely during the spring freshet. The watercourse drains southeast toward Ridge Brook. There were abundant signs of browsing by ungulates. No SAR were observed in the wetland or adjacent forest.

The Wetland Functional Assessment revealed that WL1 provides higher functional values in water cooling (shade) and organic nutrient export, song bird, raptor, mammal habitat and pollinator habitat. Due to the seasonally intermittent nature of the water flow, WL1 scores lower in anadromous fish habitat, and amphibian and turtle habitat, but is moderate for native fish habitat (assumed to be potentially present despite the lack of water at the time of the survey). The water storage and delay function is lower due to the nature of the vegetation, steep gradient, and topographic profile. The observed sedimentation from the road-side runoff increases wetland stressors to moderate and reduces wetland ecological condition to moderate. WL1 is not highly visible from the adjacent unpaved roadway and is challenging to access (only for fit adults); therefore, there is lower potential social or aesthetic functions.

### 6.2.2 Wetland 2 (WL2)

Wetland 2 (WL2) is a partly wooded and partly shrubby drainageway swamp dominated by Eastern White Cedar (*Thuja occidentalis*) and Speckled Alder. It is approximately 1.24 ha in total area and is located partly on former old field and in undisturbed forest along a permanent stream at the low (southeast) edge of the site. The wetland receives surface water runoff and some groundwater input from upgradient forest and old field landscapes. One paired sampling site was recorded in the wooded swamp habitat. The shrubby part of the wetland is identical to WL1, so a second sample point was not required. The wetland was determined to have normal site conditions/hydrology within it, although the eastern shrub swamp habitat appears to be on land, used historically for pasture or subsistence agriculture. The upland area around the wetland is partly mature mixed forest and advanced regeneration on old field.

In the wetland, the dominant vegetation is Eastern White Cedar, Speckled Alder in open areas, with a lush herb cover of Sensitive Fern (*Onoclea sensibilis*), Dwarf Raspberry, with lesser amounts of Spinulose Wood Fern (*Dryopteris carthusiana*), Bristly Black Gooseberry (*Ribes lacustre*) and Ostrich Fern (*Matteuccia struthiopteris*). The boundary around the shrub wetland area, like WL1, is marked by a transition from Alder dominance to Choke Cherry and Dogwood species as well as the increasing abundance of mature trees. In the wooded part of the wetland, the boundary is marked by the transition from Cedar-dominant forest to Balsam Fir-dominant forest. The topography is variable with a fairly sharp rise to the north but descending gradually south and west toward the edge of the property. The PI was observed to be 2.32. A loamy soil was present with depleted matrix (F3), oxidized rhizospheres and was saturated to the surface, with some standing water up to 1 cm in places.

The immediately adjacent upland is low to moderately sloping. The forest is mature and shows signs of past selective timber harvesting (old cut stumps) and agricultural activity (stone piles and old barbed wire fencing). The dominant tree species are Balsam Fir, White Spruce and Red Maple. The understory is also dominated by Balsam Fir regeneration and the herb layer is sparsely vegetated mainly by Northern Lady Fern (*Athyrium angustum*). The PI was observed to be 3.08, and with 77% of dominant species with a FAC wetland indicator status, thus showing the subtle gradient within the WL2 transition zone. However, the upland soil is well drained silty loam and with relatively bright colours (5YR 4/2 (B horizon) and 4/4 (C horizon)).



The wetland boundary was established utilizing changes in vegetation within a sometimes-broad transition zone and noting signs of hydrology, including presence or absence of water-stained leaves.

WL2 has both surface inflow and outflow and was flowing at the time of the Site visit. There may also be some groundwater inflow and outflow. The channel through the wetland is well developed with potential fish habitat; small fish were observed. There are signs of seasonal flooding within the entire wetland, likely during the spring freshet. The watercourse drains southeast toward Ridge Brook. There were abundant signs of browsing by ungulates. No SAR were observed in the wetland or adjacent forest.

The Wetland Functional Assessment revealed that WL2 provides higher functional values in stream flow support and water cooling (shade), organic nutrient export, song bird, raptor, mammal habitat, pollinator habitat, and native plant habitat. Due to the seasonally variable nature of the water flow, WL2 scores lower in anadromous fish habitat, but is moderate for native fish habitat and amphibian and turtle habitat. The water storage and delay function is lower due to the nature of the vegetation, steep gradient, and topographic profile. There were no observed impacts; therefore, WL2 scores lower for wetland stressors and higher for wetland ecological condition. WL2 is not visible from any roadway and is challenging to access (only for fit adults); therefore, there is lower potential for social or aesthetic functions.

## 6.3 Wildlife

### 6.3.1 Migratory Birds

The majority of bird species in Canada are protected federally under the *Migratory Birds Convention Act* (MBCA); others are provincially protected under the *New Brunswick Fish and Wildlife Act*. Avian SAR are further protected by the federal SARA as well as the provincial *New Brunswick Species at Risk Act* (NBSRA).

A review of existing data from various sources was conducted in order to provide information on birds potentially breeding in and near the Project area, including avian SAR and Species of Conservation Concern (SOCC). Data sources consulted include:

- the NB Department of Energy and Resource Development (NBDERD) list of *General Status of Wild Species* (NBDERD, 2018);
- the Maritime Breeding Birds Atlas (MBBA) (Bird Studies Canada (BSC) et al., 2018) for information on species potentially nesting in or near the Project area;
- the ACCDC for information regarding SAR and SOCC within 5 km of the Project area; and
- the Important Bird Areas (IBA) of Canada database (IBA, 2018) for information on areas of particular importance for birds.

According to ECCC's general avoidance information for migratory birds, the Project site is located in breeding Zone C3 and, in this zone, the regional nesting period during which most migratory birds covered under the MBCA breed extends from mid-April to late August (ECCC, 2019b), although it is recognized that some avian species nest outside of this period, including corvids, owls, crossbills and waxwings.

NBDERD's *General Status of Wild Species* (NBDERD, 2018) reports that there are 407 extant bird species known to occur in the Province, of which 143 are considered accidental (Table B.1 in Appendix B). Of the species that regularly occur in the Province during at least part of their life cycle (breeding, wintering and/or migration), twelve species are considered "At Risk", twelve "May be At Risk", and forty-eight are considered "Sensitive". Within the MBBA 2nd Atlas (BSC et al., 2018), which was compiled over the period of 2006 to 2010, the Study Area lies within Region #13, Petitcodiac, in Square #20LR19 (Springhill). Breeding evidence was recorded for a total of 177 bird species in the Petitcodiac region. In Square #20LR19, while the survey effort (17 hours) was below the target survey effort of 20 hours/square, breeding evidence was reported for

fifty-six species. Of these, three species were confirmed to be Breeding based on observed evidence; nine were Probable Breeders; and the rest were considered to be Possibly Breeding. Species observed within Square #20LR19 during the second MBBA are listed in Table B.2 in Appendix B.

According to the ACCDC report (Appendix A), there have been 6 reports of 4 SOCC birds within 5 km of the Project. The avian SOCC reported by ACCDC include one SAR listed under the federal SARA Schedule 1 and/or NBSRA: the Barn Swallow. The habitat requirements for this avian SAR, and its potential to occur in the Project area, is outlined in Table 6.3. No designated critical habitat for avian SAR (as defined in SARA and NBSRA species recovery plans, where available) is present within the Study Area.

**Table 6.3 Avian SAR Recorded Within 5 km of the Project Location**

Species	Status	Habitat	Potential to Occur in Project Area
Barn Swallow	NBSRA: Threatened  SARA: Threatened	Requires open areas (fields, meadows) for foraging and open structures such as barns for nesting; typically found near aquatic habitats, as a source of mud is required for nest construction.	Potentially present during the breeding season; suitable nesting habitat nearby.

Breeding bird surveys, including targeted surveys for nocturnal species such as owls and common nighthawks, were conducted within the Phase 1 footprint on June 4<sup>th</sup> and June 22<sup>nd</sup>, 2019. A total of seven diurnal point counts and five nighttime point counts were conducted, with all surveys undertaken in suitable listening conditions, with no precipitation and low winds. A list of species observed during the June surveys is provided in Table B.3 in Appendix B; one Provincially-listed SAR, the Bald Eagle, was seen approximately 300 m north of the Phase 1 footprint but is considered unlikely to be nesting within the footprint based on the available habitat.

Geographic information system (GIS) digital datasets were supplied by NBDERD to derive potential habitat types. GeoNB (SNB, 2016) was used to map NB regulated wetlands while in-house data was used to update edge area to include activity that has occurred since 2013, such as forestry. From available mapping and verified field records, six broad land/habitat types were identified within the Project footprint (Figure 6.1):

- Agricultural;
- Hardwood;
- Softwood;
- Unclassified Forest (generally non-merchantable, including regeneration);
- Wetland; and
- Infrastructure.



In order to determine the amount of habitat potentially affected by the proposed Project within the Phase 1 footprint, the total area in square metres (m<sup>2</sup>) was calculated for each habitat type. The Phase 1 footprint of the Springhill Quarry property consists of approximately 829876.8 m<sup>2</sup> (~83 ha) of potential migratory bird habitat. Table 6.4 summarizes the areas of each habitat type within the Phase 1 footprint. The prevalent habitat types within the proposed Project footprint are Softwood (36.1%), hardwood (33.3%) and unclassified (generally non-merchantable) forest including regen (14.3%). The remaining areas are mostly agricultural fields (11.3%) and wetlands (2.7%).

**Table 6.4 Habitat Present Within the Phase 1 Footprint**

Habitat Type	Study Area (m <sup>2</sup> )
Agricultural Land	93,792
Hardwood	276,086
Softwood	299,395
Unclassified	118,841
Wetland	22,691
Infrastructure	19,072
<b>Total</b>	<b>829,877</b>

The nearest IBA is Shepody Bay West, a tidal embayment located at the western head of the Bay of Fundy, which extends 35 km along the western coast of Chignecto Bay, from Hopewell Cape to Rocher Bay, and is within approximately 55 km of the proposed Project area to the southeast. This IBA features extensive intertidal mudflats with some fresh and salt water marshes that provide important migratory stopover sites for several shorebirds. Significant species include Semipalmated Sandpipers, Semipalmated Plovers, Short-billed Dowitcher, Sanderling, Least Sandpiper, and the Endangered (SARA and NBSRA) Red Knot.

### 6.3.2 Mammals

NBDERD's *General Status of Wild Species* (NBDERD, 2018) reports that there are 52 species of mammals known to occur in the Province, and a further seven which are extinct, extirpated or unverified (Table B.1 in Appendix B). Of these 52 species, one (Canada Lynx) is considered to be "At Risk", two species (Gaspé Shrew and Long-tailed Shrew) "May Be At Risk" and four are considered "Sensitive": Big Brown Bat, Little Brown Bat (little myotis), Northern Long-eared Bat (northern myotis) and Eastern Pipistrelle (Tri-coloured Bat). The Canada Lynx is listed as Endangered under the NBSRA; the Little Brown Bat, Northern Long-eared Bat and Eastern Pipistrelle are listed as Endangered under SARA.

The ACCDC report (Appendix A) showed no records of mammal SOCC within the 5 km Study Area. During the June field surveys, evidence of White-tailed Deer and Snowshoe Hare was observed within the Phase 1 footprint. In August, deer were observed on Cross Road and throughout the Site there were abundant signs of grazing and faecal matter. Red Squirrels and Eastern Chipmunks were abundant. Snowshoe Hare and Coyote scat was present. It is also likely that other mammals use the area; Black Bear, Red Fox, Raccoon and Skunks could be present.



### 6.3.3 Amphibians and Reptiles

NBDERD's General Status of Wild Species (NBDERD, 2018) reports that there are 16 species of amphibian and 7 reptile species known to occur within the Province (Table B.1 in Appendix B). Of these, one (Wood Turtle) is considered to be At Risk and one is considered Sensitive (Dusky Salamander). No terrestrial reptiles or amphibians are listed under the NBSRA. The Wood Turtle is listed as Threatened and the Snapping Turtle is considered an SOCC under SARA.

The ACCDC report (Appendix A) showed no records of reptile or amphibian SOCC within the 5 km Study Area. During the June field surveys, spring peepers were heard within the Phase 1 footprint. There is little high-quality amphibian habitat onsite, with the exception of WL1 and WL2. The Site lies within an identified Wood Turtle and Snapping Turtle watershed (the Canaan River), so turtles could potentially wander into the Project footprint from tributaries (the primary River route being located approximately 5 km northwest). The discovered watercourses within the Project footprint (WC1 & WC2) are not typical or high-quality turtle habitat.

### 6.3.4 Invertebrates

NBDERD's *General Status of Wild Species* (NBDERD, 2018) maintains lists of butterfly and odonate (dragonfly and damselfly) species in NB. According to these lists, there are 80 butterfly and 131 odonate species known to occur in the Province (Table B.1 in Appendix B). Of these, one (Maritime Ringlet) is considered to be "At Risk"; fifteen (4 butterflies and 11 odonates) "May Be At Risk", and thirteen (1 butterfly and 12 odonates) are considered "Sensitive". The Cobblestone Tiger Beetle (*Cicindela marginipennis*), Maritime Ringlet (a butterfly) and Skillet Clubtail (an odonate) are listed as Endangered under SARA; while the Monarch Butterfly and Pygmy Snaketail (an odonate) are considered to be SOCC. The Maritime Ringlet is listed as Endangered under the NBSRA.

The ACCDC report (Appendix A) showed no records of invertebrate SOCC within the 5 km Study Area.

## 6.4 Fish, Fish Habitat, and Fisheries Resources

The main stem of the Canaan River is approximately 72 km long and drains into Washademoak Lake east of Gagetown, NB. In addition to the main stem, the 2,167 square kilometre (km<sup>2</sup>) watershed contains 17 tributaries with an approximate cumulative length of 135 km. The Canaan watershed is predominantly forested land and wetlands with smaller sections of agriculture, residential, commercial, and industrial areas (NBDELG, 2007).

A number of recreational fish species reside in the Canaan River, including landlocked Atlantic Salmon (*Salmo salar*), Brook Trout (*Salvelinus fontinalis*), Smallmouth Bass (*Micropterus dolomieu*), Smelt (*Osmerus mordax*), Striped Bass (*Morone saxatilis*), Muskellunge (*Esox masquinongy*), Burbot (*Lota lota*), Yellow Perch (*Perca flavescens*) and Sturgeon (*Acipenser oxyrinchus oxyrinchus*).

The federal *Fisheries Act* under the jurisdiction of Fisheries and Oceans Canada (DFO) protects fish that are part of commercial, recreational or aboriginal fisheries as well as fish that support such a fishery. Section 36 (3) states that no person shall permit the deposit of a deleterious substance of any type in water frequented by fish, or in any place under any conditions where the deleterious substance may enter any such water.

### 6.4.1 Onsite Watercourses

This section describes the results of aquatic habitat surveys and electrofishing conducted on September 4<sup>th</sup>, 2019. Two small watercourses were identified within the Project Phase 1 footprint as indicated on Figure 6.1. Standard aquatic habitat forms are presented in Appendix E with site photos.

#### **Northern watercourse (Watercourse 1)**

The survey started at the upstream extent of the watercourse (45.99957°; -65.36777°), which appeared to be the origins of a channelized section. The watercourse proceeded in a general southeast direction, ending at the eastern edge of the property (45.99817°; -65.36370°).

The first surveyed section (Unit #1) was 55 m long and consisted of a channel averaging 1.2 m wide (bank width). The channel was wet, but water depth would have rarely been over 5 cm. The substrate was predominantly fines with lesser amounts of sand and rare instances of rock. Undercut bank was not noted but overhanging vegetation was plentiful. Riparian vegetation was a mix of grass and trees with lesser amounts of shrub. Trees primarily consisted of tall alders. Between the canopy and overhanging vegetation shade was plentiful.

The next section (Unit #2) was 146 m long and consisted of a channel averaging 1.4 m wide (bank width). The channel was wet, but water depth would have rarely been over 5 cm. The substrate was predominantly rubble with lesser amounts of gravel, sand, and rock. Rare instances of undercut bank were noted, and overhanging vegetation was present. Riparian vegetation was predominantly softwood trees with lesser amounts of grasses and shrubs. The degree of shade was still high, but less than that seen in Units #1 and #3.

The last surveyed section (Unit #3) was 247 m long and consisted of a channel averaging 0.7 m wide (bank width). The channel was wet, but water depth would have rarely been over 5 cm. Two areas that accumulated a depth of water that could sustain fish were noted in this section. The substrate was a mix of sand and gravel with lesser amounts of rock and fines. Rare instances of undercut bank were noted, and overhanging vegetation was plentiful. Riparian vegetation was predominantly softwood trees with lesser amounts of grasses and shrubs and shade was plentiful.

### Electrofishing

Fishing was conducted at two sites, both approximately 1.5 x 1.5 m in area with ample depth to support fish. A total of 98 seconds of fishing effort was used between the two sites and a total of 12 creek chub (*Semotilus atromaculatus*) were collected. Four young-of-the-year (YoY) chub were collected. Sampling was completed using a Smith-Root LR24 electrofisher with settings of 325 volts; 45 Hz frequency, and a 12% duty cycle. A summary of fish parameters is presented in Table 6.5.

**Table 6.5 Fish Captured in Watercourse 1**

Site	Species	Fork (mm)	Length	Weight (g)
1	Creek chub	94		7.6
	Creek chub	81		5.9
	Creek chub	89		7.6
	Creek chub	35		0.2
	Creek chub	39		0.2
2	Creek chub	105		13.4
	Creek chub	101		11.1
	Creek chub	106		12.4
	Creek chub	25		0.2
	Creek chub	25		0.3
	Creek chub	102		11.6
	Creek chub	59		2.2

### Southern Watercourse (Watercourse 2)

This survey began at the downstream side of the culvert beneath Cross Road (45.99670°; -65.36682°). The watercourse proceeded in a general east-southeast direction and ended at the eastern edge of the property (45.99627°; -65.36308°). The entire extent of the watercourse was dry.

The first surveyed section (Unit #1) was 97 m long and consisted of a channel averaging 1.8 m wide (bank width). The substrate was a mix of rubble and gravel with lesser amounts of sand. Undercut bank was not noted but overhanging vegetation was plentiful. Riparian vegetation was predominantly trees with lesser amounts of shrub and grasses. Shade was plentiful due to the thick canopy and extensive overhanging vegetation.

The next section (Unit #2) was 171 m long. The channel was no longer evident, and it appeared to transition to a series of braided channels through a wetland. The watercourse was dry and the vegetation was thick making it difficult to discern where the braided channels were located through the section. Vegetation was dominated by grasses (ferns) with lesser amounts of shrubs and trees.

The last surveyed section (Unit #3) was 70 m long and consisted of a channel averaging 2.4 m wide (bank width). The substrate was predominantly rubble with lesser amounts of rock, gravel, and boulder. Rare instances of undercut bank were noted, and overhanging vegetation was sparse. Between the canopy and overhanging vegetation shade was plentiful.



## 7.0 Site History (Archaeological Resources)

An Archaeological Impact Assessment (AIA) is one component of an EIA. 1. The objectives of an AIA are to identify, inventory and evaluate all sites of archaeological, historical, and architectural significance within the Project Study Area (focusing on the Project footprint) and to assess the potential effects of the Project on these archaeological and heritage resources. These objectives are accomplished via a four-phase process:

- Phase 1: Background desktop review (documentary research, regulator consultation);
- Phase 2: Field examination (visual surface survey, informational interviews);
- Phase 3: Field evaluation (subsurface archaeological testing); and
- Phase 4: Significance determination, impact assessment, and mitigation.

This four-phase process is approached sequentially and involves decision points along the way. While these steps are initially addressed in a linear fashion, they are iterative as circumstances commonly arise during the course of investigations that require previous phases to be revisited. Therefore, the specific methodology used or recommended for each phase is based upon the results obtained in the preceding phase. The present archaeological investigations included a desktop review (Phase 1) and field examination (Phase 2).

### 7.1 Methodology

#### 7.1.1 Phase 1: Background Desktop Review

The Phase 1 documentary research included the following elements:

- Reviewing present day and historic aerial photographs and topographic maps;
- Reviewing previous archaeological surveys conducted in the area;
- Reviewing documentation on existing identified heritage sites in the vicinity;
- Reviewing the New Brunswick Register of Historic Places;
- Reviewing the Canadian Register of Historic Places;
- Reviewing the Directory of Designations of National Significance of Canada;
- Conducting a review of archaeological literature sources;
- Identifying any Nationally or Provincially designated historic sites in the area;
- Conducting a review of historical literature sources;
- Reviewing geological surficial and bedrock mapping of the area; and
- Procuring and reviewing ASNB GIS mapping for the Project area.

#### 7.1.2 Phase 2: Field Examination

The objective of the field examination (visual surface survey) is to obtain first-hand exposure to the Project impact area's geography and topography to aid in the early identification of potential archaeological resource locations. The field examination involves a visual examination of the surface of the Project impact area and vicinity; with particular attention to subsurface exposures; watercourse shorelines and erosional faces; forest clearings; and other areas indicated as having elevated potential based on Phase 1 investigations and archaeological potential modelling. The Field Examination was conducted on October 16, 2019 and, in accordance with Provincial requirements (ASNB 2012), included all accessible portions of the Project area.

## 7.2 Results of Phase 1: Background Desktop Review

Watercourses were the primary transportation routes of the past. Indigenous peoples and European settlers (Acadians, Planters, and United Empire Loyalists) utilized the river systems of NB extensively as transportation routes. Therefore, the shorelines of the Province's rivers systems have elevated potential for archaeological resources from both the precontact and historic time periods. An Indigenous portage route is known to have connected the Canaan and Petitcodiac River systems east of the Project area (Ganong 1899:246–248). The precise route of this portage is not known but is thought to have exited the Canaan 3.2 km upstream of Nevers Brook and entered the Petitcodiac 8.0 km downstream of the Village of Petitcodiac. No registered archaeological sites are known from the vicinity of the Project area.

Springhill Settlement was established circa 1814 and named after the large number of freshwater springs in the region (Provincial Archives of New Brunswick 2019). In 1866, Springhill consisted of an agricultural community of approximately eight families (ibid). The Project area falls on two parcels of land granted in 1837; one (PIDs 00170431 and 30280101) consisting of 100 acres granted to Joseph Keith and the other (PIDs 00169250, 00172999, and 00255299) of 200 acres granted to Nehemiah Keith. A 1945 aerial photograph of the Project area indicates two homesteads; one on present-day PID 00170431 and the other on PID 00255299, consisting of houses, barns, and various outbuildings. These may correspond to the residences of the original grantees. An isolated structure is visible to the southwest of the crossroads of Springhill and Cross Roads on PID 30280101. The 1945 also photograph shows the entire Project area as cleared agricultural land with small orchards. Only the eastern portion of the northern watercourse and the associated wetland are treed.

## 7.3 Results of Phase 2: Field Examination

The archaeological field examination was conducted on October 16, 2019, under AFRP 2019NB133 by Wood Archaeologist W. Jesse Webb, with assistance from Lyle Vicaire. The survey was conducted on a sunny, warm day with good visibility. The field examination consisted of a series of north-to-south transects which covered the entirety of PIDs 00170431, 00169250, 00255299, and 30280101. Special attention was paid to areas where historic structures (e.g. houses, barns, etc.) were anticipated based on historic aerial photography. The field examination resulted in the identification of two archaeological sites (temporary site numbers 2019NB133-1 and 2019NB133-2) and several cultural features that are not considered to be heritage resources. The archaeological sites are in the process of being formally registered with the Provincial regulator and are interpreted as the remains of two homesteads visible in historic aerial photography. In addition, watercourses present in the Project impact area were evaluated for archaeological potential.

### 7.3.1 Archaeological Site 2019NB133-1

The first archaeological site was identified on PID 00255299. This site consists of the remnants of a homestead visible in historic aerial photography and is presumed to date from the nineteenth century. Three cultural features were identified:

- A stone and mortar foundation (46.00684°; -65.36990°) measuring approximately 7.0 m north-to-south, 6.0 m east-to-west, and approximately 175 cm total depth. Timbers and metal debris were present in and around the feature, possibly representing remains of the demolished structure. Some red brick was also evident around the feature. A possible cellar entrance was located at the southeast corner of the feature, facing south.
- An isolated rock wall on an east-to-west axis was present approximately 40.0 m east of the foundation feature (46.00683°; -65.36935° to 46.00686°; -65.36923°). The visible portion of this wall measured approximately 75 cm high and extended for 8.0 m. It consisted of two faces of rock bound together



with mortar and a core of smaller rubble. No adjoining walls were visible intersecting with this section of wall. It is possible that this represents the remnants of a partially demolished foundation.

- A concrete foundation is located just to the east of the rock wall (46.00686°; -65.36912°). This structure measures approximately 2.0 m north-to-south, 3.0 m east-to-west, and approximately 200 cm depth. The southern face of this foundation is askew, suggesting that the feature is disturbed. Pieces of rusted sheet metal roofing were located adjacent to this structure. It is unclear how this apparently more modern feature relates to the two stone features.

### 7.3.2 Archaeological Site 2019NB133-2

The second archaeological site was identified on PID 00170431. This site consists of the remnants of another homestead visible in historic aerial photography and is likewise presumed to date from the nineteenth century. Again, three cultural features were identified:

- A stone well measuring approximately 70 cm internal diameter and 4.0 m depth was identified (46.00539°; -65.37692°). This feature was open, with water, rock, and forest detritus visible in the bottom. The entirety of the well shaft appeared to be lined with dry laid stones and is evidently hand-dug. The top courses of stone were encrusted with moss, whereas the deeper stones were relatively clear. Apple trees were present in the vicinity.
- A stone foundation feature was identified approximately 30 m west of the well (46.00549°; -65.37652°). This feature measured approximately 9.5 m north-to-south and 5.5 m east-to-west, with variable depth depending on exposure. This foundation consisted of stone that had been refurbished with concrete at a later date. Nestled within the southwest corner of the stone foundation was a smaller concrete foundation measuring approximately 3.0 m north-to-south, 2.0 m east-to-west, and 75 cm depth. Metal pipes were present within the concrete foundation. A scatter of twentieth century artifacts including rubber tires, glass, metal, and various cut mammal bones was located a few metres south of the feature. Two small fragments of gilded porcelain (probably twentieth century) were identified on the surface near the feature.
- Another stone well feature was identified approximately 10.0 m southwest of the foundation (46.00542°; -65.37645°). This well also measured approximately 70 cm internal diameter but had been filled-in with stones and was overgrown with vegetation. It is possible that this well predates the first, having been filled in and abandoned.

### 7.3.3 Other Cultural Features

In addition to the two archaeological sites, several cultural features not considered to be historically significant were identified in the Project area. Eight rock piles were identified throughout the field examination. These consisted of cobbles or boulders placed in piles generally 2.0–3.0 m diameter and less than 1.0 m high. These are interpreted as fieldstones collected and dumped as a result of agricultural land-clearing practices. The majority of the rock piles were identified along an exposure of limestone bedrock on PID 00169250 and associated with the remnants of an old metal wire fence. Such stone piles are ubiquitous in former agricultural land and, while generally indicative of historic land use, are of limited research value and not considered to have special heritage significance. Other historic structures identified during the field examination include a collapsed tree stand and abandoned wooden ladder on PID 00169250 and a dilapidated livestock enclosure (chicken coop or rabbit hutch) on PID 00170431. These are interpreted as evidence of recent hunting and agricultural activity, respectively. Slightly overgrown pits, trenches, and depressions were ubiquitous throughout the Project area and are interpreted as evidence of geological exploration of the limestone deposits. Again, while these are indicative of historic land use, they are essentially modern (i.e. late-twentieth century to present-day) and are thus not considered to have heritage significance.

### 7.3.4 Watercourse Evaluations

Two small watercourses are present in the Project area and were examined during the field evaluation. As indicated in Section 6.4.1, both watercourses are small, with channels averaging less than 2.0 m width and water depth rarely exceeding 5.0 cm. Neither watercourse has been assigned a high or medium potential archaeological buffer by the Provincial Regulator, indicating that they present low potential for buried heritage resources. The field evaluation of these watercourses supports this conclusion since the watercourses are too small to have been amenable to watercraft transport and do not support significant fish populations that might have been exploited for subsistence in the past. A tributary of Price Brook skirts the southeastern corner of PID 00169250 and has been assigned a high-to-medium potential buffer by the Regulator, which extends into the Project area. However, this watercourse was not visible in the field. A tributary of Springhill Brook has also been assigned a buffer by the Provincial Regulator; the medium potential portion of which partially falls within the northern portion of PID 00170431. Again, no watercourse was observed in the field corresponding to this buffer.

## 8.0 Socio-economic Setting

The following sections describe the socio-economic setting of the Study Area.

### 8.1 Population and Labour Force

The proposed Project is located in the community of Havelock, Kings County, NB. This region lies within the Parish (PAR) of Havelock 2016 Census subdivision (Statistics Canada, 2017); a 349.2 square kilometre (km<sup>2</sup>) area within the 3484 km<sup>2</sup> of Kings County, which comprises the Study Area's socio-economic component of the EIA.

The major commercial centre nearest Havelock is the City of Moncton, approximately 50 km east of the Springhill Quarry property. Table 8.1 displays the population of Havelock PAR, the nearby village of Petitcodiac, and Kings County as compared against the Province of NB (Statistics Canada, 2017) as per the 2016 census. Occupations most reported by the census participants were in trades, transport, and equipment operators (25%) and related occupations, and sales and services (15%).

Havelock PAR experienced a population decrease (8.4%) between 2011 and 2016, a higher rate than the rest of NB. Likewise, the Village of Petitcodiac decreased by 3.2%. Kings County and the Province decreased by 1.0% and, 0.5%, respectively.

**Table 8.1 Census Population for Study Area**

Municipality	Area (km <sup>2</sup> )	2011	2016	% Change
Havelock (PAR)	349.2	1,158	1,061	-8.4
Petitcodiac (Village)	17.21	1,429	1,383	-3.2
Kings County	3,484.2	69,665	68,941	-1.0
Province of NB	71,388.8	751,171	747,101	-0.5

Statistics Canada, 2016 Canadian Census.

## 8.2 Local Economy

The current leading industry in the community is the existing Graymont Samphill limestone quarry. Moncton is the main industrial and commercial centre near this area. Adjacent to the Study Area, there appears to be limited additional industry and commerce compared to the nearby urban centre of Moncton. Therefore, it is likely that some people in this region commute to work. The median 2015 employment income for working residents of Havelock PAR was \$26,005.

## 8.3 Cultural and Social Characteristics

The Study Area and Havelock PAR are rural communities and are predominantly surrounded by forest and agricultural land. The Study Area is approximately 4 km from the centre of Havelock. The Canaan river and associated tributaries are likely used by residents for recreational activities such as hiking, ATV use, winter snowmobiling, and fishing. There is a small public airport nearby.

## 8.4 Transportation Network

### 8.4.1 Road Transportation

The proposed quarry area is bisected by the Cross Road, a Crown Reserve dirt road that connects Springhill Road with Samphill Road to the south. The northern half of Cross Road will be included within the development area and will be cut off to traffic. There are no residences or utilities located on this short connector road.

The Site will be accessed via Cross Road and either Mineral Springs Road from Route 880 or via Springhill Road to Route 885. Each connects to Route 885 within about 1 km, and from there approximately 6 km further to access the Trans-Canada Highway (Route 2). Much of the product from the quarry will be transported to the Graymont lime-kiln facility in Havelock; which is located about 300 m east of the intersection of Routes 880 and 885. Both routes are already used for transporting product from the existing Samphill and Hicksville Quarries.

### 8.4.2 Rail

The nearest railway line to the Site is the Sussex Subdivision of the Canadian National Railway (CNR) approximately 17 km east (Figure 2.2). A former rail spur into Havelock has been converted to the NB Trail system.

### 8.4.3 Shipping

Port Saint John is Eastern Canada's largest port by volume and has a diverse cargo base, handling an average of 28 million metric tonnes of cargo annually, including dry and liquid bulks, break bulk, and containers. With global connections to 500 ports worldwide, Port Saint John is easily connected to central Canadian inland markets by rail and road (Port Saint John, 2018).

## 9.0 Environmental and Socio-economic Sensitivities

This section presents a list of sensitive environmental and economically and socially valuable resources that may be impacted by the Springhill Quarry development. Based on the above description of the existing environment (both ecological and socioeconomic), and the potential interaction of quarry activities with identified resources, an issues scoping/pathway analysis was conducted and is presented in Table 9.1.

The resulting list of potentially impacted Valued Environmental Components (VECs) include:

- Ambient Air Quality;
- Noise;
- Groundwater Resources;
- Species At Risk;
- Migratory Birds;
- Archaeological Resources;
- Local Economy; and
- Traffic Circulation.

These VECs will be carried forward into Part 2 of the Mining Plan in the sections following. Based on a detailed description of the quarry operation in Sections 10.0 and 11.0, the predicted impacts are discussed in Section 12.0, and mitigation measures are described that will minimize or eliminate negative effects.

**Table 9.1 Issues Scoping / Pathway Analysis Summary Matrix – VECs**

Environmental Resources	Environmental Components	Pathway of Concern		Possible Pathway	VEC		Rationale for Inclusion/Exclusion as Valued Environmental Component (VEC)
		Yes	No		Yes	No	
Atmospheric Environment	Ambient Air Quality	X		Dust Equipment emissions	X		Included as a VEC – Dust may exceed PM limits without mitigation.
	Noise	X		Equipment Operation Blasting	X		Included as a VEC – Blasting noise could disturb nearest residents; requires monitoring plan.
Hydrology	Climate		X	Extreme precipitation Severe weather		X	Excluded as a VEC – extreme weather events will not impact quarry operation. Site drainage and erosion control will contain runoff.
	Surface Water		X	Acid rock drainage (ARD). Site runoff		X	Excluded as a VEC – No ARD potential for site geology. Site runoff/spills will be contained within the Site Boundary. Nearest waterbody is enclosed within verified wetlands, and Site activities will be conducted outside a minimum of 30 m from the wetland perimeter. No special mitigation required
	Groundwater Resources	X		Blasting vibration Accidental release of hazardous materials	X		Included as a VEC – Blasting could impact nearby residential wells; requires monitoring plan.
Biological Environment	Vegetation / Forest Resources	X		Site clearing during quarry lifetime		X	Excluded as a VEC – Site to be restored to forested condition at end of quarry life.
	Wetlands		X	Two wetlands within Phase 1 footprint		X	Excluded as a VEC – Mine has been designed to avoid impact to wetlands.
	Species at Risk	X		Forest/vegetation clearing in quarry footprint	X		Included as a VEC – there is a small potential for plant or bird species of special status to be present in the remaining forest areas within the Site Boundary; requires confirmatory site visit.
	Wildlife	X		Forest/vegetation clearing in quarry footprint		X	Excluded as a VEC – Site to be restored to forested condition at end of quarry life. Temporary displacement of wildlife will occur during the construction and operations phases of the quarry.
	Migratory Birds	X		Forest/vegetation clearing in quarry footprint	X		Included as a VEC –migratory birds are present in vegetated areas within the Site Boundary. Mitigation is required.
	Fish, Fish Habitat, and Fisheries Resources	X		Two watercourses in project footprint	X		Excluded as a VEC – Site Plan has been designed to avoid watercourses.
	Designated Areas and Other Critical Habitat Features		X	No possible pathway identified		X	Excluded as a VEC – No possible pathway (none identified in close proximity to the Project).
Site History	Archaeological Resources	X		Stripping overburden	X		Included as a VEC – Two historic archaeological sites were identified during field examination.
Socio-Economic Setting	Local Economy	X		Local employment and spending	X		Included as a VEC – Quarry operations will provide benefits to local and provincial economy.
	Existing Land Use	X		Quarry operation		X	Excluded as a VEC – Site to be restored to forested condition at end of quarry life.
	Traffic Circulation	X		Trucking product to markets	X		Included as a VEC – Increased truck traffic and heavier trucks used for high production volumes may impact traffic circulation or require road system modifications.
	Use of Land By Indigenous People		X	No possible pathway identified		X	Excluded as a VEC – No possible pathway. Site has low historic / archaeological resource potential.



## PART 2 - MINING PLAN

### 10.0 Mine Site Description

The following subsections describe each component of the proposed development and operations of the Springhill Limestone Quarry.

#### 10.1 Ore Reserves

The Springhill area is generally along strike from Graymont's Hicksville quarry, some 3 km to the northeast. The Springhill and Hicksville areas are separate from the main Havelock Syncline and share geological similarities with each other, one of which is their relatively low manganese oxide (MnO) content. The most important stratigraphic marker in the area is the basal contact of the Macumber carbonate rocks with the underlying Hillsborough. Modeling of the previous drilling results suggest that this contact is nearly horizontal in the Springhill area, with a few structural disruptions. Thus, in general the topographically highest areas have the best potential to have the greatest limestone thicknesses. There appears to be a slight regional dip to the southwest.

To develop a robust geological model for the Springhill Quarry, a total of 73 NQ-sized drill holes, totaling 906.34 m were drilled since 2016 in the Project area to better define the extents and grades of the limestone unit of interest. In addition to the work completed by Graymont, geological information was obtained from historic Lafarge data adding an additional 81 drill holes (1032.44 m) to aid in refining the geological model. This combined geological information (Table 10.1) provided Graymont with sufficient data to upgrade resources to reserves, allowing for a detailed conceptual pit design. During mining, regular blast hole analysis of drill cuttings will be collected to continuously refine a grade control model for operations. All samples will be analysed using an XRF located at Graymont's laboratory and Havelock plant.

**Table 10.1 Drill Holes on the Springhill Claim Group**

Year	Company	# of Holes Drilled	Total Length (m)	Drilling Method
1988	Lafarge	15	240.74	Percussion
2002	Lafarge	3	31.5	Percussion
2003	Lafarge	7	89	Core
2007	Lafarge	14	174.3	Percussion
2008	Lafarge	42	496.9	Percussion
2016	Graymont	14	209.25	Core
2017	Graymont	39	468.97	Core
2018	Graymont	20	228.12	Core

In 2017, a LiDAR topographic survey was completed over the Springhill property. This gave Graymont the most accurate point data set used to create topographic contours and the ability to create a triangulated topo-surface that was used for drill hole planning, geological model creation, and ultimately the proposed engineered pit design and associated mining stockpiles.

Data was compiled and modelled using Geovia’s Surpac (2019 version) mining software. Geological contacts were identified from drill logs from both historic Lafarge holes, and Graymont drilling campaigns. However, the grade model was based on analytical data from the Graymont drilling programs since a complete suite of analytical data was non-existent with the Lafarge drilling data. A block model was generated using 5(x)x5(y)x5(z) m block sizes, which seemed reasonable for the assumption of minimum mining thickness and machinery used onsite. Analytical data was composited to 2.5 m (half the block height) to obtain a consistent sample support for grade interpolation, which was determined using the inverse distance squared method (id2). Once completed the block model validation of the project file was handed off to Graymont’s Mining Engineer for pit optimization and pit design. It should be noted that only those portions classified as measured and indicated resources are directly converted to proven and probable reserves, and only reserves are reported within the mining engineers mine plan.

The local Gays River Formation includes both calcitic (CaCO<sub>3</sub>) and dolomitic (MgCO<sub>3</sub>) limestone. Within the proposed quarry area, Graymont has located over 30 bedrock outcroppings of white limestone; which typically indicates high calcium content, and lab results for 10 limestone samples collected in 2005, 2012, and 2018 have shown percent calcium oxide (CaO) from 50.79 to 54.42%.

Open Pit Mineral Reserves have been developed using best practices in accordance with CIM guidelines and National Instrument 43-101 reporting.

The open pit design includes 6.23 Mt of Proven and Probable Mineral Reserves at a grade of 96.43% CaCO<sub>3</sub>. In order to access these reserves, 2.3 Mt of overburden, 0.9 Mt of non-spec limestone waste rock will need to be removed and stockpiled. This results in a stripping ratio of 0.51 to 1. Table 10.2 presents the open pit mineral reserves for the Springhill Project in more detail.

**Table 10.2 Open Pit Mineral Reserves**

Category	Tonnage (Mt)	CaCO <sub>3</sub> (%)	Fe <sub>2</sub> O <sub>3</sub> (%)	MgCO <sub>3</sub> (%)	MnO (ppm)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)
Proven	5.86	96.42	0.22	0.45	202.34	2.27	0.49
Probable	0.37	96.46	0.24	0.46	211.43	2.39	0.55
Proven & Probable*	6.23	96.43	0.22	0.45	202.89	2.27	0.49

\*Total may not add up due to rounding

Based upon analysis of geological information and the results of the drill hole programs, the quantity of economically viable limestone at the Springhill Quarry is expected to be approximately 6.23 Mt of Proven and Probable Mineral Reserves at a grade of 96.43% CaCO<sub>3</sub>. In order to access these reserves 2.3 Mt of overburden and 0.9 Mt of non-spec limestone waste rock will need to be removed and stockpiled. This results in a stripping ratio of 0.51 to 1.



The currently proposed annual production of 320,000 tonnes of limestone would be sustainable for at least 20 years, given the conservatively estimated total volume for the Phase 1 development. Future Phases could extend the life of the quarry up to 30 years (i.e., three 10-yr phases), but this will need to be verified through additional exploration and mining experience.

## 10.2 Mining Methods

Graymont intends to target high calcium limestone (>50% CaO) for sale to industrial markets for its chemical properties. The high calcium limestone at the site is massive, exposed on the surface, and is very white. Graymont has identified that high calcium (~53% CaO) zones are locally present but achieving a constant mining grade above 50% CaO will require selective quarrying.

The mining method selected for the Project is a conventional truck and shovel, drill and blast operation. Vegetation, topsoil and overburden will be stripped and stockpiled for future reclamation use. As the deposit is tabular in nature and consists of a Limestone geological unit of variable thickness, the mining bench height will vary to match the limestones thickness. Bench heights ranging from 4 m to a maximum of 15 m have been considered for this Project. Since the resource is exposed at the surface, Graymont can begin the quarry at the southwestern, downgradient, side of the proposed development area and generally advance northeastward into the hillside, along the strike of the limestone bedding, with a working face 10 m in height. If selective mining is conducted, the width will vary. The maximum width will be approximately 500 m.

Limestone and waste rock will be drilled, blasted and loaded into transport trucks with hydraulic excavators and wheel loaders. Limestone will be transported 5 km to the crusher located offsite at the Graymont Lime facility in Havelock. Waste rock will be loaded into articulated mining trucks and hauled to a stockpile located less than 1 km from the pit, within the Claim area (Figure 10.1). Standard quarry equipment will be used, such as an excavator, off-road trucks, front-end loaders, and rotary drills. This equipment is generally powered by diesel fuel. The nearest powerline is located at Springhill Road. Electric power will be used to run pumps onsite only as required.

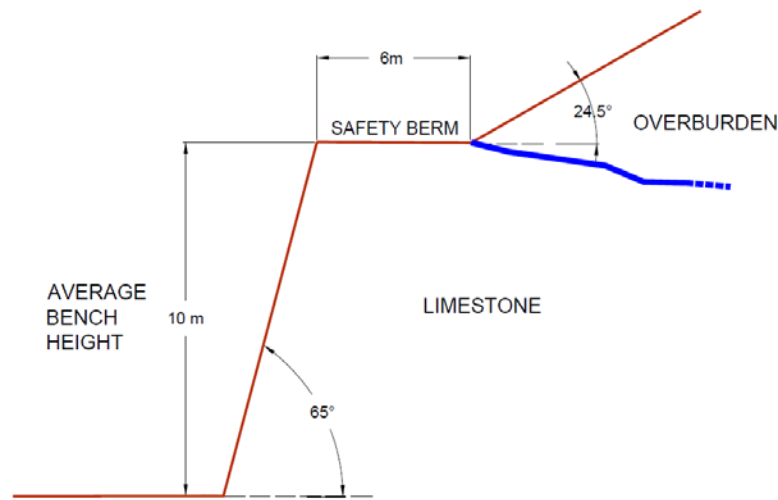
A neighboring Graymont deposit was used as a premise to establish geotechnical design parameters. Table 10.3 summarizes the geotechnical parameters considered for the Springhill Project; also conceptualized in Figure 10.1.

**Table 10.3 Pit Slope Design Parameters**

	Units	Overburden	Limestone
Face slope	Degrees(°)	24.5	65
Safety berm width	meters	6	6







**Figure 10.1 Pit Slope Profile**

### 10.3 Mine Site Layout

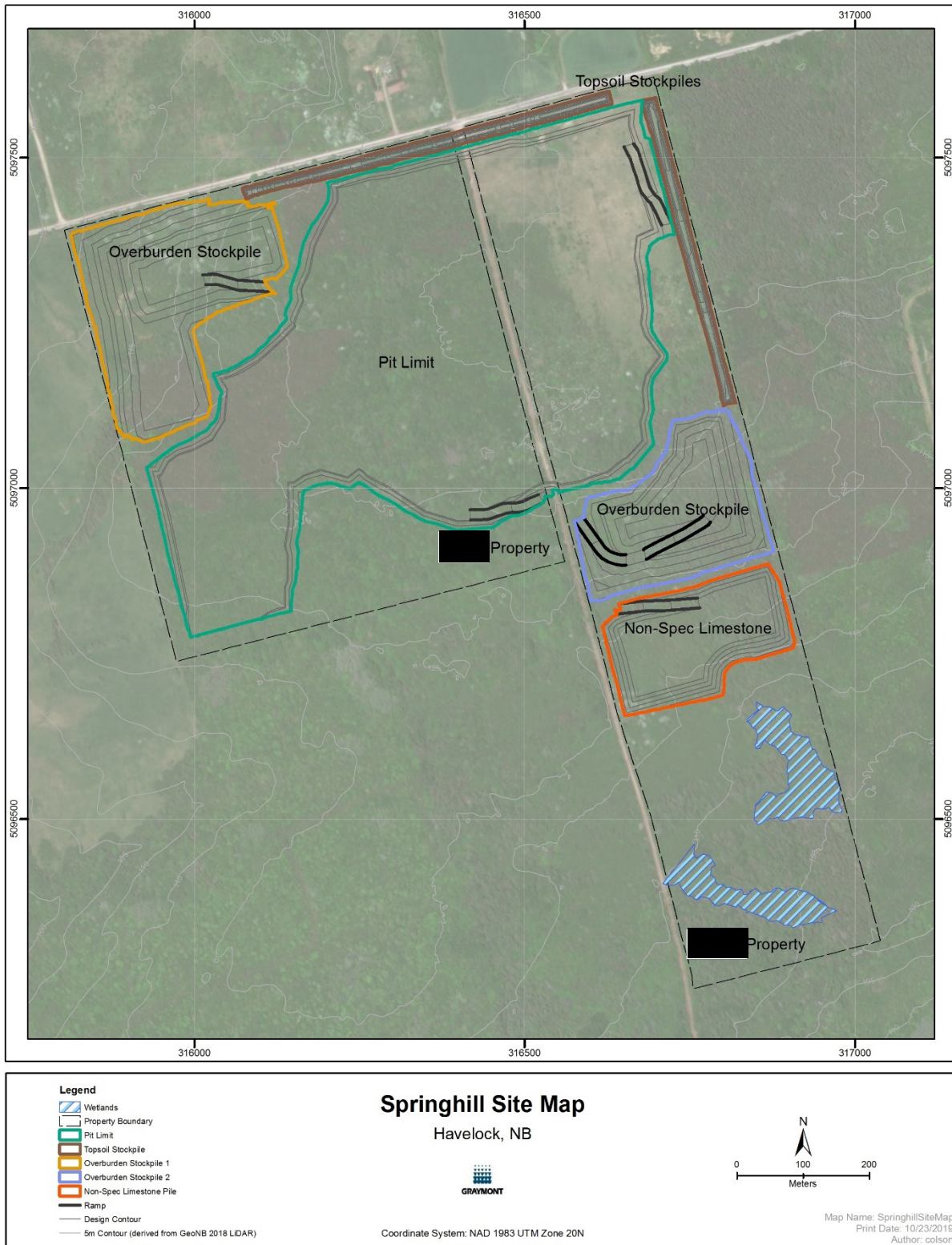
It is currently assumed that the proposed quarry layout will generally follow the highest concentration of surface outcrops of white limestone (Figure 10.2) and will have a total surface area of 360,000 m<sup>2</sup>, approximately 850 m long and 550 m wide, with a depth of 20 m from the ground surface. The limestone thickness varies throughout the pit and generally increases in thickness towards the north. Overburden thickness is also variable throughout the pit and can range from 0 m in thickness where the limestone outcrops south/west of the pit and can increase approximately 5-6 m in thickness on the north end of the pit.

Figure 10.2 shows the maximum site boundary, within which site activities may take place. Areas directly adjacent to the quarry footprint will include overburden stockpiles, seasonal staging areas for mobile equipment, and portable washroom facilities. After initial quarry development, mobile equipment may be located on the finished quarry floor.

A detailed mine site layout will be provided to regulators prior to commencement.

The Springhill quarry was designed to include a 30 m offset from neighboring property boundaries respecting the minimum distance required according to the Occupational Health and Safety Act (N.B. Reg. 91-191). Primary access to the pit will be constructed on the south end of the deposit to minimize disturbance to the surrounding communities and utilize existing road infrastructure for limestone and waste haulage. Waste and Overburden stockpiles are located at the northwest and southeast corners of the pit in close proximity to the pit access ramp to minimize haulage distances and emissions. Figure 10.2 illustrates the Site layout for the Springhill Project including the location of the non-spec limestone, overburden and topsoil stockpiles. In addition, the current stockpile footprint and localization ensures that any feasibly extractable limestone reserves are not condemned and that wetland and watercourses in the southern-most extent are not disturbed.

**Figure 10.2 Site Layout**



The south end of pit is where the deposit outcrops and contains the low quantities of overburden. The existing site road towards the south can be utilized for haulage of limestone to the crushing facility located offsite. The south end of the pit is the ideal location to commence the operation, further mine development will advance towards the north into thicker limestone areas. Mining multiple headings within the limestone geological unit will be necessary to assure a blended limestone feed equivalent or less than 250 ppm MnO. Once the pit has advanced north and established a proper mine dewatering system, the operations will open up to the east and west to facilitate a blending of limestone quality to assure  $\leq 250$  ppm MnO grade is attained.

All work will be conducted following the environmental mitigation measures described in the EMP&RP and requirements of the Provincial operating approval. These documents would be part of any sub-contractor agreements.

Blasting will be conducted by a certified contractor with a blasting permit, using an approved Blast Monitoring Plan. Blasting patterns and procedures will be used that minimize shock or instantaneous peak noise levels, where possible. It is expected that the details of drilling and blasting, such as optimum hole spacing, hole diameter, and powder factor for these rocks, etc., will be known by the contracted blasting company so will not have to be researched and optimized through experimentation.

Seasonally appropriate preparation (clearing and earthworks) of the planned quarry footprint would be conducted shortly in advance of the work, minimizing the area of disturbed overburden at any one time. Tree clearing would be done in late autumn and winter, to avoid impacts on actively nesting birds. Topsoil will be stored separately for reuse in site reclamation. Overburden stockpiles would be windrowed along the east and west edges of the Site Boundary and stabilized in a manner which minimizes dust and run-off from leaving the site.



## 11.0 Mining Operations

A separate EMP&RP has been developed in conjunction with this Mining Plan. The EMP&RP is a living document that will evolve during the mining operation and be reviewed annually and revised appropriately over time (unlike this Mining Plan). The EMP&RP includes details related to protection of environmental features, emergency response, regulatory compliance, and final abandonment and site reclamation.

### 11.1 Development Timeline

Graymont is planning to commence quarrying in early to mid-2020 if / when commercial contracts are obtained, with an initial production volume of 320,000 t/y (over 8 months). As stated in Section 10.1, the estimated timeline is based on assumed conditions. Table 11.1 shows a tentative Project schedule, based on the use of all quarry products (including non-high calcium limestone) and a total extraction of about 6.23 Mt of material in Phase 1. The actual volume of future phases will be developed prior to proposed quarry expansions, but for the purpose of this application, it is assumed that each future phase will be of approximately the same scale as Phase 1.

**Table 11.1 Project Timeline**

Project Phase	Start	End
Obtain Mining Lease and Environmental Approvals	June 2019	March 2020
<b>Phase 1 – Initial Quarry Development (50 ha)</b>	April 2020	2030
Progressive Reclamation (Phase 1) (contour and stabilize abandoned quarry areas)	May 2031	September 2031
<i>Phase 2 – 1<sup>st</sup> Quarry Expansion (+50 ha) (subject to regulatory approvals)</i>	2031	2040
Progressive Reclamation (Phase 2) (contour and stabilize abandoned quarry areas)	May 2041	September 2041
<i>Phase 3 – 3<sup>rd</sup> Quarry Expansion (+50 ha) (subject to regulatory approvals)</i>	2041	2050
<b>Mine Decommissioning</b> (remove all equipment & waste, contour final quarry faces to safe angle)	2051	December 2051
<b>Final Reclamation</b> (restore overburden/top soil and revegetate)	2051	2052

The following sections provide detailed planning for Phase 1.

### 11.2 Mining Sequence

The mine plan for the first ten years of production, annually, followed by five year periods for a total of twenty years, has been established. All removal and storage of overburden and waste material onsite will be considered contract mining. Graymont will manage the movement of limestone from the quarry to the crusher.

Mining operations for the Project will be a seasonal work schedule, operating 5 days per week on a 12-hour shift per day between April and December. One (1) week closure was considered to account for adverse weather conditions. The mining schedule includes a pre-production period of approximately six (6) to twelve (12) months to ensure that sufficient limestone is exposed before mining commences. During this period, approximately 162,000 tonnes of overburden and 25,500 tonnes of waste rock will be mined. In addition, a total of approximately 24,000 tonnes of limestone will be stockpiled during pre-production. This stockpile will be processed during the first year of production (Table 11.2).



**Table 11.2 Mining Schedule**

Description	Units	Pre-prod	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Total
			1	2	3	4	5	6	7	8	9	10	11-15	15-20	
<b>LIMESTONE (ROM)*</b>	<b>tonnes</b>	<b>23,914</b>	<b>288,091</b>	<b>321,180</b>	<b>321,091</b>	<b>320,765</b>	<b>318,622</b>	<b>319,102</b>	<b>318,758</b>	<b>317,126</b>	<b>318,461</b>	<b>318,945</b>	<b>1,592,531</b>	<b>1,458,236</b>	<b>6,236,822</b>
<b>LIMESTONE (ROM)</b>	<b>m<sup>3</sup></b>	<b>8,956</b>	<b>107,898</b>	<b>120,292</b>	<b>120,258</b>	<b>120,134</b>	<b>119,335</b>	<b>119,513</b>	<b>119,384</b>	<b>118,770</b>	<b>119,274</b>	<b>119,454</b>	<b>596,451</b>	<b>546,155</b>	<b>2,335,874</b>
Al <sub>2</sub> O <sub>3</sub>	%	0.58	0.58	0.41	0.56	0.46	0.44	0.47	0.46	0.47	0.50	0.42	0.46	0.54	<b>0.49</b>
CaCO <sub>3</sub>	%	96.43	96.45	97.05	96.37	96.47	96.60	96.36	96.39	96.20	96.39	96.60	96.55	96.15	<b>96.43</b>
Fe <sub>2</sub> O <sub>3</sub>	%	0.27	0.27	0.19	0.26	0.22	0.21	0.22	0.21	0.21	0.21	0.19	0.23	0.23	<b>0.22</b>
MgCO <sub>3</sub>	%	0.47	0.47	0.40	0.47	0.44	0.43	0.45	0.44	0.45	0.45	0.42	0.44	0.47	<b>0.45</b>
MnO	ppm	211.89	213.75	214.38	211.43	211.42	177.06	209.13	200.47	219.26	223.77	191.95	195.60	201.33	<b>202.89</b>
SiO <sub>2</sub>	%	2.56	2.56	1.93	2.52	2.22	2.24	2.28	2.31	2.42	2.32	2.14	2.15	2.36	<b>2.27</b>
<b>TOTAL WASTE</b>	<b>tonnes</b>	<b>187,746</b>	<b>169,530</b>	<b>185,055</b>	<b>183,554</b>	<b>205,671</b>	<b>210,228</b>	<b>209,074</b>	<b>190,184</b>	<b>176,934</b>	<b>178,705</b>	<b>179,918</b>	<b>697,411</b>	<b>434,528</b>	<b>3,208,538</b>
<b>TOTAL WASTE</b>	<b>m<sup>3</sup></b>	<b>94,944</b>	<b>84,800</b>	<b>93,173</b>	<b>93,091</b>	<b>104,360</b>	<b>105,701</b>	<b>103,017</b>	<b>92,085</b>	<b>86,008</b>	<b>89,148</b>	<b>84,429</b>	<b>319,879</b>	<b>200,627</b>	<b>1,551,262</b>
Waste Rock (inf+non-spec LS)	tonnes	25,505	29,189	27,839	23,172	25,623	32,575	46,249	52,786	46,877	32,319	67,642	310,820	184,960	<b>905,556</b>
Waste Rock (inf+non-spec LS)	m <sup>3</sup>	9,553	10,934	10,428	8,681	9,598	12,200	17,321	19,768	17,555	12,104	25,336	116,409	69,275	<b>339,162</b>
Overburden	tonnes	162,241	140,341	157,216	160,382	180,048	177,653	162,825	137,398	130,057	146,386	112,276	386,591	249,568	<b>2,302,982</b>
Overburden	m <sup>3</sup>	85,391	73,866	82,745	84,410	94,762	93,501	85,696	72,317	68,453	77,044	59,093	203,470	131,352	<b>1,212,100</b>
Stripping ratio	w/o	N/A	0.59	0.58	0.57	0.64	0.66	0.66	0.60	0.56	0.56	0.56	0.44	0.30	<b>0.51</b>
<b>Total Material Moved</b>	<b>tonnes</b>	<b>211,660</b>	<b>457,621</b>	<b>506,235</b>	<b>504,645</b>	<b>526,436</b>	<b>528,850</b>	<b>528,176</b>	<b>508,942</b>	<b>494,060</b>	<b>497,166</b>	<b>498,863</b>	<b>2,289,942</b>	<b>1,892,764</b>	<b>9,445,360</b>
* Run of mine is on a dry basis															
* Run of mine in pre-production will be stockpiles and process in Year															



The total material mined per year during the first 10 years of full production ranges between 450,000 tonnes and 530,000 tonnes, the rate of which will reduce as pit limits are reached. Stripping and waste mining is predicted to be consistent at an annual movement between 180,000 and 210,000 t/y. As the pit limits are reached, stripping will reduce as all the available limestone within the pit is exposed. Throughout the entirety of the mine plan, the average annual grade of CaCO<sub>3</sub> varies from 96.20% to 96.60% and the MnO average grade ranges from 170 ppm to 213 ppm.

### 11.3 Ore Processing Plan

There is no processing required for the high calcium limestone. Shot rock will be loaded into highway trucks with a wheel loader and brought to the Graymont Lime Facility in Havelock for crushing, washing and screening into various sizes required for processing.

Relatively little waste rock is expected to be produced, since the associated gabbro and non-high calcium limestone is also marketable. Any stone trucked to the processing facility has passed all chemical specifications through testing of borehole chips during production drilling. No stone is wasted.

Water treatment will be limited to settling of site run-off by a sump pit and infiltration to the ground. Due to the generally basic chemistry of the target geology, there is no risk of acid rock drainage.

### 11.4 Water Management Plan

#### 11.4.1 Surface Water Runoff

As surface water is expected to accumulate downgradient to the south end of the deposit, the ideal starting point for the mining operation will be in the south closest to the Site access road establishing a drainage cut for dewatering the pit. Further development of the pit will expand towards the north and then open towards the east and west to accommodate the need for blending limestone quality on multiple fronts.

The Site will be contoured to prevent runoff from leaving the site. If necessary, a perimeter ditch will be used to intercept site drainage and direct it back to the quarry. The quarry footprint will be graded so that site runoff is collected at a sump pit; where it can infiltrate the ground.

#### 11.4.2 Potable Water

For initial quarry development, potable water will be brought to the site. If quarry production is expanded significantly, an onsite water well will be developed.

#### 11.4.3 Mine Water Balance and Loadings

Based on experience at the existing Samphill Quarry, it is not expected that mine water will accumulate significantly and is expected to drain naturally by infiltration. During initial quarry development, no significant accumulation of mine water is expected, and dewatering will not be required. The design of this system will be provided to regulators for review and approval prior to installation, including water balance calculations.

## 11.5 Waste Management Plan

### 11.5.1 Air Emissions

Air emissions from the Site will include engine exhaust from 5 - 6 heavy vehicles as well as dust. Vehicles and generators will be maintained in good operating condition. Idling will be minimized to the extent possible. Dust from operations will be controlled through the application of water on roadways and working areas, and low speed limits set for trucks. Areas of bare ground and overburden stockpiles could also generate dust; therefore, disturbed areas will be kept to the smallest size possible and exposed ground and stockpiles stabilized with vegetation as soon as possible.

### 11.5.2 Tailings Management and Waste Rock Storage

Production of chemical limestone will not generate tailings. Relatively little waste rock is expected to be produced, since the associated gabbro and non-high calcium limestone is also marketable. Any waste rock that is generated will be used onsite to the extent possible for grading, or stored within the quarry for use in final contouring during site reclamation.

### 11.5.3 Water Treatment

No site run-off or process water will leave the site. Water treatment will be limited to settling of site run-off by a sump pit and infiltration to the ground. Due to the generally basic chemistry of the target geology, there is no risk of acid-rock drainage.

### 11.5.4 Solid Waste Disposal and Sewage

All solid waste will be placed in appropriate temporary storage, for later disposal off-site at an approved waste receiver. No waste will be disposed onsite. Good housekeeping practices will ensure that blowable trash (i.e., food wrappers, plastic, etc.) will be collected and placed in garbage bins.

There will be no onsite sewage system. Sewage facilities will be provided by "blue box" style portable bathrooms, to be maintained by subcontractor and cleaned out regularly. All sewage will be removed from the Site and disposed at an approved waste receiver.

### 11.5.5 Hazardous Products

Hazardous waste will include limited onsite storage of fuel, and common industrial maintenance products such as cleaners, grease, and paint. All hazardous materials will be stored in secondary containment, including sealed liners capable of holding 120% of the stored volume.

## 11.6 Environmental Monitoring

Environmental monitoring will include:

- Noise and vibration measurements during blasting, according to the Blast Monitoring Plan.
- Daily Site inspection, during operation, to ensure site run-off is contained and erosion control devices (silt fence, drainage system) is still effective.
- Continuous vigilance by all workers of possible dust concern, to be addressed by the application of water if needed.

## 11.7 Physical Stability

Quarry walls of 10 m height are expected to be generally stable, without special measures. Based on its past operations in other local quarries, Graymont has demonstrated sufficient experience and qualifications to design quarry walls that are safe for work.

A neighboring Graymont deposit was used as a premise to establish geotechnical design parameters. Section 10 describes pit slope design parameters and slope profile in Table 10.3 and Figure 10.1

## 11.8 Progressive Reclamation

As indicated above, the quarrying sequence will include progressive reclamation, including final contouring and stabilization for areas that will no longer be mined. This includes portions of the quarry associated with the completion of Phases 1 and 2. More detail is provided in the EMP&RP.

## 11.9 Emergency Preparedness Plan

Site emergencies could include accidental spills of fuel or other hazardous material, equipment fire, or worker injury. External emergencies could also influence mining operations, such as a forest fire or severe weather. The EMP&RP includes measures for reacting to possible emergency situations, as well as the communication and reporting requirements. A detailed site-specific emergency preparedness plan will be developed by the contractor for review by Graymont to ensure it is compliant with the EMP&RP.

## 11.10 Site Security and Safety

All access roads to the quarry will have a locked gate. The existing Cross Road will be barred at an appropriate distance from the mining activities, and clearly marked with signage to indicate the potential danger. No person will be allowed to enter the site unattended other than a trained member of the quarry workforce. All persons in the quarry will wear appropriate personal protective equipment (PPE) at all times, unless in a designated safe area. If during production high quarry walls pose a danger to 3<sup>rd</sup> parties, additional fencing and signage will be installed along the dangerous sections to warn of accidental falls. A detailed site-specific safety plan will be developed by the contractor for review by Graymont to ensure it is compliant with the EMP&RP, the Provincial Approval to Operate and Provincial health and safety regulations. During winter season closures, the quarry access will remain barred and potentially dangerous areas will be identified with temporary signage and snow-fencing.

## 11.11 Temporary Shutdown Procedure

Once operations commence, significant shutdowns are not anticipated beyond the regular seasonal winter closure (January to April). During the winter closure, and any other pause in mining exceeding one month, the Site will be prepared for a period of inactivity, including disposal of all waste, removal / lockdown of stored hazardous materials, stabilization of all disturbed areas, inspection of site drainage control measures, and installation of temporary barriers and warning signs.



Should the quarry remain inactive for 3 years, and the restart of regular operations is not reasonably foreseeable, then the Reclamation Plan will be revised in consultation with NBDERD. The revised reclamation schedule would address the likelihood of permanent mine closure and the necessity of abandonment and final reclamation.



## 12.0 Environmental Impacts and Associated Mitigation

### 12.1 Ambient Air Quality

As identified in Section 4.1.1, the regional air quality in the Study Area is relatively good. The Springhill Quarry operation will generate some combustion-related air emissions from several heavy vehicles onsite and diesel generators. Overall, these emissions will be small and are not expected to have any effect outside the Site Boundary but should nevertheless be minimized to the extent possible by regular equipment maintenance and selection of lower emission vehicles and generators when possible.

The overburden stripping associated with exposing the bedrock within the quarry footprint as well as exposed dirt in the access road and other mine development areas will be a potential source of fugitive dust (PM), which may cause fugitive dust to exceed PM limits or cause nuisance. This would be exacerbated on dry, windy days in the summer. PM is a regulated contaminant; which requires mitigation to limit concentrations in the local air shed. Dust could also become a nuisance to nearby residents.

Dust will be controlled on the access road and working surfaces by water spray / water truck. Low vehicle speeds will be maintained. All onsite workers will be vigilant of increasing dust clouds and inform the Site manager when water needs to be applied.

Overburden stockpiles will be stabilized with vegetation as soon as possible following stripping to protect them from wind. Temporary stockpiles may be covered by tarps in high wind.

#### 12.1.1 Noise

The existing acoustic environment of the Study Area is described in Section 4.1.2. The potential for most quarrying noise to impact the nearest permanent residences is considered low. Since the nearest residences are approximately 100 – 300 m from the Site perimeter, the quarry noise can reasonably be expected to attenuate -15 dBA, even without considering the intervening forest. Typical loud heavy machinery generates noise levels from 98 - 108 dBA which would be reduced to 83 - 93 dBA at the receptors. This would be noticeable but approximately within the high range of normal ambient daytime sound levels. Taking the forest screen, and intervening terrain into account, that is likely to be even lower. Intermittent blasting may produce higher instantaneous noise levels at residences, which would be monitored according to the Blast Monitoring Plan. Standard blasting activities by a certified contractor, in accordance with regulatory requirements, is unlikely to cause a significant noise impact.

For public exposure in rural settings, such as the Project area, the Province does not have specific guidelines for environmental noise (with the exception of specific industries, such as oil and gas). Health Canada has not set threshold values for noise but recommends that mitigation measures be employed if levels of 75 dBA are exceeded for more than a year (Health Canada, 2010). Therefore, no recommended limits are likely to be exceeded.

For the nearest residents, located to the north (~100 m) and west (~300 m), the nuisance factor may be an issue if standard quarrying methods are used. However, noise levels are not anticipated to be a health risk.

Residences further away (~500 m or more) are expected to find quarry related noise noticeable but generally not annoying. Mining activities will be completed in sections, limiting the amount of time that noise is produced at each boundary of the quarry.

Impacts on wildlife are expected to be relatively minor, given the presence of the existing Samphill Quarry which has included periodic blasting. Any wildlife that use the area would be habituated to the quarry noise and relatively nearby highway traffic noise. In addition, most of the proposed quarry footprint has been subject to past timber harvesting.

## 12.2 Groundwater Resources

Groundwater resources within the Study Area have been described above in Section 5.3. Based on the mining methods and mining operations presented in Sections 10.0 and 11.0, there are no anticipated adverse effects on groundwater. Normal operational activities were considered, including blasting and the onsite storage of petroleum hydrocarbons for use with equipment and vehicles.

It is understood that intermittent blasting will be conducted by a certified employee, with a blasting permit and adherence to a Blast Monitoring Plan. It is understood that intermittent blasting of low charge will be required to develop the quarry. Applying basic ground vibration propagation theories, it is anticipated that ground vibrations due to the small and intermittent blasts will be more than sufficiently dampened prior to reaching water wells over 800 m from the Project. There are approximately 5 residences within the 800 m zone. Therefore, impacts on some water wells may be a concern. A pre-blast sampling program will be implemented, subject to regulatory review and approval, in order to establish baseline conditions in nearby groundwater wells.

As per accidental spills or leaks of petroleum hydrocarbons used as fuel for equipment and vehicles, all spills will be reported and cleaned up. In general, the distance between the Project working area and residences along Springhill Road provides a substantial buffer from migration of dissolved hydrocarbons in groundwater, since the more mobile portions of hydrocarbon plumes can reach a stable, or a shrinking state or even be exhausted in less than 300 to 400 m (API, 1998) due to natural processes. However, a few residences are located within 100 to 300 m, on the opposite side of Springhill Road, which may be at some risk of contamination in the event of an accidental spill. Baseline sampling already proposed above will also address Project related contamination.

## 12.3 Species-at-Risk

Vegetation clearing during quarry development could impact previously unmapped plant SAR or SOCC. As described in Section 6.0, the likelihood of plant SAR to occur within the quarry footprint is low to none, since a majority of the area has been disturbed from logging, agriculture and previous clearing for bore testing. There is one reported species in the surrounding area that could potentially be present in the remaining forest areas within the quarry, Butternut (*Juglans cinerea*). The forest habitat is largely regenerated mature mixed wood which some areas heavily deciduous, so there is some potential for previously unreported species to be present but were not observed during biological surveys.

Wildlife SAR and SOCC (excluding birds) also have a relatively low potential to be present based on the history of timber harvesting and agricultural activities. Should wildlife SAR / SOCC incidentally occur within the proposed new quarry development area, it is expected they would simply move away into adjacent available habitat.

Bird SAR / SOCC are addressed in the following section under Migratory Birds. To address the potential for unreported plant SAR and other incidental wildlife to be present within the Site Boundary, Graymont will conduct a confirmatory site survey in June 2019 and report findings to regulators. If SAR or sensitive habitat is identified, Graymont will develop site specific mitigation in consultation with regulators.

## 12.4 Migratory Birds

As described in Section 6.2, there are forest areas within the Site Boundary including both hardwood and softwood (Figure 6.1). Migratory birds are protected under the MBCA and vegetation clearing within the quarry development area could impact migratory birds during the nesting season.

The primary mitigation to minimize or eliminate risk of impacting migratory birds is to schedule clearing activities to occur outside the sensitive nesting window of mid-April to September (i.e., clear in winter to the extent possible).

To address the potential for nesting birds to be present within the Site Boundary, Graymont will conduct a confirmatory site survey in June 2020 and report findings to regulators. If nesting migratory birds or sensitive habitat is identified, Graymont will develop site-specific mitigation in consultation with regulators.

## 12.5 Archaeological Resources

As identified in Sections 7.2 and 7.3, two historic homesteads were present within the Site boundary; the structural remnants of which (foundations, wells, artifact scatters) remain visible on the surface. According to the Provincial Guidelines (ASBNB 2012:8), "any historic feature (foundation, wharf, etc.)... known or suspected to be 100 years old or older" is considered to be an archaeological site. These two sites have been assigned the temporary site numbers 2019NB133-1 and 2019NB133-2, pending formal registration with the Provincial Regulator. Site 2019NB133-1 is located within 40 – 60 m of Springhill Road in PID 00255299 (Figure 2.2) and, thus, within the proposed pit limit. Site 2019NB133-2 falls within the overburden stockpile area in the northwest corner of PID 00170431 outside the excavation area. It is recommended that these sites be avoided during construction activities, as both quarrying and stockpiling activities may negatively impact buried heritage resources. If the sites cannot be avoided and it is determined that they will be negatively impacted by the Project, mitigation measures in the form of evaluative testing and/or limited excavation may be required by the Provincial Regulator.

The two watercourses and wetlands identified within the Site boundary are considered to have low potential for undiscovered archaeological resources. These watercourses are to be avoided during quarrying and stockpiling activities and, thus, will not be impacted by Project activities. Therefore, no additional archaeological mitigation is required for these watercourses. The archaeological buffers indicated by the Provincial Regulator around the tributaries of Springhill and Price Brooks will also not be impacted by the quarry.

## 12.6 Local Economy

The Springhill Quarry will provide significant benefits to the local and provincial economy, including relatively high wage employment, local spending on equipment and supplies, tax revenue to the Province, and potential usage of regional transportation services (port and rail).

The lime processing facility in Havelock has been in operation for over 80 years. The first lime kiln began operations in 1972 to supply the quicklime market demand for the Atlantic Provinces and parts of Maine. A second vertical kiln implemented in 1984. This vertical kiln is powered by compressed natural gas, thereby being one of the lowest GHG emitting kilns in North America. Graymont has a diversified market supplying lime and hydrated lime to pulp & paper operations, smelters, mines (for process pH adjustment and acid tailings treatment), sewage treatment facilities, drinking water treatment and agriculture.

Although market forecasts predict sold out conditions for this kiln within the next two years, Graymont has other manufacturing plants in their supply network to share the market. Graymont's agricultural lime sales are typically over 100,000 t/y. The pulverized limestone market is stable at around 25,000 tonnes per year. This operation has been economically viable for 80 years. The development of this new quarry will extend the reserve life and reduce costs significantly due to lower quarry stripping and operating costs.

It is estimated that the Project may inject approximately \$10 to \$15 Million per year to the local economy during operation, depending on market opportunities. In order to maximize benefits to the local economy, Graymont's policy will be to prefer selection of local contractors, equipment suppliers, and transportation

services (port, rail), and to coordinate with national and provincial agencies to optimize market access and opportunities.

## 12.7 Traffic Circulation

Since the mined product will be transported to the Havelock Plant using the same route as that of the Samphill mine, trucking volumes are expected to produce negligible impacts on traffic patterns and road safety. No new roadway construction will be required to accommodate the increased trucking volumes. The existing roadways are currently designed to accommodate the appropriate vehicles. It is proposed that Cross Road will be incorporated into the Project area and will not affect current traffic patterns.

## 12.8 Summary of Potential Environmental Effects and Mitigation

Table 12.1 provides an overview of the VECs considered as part of the Mining Plan, potential effects and mitigation measures.

**Table 12.1 Summary of Potential Impacts and Mitigation**

Valued Environmental Components (VECs)	Potential Impact	Mitigation
Ambient Air Quality	Overburden disturbance may cause fugitive dust to exceed PM limits or cause nuisance.  Local air quality may be impacted by vehicle and diesel generator exhaust.	<ul style="list-style-type: none"> <li>Control dust on access road and work areas with the use of water.</li> <li>Maintain low vehicle speeds on access road and work areas.</li> <li>Stabilize overburden stockpiles with grass and cover temporary piles to prevent particulate release.</li> <li>Maintain equipment in good condition to limit particulate exhaust releases.</li> <li>Comply with Provincial Approval to Operate.</li> </ul>
Noise	Blasting may cause short term, high intensity noise at nearest residences.	<ul style="list-style-type: none"> <li>Blasting activities will be conducted by a certified contractor in accordance with the Blast Monitoring Plan and in compliance with the Provincial Approval to Operate.</li> </ul>
Groundwater Resources	Blasting could impact nearby residential wells.  Contamination of local groundwater could occur from accidental spill.	<ul style="list-style-type: none"> <li>Blasting activities will be conducted by a certified contractor in accordance with the Blast Monitoring Plan and in compliance with the Provincial Approval to Operate.</li> <li>Store all fuel and industrial chemicals (cleaning, grease, paint, etc.) in secondary containment with at least 120% capacity of the stored fluids.</li> <li>Maintain readiness for accidental spill response and have a supply of suitable absorbent material on-site.</li> <li>Follow emergency preparedness and reporting requirements in the EMP&amp;RP and the Provincial Approval to Operate.</li> </ul>
Species at Risk	Vegetation clearing during quarry development may impact previously unmapped plant SAR.	<ul style="list-style-type: none"> <li>Conduct confirmatory site survey prior to quarry development, and if SAR are identified within the Project footprint, develop site-specific mitigation in consultation with regulators.</li> </ul>
Migratory Birds	Vegetation clearing within the quarry development area could impact migratory birds during the nesting season.	<ul style="list-style-type: none"> <li>Conduct a confirmatory site visit to identify the presence of sensitive migratory bird populations and, if found, develop mitigation in consultation with regulators.</li> <li>Schedule clearing activities to occur outside the sensitive nesting window of May to September (i.e., clear in winter to the extent possible).</li> <li>Comply with MBCA stipulations.</li> </ul>
Archaeological Resources	Stripping overburden from quarry footprint and stockpiling of overburden may impact identified historic archaeological sites.	<ul style="list-style-type: none"> <li>Evaluative testing and/or limited excavation may be required if deemed necessary by Provincial regulators.</li> </ul>



Valued Environmental Components (VECs)	Potential Impact	Mitigation
Local Economy	Quarry operation will provide employment and spending benefits to the local and provincial economy.	<ul style="list-style-type: none"> <li>• None required; maximize benefits to local economy through selection of local contractors, equipment suppliers, and transportation services (port, rail), and coordination with national and provincial agencies to optimize market access and opportunities.</li> </ul>
Traffic Circulation	Truck traffic related noise and dust may cause additional nuisance for some local residents.	<ul style="list-style-type: none"> <li>• Graymont will work with the local community to address any noise or dust related complaints that are received, in a prompt manner.</li> </ul>



## 13.0 Conclusion

The Springhill Limestone Quarry will add significant value to the local and Provincial economy for up to 30 years (or longer), including relatively high paying jobs, local spending, and tax revenue.

Potential negative environmental impacts are relatively minor (mainly dust and noise) and can be mitigated to insignificance through implementation of the EMP&RP (under separate cover), established protocols for Graymont NB mining operations, and compliance with the Provincial Approval to Operate.





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**Appendix A**

**Species at Risk Report**

**Atlantic Canada Conservation Data Centre  
(ACCDC)**

# DATA REPORT 6386: Havelock, NB

Prepared 8 April 2019

by J. Churchill, Data Manager

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Map 1. A 100 km buffer around the study area

## 1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; [www.accdc.com](http://www.accdc.com)) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

### 1.1 DATA LIST

Included datasets:

Filename	Contents
HavelockNB_6386ob.xls	All Rare and legally protected <i>Flora and Fauna</i> in your study area
HavelockNB_6386ob100km.xls	A list of Rare and legally protected <i>Flora and Fauna</i> within 100 km of your study area
HavelockNB_6386sa.xls	All <i>Significant Natural Areas</i> in your study area

## 1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

- a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
- b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
- c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
- d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
- e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
- f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
- g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

## 1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

### Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney, Senior Scientist, Executive Director

Tel: (506) 364-2658

[sean.blaney@accdc.ca](mailto:sean.blaney@accdc.ca)

### Animals (Fauna)

John Klymko, Zoologist

Tel: (506) 364-2660

[john.klymko@accdc.ca](mailto:john.klymko@accdc.ca)

### Plant Communities

Sarah Robinson, Community Ecologist

Tel: (506) 364-2664

[sarah.robinson@accdc.ca](mailto:sarah.robinson@accdc.ca)

### Data Management, GIS

James Churchill, Data Manager

Tel: (902) 679-6146

[james.churchill@accdc.ca](mailto:james.churchill@accdc.ca)

### Billing

Jean Breau

Tel: (506) 364-2657

[jean.breau@accdc.ca](mailto:jean.breau@accdc.ca)

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

**Western:** Duncan Bayne  
(902) 648-3536  
[Duncan.Bayne@novascotia.ca](mailto:Duncan.Bayne@novascotia.ca)

**Western:** Sarah Spencer  
(902) 634-7555  
[Sarah.Spencer@novascotia.ca](mailto:Sarah.Spencer@novascotia.ca)

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(902) 893-6350  
[Shavonne.Meyer@novascotia.ca](mailto:Shavonne.Meyer@novascotia.ca)

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(902) 890-1046  
[Kimberly.George@novascotia.ca](mailto:Kimberly.George@novascotia.ca)

**Eastern:** Lisa Doucette  
(902) 863-4513  
[Lisa.Doucette@novascotia.ca](mailto:Lisa.Doucette@novascotia.ca)

**Eastern:** Terry Power  
(902) 563-3370  
[Terrance.Power@novascotia.ca](mailto:Terrance.Power@novascotia.ca)

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

## 2.0 RARE AND ENDANGERED SPECIES

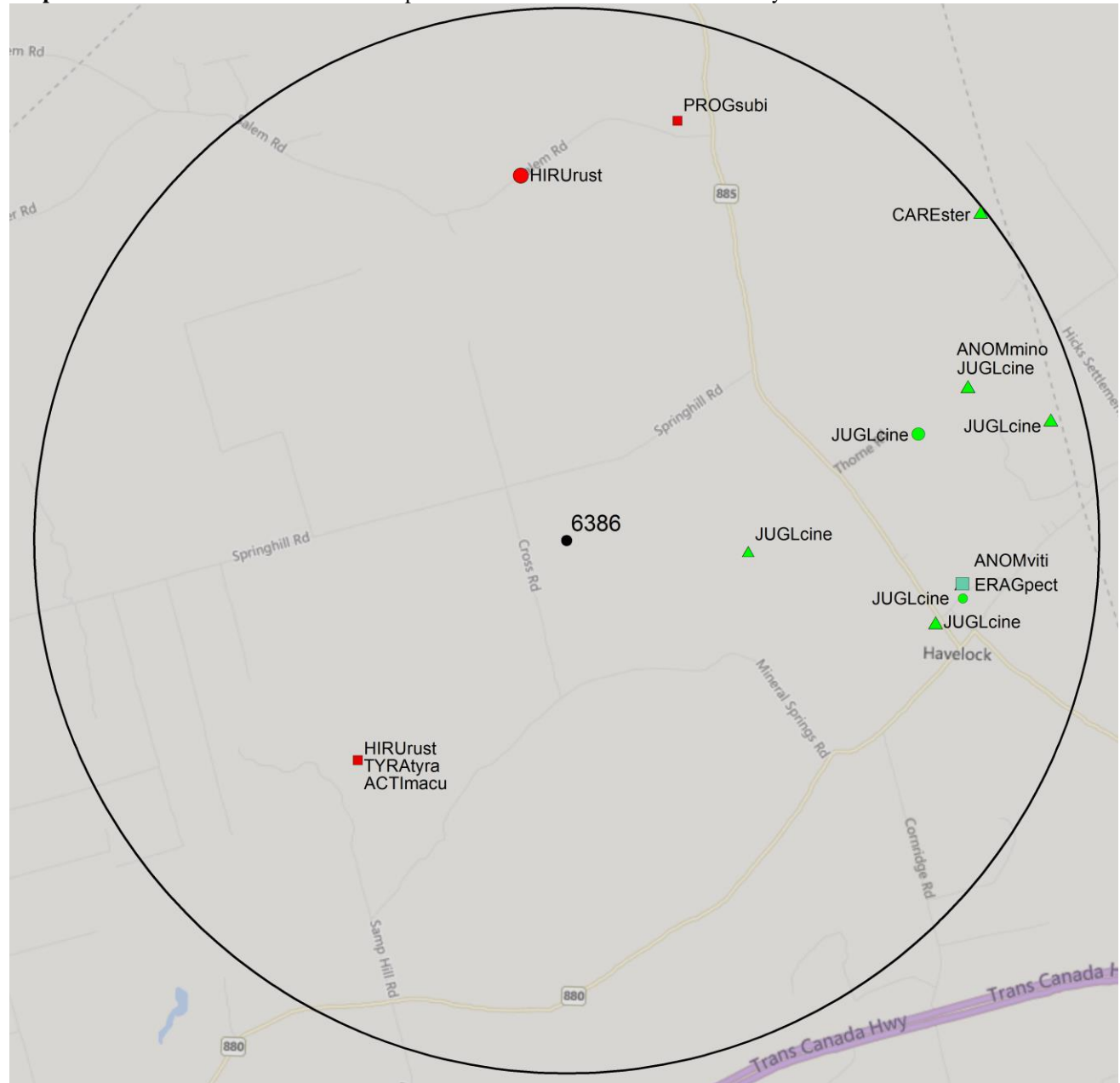
### 2.1 FLORA

The study area contains 8 records of 3 vascular, 2 records of 2 nonvascular flora (Map 2 and attached: \*ob.xls).

### 2.2 FAUNA

The study area contains 6 records of 4 vertebrate, no records of invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

**Map 2:** Known observations of rare and/or protected flora and fauna within the study area.



#### RESOLUTION

- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- △ 3.0 within kilometers
- △ 2.7 within 500s of meters
- ◇ 2.0 within 100s of meters
- ◇ 1.7 within 10s of meters

#### HIGHER TAXON

- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

### 3.0 SPECIAL AREAS

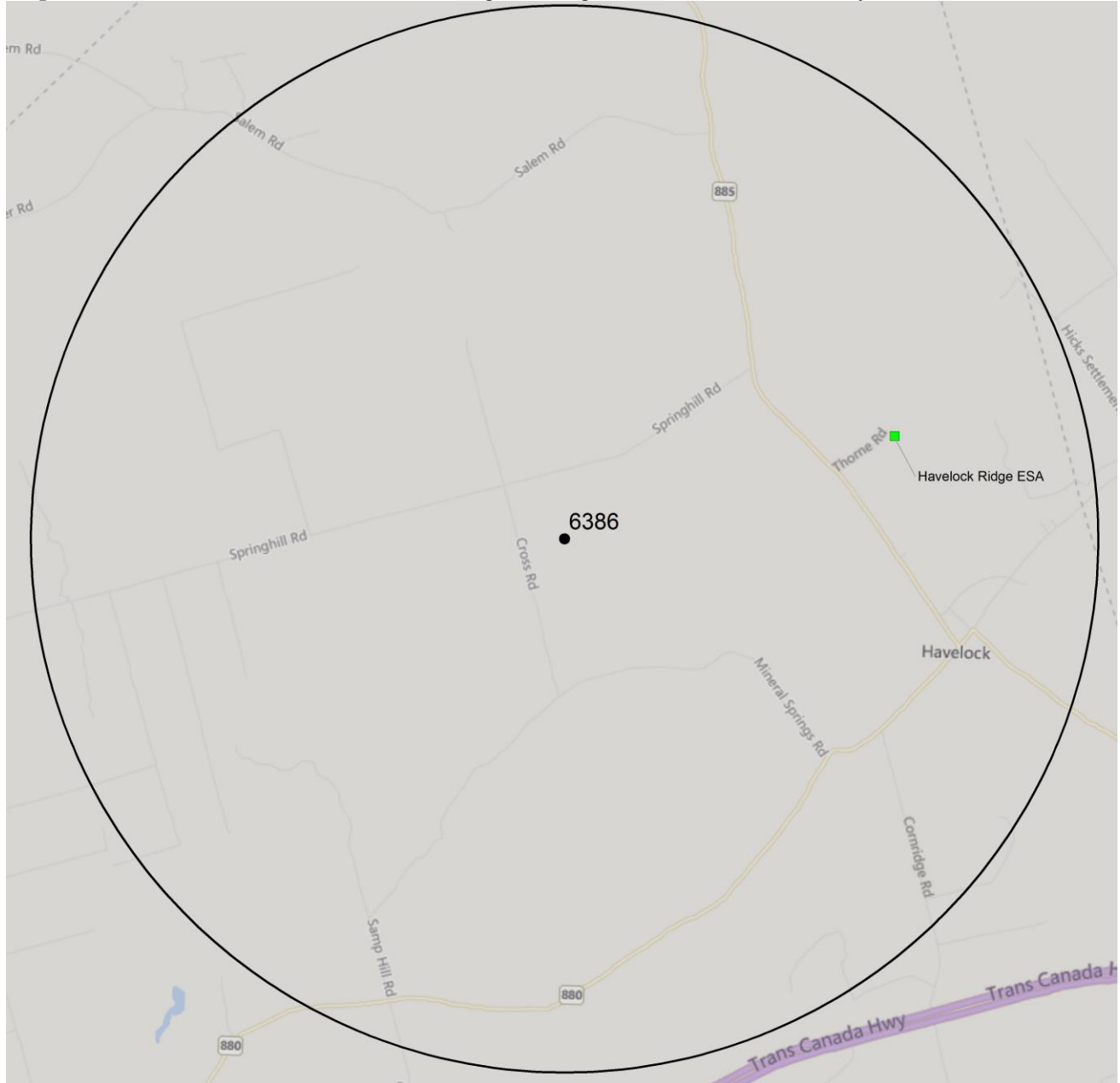
#### 3.1 MANAGED AREAS

The GIS scan identified no managed areas in the vicinity of the study area (Map 3).






#### 3.2 SIGNIFICANT AREAS

The GIS scan identified 1 biologically significant site in the vicinity of the study area (Map 3 and attached file: \*sa\*.xls).

**Map 3:** Boundaries and/or locations of known Managed and Significant Areas within the study area.



**MANAGED AREAS    SIGNIFIGANT AREAS**

-  boundary
-  boundary
-  approximate
-  approximate
-  point location



## 4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation ( $\pm$  the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files \*ob.xls/\*ob.shp only.

### 4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	<i>Anomodon viticulosus</i>	a Moss				S2	2 May Be At Risk	1	3.7 $\pm$ 10.0
N	<i>Anomodon minor</i>	Blunt-leaved Anomodon Moss				S2?	2 May Be At Risk	1	4.0 $\pm$ 1.0
P	<i>Juglans cinerea</i>	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	6	1.7 $\pm$ 0.0
P	<i>Carex sterilis</i>	Sterile Sedge				S1	2 May Be At Risk	1	5.0 $\pm$ 2.0
P	<i>Eragrostis pectinacea</i>	Tufted Love Grass				S2S3	4 Secure	1	3.8 $\pm$ 0.0

### 4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	2	2.8 $\pm$ 7.0
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	2 May Be At Risk	2	4.1 $\pm$ 7.0
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	1	2.8 $\pm$ 7.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B,S5M	4 Secure	1	2.8 $\pm$ 7.0

### 4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive”. Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with “YES”.

#### New Brunswick

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Chrysemys picta picta</i>	Eastern Painted Turtle			No
<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	No
<i>Haliaeetus leucocephalus</i>	Bald Eagle		Endangered	No
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Endangered	Endangered	No
<i>Coenonympha nipisiquit</i>	Maritime Ringlet	Endangered	Endangered	No
<i>Bat Hibernaculum</i>		[Endangered] <sup>1</sup>	[Endangered] <sup>1</sup>	No

<sup>1</sup> *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

### 4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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4	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
2	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
2	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
2	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs.
1	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
1	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.

# recs	CITATION
1	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
1	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
1	Goltz, J.P. 2012. Field Notes, 1989-2005. , 1091 recs.
1	Loo, J. & MacDougall, A. 1994. GAP analysis: Summary Report. Fundy Model Forest, 2 recs.
1	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc.

## 5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 31725 records of 139 vertebrate and 1517 records of 87 invertebrate fauna; 6561 records of 330 vascular, 780 records of 192 nonvascular flora (attached: \*ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation ( $\pm$  the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	62	41.4 $\pm$ 0.0	NB
A	<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	21	41.4 $\pm$ 0.0	NB
A	<i>Perimyotis subflavus</i>	Eastern Pipitrelle	Endangered	Endangered	Endangered	S1	1 At Risk	17	36.2 $\pm$ 0.0	NB
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1?B,S1?M	1 At Risk	1	96.3 $\pm$ 0.0	NS
A	<i>Charadrius melodius melodius</i>	Piping Plover melodius ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	735	56.7 $\pm$ 7.0	NB
A	<i>Dermochelys coriacea</i> (Atlantic pop.)	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	4	95.1 $\pm$ 1.0	NB
A	<i>Salmo salar pop. 1</i>	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	2 May Be At Risk	73	29.1 $\pm$ 0.0	NB
A	<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	1 At Risk	557	50.5 $\pm$ 0.0	NB
A	<i>Rangifer tarandus pop. 2</i>	Woodland Caribou (Atlantic- Gasp  —sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	4	35.8 $\pm$ 1.0	NB
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	2 May Be At Risk	52	10.1 $\pm$ 7.0	NB
A	<i>Ixobrychus exilis</i>	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	1 At Risk	24	38.9 $\pm$ 7.0	NB
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	2 May Be At Risk	130	10.1 $\pm$ 7.0	NB
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	75	18.4 $\pm$ 7.0	NB
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	1352	2.8 $\pm$ 7.0	NB
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	1 At Risk	9	49.7 $\pm$ 2.0	NB
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	609	14.6 $\pm$ 0.0	NB
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	328	17.0 $\pm$ 7.0	NB
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Threatened	S2S3B,S2S3M	3 Sensitive	560	5.4 $\pm$ 3.0	NB
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened	Threatened	Threatened	S3	4 Secure	2	26.5 $\pm$ 1.0	NB
A	<i>Cardellina canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	876	12.0 $\pm$ 0.0	NB
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	3 Sensitive	1326	5.4 $\pm$ 3.0	NB
A	<i>Anguilla rostrata</i>	American Eel	Threatened	Threatened	Threatened	S4	4 Secure	84	21.4 $\pm$ 0.0	NB
A	<i>Coturnicops noveboracensis</i>	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	2 May Be At Risk	8	62.1 $\pm$ 7.0	NB
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	1 At Risk	357	27.1 $\pm$ 0.0	NB
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	51	51.4 $\pm$ 64.0	NB
A	<i>Bucephala islandica</i> (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	141	27.1 $\pm$ 83.0	NB
A	<i>Balaenoptera physalus</i>	Fin Whale - Atlantic pop.	Special Concern	Special Concern	Special Concern	S2S3		2	61.3 $\pm$ 1.0	NB
A	<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	7	54.3 $\pm$ 10.0	NB
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	12	42.5 $\pm$ 0.0	NB
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	118	17.0 $\pm$ 7.0	NB
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	1 At Risk	579	10.1 $\pm$ 3.0	NB
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Special Concern	S3B,S3S4N,SUM	3 Sensitive	297	8.2 $\pm$ 7.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	1 At Risk	387	8.0 ± 0.0	NB
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	14	27.1 ± 0.0	NB
A	<i>Phocoena phocoena</i> (NW Atlantic pop.)	Harbour Porpoise - Northwest Atlantic pop.	Special Concern	Threatened		S4		4	97.7 ± 0.0	NB
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern			S4	4 Secure	27	44.5 ± 1.0	NB
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	4 Secure	743	8.2 ± 7.0	NB
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern		Special Concern	S4N,S4M	4 Secure	47	15.7 ± 219.0	NB
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S1?	5 Undetermined	3	52.2 ± 0.0	NB
A	<i>Bubo scandiacus</i>	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	42	9.7 ± 1.0	NB
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	2 May Be At Risk	13	30.5 ± 7.0	NB
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	59	24.7 ± 2.0	NB
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	5	73.5 ± 7.0	NB
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	5	50.1 ± 0.0	NB
A	<i>Buteo lineatus</i>	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	2 May Be At Risk	39	18.2 ± 7.0	NB
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	194	27.1 ± 0.0	NB
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3		2	84.2 ± 0.0	NB
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	19	25.6 ± 10.0	NB
A	<i>Desmognathus fuscus</i>	Northern Dusky Salamander	Not At Risk			S3	3 Sensitive	41	54.4 ± 0.0	NB
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	502	42.0 ± 7.0	NB
A	<i>Podiceps grisegena</i>	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	48	64.1 ± 5.0	NB
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk			S3S4		2	65.4 ± 1.0	NB
A	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	1181	6.4 ± 75.0	NB
A	<i>Canis lupus</i>	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	3	33.5 ± 1.0	NB
A	<i>Puma concolor pop. 1</i>	Eastern Cougar	Data Deficient		Endangered	SNA	5 Undetermined	126	7.0 ± 1.0	NB
A	<i>Morone saxatilis</i>	Striped Bass	E,E,SC			S3	2 May Be At Risk	42	26.5 ± 0.0	NB
A	<i>Salvelinus alpinus</i>	Arctic Char				S1	3 Sensitive	3	43.1 ± 1.0	NB
A	<i>Vireo flavifrons</i>	Yellow-throated Vireo				S1?B,S1?M	8 Accidental	10	38.9 ± 7.0	NB
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	4 Secure	1651	20.3 ± 0.0	NB
A	<i>Aythya americana</i>	Redhead				S1B,S1M	8 Accidental	7	53.5 ± 0.0	NB
A	<i>Gallinula galeata</i>	Common Gallinule				S1B,S1M	3 Sensitive	33	27.0 ± 0.0	NB
A	<i>Antigone canadensis</i>	Sandhill Crane				S1B,S1M	8 Accidental	14	28.2 ± 0.0	NB
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B,S1M	3 Sensitive	45	19.7 ± 7.0	NB
A	<i>Phalaropus tricolor</i>	Wilson's Phalarope				S1B,S1M	3 Sensitive	45	27.0 ± 0.0	NB
A	<i>Leucophaeus atricilla</i>	Laughing Gull				S1B,S1M	3 Sensitive	12	47.1 ± 1.0	NB
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	2 May Be At Risk	236	4.1 ± 7.0	NB
A	<i>Thryothorus ludovicianus</i>	Carolina Wren				S1B,S1M	8 Accidental	14	56.8 ± 5.0	NB
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B,S2S3M	4 Secure	108	27.1 ± 2.0	NB
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	4 Secure	238	27.1 ± 0.0	NB
A	<i>Aythya marila</i>	Greater Scaup				S1B,S4M,S2N	4 Secure	28	56.9 ± 1.0	NB
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	59	14.5 ± 7.0	NB
A	<i>Sterna paradisaea</i>	Arctic Tern				S1B,SUM	2 May Be At Risk	21	53.2 ± 11.0	NB
A	<i>Fratercula arctica</i>	Atlantic Puffin				S1B,SUN,SUM	3 Sensitive	2	53.2 ± 11.0	NB
A	<i>Branta bernicla</i>	Brant				S1N, S2S3M	4 Secure	31	50.5 ± 0.0	NB
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S1N,S2M	3 Sensitive	14	46.4 ± 0.0	NB
A	<i>Butorides virescens</i>	Green Heron				S1S2B,S1S2M	3 Sensitive	18	38.2 ± 7.0	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	10	44.6 ± 0.0	NB
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	98	14.5 ± 7.0	NB
A	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	5	62.1 ± 7.0	NB
A	<i>Troglodytes aedon</i>	House Wren				S1S2B,S1S2M	5 Undetermined	22	48.7 ± 7.0	NB
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S1S2B,S4N,S5M	4 Secure	4	73.2 ± 0.0	NB
A	<i>Calidris bairdii</i>	Baird's Sandpiper				S1S2M	3 Sensitive	50	51.4 ± 0.0	NB
A	<i>Cistothorus palustris</i>	Marsh Wren				S2B,S2M	3 Sensitive	98	38.9 ± 7.0	NB
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	3 Sensitive	152	19.7 ± 7.0	NB
A	<i>Toxostoma rufum</i>	Brown Thrasher				S2B,S2M	3 Sensitive	50	22.1 ± 7.0	NB
A	<i>Pooecetes gramineus</i>	Vesper Sparrow				S2B,S2M	2 May Be At Risk	105	10.1 ± 7.0	NB
A	<i>Mareca strepera</i>	Gadwall				S2B,S3M	4 Secure	204	24.7 ± 6.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	31	32.0 ± 7.0	NB
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	4 Secure	188	12.1 ± 7.0	NB
A	<i>Anser caerulescens</i>	Snow Goose				S2M	4 Secure	24	24.8 ± 0.0	NB
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2N,S2M	4 Secure	21	45.1 ± 2.0	NB
A	<i>Somateria spectabilis</i>	King Eider				S2N,S2M	4 Secure	4	70.3 ± 0.0	NB
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	4 Secure	163	37.0 ± 0.0	NB
A	<i>Asio otus</i>	Long-eared Owl				S2S3	5 Undetermined	19	30.5 ± 7.0	NB
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S2S3	3 Sensitive	19	18.1 ± 0.0	NB
A	<i>Salmo salar</i>	Atlantic Salmon				S2S3	2 May Be At Risk	29	21.4 ± 0.0	NB
A	<i>Spatula clypeata</i>	Northern Shoveler				S2S3B,S2S3M	4 Secure	348	16.2 ± 0.0	NB
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	217	22.1 ± 7.0	NB
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	612	7.7 ± 0.0	NB
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	3 Sensitive	165	60.1 ± 0.0	NB
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S2S3N,SUM	3 Sensitive	47	37.8 ± 9.0	NB
A	<i>Cephus grylle</i>	Black Guillemot				S3	4 Secure	40	53.2 ± 11.0	NB
A	<i>Loxia curvirostra</i>	Red Crossbill				S3	4 Secure	168	17.7 ± 0.0	NB
A	<i>Spinus pinus</i>	Pine Siskin				S3	4 Secure	377	14.5 ± 7.0	NB
A	<i>Prosopium cylindraceum</i>	Round Whitefish				S3	4 Secure	1	71.6 ± 0.0	NB
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	4 Secure	123	77.6 ± 0.0	NB
A	<i>Eptesicus fuscus</i>	Big Brown Bat				S3	3 Sensitive	38	33.9 ± 1.0	NB
A	<i>Cathartes aura</i>	Turkey Vulture				S3B,S3M	4 Secure	236	16.3 ± 0.0	NB
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	3 Sensitive	203	34.2 ± 7.0	NB
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	3 Sensitive	925	8.3 ± 7.0	NB
A	<i>Tringa semipalmata</i>	Willet				S3B,S3M	3 Sensitive	437	24.7 ± 2.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B,S3M	4 Secure	177	5.4 ± 1.0	NB
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B,S3M	4 Secure	234	22.1 ± 7.0	NB
A	<i>Piranga olivacea</i>	Scarlet Tanager				S3B,S3M	4 Secure	105	14.5 ± 7.0	NB
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	4 Secure	78	36.3 ± 0.0	NB
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	323	12.2 ± 7.0	NB
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	4 Secure	201	8.2 ± 7.0	NB
A	<i>Somateria mollissima</i>	Common Eider				S3B,S4M,S3N	4 Secure	177	49.4 ± 0.0	NB
A	<i>Setophaga tigrina</i>	Cape May Warbler				S3B,S4S5M	4 Secure	247	8.2 ± 7.0	NB
A	<i>Anas acuta</i>	Northern Pintail				S3B,S5M	3 Sensitive	128	34.2 ± 7.0	NB
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	237	35.7 ± 7.0	NB
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	705	47.6 ± 0.0	NB
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S3M	3 Sensitive	4	53.2 ± 11.0	NB
A	<i>Melanitta americana</i>	Black Scoter				S3M,S1S2N	3 Sensitive	227	27.1 ± 1.0	NB
A	<i>Bucephala albeola</i>	Bufflehead				S3M,S2N	3 Sensitive	402	24.7 ± 0.0	NB
A	<i>Calidris maritima</i>	Purple Sandpiper				S3M,S3N	4 Secure	65	26.7 ± 0.0	NB
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	4 Secure	102	26.0 ± 1.0	NB
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	590	2.8 ± 7.0	NB
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	4 Secure	957	2.8 ± 7.0	NB
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	4 Secure	1055	10.5 ± 0.0	NB
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	4 Secure	311	27.1 ± 1.0	NB
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B,S5M	4 Secure	53	32.7 ± 0.0	NB
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3S4M	4 Secure	1379	51.4 ± 0.0	NB
A	<i>Limosa haemastica</i>	Hudsonian Godwit				S3S4M	4 Secure	206	60.1 ± 0.0	NB
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	4 Secure	2048	24.7 ± 2.0	NB
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3S4M	4 Secure	331	15.7 ± 219.0	NB
A	<i>Calidris alba</i>	Sanderling				S3S4M,S1N	3 Sensitive	1393	39.8 ± 0.0	NB
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	4 Secure	146	53.2 ± 11.0	NB
A	<i>Lanius ludovicianus</i>	Loggerhead Shrike				SXB,SXM	1 At Risk	1	44.6 ± 0.0	NB
C	<i>Quercus macrocarpa</i> - <i>Acer rubrum</i> / <i>Onoclea sensibilis</i> - <i>Carex arcta</i> Forest	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2		1	64.9 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
C	<i>Acer saccharum - Fraxinus americana / Polystichum acrostichoides</i>	Sugar Maple - White Ash / Christmas Fern Forest				S3S4		1	72.8 ± 0.0	NB
	<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Endangered	Endangered	Endangered	S1	1 At Risk	74	48.4 ± 0.0	NB
	<i>Gomphus ventricosus</i>	Skillet Clubtail	Endangered		Endangered	S1S2	2 May Be At Risk	41	14.5 ± 0.0	NB
	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	3 Sensitive	144	17.9 ± 0.0	NB
	<i>Ophiogomphus howei</i>	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	2 May Be At Risk	26	45.4 ± 0.0	NB
	<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern		Special Concern	S2	3 Sensitive	32	13.2 ± 1.0	NB
	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	92	22.8 ± 0.0	NB
	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern			S3?	3 Sensitive	33	19.8 ± 0.0	NB
	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle	Special Concern			SH	2 May Be At Risk	29	39.6 ± 1.0	NB
	<i>Appalachina sayana</i>	Spike-lip Crater	Not At Risk			S3?		2	44.1 ± 1.0	NB
	<i>Erora laeta</i>	Early Hairstreak				S1	2 May Be At Risk	1	43.9 ± 1.0	NB
	<i>Leucorrhinia patricia</i>	Canada Whiteface				S1	2 May Be At Risk	7	94.2 ± 1.0	NB
	<i>Arigomphus furcifer</i>	Lilypad Clubtail				S1	5 Undetermined	6	61.3 ± 0.0	NB
	<i>Polites origenes</i>	Crossline Skipper				S1?	5 Undetermined	6	66.3 ± 0.0	NB
	<i>Plebejus saepiolus</i>	Greenish Blue				S1S2	4 Secure	4	17.1 ± 2.0	NB
	<i>Ophiogomphus colubrinus</i>	Boreal Snaketail				S1S2	2 May Be At Risk	28	69.7 ± 0.0	NB
	<i>Cicindela ancisciconensis</i>	Appalachian Tiger Beetle				S2	5 Undetermined	1	69.9 ± 0.0	NB
	<i>Brachyleptura circumdata</i>	a Longhorned Beetle				S2		6	71.5 ± 0.0	NB
	<i>Satyrium calanus</i>	Banded Hairstreak				S2	3 Sensitive	21	73.6 ± 1.0	NB
	<i>Satyrium calanus falacer</i>	Banded Hairstreak				S2	4 Secure	1	96.7 ± 1.0	NB
	<i>Strymon melinus</i>	Grey Hairstreak				S2	4 Secure	1	38.9 ± 2.0	NB
	<i>Aeshna clepsydra</i>	Mottled Darner				S2	3 Sensitive	7	70.7 ± 0.0	NB
	<i>Somatochlora brevicincta</i>	Quebec Emerald				S2	5 Undetermined	2	38.6 ± 0.0	NB
	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S2	5 Undetermined	4	66.3 ± 1.0	NB
	<i>Ladona exusta</i>	White Corporal				S2	5 Undetermined	1	85.6 ± 0.0	NB
	<i>Coenagrion interrogatum</i>	Subarctic Bluet				S2	3 Sensitive	1	83.1 ± 1.0	NB
	<i>Callophrys henrici</i>	Henry's Elfin				S2S3	4 Secure	19	35.4 ± 0.0	NB
	<i>Sphaeroderus nitidicollis</i>	a Ground Beetle				S3	4 Secure	1	71.5 ± 0.0	NB
	<i>Lepturosis biforis</i>	a Longhorned Beetle				S3		1	98.0 ± 1.0	NB
	<i>Orthosoma brunneum</i>	a Longhorned Beetle				S3		1	62.0 ± 5.0	NB
	<i>Elaphrus americanus</i>	a Ground Beetle				S3	4 Secure	2	57.1 ± 0.0	NB
	<i>Desmocerus palliatus</i>	Elderberry Borer				S3		4	98.0 ± 1.0	NB
	<i>Agonum crenistriatum</i>	a Ground Beetle				S3	5 Undetermined	1	47.1 ± 1.0	NB
	<i>Agonum consimile</i>	a Ground Beetle				S3	4 Secure	1	47.1 ± 1.0	NB
	<i>Agonum excavatum</i>	a Ground Beetle				S3	4 Secure	1	83.1 ± 0.0	NB
	<i>Clivina americana</i>	a Ground Beetle				S3	4 Secure	1	83.1 ± 0.0	NB
	<i>Lachnocrepis parallela</i>	a Ground Beetle				S3	4 Secure	1	61.3 ± 0.0	NB
	<i>Dyschirius setosus</i>	a Ground Beetle				S3	5 Undetermined	3	61.3 ± 0.0	NB
	<i>Harpalus fulvilabris</i>	a Ground Beetle				S3	4 Secure	1	57.4 ± 0.0	NB
	<i>Olisthopus parmatus</i>	a Ground Beetle				S3	4 Secure	1	71.5 ± 0.0	NB
	<i>Paratachys scitulus</i>	a Ground Beetle				S3	5 Undetermined	1	83.1 ± 0.0	NB
	<i>Amara pallipes</i>	a Ground Beetle				S3	4 Secure	2	47.1 ± 1.0	NB
	<i>Carabus maeander</i>	a Ground Beetle				S3	5 Undetermined	1	47.1 ± 1.0	NB
	<i>Carabus serratus</i>	a Ground Beetle				S3	4 Secure	1	43.7 ± 1.0	NB
	<i>Coccinella hieroglyphica kirbyi</i>	a Ladybird Beetle				S3	4 Secure	1	98.0 ± 1.0	NB
	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle				S3	4 Secure	9	45.6 ± 0.0	NB
	<i>Stenocorus vittigera</i>	a Longhorned Beetle				S3		1	83.0 ± 0.0	NB
	<i>Gnathacmaeops pratensis</i>	a Longhorned Beetle				S3		5	98.0 ± 1.0	NB
	<i>Pogonocherus mixtus</i>	a Longhorned Beetle				S3		1	98.0 ± 1.0	NB
	<i>Xylotrechus undulatus</i>	a Longhorned Beetle				S3		1	62.9 ± 1.0	NB
	<i>Badister neopulchellus</i>	a Ground Beetle				S3	4 Secure	1	83.1 ± 0.0	NB
	<i>Calathus gregarius</i>	a Ground Beetle				S3	4 Secure	1	49.5 ± 1.0	NB
	<i>Gonioctena americana</i>	a Leaf Beetle				S3		1	61.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
I	<i>Trachysida aspera</i>	a Longhorned Beetle				S3		1	57.0 ± 0.0	NB
I	<i>Hesperia sassacus</i>	Indian Skipper				S3	4 Secure	16	17.9 ± 0.0	NB
I	<i>Euphyes bimacula</i>	Two-spotted Skipper				S3	4 Secure	22	35.4 ± 1.0	NB
I	<i>Papilio brevicauda bretonensis</i>	Short-tailed Swallowtail				S3	4 Secure	12	77.4 ± 0.0	NB
I	<i>Lycaena hyllus</i>	Bronze Copper				S3	3 Sensitive	118	40.9 ± 1.0	NB
I	<i>Lycaena dospassosi</i>	Salt Marsh Copper				S3	4 Secure	48	71.1 ± 0.0	NB
I	<i>Satyrium acadica</i>	Acadian Hairstreak				S3	4 Secure	23	33.1 ± 2.0	NB
I	<i>Callophrys polios</i>	Hoary Elfin				S3	4 Secure	21	22.9 ± 0.0	NB
I	<i>Plebejus idas empetri</i>	Crowberry Blue				S3	4 Secure	22	52.6 ± 20.0	NB
I	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	4 Secure	30	42.6 ± 0.0	NB
I	<i>Boloria eunomia</i>	Bog Fritillary				S3	5 Undetermined	4	94.5 ± 0.0	NB
I	<i>Boloria bellona</i>	Meadow Fritillary				S3	4 Secure	43	47.5 ± 0.0	NB
I	<i>Boloria chariclea</i>	Arctic Fritillary				S3	4 Secure	9	69.1 ± 7.0	NB
I	<i>Polygonia satyrus</i>	Satyr Comma				S3	4 Secure	21	52.3 ± 5.0	NB
I	<i>Polygonia gracilis</i>	Hoary Comma				S3	4 Secure	8	79.8 ± 7.0	NB
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S3	4 Secure	17	45.2 ± 10.0	NB
I	<i>Gomphus vastus</i>	Cobra Clubtail				S3	3 Sensitive	55	49.6 ± 0.0	NB
I	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail				S3	4 Secure	24	38.0 ± 0.0	NB
I	<i>Dorocordulia lepida</i>	Petite Emerald				S3	4 Secure	19	8.6 ± 1.0	NB
I	<i>Somatochlora cingulata</i>	Lake Emerald				S3	4 Secure	6	46.6 ± 1.0	NB
I	<i>Somatochlora forcipata</i>	Forcipate Emerald				S3	4 Secure	10	45.8 ± 1.0	NB
I	<i>Williamsonia fletcheri</i>	Ebony Boghaunter				S3	4 Secure	15	38.9 ± 1.0	NB
I	<i>Lestes eurinus</i>	Amber-Winged Spreadwing				S3	4 Secure	11	8.6 ± 1.0	NB
I	<i>Lestes vigilax</i>	Swamp Spreadwing				S3	3 Sensitive	13	73.7 ± 0.0	NB
I	<i>Enallagma geminatum</i>	Skimming Bluet				S3	5 Undetermined	13	44.4 ± 0.0	NB
I	<i>Enallagma signatum</i>	Orange Bluet				S3	4 Secure	10	44.4 ± 0.0	NB
I	<i>Stylurus scudderi</i>	Zebra Clubtail				S3	4 Secure	42	23.7 ± 1.0	NB
I	<i>Alasmidonta undulata</i>	Triangle Floater				S3	3 Sensitive	56	9.4 ± 0.0	NB
I	<i>Leptodea ochracea</i>	Tidewater Mucket				S3	4 Secure	78	30.5 ± 0.0	NB
I	<i>Neohelix albolabris</i>	Whitelip				S3		1	44.2 ± 0.0	NB
I	<i>Spurwinkia salsa</i>	Saltmarsh Hydrobe				S3		30	74.1 ± 0.0	NB
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S3B,S3M	4 Secure	3	66.4 ± 0.0	NB
I	<i>Satyrium liparops</i>	Striped Hairstreak				S3S4	4 Secure	35	22.5 ± 1.0	NB
I	<i>Satyrium liparops strigosum</i>	Striped Hairstreak				S3S4	4 Secure	4	44.6 ± 1.0	NB
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	4 Secure	43	48.9 ± 0.0	NB
N	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered		Endangered		2 May Be At Risk	1	57.6 ± 1.0	NB
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	1 At Risk	2	77.2 ± 0.0	NS
N	<i>Peltigera hydrothyrta</i>	Eastern Waterfan	Threatened			S1	5 Undetermined	6	47.5 ± 1.0	NB
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened			S1S2	5 Undetermined	2	46.0 ± 1.0	NB
N	<i>Pectenium plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	2 May Be At Risk	2	77.1 ± 0.0	NS
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	5 Undetermined	14	52.0 ± 0.0	NB
N	<i>Aloina rigida</i>	Aloe-Like Rigid Screw Moss				S1	2 May Be At Risk	1	71.6 ± 0.0	NB
N	<i>Aulacomnium heterostichum</i>	One-sided Groove Moss				S1	2 May Be At Risk	1	96.7 ± 0.0	NB
N	<i>Bryum muehlenbeckii</i>	Muehlenbeck's Bryum Moss				S1	2 May Be At Risk	1	97.2 ± 1.0	NB
N	<i>Campylostelium saxicola</i>	a Moss				S1	2 May Be At Risk	1	99.0 ± 0.0	NB
N	<i>Dicranoweisia crispula</i>	Mountain Thatch Moss				S1	2 May Be At Risk	1	53.1 ± 0.0	NB
N	<i>Didymodon rigidulus</i> var. <i>gracilis</i>	a moss				S1	2 May Be At Risk	1	57.5 ± 1.0	NB
N	<i>Syntrichia ruralis</i>	a Moss				S1	2 May Be At Risk	1	32.8 ± 0.0	NB
N	<i>Zygodon viridissimus</i> var. <i>viridissimus</i>	a Moss				S1	2 May Be At Risk	1	96.7 ± 0.0	NB
N	<i>Collema tenax</i>	Soil Tarpaper Lichen				S1		1	88.1 ± 0.0	NS
N	<i>Cladonia straminea</i>	Reptilian Pixie-cup Lichen				S1	5 Undetermined	5	48.4 ± 1.0	NB
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S1	2 May Be At Risk	1	48.4 ± 1.0	NB
N	<i>Peltigera malacea</i>	Veinless Pelt Lichen				S1	5 Undetermined	1	51.5 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Bryoria bicolor</i>	Electrified Horsehair Lichen				S1	2 May Be At Risk	1	51.5 ± 1.0	NB
N	<i>Hygrobriella laxifolia</i>	Lax Notchwort				S1?	6 Not Assessed	1	50.4 ± 1.0	NB
N	<i>Bartramia ithyphylla</i>	Straight-leaved Apple Moss				S1?	2 May Be At Risk	2	50.4 ± 0.0	NB
N	<i>Dichelyma falcatum</i>	a Moss				S1?	2 May Be At Risk	2	96.3 ± 1.0	NB
N	<i>Dicranum bonjeanii</i>	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	99.8 ± 1.0	NB
N	<i>Dicranum condensatum</i>	Condensed Broom Moss				S1?	2 May Be At Risk	1	52.9 ± 0.0	NB
N	<i>Entodon brevisetus</i>	a Moss				S1?	2 May Be At Risk	1	15.3 ± 10.0	NB
N	<i>Eurhynchium hians</i>	Light Beaked Moss				S1?	2 May Be At Risk	2	37.9 ± 0.0	NB
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S1?	2 May Be At Risk	4	11.4 ± 1.0	NB
N	<i>Plagiothecium latebricola</i>	Alder Silk Moss				S1?	2 May Be At Risk	1	56.6 ± 1.0	NB
N	<i>Rhytidium rugosum</i>	Wrinkle-leaved Moss				S1?	2 May Be At Risk	2	39.7 ± 0.0	NB
N	<i>Seligeria recurvata</i>	a Moss				S1?	2 May Be At Risk	3	11.4 ± 1.0	NB
N	<i>Splachnum pennsylvanicum</i>	Southern Dung Moss				S1?	2 May Be At Risk	1	75.1 ± 1.0	NB
N	<i>Rhizomnium pseudopunctatum</i>	Felted Leafy Moss				S1?	2 May Be At Risk	1	96.4 ± 0.0	NB
N	<i>Cephaloziella spinigera</i>	Spiny Threadwort				S1S2	6 Not Assessed	2	27.4 ± 0.0	NB
N	<i>Cladopodiella francisci</i>	Holt's Notchwort				S1S2	6 Not Assessed	4	46.9 ± 1.0	NB
N	<i>Harpanthus flotovianus</i>	Great Mountain Flapwort				S1S2	6 Not Assessed	2	42.4 ± 1.0	NB
N	<i>Jungermannia obovata</i>	Egg Flapwort				S1S2	6 Not Assessed	2	55.9 ± 0.0	NB
N	<i>Pallavicinia lyellii</i>	Lyell's Ribbonwort				S1S2	6 Not Assessed	3	15.3 ± 1.0	NB
N	<i>Radula tenax</i>	Tenacious Scalewort				S1S2	6 Not Assessed	1	55.9 ± 0.0	NB
N	<i>Brachythecium acuminatum</i>	Acuminate Ragged Moss				S1S2	5 Undetermined	5	49.7 ± 100.0	NB
N	<i>Bryum salinum</i>	a Moss				S1S2	2 May Be At Risk	1	56.6 ± 1.0	NB
N	<i>Campyllum radicale</i>	Long-stalked Fine Wet Moss				S1S2	5 Undetermined	1	99.7 ± 1.0	NB
N	<i>Tortula obtusifolia</i>	a Moss				S1S2	2 May Be At Risk	1	72.7 ± 0.0	NB
N	<i>Distichium inclinatum</i>	Inclined Iris Moss				S1S2	2 May Be At Risk	5	57.5 ± 1.0	NB
N	<i>Ditrichum pallidum</i>	Pale Cow-hair Moss				S1S2	2 May Be At Risk	1	16.2 ± 1.0	NB
N	<i>Drummondia prorepens</i>	a Moss				S1S2	2 May Be At Risk	1	99.3 ± 0.0	NB
N	<i>Hygrohypnum bestii</i>	Best's Brook Moss				S1S2	3 Sensitive	5	26.5 ± 0.0	NB
N	<i>Seligeria brevifolia</i>	a Moss				S1S2	3 Sensitive	4	96.4 ± 0.0	NB
N	<i>Timmia norvegica</i>	a moss				S1S2	2 May Be At Risk	3	46.5 ± 0.0	NB
N	<i>Timmia norvegica var. excurrens</i>	a moss				S1S2	2 May Be At Risk	1	57.6 ± 0.0	NB
N	<i>Tortella humilis</i>	Small Crisp Moss				S1S2	2 May Be At Risk	7	42.3 ± 1.0	NB
N	<i>Pseudotaxiphyllum distichaceum</i>	a Moss				S1S2	2 May Be At Risk	1	66.4 ± 1.0	NB
N	<i>Hamatocaulis vernicosus</i>	a Moss				S1S2	2 May Be At Risk	1	80.6 ± 100.0	NB
N	<i>Umbilicaria vellea</i>	Grizzled Rocktripe Lichen				S1S2	5 Undetermined	1	57.1 ± 1.0	NB
N	<i>Peltigera scabrosa</i>	Greater Toad Pelt Lichen				S1S2	2 May Be At Risk	4	44.6 ± 1.0	NB
N	<i>Calypogeia neesiana</i>	Nees' Pouchwort				S1S3	6 Not Assessed	1	73.5 ± 1.0	NB
N	<i>Porella pinnata</i>	Pinnate Scalewort				S1S3	6 Not Assessed	1	66.7 ± 1.0	NB
N	<i>Tritomaria scitula</i>	Mountain Notchwort				S1S3	6 Not Assessed	1	53.7 ± 1.0	NB
N	<i>Amphidium mougeotii</i>	a Moss				S2	3 Sensitive	10	49.6 ± 0.0	NB
N	<i>Anomodon viticulosus</i>	a Moss				S2	2 May Be At Risk	5	3.7 ± 10.0	NB
N	<i>Cirriphyllum pilliferum</i>	Hair-pointed Moss				S2	3 Sensitive	4	15.3 ± 5.0	NB
N	<i>Dicranella palustris</i>	Drooping-Leaved Fork Moss				S2	3 Sensitive	9	43.3 ± 5.0	NB
N	<i>Didymodon ferrugineus</i>	a moss				S2	3 Sensitive	2	57.4 ± 0.0	NB
N	<i>Anomodon tristis</i>	a Moss				S2	2 May Be At Risk	3	49.5 ± 10.0	NB
N	<i>Isopterygiopsis pulchella</i>	Neat Silk Moss				S2	3 Sensitive	7	49.4 ± 1.0	NB
N	<i>Meesia triquetra</i>	Three-ranked Cold Moss				S2	2 May Be At Risk	1	49.7 ± 100.0	NB
N	<i>Physcomitrium immersum</i>	a Moss				S2	3 Sensitive	6	66.7 ± 1.0	NB
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2	3 Sensitive	4	20.3 ± 15.0	NB
N	<i>Pohlia elongata</i>	Long-necked Nodding Moss				S2	3 Sensitive	14	45.3 ± 0.0	NB
N	<i>Pohlia sphagnicola</i>	a moss				S2	3 Sensitive	1	94.8 ± 0.0	NB
N	<i>Seligeria calcarea</i>	Chalk Brittle Moss				S2	3 Sensitive	2	45.4 ± 0.0	NB
N	<i>Sphagnum centrale</i>	Central Peat Moss				S2	3 Sensitive	6	45.3 ± 0.0	NB
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S2	3 Sensitive	4	79.4 ± 5.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Sphagnum flexuosum</i>	Flexuous Peatmoss				S2	3 Sensitive	4	46.5 ± 0.0	NB
N	<i>Tayloria serrata</i>	Serrate Trumpet Moss				S2	3 Sensitive	8	8.2 ± 1.0	NB
N	<i>Tetradontium brownianum</i>	Little Georgia				S2	3 Sensitive	12	49.5 ± 10.0	NB
N	<i>Thamnobryum alleghaniense</i>	a Moss				S2	3 Sensitive	12	35.7 ± 0.0	NB
N	<i>Tortula mucronifolia</i>	Mucronate Screw Moss				S2	3 Sensitive	1	99.9 ± 0.0	NB
N	<i>Ulota phyllantha</i>	a Moss				S2	3 Sensitive	4	57.3 ± 0.0	NB
N	<i>Anomobryum filiforme</i>	a moss				S2	5 Undetermined	5	57.5 ± 1.0	NB
N	<i>Cladonia macrophylla</i>	Fig-leaved Lichen				S2	5 Undetermined	3	51.4 ± 1.0	NB
N	<i>Fuscopannaria leucosticta</i>	Rimmed Shingles Lichen				S2	2 May Be At Risk	41	38.4 ± 0.0	NB
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S2	2 May Be At Risk	1	69.0 ± 0.0	NB
N	<i>Leptogium milligranum</i>	Stretched Jellyskin Lichen				S2	5 Undetermined	1	71.4 ± 0.0	NB
N	<i>Nephroma laevigatum</i>	Mustard Kidney Lichen				S2	2 May Be At Risk	4	88.0 ± 0.0	NS
N	<i>Anacamptodon splachnoides</i>	a Moss				S2?	3 Sensitive	1	77.0 ± 1.0	NB
N	<i>Andreaea rothii</i>	a Moss				S2?	3 Sensitive	6	49.6 ± 0.0	NB
N	<i>Anomodon minor</i>	Blunt-leaved Anomodon Moss				S2?	2 May Be At Risk	1	4.0 ± 1.0	NB
N	<i>Brachythecium digastrum</i>	a Moss				S2?	3 Sensitive	2	64.5 ± 0.0	NB
N	<i>Bryum pallescens</i>	Pale Bryum Moss				S2?	5 Undetermined	2	74.1 ± 100.0	NB
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss				S2?	3 Sensitive	1	15.4 ± 3.0	NB
N	<i>Hygrohypnum montanum</i>	a Moss				S2?	3 Sensitive	2	46.9 ± 1.0	NB
N	<i>Schistostega pennata</i>	Luminous Moss				S2?	3 Sensitive	3	50.2 ± 100.0	NB
N	<i>Seligeria campylopoda</i>	a Moss				S2?	3 Sensitive	1	80.6 ± 100.0	NB
N	<i>Seligeria diversifolia</i>	a Moss				S2?	3 Sensitive	2	58.5 ± 0.0	NB
N	<i>Sphagnum angermanicum</i>	a Peatmoss				S2?	3 Sensitive	1	16.9 ± 10.0	NB
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss				S2?	3 Sensitive	2	11.4 ± 10.0	NB
N	<i>Plagiomnium rostratum</i>	Long-beaked Leafy Moss				S2?	3 Sensitive	5	35.7 ± 0.0	NB
N	<i>Ramalina labiosorediata</i>	Chalky Ramalina Lichen				S2?	5 Undetermined	1	56.8 ± 1.0	NB
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2?	5 Undetermined	1	96.4 ± 0.0	NB
N	<i>Nephroma arcticum</i>	Arctic Kidney Lichen				S2?	3 Sensitive	1	49.8 ± 1.0	NB
N	<i>Bryum uliginosum</i>	a Moss				S2S3	3 Sensitive	2	57.3 ± 0.0	NB
N	<i>Calliergonella cuspidata</i>	Common Large Wetland Moss				S2S3	3 Sensitive	4	7.1 ± 5.0	NB
N	<i>Campyllum polygamum</i>	a Moss				S2S3	3 Sensitive	1	45.8 ± 0.0	NB
N	<i>Palustriella falcata</i>	a Moss				S2S3	3 Sensitive	2	49.5 ± 0.0	NB
N	<i>Didymodon rigidulus</i>	Rigid Screw Moss				S2S3	3 Sensitive	8	54.0 ± 2.0	NB
N	<i>Ephemerum serratum</i>	a Moss				S2S3	3 Sensitive	2	32.0 ± 0.0	NB
N	<i>Orthotrichum speciosum</i>	Showy Bristle Moss				S2S3	5 Undetermined	4	78.5 ± 4.0	NB
N	<i>Pohlia prolifera</i>	Cottony Nodding Moss				S2S3	3 Sensitive	13	20.3 ± 15.0	NB
N	<i>Racomitrium fasciculare</i>	a Moss				S2S3	3 Sensitive	3	49.8 ± 0.0	NB
N	<i>Racomitrium affine</i>	a Moss				S2S3	3 Sensitive	1	46.1 ± 1.0	NB
N	<i>Saelania glaucescens</i>	Blue Dew Moss				S2S3	3 Sensitive	2	53.1 ± 0.0	NB
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2S3	3 Sensitive	3	87.8 ± 0.0	NB
N	<i>Sphagnum subfulvum</i>	a Peatmoss				S2S3	2 May Be At Risk	2	94.2 ± 0.0	NB
N	<i>Taxiphyllum deplanatum</i>	Imbricate Yew-leaved Moss				S2S3	3 Sensitive	2	55.6 ± 1.0	NB
N	<i>Zygodon viridissimus</i>	a Moss				S2S3	2 May Be At Risk	2	55.6 ± 1.0	NB
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S2S3	3 Sensitive	3	44.7 ± 1.0	NB
N	<i>Loeskeobryum brevirostre</i>	a Moss				S2S3	3 Sensitive	10	34.9 ± 2.0	NB
N	<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss				S2S3	3 Sensitive	6	45.5 ± 0.0	NB
N	<i>Cladonia acuminata</i>	Scantily Clad Pixie Lichen				S2S3	5 Undetermined	2	57.1 ± 1.0	NB
N	<i>Cladonia ramulosa</i>	Bran Lichen				S2S3	5 Undetermined	4	52.3 ± 1.0	NB
N	<i>Cladonia sulphurina</i>	Greater Sulphur-cup Lichen				S2S3	5 Undetermined	1	47.9 ± 1.0	NB
N	<i>Dendriscoaulon umhausense</i>	a lichen				S2S3	3 Sensitive	1	99.4 ± 0.0	NB
N	<i>Parmeliopsis ambigua</i>	Green Starburst Lichen				S2S3	5 Undetermined	1	56.6 ± 1.0	NB
N	<i>Sphaerophorus globosus</i>	Northern Coral Lichen				S2S3	3 Sensitive	5	51.5 ± 1.0	NB
N	<i>Hypnum curvifolium</i>	Curved-leaved Plait Moss				S3	3 Sensitive	6	49.4 ± 1.0	NB



Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Tortella fragilis</i>	Fragile Twisted Moss				S3	3 Sensitive	1	57.6 ± 0.0	NB
N	<i>Schistidium maritimum</i>	a Moss				S3	4 Secure	6	56.9 ± 0.0	NB
N	<i>Hymenostylium recurvirostre</i>	Hymenostylium Moss				S3	3 Sensitive	4	57.7 ± 1.0	NB
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	3 Sensitive	1	99.4 ± 0.0	NB
N	<i>Solorina saccata</i>	Woodland Owl Lichen				S3	5 Undetermined	6	56.6 ± 1.0	NB
N	<i>Ahtiana aurescens</i>	Eastern Candlewax Lichen				S3	5 Undetermined	1	95.0 ± 0.0	NB
N	<i>Normandina pulchella</i>	Rimmed Elf-ear Lichen				S3	5 Undetermined	8	52.3 ± 1.0	NB
N	<i>Cladonia farinacea</i>	Farinose Pixie Lichen				S3	5 Undetermined	5	52.9 ± 1.0	NB
N	<i>Cladonia strepsilis</i>	Olive Cladonia Lichen				S3	4 Secure	1	65.4 ± 0.0	NB
N	<i>Leptogium lichenoides</i>	Tattered Jellyskin Lichen				S3	5 Undetermined	6	57.1 ± 1.0	NB
N	<i>Nephroma bellum</i>	Naked Kidney Lichen				S3	4 Secure	3	45.3 ± 1.0	NB
N	<i>Peltigera degenii</i>	Lustrous Pelt Lichen				S3	5 Undetermined	3	47.5 ± 1.0	NB
N	<i>Usnea strigosa</i>	Bushy Beard Lichen				S3	5 Undetermined	4	56.7 ± 1.0	NB
N	<i>Leptogium laceroides</i>	Short-bearded Jellyskin Lichen				S3	3 Sensitive	2	46.0 ± 1.0	NB
N	<i>Peltigera membranacea</i>	Membranous Pelt Lichen				S3	5 Undetermined	7	56.6 ± 1.0	NB
N	<i>Cladonia carneola</i>	Crowned Pixie-cup Lichen				S3	5 Undetermined	1	52.9 ± 1.0	NB
N	<i>Cladonia deformis</i>	Lesser Sulphur-cup Lichen				S3	4 Secure	5	49.8 ± 1.0	NB
N	<i>Aulacomnium androgynum</i>	Little Groove Moss				S3?	4 Secure	8	20.3 ± 15.0	NB
N	<i>Dicranella rufescens</i>	Red Forklet Moss				S3?	5 Undetermined	2	57.6 ± 0.0	NB
N	<i>Rhytidiadelphus loreus</i>	Lanky Moss				S3?	2 May Be At Risk	1	57.5 ± 1.0	NB
N	<i>Sphagnum lescurii</i>	a Peatmoss				S3?	5 Undetermined	6	43.3 ± 1.0	NB
N	<i>Stereocaulon subcoralloides</i>	Coralloid Foam Lichen				S3?	5 Undetermined	1	56.8 ± 1.0	NB
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3S4	4 Secure	1	37.7 ± 15.0	NB
N	<i>Brachythecium velutinum</i>	Velvet Ragged Moss				S3S4	4 Secure	1	44.7 ± 1.0	NB
N	<i>Dicranella cerviculata</i>	a Moss				S3S4	3 Sensitive	3	45.0 ± 2.0	NB
N	<i>Dicranum majus</i>	Greater Broom Moss				S3S4	4 Secure	19	45.5 ± 0.0	NB
N	<i>Dicranum leioneuron</i>	a Dicranum Moss				S3S4	4 Secure	2	48.5 ± 0.0	NB
N	<i>Encalypta ciliata</i>	Fringed Extinguisher Moss				S3S4	3 Sensitive	1	57.4 ± 0.0	NB
N	<i>Fissidens bryoides</i>	Lesser Pocket Moss				S3S4	4 Secure	3	56.9 ± 0.0	NB
N	<i>Heterocladium dimorphum</i>	Dimorphous Tangle Moss				S3S4	4 Secure	5	49.6 ± 0.0	NB
N	<i>Isopterygiopsis muelleriana</i>	a Moss				S3S4	4 Secure	14	45.5 ± 0.0	NB
N	<i>Myurella julacea</i>	Small Mouse-tail Moss				S3S4	4 Secure	2	57.4 ± 0.0	NB
N	<i>Physcomitrium pyriforme</i>	Pear-shaped Urn Moss				S3S4	3 Sensitive	4	33.9 ± 0.0	NB
N	<i>Pogonatum dentatum</i>	Mountain Hair Moss				S3S4	4 Secure	4	57.3 ± 0.0	NB
N	<i>Sphagnum compactum</i>	Compact Peat Moss				S3S4	4 Secure	1	98.9 ± 1.0	NB
N	<i>Sphagnum quinquefarium</i>	Five-ranked Peat Moss				S3S4	4 Secure	1	48.5 ± 0.0	NB
N	<i>Sphagnum torreyanum</i>	a Peatmoss				S3S4	4 Secure	2	56.5 ± 0.0	NB
N	<i>Sphagnum austinii</i>	Austin's Peat Moss				S3S4	4 Secure	1	93.9 ± 0.0	NS
N	<i>Sphagnum contortum</i>	Twisted Peat Moss				S3S4	4 Secure	2	87.7 ± 0.0	NB
N	<i>Splachnum rubrum</i>	Red Collar Moss				S3S4	4 Secure	1	87.8 ± 1.0	NB
N	<i>Tetraphis geniculata</i>	Geniculate Four-tooth Moss				S3S4	4 Secure	11	37.7 ± 15.0	NB
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	3	76.8 ± 0.0	NS
N	<i>Weissia controversa</i>	Green-Cushioned Weissia				S3S4	4 Secure	1	57.7 ± 1.0	NB
N	<i>Abietinella abietina</i>	Wiry Fern Moss				S3S4	4 Secure	1	57.6 ± 0.0	NB
N	<i>Trichostomum tenuirostre</i>	Acid-Soil Moss				S3S4	4 Secure	3	49.8 ± 0.0	NB
N	<i>Rauvella scita</i>	Smaller Fern Moss				S3S4	3 Sensitive	1	91.1 ± 0.0	NB
N	<i>Pannaria rubiginosa</i>	Brown-eyed Shingle Lichen				S3S4	3 Sensitive	2	56.5 ± 1.0	NB
N	<i>Ramalina thrausta</i>	Angelhair Ramalina Lichen				S3S4	5 Undetermined	11	44.6 ± 1.0	NB
N	<i>Hypogymnia vittata</i>	Slender Monk's Hood Lichen				S3S4	4 Secure	23	47.0 ± 1.0	NB
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen				S3S4	4 Secure	5	44.8 ± 1.0	NB
N	<i>Xylopsora friesii</i>	a Lichen				S3S4	5 Undetermined	1	57.1 ± 1.0	NB
N	<i>Montanella panniformis</i>	Shingled Camouflage Lichen				S3S4	5 Undetermined	4	47.6 ± 1.0	NB
N	<i>Nephroma parile</i>	Powdery Kidney Lichen				S3S4	4 Secure	8	21.6 ± 0.0	NB
N	<i>Protopannaria pezizoides</i>	Brown-gray Moss-shingle				S3S4	4 Secure	13	38.5 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Pseudocyphellaria holarctica</i>	Lichen				S3S4	3 Sensitive	50	20.7 ± 0.0	NB
N	<i>Stereocaulon paschale</i>	Yellow Specklebelly Lichen				S3S4	5 Undetermined	2	80.1 ± 1.0	NB
N	<i>Pannaria conoplea</i>	Easter Foam Lichen				S3S4	3 Sensitive	2	69.0 ± 0.0	NB
N	<i>Anapychia palmulata</i>	Mealy-rimmed Shingle Lichen				S3S4	3 Sensitive	3	46.0 ± 1.0	NB
N	<i>Peltigera neopolydactyla</i>	Shaggy Fringed Lichen				S3S4	5 Undetermined	8	47.5 ± 1.0	NB
N	<i>Cladonia cariosa</i>	Undulating Pelt Lichen				S3S4	4 Secure	4	55.9 ± 1.0	NB
N	<i>Hypocenomyce scalaris</i>	Lesser Ribbed Pixie Lichen				S3S4	5 Undetermined	1	56.8 ± 1.0	NB
N	<i>Dermatocarpon luridum</i>	Common Clam Lichen				S3S4	4 Secure	34	47.5 ± 1.0	NB
N	<i>Grimmia anodon</i>	Brookside Stippleback Lichen				SH	5 Undetermined	2	97.6 ± 10.0	NB
N	<i>Leucodon brachypus</i>	Toothless Grimmiid Moss				SH	2 May Be At Risk	12	46.3 ± 0.0	NB
N	<i>Splachnum luteum</i>	a Moss				SH	5 Undetermined	1	74.1 ± 100.0	NB
N	<i>Thelia hirtella</i>	Yellow Collar Moss				SH	2 May Be At Risk	1	49.7 ± 100.0	NB
N	<i>Cyrto-hypnum minutulum</i>	a Moss				SH	2 May Be At Risk	3	19.8 ± 10.0	NB
P	<i>Juglans cinerea</i>	Tiny Cedar Moss	Endangered	Endangered	Endangered	S1	1 At Risk	61	1.7 ± 0.0	NB
P	<i>Symphyotrichum laurentianum</i>	Butternut	Threatened	Threatened	Endangered	S1	1 At Risk	7	91.9 ± 0.0	NB
P	<i>Symphyotrichum subulatum</i> (Bathurst pop)	Gulf of St Lawrence Aster	Special Concern	Special Concern	Endangered	S2	1 At Risk	20	77.8 ± 0.0	NB
P	<i>Isoetes prototypus</i>	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	1 At Risk	1	92.3 ± 0.0	NB
P	<i>Lechea maritima</i> var. <i>subcylindrica</i>	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	3 Sensitive	423	77.4 ± 0.0	NB
P	<i>Cryptotaenia canadensis</i>	Beach Pinweed	Special Concern			S1	2 May Be At Risk	2	32.5 ± 1.0	NB
P	<i>Sanicula trifoliata</i>	Canada Honewort				S1	2 May Be At Risk	1	63.2 ± 5.0	NB
P	<i>Antennaria parlinii</i>	Large-Fruited Sanicle				S1	2 May Be At Risk	5	57.0 ± 1.0	NB
P	<i>Antennaria howellii</i> ssp. <i>petaloidea</i>	a Pussytoes				S1	2 May Be At Risk	2	98.9 ± 1.0	NB
P	<i>Bidens discoidea</i>	Pussy-Toes				S1	2 May Be At Risk	3	71.0 ± 0.0	NB
P	<i>Pseudognaphalium obtusifolium</i>	Swamp Beggarticks				S1	2 May Be At Risk	6	50.1 ± 0.0	NB
P	<i>Hieracium paniculatum</i>	Eastern Cudweed				S1	2 May Be At Risk	2	55.1 ± 0.0	NB
P	<i>Hieracium robinsonii</i>	Panicled Hawkweed				S1	3 Sensitive	9	48.7 ± 0.0	NB
P	<i>Solidago multiradiata</i>	Robinson's Hawkweed				S1	2 May Be At Risk	19	53.9 ± 0.0	NB
P	<i>Cardamine parviflora</i>	Multi-rayed Goldenrod				S1	2 May Be At Risk	8	71.6 ± 0.0	NB
P	<i>Draba arabisans</i>	Small-flowered Bittercress				S1	2 May Be At Risk	27	51.5 ± 0.0	NB
P	<i>Draba glabella</i>	Rock Whitlow-Grass				S1	2 May Be At Risk	12	57.5 ± 0.0	NB
P	<i>Stellaria crassifolia</i>	Rock Whitlow-Grass				S1	2 May Be At Risk	2	69.1 ± 5.0	NB
P	<i>Chenopodium simplex</i>	Fleshy Stitchwort				S1	2 May Be At Risk	9	17.3 ± 5.0	NB
P	<i>Blitum capitatum</i>	Maple-leaved Goosefoot				S1	2 May Be At Risk	3	56.1 ± 1.0	NB
P	<i>Suaeda rolandii</i>	strawberry-blite				S1	3 Sensitive	2	55.6 ± 0.0	NB
P	<i>Hypericum virginicum</i>	Roland's Sea-Blite				S1	2 May Be At Risk	3	90.9 ± 0.0	NB
P	<i>Corema conradii</i>	Virginia St. John's-wort				S1	2 May Be At Risk	1	100.0 ± 10.0	NB
P	<i>Vaccinium boreale</i>	Broom Crowberry				S1	2 May Be At Risk	3	71.1 ± 0.0	NS
P	<i>Euphorbia polygonifolia</i>	Northern Blueberry				S1	2 May Be At Risk	2	95.0 ± 10.0	NB
P	<i>Lespedeza capitata</i>	Seaside Spurge				S1	2 May Be At Risk	9	50.1 ± 0.0	NB
P	<i>Proserpinaca pectinata</i>	Round-headed Bush-clover				S1	2 May Be At Risk	1	96.6 ± 5.0	NS
P	<i>Pycnanthemum virginianum</i>	Comb-leaved Mermaidweed				S1	2 May Be At Risk	4	65.1 ± 0.0	NB
P	<i>Lysimachia quadrifolia</i>	Virginia Mountain Mint				S1	2 May Be At Risk	14	54.9 ± 0.0	NB
P	<i>Primula laurentiana</i>	Whorled Yellow Loosestrife				S1	2 May Be At Risk	29	57.4 ± 0.0	NB
P	<i>Ranunculus sceleratus</i>	Laurentian Primrose				S1	2 May Be At Risk	2	99.7 ± 0.0	NB
P	<i>Amelanchier fernaldii</i>	Cursed Buttercup				S1	2 May Be At Risk	1	45.3 ± 1.0	NB
P	<i>Crataegus jonesiae</i>	Fernald's Serviceberry				S1	2 May Be At Risk	3	43.2 ± 1.0	NB
P	<i>Dryas integrifolia</i>	Jones' Hawthorn				S1	2 May Be At Risk	14	54.7 ± 0.0	NB
P	<i>Potentilla canadensis</i>	Entire-leaved Mountain Avens				S1	5 Undetermined	1	44.4 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Geum fragarioides</i>	Barren Strawberry				S1	2 May Be At Risk	1	78.7 ± 1.0	NB
P	<i>Salix myrtilifolia</i>	Blueberry Willow				S1	2 May Be At Risk	24	55.7 ± 0.0	NB
P	<i>Saxifraga paniculata</i> ssp. <i>laestadii</i>	Laestadius' Saxifrage				S1	2 May Be At Risk	32	39.4 ± 1.0	NB
P	<i>Agalinis tenuifolia</i>	Slender Agalinis				S1	2 May Be At Risk	6	93.6 ± 0.0	NB
P	<i>Agalinis purpurea</i> var. <i>parviflora</i>	Small-flowered Purple False Foxglove				S1	2 May Be At Risk	31	75.8 ± 1.0	NB
P	<i>Alisma subcordatum</i>	Southern Water Plantain				S1	5 Undetermined	2	68.2 ± 0.0	NB
P	<i>Carex annectens</i>	Yellow-Fruited Sedge				S1	2 May Be At Risk	2	76.9 ± 0.0	NB
P	<i>Carex atlantica</i> ssp. <i>atlantica</i>	Atlantic Sedge				S1	2 May Be At Risk	8	56.1 ± 0.0	NB
P	<i>Carex backii</i>	Rocky Mountain Sedge				S1	2 May Be At Risk	3	33.9 ± 0.0	NB
P	<i>Carex merritt-feraldii</i>	Merritt Fernald's Sedge				S1	2 May Be At Risk	1	35.1 ± 0.0	NB
P	<i>Carex scirpoidea</i>	Scirpuslike Sedge				S1	2 May Be At Risk	6	40.1 ± 0.0	NB
P	<i>Carex sterilis</i>	Sterile Sedge				S1	2 May Be At Risk	1	5.0 ± 2.0	NB
P	<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	9	33.2 ± 5.0	NB
P	<i>Carex saxatilis</i>	Russet Sedge				S1	2 May Be At Risk	14	75.9 ± 10.0	NB
P	<i>Cyperus diandrus</i>	Low Flatsedge				S1	2 May Be At Risk	4	95.7 ± 1.0	NB
P	<i>Cyperus lupulinus</i>	Hop Flatsedge				S1	2 May Be At Risk	18	52.5 ± 0.0	NB
P	<i>Cyperus lupulinus</i> ssp. <i>macilentus</i>	Hop Flatsedge				S1	2 May Be At Risk	16	54.9 ± 0.0	NB
P	<i>Scirpus pendulus</i>	Hanging Bulrush				S1	2 May Be At Risk	6	7.4 ± 0.0	NB
P	<i>Schoenoplectiella smithii</i> var. <i>leviseta</i>	Smith's Bulrush				S1	2 May Be At Risk	1	97.8 ± 0.0	NB
P	<i>Juncus greenei</i>	Greene's Rush				S1	2 May Be At Risk	2	63.7 ± 10.0	NB
P	<i>Juncus stygius</i> ssp. <i>americanus</i>	Moor Rush				S1	2 May Be At Risk	17	63.7 ± 10.0	NB
P	<i>Juncus subtilis</i>	Creeping Rush				S1	2 May Be At Risk	1	67.6 ± 5.0	NB
P	<i>Allium canadense</i>	Canada Garlic				S1	2 May Be At Risk	2	65.0 ± 0.0	NB
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S1	2 May Be At Risk	5	17.2 ± 5.0	NB
P	<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	North American White Adder's-mouth				S1	2 May Be At Risk	1	88.2 ± 0.0	NS
P	<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid				S1	2 May Be At Risk	2	91.1 ± 10.0	NB
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S1	2 May Be At Risk	2	40.1 ± 1.0	NB
P	<i>Bromus pubescens</i>	Hairy Wood Brome Grass				S1	5 Undetermined	6	64.8 ± 0.0	NB
P	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	Slim-stemmed Reed Grass				S1	2 May Be At Risk	2	86.5 ± 1.0	NB
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1	2 May Be At Risk	5	55.3 ± 1.0	NB
P	<i>Danthonia compressa</i>	Flattened Oat Grass				S1	2 May Be At Risk	9	34.2 ± 1.0	NB
P	<i>Dichanthelium dichotomum</i>	Forked Panic Grass				S1	2 May Be At Risk	1	73.1 ± 1.0	NB
P	<i>Festuca subverticillata</i>	Nodding Fescue				S1	2 May Be At Risk	2	82.0 ± 0.0	NS
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S1	2 May Be At Risk	6	87.7 ± 0.0	NS
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	2 May Be At Risk	6	79.8 ± 0.0	NB
P	<i>Potamogeton strictifolius</i>	Straight-leaved Pondweed				S1	2 May Be At Risk	2	62.2 ± 2.0	NB
P	<i>Xyris difformis</i>	Bog Yellow-eyed-grass				S1	5 Undetermined	3	91.0 ± 0.0	NB
P	<i>Asplenium ruta-muraria</i> var. <i>cryptolepis</i>	Wallrue Spleenwort				S1	2 May Be At Risk	3	84.4 ± 0.0	NB
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern				S1	2 May Be At Risk	1	40.1 ± 1.0	NB
P	<i>Dryopteris filix-mas</i> ssp. <i>brittonii</i>	Britton's Male Fern				S1	2 May Be At Risk	2	41.6 ± 1.0	NB
P	<i>Sceptridium oneidense</i>	Blunt-lobed Moonwort				S1	2 May Be At Risk	3	78.1 ± 5.0	NB
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S1	2 May Be At Risk	9	48.8 ± 0.0	NB
P	<i>Cuscuta campestris</i>	Field Dodder				S1?	2 May Be At Risk	6	51.8 ± 5.0	NB
P	<i>Polygonum aviculare</i> ssp. <i>neglectum</i>	Narrow-leaved Knotweed				S1?	5 Undetermined	7	74.9 ± 0.0	NB
P	<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1?	5 Undetermined	1	88.2 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Wolffia columbiana</i>	Columbian Watermeal				S1?	2 May Be At Risk	5	76.1 ± 0.0	NB
P	<i>Selaginella rupestris</i>	Rock Spikemoss				S1S2	2 May Be At Risk	7	34.2 ± 1.0	NB
P	<i>Thelypteris simulata</i>	Bog Fern				S1S2	2 May Be At Risk	7	55.3 ± 0.0	NB
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	2 May Be At Risk	6	61.1 ± 0.0	NB
P	<i>Eriophorum russeolum</i> ssp. <i>albidum</i>	smooth-fruited russet cottongrass				S1S3	5 Undetermined	1	85.4 ± 1.0	NB
P	<i>Neottia bifolia</i>	Southern Twayblade			Endangered	S2	1 At Risk	37	64.8 ± 0.0	NB
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	3 Sensitive	4	66.9 ± 0.0	NB
P	<i>Ionactis linariifolia</i>	Flax-leaved Aster				S2	3 Sensitive	27	78.8 ± 0.0	NB
P	<i>Symphotrichum racemosum</i>	Small White Aster				S2	3 Sensitive	11	40.4 ± 0.0	NB
P	<i>Pseudognaphalium macounii</i>	Macoun's Cudweed				S2	3 Sensitive	3	17.2 ± 5.0	NB
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	2 May Be At Risk	8	39.9 ± 0.0	NB
P	<i>Alnus serrulata</i>	Smooth Alder				S2	3 Sensitive	8	58.4 ± 0.0	NB
P	<i>Boechera stricta</i>	Drummond's Rockcress				S2	3 Sensitive	20	35.2 ± 0.0	NB
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	3 Sensitive	13	44.5 ± 1.0	NB
P	<i>Atriplex glabriuscula</i> var. <i>franktonii</i>	Frankton's Saltbush				S2	4 Secure	4	60.2 ± 1.0	NB
P	<i>Oxybasis rubra</i>	Red Goosefoot				S2	3 Sensitive	13	73.0 ± 0.0	NB
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort				S2	3 Sensitive	2	41.5 ± 1.0	NB
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2	3 Sensitive	7	16.5 ± 0.0	NB
P	<i>Shepherdia canadensis</i>	Soapberry				S2	3 Sensitive	41	54.1 ± 0.0	NB
P	<i>Astragalus eucosmus</i>	Elegant Milk-vetch				S2	2 May Be At Risk	4	74.7 ± 0.0	NB
P	<i>Oxytropis campestris</i> var. <i>johannensis</i>	Field Locoweed				S2	3 Sensitive	27	48.8 ± 0.0	NB
P	<i>Quercus macrocarpa</i>	Bur Oak				S2	2 May Be At Risk	47	48.4 ± 1.0	NB
P	<i>Gentiana linearis</i>	Narrow-Leaved Gentian				S2	3 Sensitive	7	59.0 ± 50.0	NB
P	<i>Myriophyllum humile</i>	Low Water Milfoil				S2	3 Sensitive	5	42.4 ± 1.0	NB
P	<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S2	3 Sensitive	4	41.9 ± 0.0	NB
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2	4 Secure	5	34.3 ± 0.0	NB
P	<i>Nuphar x rubrodisca</i>	Red-disk Yellow Pond-lily				S2	3 Sensitive	15	48.9 ± 0.0	NB
P	<i>Aphyllon uniflorum</i>	one-flowered broomrape				S2	3 Sensitive	7	74.5 ± 1.0	NB
P	<i>Polygaloides paucifolia</i>	Fringed Milkwort				S2	3 Sensitive	7	19.4 ± 1.0	NB
P	<i>Persicaria amphibia</i> var. <i>emersa</i>	Long-root Smartweed				S2	3 Sensitive	36	40.2 ± 0.0	NB
P	<i>Persicaria careyi</i>	Carey's Smartweed				S2	3 Sensitive	12	48.1 ± 1.0	NB
P	<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed				S2	3 Sensitive	5	97.4 ± 0.0	NB
P	<i>Anemone parviflora</i>	Small-flowered Anemone				S2	3 Sensitive	8	56.5 ± 5.0	NB
P	<i>Hepatica americana</i>	Round-lobed Hepatica				S2	3 Sensitive	1	43.7 ± 1.0	NB
P	<i>Ranunculus flabellaris</i>	Yellow Water Buttercup				S2	4 Secure	16	61.7 ± 1.0	NB
P	<i>Crataegus scabrada</i>	Rough Hawthorn				S2	3 Sensitive	10	30.2 ± 1.0	NB
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn				S2	3 Sensitive	1	99.7 ± 5.0	NB
P	<i>Cephalanthus occidentalis</i>	Common Buttonbush				S2	3 Sensitive	20	59.5 ± 0.0	NB
P	<i>Euphrasia randii</i>	Rand's Eyebright				S2	2 May Be At Risk	4	58.7 ± 0.0	NB
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S2	3 Sensitive	4	33.0 ± 5.0	NB
P	<i>Dirca palustris</i>	Eastern Leatherwood				S2	2 May Be At Risk	1	52.8 ± 1.0	NB
P	<i>Viola novae-angliae</i>	New England Violet				S2	3 Sensitive	4	71.9 ± 0.0	NB
P	<i>Sagittaria montevidensis</i> ssp. <i>spongiosa</i>	Spongy Arrowhead				S2	4 Secure	67	59.1 ± 0.0	NB
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S2	3 Sensitive	138	70.5 ± 5.0	NB
P	<i>Carex comosa</i>	Bearded Sedge				S2	2 May Be At Risk	6	85.8 ± 1.0	NS
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S2	3 Sensitive	5	32.4 ± 5.0	NB
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S2	3 Sensitive	1	34.2 ± 1.0	NB
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2	3 Sensitive	5	16.4 ± 5.0	NB
P	<i>Carex livida</i>	Livid Sedge				S2	3 Sensitive	9	85.8 ± 0.0	NB
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S2	3 Sensitive	1	57.3 ± 0.0	NB
P	<i>Carex rostrata</i>	Narrow-leaved Beaked				S2	3 Sensitive	2	42.3 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
		Sedge								
P	<i>Carex sprengelii</i>	Longbeak Sedge				S2	3 Sensitive	2	36.1 ± 0.0	NB
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S2	2 May Be At Risk	3	16.0 ± 10.0	NB
P	<i>Carex albicans</i>	White-tinged Sedge				S2	3 Sensitive	1	88.1 ± 0.0	NS
P	<i>Carex albicans</i> var. <i>emmonsii</i>	White-tinged Sedge				S2	3 Sensitive	9	56.0 ± 0.0	NB
P	<i>Cyperus squarrosus</i>	Awnead Flatsedge				S2	3 Sensitive	36	47.3 ± 0.0	NB
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2	2 May Be At Risk	45	63.8 ± 10.0	NB
P	<i>Blysmopsis rufa</i>	Red Bulrush				S2	3 Sensitive	27	87.7 ± 0.0	NB
P	<i>Elodea nuttallii</i>	Nuttall's Waterweed				S2	3 Sensitive	7	65.1 ± 0.0	NB
P	<i>Juncus vaseyi</i>	Vasey Rush				S2	3 Sensitive	9	32.4 ± 0.0	NB
P	<i>Allium tricoccum</i>	Wild Leek				S2	2 May Be At Risk	10	16.4 ± 5.0	NB
P	<i>Najas gracillima</i>	Thread-Like Naiad				S2	3 Sensitive	3	69.7 ± 0.0	NB
P	<i>Calypso bulbosa</i> var. <i>americana</i>	Calypso				S2	2 May Be At Risk	8	11.7 ± 5.0	NB
P	<i>Coeloglossum viride</i>	Long-bracted Frog Orchid				S2	2 May Be At Risk	6	33.2 ± 0.0	NB
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	1	75.8 ± 1.0	NB
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	3 Sensitive	12	16.5 ± 1.0	NB
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S2	2 May Be At Risk	6	71.7 ± 0.0	NB
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	3 Sensitive	2	43.2 ± 0.0	NB
P	<i>Elymus canadensis</i>	Canada Wild Rye				S2	2 May Be At Risk	2	36.3 ± 1.0	NB
P	<i>Leersia virginica</i>	White Cut Grass				S2	2 May Be At Risk	35	63.9 ± 0.0	NB
P	<i>Piptatheropsis canadensis</i>	Canada Ricegrass				S2	3 Sensitive	4	16.5 ± 10.0	NB
P	<i>Poa glauca</i>	Glaucous Blue Grass				S2	4 Secure	17	50.1 ± 0.0	NB
P	<i>Puccinellia phryganodes</i> ssp. <i>neoarctica</i>	Creeping Alkali Grass				S2	3 Sensitive	2	61.6 ± 0.0	NB
P	<i>Schizachyrium scoparium</i>	Little Bluestem				S2	3 Sensitive	39	41.2 ± 0.0	NB
P	<i>Zizania aquatica</i> var. <i>aquatica</i>	Eastern Wild Rice				S2	5 Undetermined	6	38.4 ± 1.0	NB
P	<i>Piptatheropsis pungens</i>	Slender Ricegrass				S2	2 May Be At Risk	5	35.1 ± 0.0	NB
P	<i>Potamogeton vaseyi</i>	Vasey's Pondweed				S2	3 Sensitive	2	99.0 ± 1.0	NB
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S2	3 Sensitive	11	35.2 ± 1.0	NB
P	<i>Anchistea virginica</i>	Virginia chain fern				S2	3 Sensitive	3	90.1 ± 0.0	NB
P	<i>Woodsia alpina</i>	Alpine Cliff Fern				S2	3 Sensitive	9	47.8 ± 0.0	NB
P	<i>Diphasiastrum sitchense</i>	Sitka Ground-cedar				S2	3 Sensitive	4	62.7 ± 5.0	NB
P	<i>Selaginella selaginoides</i>	Low Spikemoss				S2	3 Sensitive	8	48.9 ± 5.0	NB
P	<i>Toxicodendron radicans</i> var. <i>radicans</i>	eastern poison ivy				S2?	3 Sensitive	12	42.2 ± 0.0	NB
P	<i>Symphotrichum novi-belgii</i> var. <i>crenifolium</i>	New York Aster				S2?	5 Undetermined	7	55.4 ± 0.0	NB
P	<i>Humulus lupulus</i> var. <i>lupuloides</i>	Common Hop				S2?	3 Sensitive	4	67.8 ± 5.0	NB
P	<i>Rubus x recurvicaulis</i>	arching dewberry				S2?	4 Secure	6	48.6 ± 1.0	NB
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2?	4 Secure	10	55.2 ± 1.0	NB
P	<i>Salix myricoides</i>	Bayberry Willow				S2?	3 Sensitive	4	49.8 ± 0.0	NB
P	<i>Carex vacillans</i>	Estuarine Sedge				S2?	3 Sensitive	1	85.6 ± 0.0	NB
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S2?	5 Undetermined	1	81.5 ± 10.0	NS
P	<i>Solidago altissima</i>	Tall Goldenrod				S2S3	4 Secure	3	63.7 ± 0.0	NB
P	<i>Callitriche hermaphroditica</i>	Northern Water-starwort				S2S3	4 Secure	9	43.7 ± 0.0	NB
P	<i>Elatine americana</i>	American Waterwort				S2S3	3 Sensitive	12	59.3 ± 0.0	NB
P	<i>Bartonia paniculata</i> ssp. <i>iodandra</i>	Branched Bartonia				S2S3	3 Sensitive	22	44.9 ± 0.0	NB
P	<i>Geranium robertianum</i>	Herb Robert				S2S3	4 Secure	33	48.6 ± 1.0	NB
P	<i>Myriophyllum quitense</i>	Andean Water Milfoil				S2S3	4 Secure	71	62.2 ± 0.0	NB
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2S3	3 Sensitive	5	86.7 ± 1.0	NS
P	<i>Rumex pallidus</i>	Seabeach Dock				S2S3	3 Sensitive	5	61.3 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Rubus pensilvanicus</i>	Pennsylvania Blackberry				S2S3	4 Secure	18	20.0 ± 0.0	NB
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2S3	3 Sensitive	2	17.4 ± 0.0	NB
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	4 Secure	10	45.9 ± 10.0	NB
P	<i>Corallorhiza maculata</i> var. <i>occidentalis</i>	Spotted Coralroot				S2S3	3 Sensitive	6	31.7 ± 1.0	NB
P	<i>Corallorhiza maculata</i> var. <i>maculata</i>	Spotted Coralroot				S2S3	3 Sensitive	1	98.9 ± 1.0	NB
P	<i>Neottia auriculata</i>	Auricled Twayblade				S2S3	3 Sensitive	1	49.7 ± 0.0	NB
P	<i>Spiranthes cernua</i>	Nodding Ladies'-Tresses				S2S3	3 Sensitive	17	52.2 ± 0.0	NB
P	<i>Eragrostis pectinacea</i>	Tufted Love Grass				S2S3	4 Secure	13	3.8 ± 0.0	NB
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	3 Sensitive	6	73.6 ± 1.0	NB
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S2S3	4 Secure	12	66.1 ± 0.0	NB
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	3 Sensitive	5	34.7 ± 5.0	NB
P	<i>Panax trifolius</i>	Dwarf Ginseng				S3	3 Sensitive	24	43.9 ± 0.0	NB
P	<i>Arnica lanceolata</i>	Lance-leaved Arnica				S3	4 Secure	1	99.9 ± 0.0	NB
P	<i>Artemisia campestris</i> ssp. <i>caudata</i>	Tall Wormwood				S3	4 Secure	97	46.6 ± 0.0	NB
P	<i>Artemisia campestris</i>	Field Wormwood				S3	4 Secure	9	48.4 ± 0.0	NB
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S3	4 Secure	34	55.7 ± 1.0	NB
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	4 Secure	82	32.2 ± 0.0	NB
P	<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot				S3	4 Secure	61	40.8 ± 0.0	NB
P	<i>Tanacetum bipinnatum</i> ssp. <i>huronense</i>	Lake Huron Tansy				S3	4 Secure	14	59.3 ± 0.0	NB
P	<i>Symphyotrichum boreale</i>	Boreal Aster				S3	3 Sensitive	8	17.5 ± 0.0	NB
P	<i>Betula pumila</i>	Bog Birch				S3	4 Secure	32	30.9 ± 0.0	NB
P	<i>Turritis glabra</i>	Tower Mustard				S3	5 Undetermined	5	58.7 ± 0.0	NB
P	<i>Arabis pycnocarpa</i>	Cream-flowered Rockcress				S3	4 Secure	20	35.2 ± 1.0	NB
P	<i>Cardamine maxima</i>	Large Toothwort				S3	4 Secure	30	54.4 ± 0.0	NB
P	<i>Subularia aquatica</i> ssp. <i>americana</i>	American Water Awlwort				S3	4 Secure	2	41.7 ± 0.0	NB
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S3	4 Secure	14	55.3 ± 0.0	NB
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S3	3 Sensitive	32	17.6 ± 0.0	NB
P	<i>Hudsonia tomentosa</i>	Woolly Beach-heath				S3	4 Secure	142	63.8 ± 50.0	NB
P	<i>Cornus obliqua</i>	Silky Dogwood				S3	3 Sensitive	81	39.6 ± 0.0	NB
P	<i>Crassula aquatica</i>	Water Pygmyweed				S3	4 Secure	9	57.8 ± 0.0	NB
P	<i>Rhodiola rosea</i>	Roseroot				S3	4 Secure	44	39.8 ± 0.0	NB
P	<i>Penthorum sedoides</i>	Ditch Stonecrop				S3	4 Secure	70	16.4 ± 0.0	NB
P	<i>Elatine minima</i>	Small Waterwort				S3	4 Secure	7	42.3 ± 0.0	NB
P	<i>Hedysarum americanum</i>	Alpine Hedysarum				S3	4 Secure	2	75.0 ± 0.0	NB
P	<i>Gentianella amarella</i> ssp. <i>acuta</i>	Northern Gentian				S3	4 Secure	2	99.5 ± 0.0	NB
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	4 Secure	16	7.4 ± 0.0	NB
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S3	4 Secure	12	43.1 ± 0.0	NB
P	<i>Myriophyllum heterophyllum</i>	Variable-leaved Water Milfoil				S3	4 Secure	51	40.8 ± 0.0	NB
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S3	4 Secure	29	46.5 ± 0.0	NB
P	<i>Teucrium canadense</i>	Canada Germander				S3	3 Sensitive	54	64.8 ± 0.0	NB
P	<i>Stachys hispida</i>	Smooth Hedge-Nettle				S3	3 Sensitive	4	61.8 ± 0.0	NB
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily				S3	4 Secure	18	39.3 ± 0.0	NB
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb				S3	4 Secure	4	51.2 ± 0.0	NB
P	<i>Epilobium hornemannii</i> ssp. <i>hornemannii</i>	Hornemann's Willowherb				S3	4 Secure	1	51.1 ± 0.0	NB
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	4 Secure	26	18.1 ± 0.0	NB
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	3 Sensitive	42	16.2 ± 5.0	NB
P	<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb				S3	4 Secure	84	16.5 ± 0.0	NB
P	<i>Persicaria punctata</i>	Dotted Smartweed				S3	4 Secure	22	16.3 ± 0.0	NB
P	<i>Fallopia scandens</i>	Climbing False Buckwheat				S3	4 Secure	78	16.4 ± 0.0	NB
P	<i>Littorella americana</i>	American Shoreweed				S3	4 Secure	7	57.8 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Primula mistassinica</i>	Mistassini Primrose				S3	4 Secure	11	74.7 ± 0.0	NB
P	<i>Samolus parviflorus</i>	Seaside Brookweed				S3	4 Secure	98	57.5 ± 0.0	NB
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	4 Secure	4	47.3 ± 1.0	NB
P	<i>Clematis occidentalis</i>	Purple Clematis				S3	4 Secure	20	35.0 ± 0.0	NB
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	4 Secure	50	16.4 ± 0.0	NB
P	<i>Thalictrum confine</i>	Northern Meadow-rue				S3	4 Secure	69	52.5 ± 1.0	NB
P	<i>Amelanchier canadensis</i>	Canada Serviceberry				S3	4 Secure	20	34.9 ± 1.0	NB
P	<i>Rosa palustris</i>	Swamp Rose				S3	4 Secure	13	40.8 ± 5.0	NB
P	<i>Rubus occidentalis</i>	Black Raspberry				S3	4 Secure	3	54.5 ± 0.0	NB
P	<i>Sanguisorba canadensis</i>	Canada Burnet				S3	4 Secure	15	52.0 ± 0.0	NB
P	<i>Galium boreale</i>	Northern Bedstraw				S3	4 Secure	3	57.0 ± 0.0	NB
P	<i>Salix nigra</i>	Black Willow				S3	3 Sensitive	121	34.3 ± 50.0	NB
P	<i>Salix pedicellaris</i>	Bog Willow				S3	4 Secure	57	17.2 ± 5.0	NB
P	<i>Salix interior</i>	Sandbar Willow				S3	4 Secure	13	48.0 ± 1.0	NB
P	<i>Comandra umbellata</i>	Bastard's Toadflax				S3	4 Secure	34	55.2 ± 10.0	NB
P	<i>Parnassia glauca</i>	Fen Grass-of-Parnassus				S3	4 Secure	1	97.4 ± 0.0	NB
P	<i>Limosella australis</i>	Southern Mudwort				S3	4 Secure	54	56.1 ± 0.0	NB
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle				S3	3 Sensitive	4	69.8 ± 0.0	NB
P	<i>Pilea pumila</i>	Dwarf Clearweed				S3	4 Secure	38	10.6 ± 0.0	NB
P	<i>Viola adunca</i>	Hooked Violet				S3	4 Secure	7	35.1 ± 0.0	NB
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S3	4 Secure	14	50.5 ± 0.0	NB
P	<i>Carex arcta</i>	Northern Clustered Sedge				S3	4 Secure	49	16.4 ± 5.0	NB
P	<i>Carex capillaris</i>	Hairlike Sedge				S3	4 Secure	22	49.5 ± 0.0	NB
P	<i>Carex chordorrhiza</i>	Creeping Sedge				S3	4 Secure	69	34.9 ± 0.0	NB
P	<i>Carex conoidea</i>	Field Sedge				S3	4 Secure	19	24.4 ± 1.0	NB
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	4 Secure	11	42.3 ± 100.0	NB
P	<i>Carex exilis</i>	Coastal Sedge				S3	4 Secure	16	56.2 ± 0.0	NB
P	<i>Carex garberi</i>	Garber's Sedge				S3	3 Sensitive	3	72.8 ± 0.0	NB
P	<i>Carex haydenii</i>	Hayden's Sedge				S3	4 Secure	36	38.1 ± 0.0	NB
P	<i>Carex lupulina</i>	Hop Sedge				S3	4 Secure	75	16.4 ± 0.0	NB
P	<i>Carex michauxiana</i>	Michaux's Sedge				S3	4 Secure	22	43.3 ± 0.0	NB
P	<i>Carex ormostachya</i>	Necklace Spike Sedge				S3	4 Secure	7	19.3 ± 1.0	NB
P	<i>Carex rosea</i>	Rosy Sedge				S3	4 Secure	17	29.6 ± 0.0	NB
P	<i>Carex tenera</i>	Tender Sedge				S3	4 Secure	42	8.9 ± 0.0	NB
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S3	4 Secure	87	16.2 ± 5.0	NB
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	4 Secure	120	12.9 ± 10.0	NB
P	<i>Carex recta</i>	Estuary Sedge				S3	4 Secure	14	56.6 ± 0.0	NB
P	<i>Cyperus dentatus</i>	Toothed Flatsedge				S3	4 Secure	165	40.3 ± 0.0	NB
P	<i>Cyperus esculentus</i>	Perennial Yellow Nutsedge				S3	4 Secure	11	41.5 ± 0.0	NB
P	<i>Cyperus esculentus var. leptostachyus</i>	Perennial Yellow Nutsedge				S3	4 Secure	40	10.7 ± 0.0	NB
P	<i>Eleocharis intermedia</i>	Matted Spikerush				S3	4 Secure	1	25.0 ± 0.0	NB
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S3	4 Secure	6	85.8 ± 0.0	NB
P	<i>Rhynchospora capitellata</i>	Small-headed Beakrush				S3	4 Secure	12	44.5 ± 1.0	NB
P	<i>Rhynchospora fusca</i>	Brown Beakrush				S3	4 Secure	16	44.9 ± 0.0	NB
P	<i>Trichophorum clintonii</i>	Clinton's Clubrush				S3	4 Secure	27	49.3 ± 0.0	NB
P	<i>Bolboschoenus fluviatilis</i>	River Bulrush				S3	3 Sensitive	62	54.9 ± 0.0	NB
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush				S3	4 Secure	19	40.4 ± 0.0	NB
P	<i>Lemna trisulca</i>	Star Duckweed				S3	4 Secure	37	13.0 ± 1.0	NB
P	<i>Triantha glutinosa</i>	Sticky False-Asphodel				S3	4 Secure	7	75.2 ± 0.0	NB
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S3	3 Sensitive	7	17.7 ± 0.0	NB
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	4 Secure	12	6.1 ± 1.0	NB
P	<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	4 Secure	106	34.2 ± 0.0	NB
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	3 Sensitive	17	24.9 ± 1.0	NB
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S3	3 Sensitive	25	13.4 ± 0.0	NB
P	<i>Calamagrostis pickeringii</i>	Pickering's Reed Grass				S3	4 Secure	8	9.5 ± 0.0	NB
P	<i>Dichanthelium depauperatum</i>	Starved Panic Grass				S3	4 Secure	26	46.3 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Dichanthelium depauperatum</i> var. 1	Starved Panic Grass				S3	4 Secure	1	50.4 ± 0.0	NB
P	<i>Heteranthera dubia</i>	Water Stargrass				S3	4 Secure	51	55.6 ± 0.0	NB
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	4 Secure	29	16.4 ± 0.0	NB
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S3	3 Sensitive	16	50.0 ± 0.0	NB
P	<i>Xyris montana</i>	Northern Yellow-Eyed-Grass				S3	4 Secure	41	17.6 ± 5.0	NB
P	<i>Zannichellia palustris</i>	Horned Pondweed				S3	4 Secure	44	58.2 ± 0.0	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S3	4 Secure	2	43.7 ± 1.0	NB
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S3	4 Secure	2	67.4 ± 0.0	NB
P	<i>Asplenium viride</i>	Green Spleenwort				S3	4 Secure	18	35.2 ± 1.0	NB
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S3	4 Secure	47	40.7 ± 1.0	NB
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S3	4 Secure	44	45.4 ± 0.0	NB
P	<i>Equisetum palustre</i>	Marsh Horsetail				S3	4 Secure	6	91.3 ± 0.0	NB
P	<i>Isoetes tuckermanii</i>	Tuckerman's Quillwort				S3	4 Secure	6	42.1 ± 0.0	NB
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar				S3	4 Secure	24	47.2 ± 0.0	NB
P	<i>Huperzia appressa</i>	Mountain Firmoss				S3	3 Sensitive	20	49.5 ± 0.0	NB
P	<i>Sceptridium dissectum</i>	Dissected Moonwort				S3	4 Secure	19	55.1 ± 1.0	NB
P	<i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i>	Narrow Triangle Moonwort				S3	3 Sensitive	11	39.3 ± 5.0	NB
P	<i>Botrychium simplex</i>	Least Moonwort				S3	4 Secure	5	78.5 ± 0.0	NB
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	4 Secure	26	32.4 ± 1.0	NB
P	<i>Utricularia resupinata</i>	Inverted Bladderwort				S3?	4 Secure	4	81.1 ± 1.0	NB
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S3?	3 Sensitive	7	55.3 ± 1.0	NB
P	<i>Mertensia maritima</i>	Sea Lungwort				S3S4	4 Secure	12	56.9 ± 0.0	NB
P	<i>Lobelia kalmii</i>	Brook Lobelia				S3S4	4 Secure	10	48.7 ± 10.0	NB
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	4 Secure	27	47.7 ± 5.0	NB
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	4 Secure	31	35.5 ± 0.0	NB
P	<i>Stachys pilosa</i>	Hairy Hedge-Nettle				S3S4	5 Undetermined	6	55.7 ± 1.0	NB
P	<i>Utricularia gibba</i>	Humped Bladderwort				S3S4	4 Secure	8	64.4 ± 0.0	NB
P	<i>Rumex fueginus</i>	Tierra del Fuego Dock				S3S4	4 Secure	57	44.1 ± 1.0	NB
P	<i>Drymocallis arguta</i>	Tall Wood Beauty				S3S4	4 Secure	2	75.6 ± 0.0	NB
P	<i>Rubus chamaemorus</i>	Cloudberry				S3S4	4 Secure	24	38.2 ± 0.0	NB
P	<i>Geocaulon lividum</i>	Northern Comandra				S3S4	4 Secure	33	48.4 ± 1.0	NB
P	<i>Juniperus horizontalis</i>	Creeping Juniper				S3S4	4 Secure	3	44.5 ± 1.0	NB
P	<i>Cladium mariscoides</i>	Smooth Twigrush				S3S4	4 Secure	8	80.3 ± 0.0	NB
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	211	43.0 ± 5.0	NB
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	4 Secure	55	56.7 ± 0.0	NB
P	<i>Spirodela polyrhiza</i>	great duckweed				S3S4	4 Secure	43	56.9 ± 0.0	NB
P	<i>Corallorhiza maculata</i>	Spotted Coralroot				S3S4	3 Sensitive	20	30.3 ± 0.0	NB
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	19	43.7 ± 0.0	NB
P	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	11	84.2 ± 0.0	NB
P	<i>Distichlis spicata</i>	Salt Grass				S3S4	4 Secure	59	29.1 ± 1.0	NB
P	<i>Potamogeton oakesianus</i>	Oakes' Pondweed				S3S4	4 Secure	18	42.4 ± 10.0	NB
P	<i>Toxicodendron radicans</i>	Poison Ivy				S5	4 Secure	1	69.7 ± 0.0	NB
P	<i>Montia fontana</i>	Water Blinks				SH	2 May Be At Risk	3	68.5 ± 1.0	NB
P	<i>Barbarea orthoceras</i>	American Yellow Rocket				SNA		1	37.8 ± 1.0	NB
P	<i>Solidago caesia</i>	Blue-stemmed Goldenrod				SX	0.1 Extirpated	2	97.7 ± 1.0	NB
P	<i>Agalinis maritima</i>	Saltmarsh Agalinis				SX	0.1 Extirpated	2	87.8 ± 50.0	NB



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The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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**Appendix B**  
**Migratory Bird Data**

**Table B.1**  
**New Brunswick General Status of Wild Species (NBDNR 2018)**

<b>Taxon</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Population</b>	<b>Status</b>	<b>Year Assessed</b>
Birds	Acadian Flycatcher	<i>Empidonax virescens</i>	n/a	Accidental	2006
Birds	Alder Flycatcher	<i>Empidonax alnorum</i>	Breeding	Secure	2006
Birds	American Avocet	<i>Recurvirostra americana</i>	n/a	Accidental	2006
Birds	American Bittern	<i>Botaurus lentiginosus</i>	Breeding	Secure	2006
Birds	American Black Duck	<i>Anas rubripes</i>	Breeding	Secure	2006
Birds	American Black Duck	<i>Anas rubripes</i>	Migrating	Secure	2006
Birds	American Black Duck	<i>Anas rubripes</i>	Wintering	Secure	2006
Birds	American Coot	<i>Fulica americana</i>	Breeding	Sensitive	2006
Birds	American Crow	<i>Corvus brachyrhynchos</i>	Breeding	Secure	2006
Birds	American Goldfinch	<i>Carduelis tristis</i>	Breeding	Secure	2006
Birds	American Kestrel	<i>Falco sparverius</i>	Breeding	Secure	2006
Birds	American Oystercatcher	<i>Haematopus palliatus</i>	n/a	Accidental	2006
Birds	American Pipit	<i>Anthus rubescens</i>	Migrating	Secure	2006
Birds	American Redstart	<i>Setophaga ruticilla</i>	Breeding	Secure	2006
Birds	American Robin	<i>Turdus migratorius</i>	Breeding	Secure	2006
Birds	American Tree Sparrow	<i>Spizella arborea</i>	Wintering	Secure	2006
Birds	American White Pelican	<i>Pelecanus erythrorhynchos</i>	n/a	Accidental	2006
Birds	American Wigeon	<i>Anas americana</i>	Breeding	Secure	2006
Birds	American Woodcock	<i>Scolopax minor</i>	Breeding	Secure	2006
Birds	American Woodcock	<i>Scolopax minor</i>	Migrating	Secure	2006
Birds	American-Golden Plover; Lesser Golden-Plover	<i>Pluvialis dominica</i>	Migrating	Sensitive	2006
Birds	Arctic Tern	<i>Sterna paradisaea</i>	Breeding	Sensitive	2006
Birds	Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	n/a	Accidental	2006
Birds	Atlantic Puffin	<i>Fratercula arctica</i>	Breeding	Sensitive	2006
Birds	Baird's Sandpiper	<i>Calidris bairdii</i>	Migrating	Sensitive	2006
Birds	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Breeding	At risk	2006
Birds	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Wintering	At risk	2006
Birds	Baltimore Oriole	<i>Icterus galbula</i>	Breeding	Secure	2006
Birds	Band-tailed Pigeon	<i>Columba fasciata</i>	n/a	Accidental	2006
Birds	Bank Swallow	<i>Riparia riparia</i>	Breeding	Sensitive	2006
Birds	Barn Owl	<i>Tyto alba</i>	n/a	Accidental	2006
Birds	Barn Swallow	<i>Hirundo rustica</i>	Breeding	Sensitive	2006
Birds	Barnacle Goose	<i>Branta leucopsis</i>	n/a	Accidental	2006
Birds	Barred Owl	<i>Strix varia</i>	Resident	Secure	2006
Birds	Barrow's Goldeneye	<i>Bucephala islandica</i>	Wintering	Sensitive	2006
Birds	Bay-breasted Warbler	<i>Dendroica castanea</i>	Breeding	Secure	2006
Birds	Belted Kingfisher	<i>Ceryle alcyon</i>	Breeding	Secure	2006
Birds	Bewick's Wren	<i>Thryomanes bewickii</i>	n/a	Accidental	2006
Birds	Bicknell's Thrush	<i>Catharus bicknelli</i>	Breeding	May be at risk	2006
Birds	Black Guillemot	<i>Cephus grylle</i>	Breeding	Secure	2006
Birds	Black Guillemot	<i>Cephus grylle</i>	Wintering	Secure	2006
Birds	Black Scoter; Common Scoter	<i>Melanitta nigra</i>	Migrating	Sensitive	2006
Birds	Black Scoter; Common Scoter	<i>Melanitta nigra</i>	Wintering	Sensitive	2006
Birds	Black Skimmer	<i>Rynchops niger</i>	n/a	Accidental	2006
Birds	Black Tern	<i>Chlidonias niger</i>	Breeding	Sensitive	2006
Birds	Black Vulture	<i>Coragyps atratus</i>	n/a	Accidental	2006
Birds	Black-and-white Warbler	<i>Mniotilta varia</i>	Breeding	Secure	2006
Birds	Black-backed Woodpecker	<i>Picoides arcticus</i>	Breeding	Secure	2006
Birds	Black-bellied Plover	<i>Pluvialis squatarola</i>	Migrating	Secure	2006
Birds	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Breeding	Secure	2006
Birds	Black-billed Magpie	<i>Pica pica</i>	n/a	Accidental	2006
Birds	Blackburnian Warbler	<i>Dendroica fusca</i>	Breeding	Secure	2006
Birds	Black-capped Chickadee	<i>Poecile atricapilla</i>	Breeding	Secure	2006
Birds	Black-chinned Hummingbird	<i>Archilochus alexandri</i>	n/a	Accidental	2006
Birds	Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	Breeding	Sensitive	2006
Birds	Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	n/a	Accidental	2006
Birds	Black-headed Gull	<i>Larus ridibundus</i>	Migrating	Sensitive	2006
Birds	Black-headed Gull	<i>Larus ridibundus</i>	Wintering	Sensitive	2006
Birds	Black-legged Kittiwake	<i>Rissa tridactyla</i>	Breeding	Sensitive	2006
Birds	Black-legged Kittiwake	<i>Rissa tridactyla</i>	Wintering	Secure	2006
Birds	Black-necked Stilt	<i>Himantopus mexicanus</i>	n/a	Accidental	2006
Birds	Blackpoll Warbler	<i>Dendroica striata</i>	Breeding	Secure	2006
Birds	Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	Breeding	Secure	2006
Birds	Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	n/a	Accidental	2006
Birds	Black-throated Green Warbler	<i>Dendroica virens</i>	Breeding	Secure	2006
Birds	Blue Grosbeak	<i>Guiraca caerulea</i>	n/a	Accidental	2006
Birds	Blue Jay	<i>Cyanocitta cristata</i>	Breeding	Secure	2006

Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Birds	Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	n/a	Accidental	2006
Birds	Blue-headed Vireo; Solitary Vireo	<i>Vireo solitarius</i>	Breeding	Secure	2006
Birds	Blue-winged Teal	<i>Anas discors</i>	Breeding	Secure	2006
Birds	Blue-winged Warbler	<i>Vermivora pinus</i>	n/a	Accidental	2006
Birds	Bobolink	<i>Dolichonyx oryzivorus</i>	Breeding	Sensitive	2006
Birds	Bohemian Waxwing	<i>Bombycilla garrulus</i>	Wintering	Secure	2006
Birds	Bonaparte's Gull	<i>Larus philadelphia</i>	Migrating	Secure	2006
Birds	Boreal Chickadee	<i>Poecile hudsonica</i>	Breeding	Secure	2006
Birds	Boreal Owl	<i>Aegolius funereus</i>	Breeding	May be at risk	2006
Birds	Brant	<i>Branta bernicla</i>	Migrating	Secure	2006
Birds	Brant	<i>Branta bernicla</i>	Wintering	Sensitive	2006
Birds	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	n/a	Accidental	2006
Birds	Broad-billed Hummingbird	<i>Cynanthus latirostris</i>	n/a	Accidental	2006
Birds	Broad-winged Hawk	<i>Buteo platypterus</i>	Breeding	Secure	2006
Birds	Brown Creeper	<i>Certhia americana</i>	Breeding	Secure	2006
Birds	Brown Pelican	<i>Pelecanus occidentalis</i>	n/a	Accidental	2006
Birds	Brown Thrasher	<i>Toxostoma rufum</i>	Breeding	Sensitive	2006
Birds	Brown-headed Cowbird	<i>Molothrus ater</i>	Breeding	May be at risk	2006
Birds	Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	n/a	Accidental	2006
Birds	Bufflehead	<i>Bucephala albeola</i>	Wintering	Sensitive	2006
Birds	Burrowing Owl	<i>Athene cunicularia</i>	n/a	Accidental	2006
Birds	Cackling Goose	<i>Branta hutchinsii</i>	n/a	Accidental	2006
Birds	California Gull	<i>Larus californicus</i>	n/a	Accidental	2006
Birds	Canada Goose	<i>Branta canadensis</i>	Breeding	Exotic	2006
Birds	Canada Goose	<i>Branta canadensis</i>	Migrating	Secure	2006
Birds	Canada Warbler	<i>Wilsonia canadensis</i>	Breeding	At risk	2008
Birds	Canvasback	<i>Aythya valisineria</i>	n/a	Accidental	2006
Birds	Cape May Warbler	<i>Dendroica tigrina</i>	Breeding	Secure	2006
Birds	Carolina Wren	<i>Thryothorus ludovicianus</i>	n/a	Accidental	2006
Birds	Caspian Tern	<i>Sterna caspia</i>	Migrating	Secure	2006
Birds	Cattle Egret	<i>Bubulcus ibis</i>	n/a	Accidental	2006
Birds	Cave Swallow	<i>Petrochelidon fulva</i>	n/a	Accidental	2006
Birds	Cedar Waxwing	<i>Bombycilla cedrorum</i>	Breeding	Secure	2006
Birds	Cerulean Warbler	<i>Dendroica cerulea</i>	n/a	Accidental	2006
Birds	Chestnut-collared Longspur	<i>Calcarius ornatus</i>	n/a	Accidental	2006
Birds	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	Breeding	Secure	2006
Birds	Chimney Swift	<i>Chaetura pelagica</i>	Breeding	At risk	2007
Birds	Chipping Sparrow	<i>Spizella passerina</i>	Breeding	Secure	2006
Birds	Chuck-will's-widow	<i>Caprimulgus carolinensis</i>	n/a	Accidental	2006
Birds	Cinnamon Teal	<i>Anas cyanoptera</i>	n/a	Accidental	2006
Birds	Clapper Rail	<i>Rallus longirostris</i>	n/a	Accidental	2006
Birds	Clay-colored Sparrow	<i>Spizella pallida</i>	n/a	Accidental	2006
Birds	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	Breeding	Secure	2006
Birds	Common Chaffinch	<i>Fringilla coelebs</i>	n/a	Accidental	2006
Birds	Common Eider	<i>Somateria mollissima</i>	Breeding	Secure	2006
Birds	Common Eider	<i>Somateria mollissima</i>	Migrating	Secure	2006
Birds	Common Eider	<i>Somateria mollissima</i>	Wintering	Secure	2006
Birds	Common Goldeneye	<i>Bucephala clangula</i>	Breeding	Secure	2006
Birds	Common Goldeneye	<i>Bucephala clangula</i>	Migrating	Secure	2006
Birds	Common Goldeneye	<i>Bucephala clangula</i>	Wintering	Secure	2006
Birds	Common Grackle	<i>Quiscalus quiscula</i>	Breeding	Secure	2006
Birds	Common Loon	<i>Gavia immer</i>	Breeding	Secure	2006
Birds	Common Loon	<i>Gavia immer</i>	Migrating	Secure	2006
Birds	Common Loon	<i>Gavia immer</i>	Wintering	Secure	2006
Birds	Common Merganser	<i>Mergus merganser</i>	Breeding	Secure	2006
Birds	Common Merganser	<i>Mergus merganser</i>	Wintering	Secure	2006
Birds	Common Moorhen	<i>Gallinula chloropus</i>	Breeding	Sensitive	2006
Birds	Common Murre	<i>Uria aalge</i>	Breeding	Sensitive	2006
Birds	Common Murre	<i>Uria aalge</i>	Wintering	Secure	2006
Birds	Common Nighthawk	<i>Chordeiles minor</i>	Breeding	At risk	2007
Birds	Common Raven	<i>Corvus corax</i>	Breeding	Secure	2006
Birds	Common Redpoll	<i>Carduelis flammea</i>	Wintering	Secure	2006
Birds	Common Tern	<i>Sterna hirundo</i>	Breeding	Sensitive	2006
Birds	Common Yellowthroat	<i>Geothlypis trichas</i>	Breeding	Secure	2006
Birds	Connecticut Warbler	<i>Oporornis agilis</i>	n/a	Accidental	2006
Birds	Cooper's Hawk	<i>Accipiter cooperii</i>	Breeding	May be at risk	2006
Birds	Crested Caracara	<i>Caracara cheriway</i>	n/a	Accidental	2006
Birds	Curler Sandpiper	<i>Calidris ferruginea</i>	n/a	Accidental	2006
Birds	Dark-eyed Junco	<i>Junco hyemalis</i>	Breeding	Secure	2006
Birds	Dickcissel	<i>Spiza americana</i>	n/a	Accidental	2006



Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Birds	Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Breeding	Secure	2006
Birds	Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Migrating	Secure	2006
Birds	Dovekie	<i>Alle alle</i>	Wintering	Secure	2006
Birds	Downy Woodpecker	<i>Picoides pubescens</i>	Breeding	Secure	2006
Birds	Dunlin	<i>Calidris alpina</i>	Migrating	Secure	2006
Birds	Eared Grebe	<i>Podiceps nigricollis</i>	n/a	Accidental	2006
Birds	Eastern Bluebird	<i>Sialia sialis</i>	Breeding	Sensitive	2006
Birds	Eastern Kingbird	<i>Tyrannus tyrannus</i>	Breeding	Sensitive	2006
Birds	Eastern Meadowlark	<i>Sturnella magna</i>	Breeding	May be at risk	2006
Birds	Eastern Phoebe	<i>Sayornis phoebe</i>	Breeding	Secure	2006
Birds	Eastern Screech Owl	<i>Otus asio</i>	n/a	Accidental	2006
Birds	Eastern Towhee; Rufous-sided Towhee	<i>Pipilo erythrophthalmus</i>	Breeding	Undetermined	2006
Birds	Eastern Wood-Pewee	<i>Contopus virens</i>	Breeding	Secure	2006
Birds	Eskimo Curlew	<i>Numenius borealis</i>	Migrating	Undetermined	2006
Birds	Eurasian Kestrel	<i>Falco tinnunculus</i>	n/a	Accidental	2006
Birds	Eurasian Wigeon	<i>Anas penelope</i>	n/a	Accidental	2006
Birds	European Starling	<i>Sturnus vulgaris</i>	n/a	Exotic	2006
Birds	Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Breeding	Secure	2006
Birds	Field Sparrow	<i>Spizella pusilla</i>	Breeding	Undetermined	2006
Birds	Fieldfare	<i>Turdus pilaris</i>	n/a	Accidental	2006
Birds	Fork-tailed Flycatcher	<i>Tyrannus savana</i>	n/a	Accidental	2006
Birds	Forster's Tern	<i>Sterna forsteri</i>	n/a	Accidental	2006
Birds	Fox Sparrow	<i>Passerella iliaca</i>	Breeding	Secure	2006
Birds	Franklin's Gull	<i>Larus pipixcan</i>	n/a	Accidental	2006
Birds	Fulvous Whistling Duck	<i>Dendrocygna bicolor</i>	n/a	Accidental	2006
Birds	Gadwall	<i>Anas strepera</i>	Breeding	Secure	2006
Birds	Garganey	<i>Anas querquedula</i>	n/a	Accidental	2006
Birds	Glaucous Gull	<i>Larus hyperboreus</i>	Wintering	Secure	2006
Birds	Glossy Ibis	<i>Plegadis falcinellus</i>	n/a	Accidental	2006
Birds	Golden Eagle	<i>Aquila chrysaetos</i>	Breeding	Undetermined	2006
Birds	Golden-crowned Kinglet	<i>Regulus satrapa</i>	Breeding	Secure	2006
Birds	Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	n/a	Accidental	2006
Birds	Golden-winged Warbler	<i>Vermivora chrysoptera</i>	n/a	Accidental	2006
Birds	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	n/a	Accidental	2006
Birds	Gray Catbird	<i>Dumetella carolinensis</i>	Breeding	Secure	2006
Birds	Gray Jay	<i>Perisoreus canadensis</i>	Breeding	Secure	2006
Birds	Gray Partridge	<i>Perdix perdix</i>	n/a	Exotic	2006
Birds	Gray-cheeked Thrush	<i>Catharus minimus</i>	Migrating	Undetermined	2006
Birds	Great Black-backed Gull	<i>Larus marinus</i>	Breeding	Secure	2006
Birds	Great Blue Heron	<i>Ardea herodias</i>	Breeding	Secure	2006
Birds	Great Cormorant	<i>Phalacrocorax carbo</i>	Migrating	Secure	2006
Birds	Great Cormorant	<i>Phalacrocorax carbo</i>	Wintering	Secure	2006
Birds	Great Crested Flycatcher	<i>Myiarchus crinitus</i>	Breeding	Sensitive	2006
Birds	Great Egret	<i>Ardea alba</i>	n/a	Accidental	2006
Birds	Great Gray Owl	<i>Strix nebulosa</i>	n/a	Accidental	2006
Birds	Great Horned Owl	<i>Bubo virginianus</i>	Resident	Secure	2006
Birds	Great Skua	<i>Stercorarius skua</i>	Summering	Undetermined	2006
Birds	Greater Flamingo	<i>Phoenicopterus ruber</i>	n/a	Accidental	2006
Birds	Greater Scaup	<i>Aythya marila</i>	Breeding	May be at risk	2006
Birds	Greater Scaup	<i>Aythya marila</i>	Migrating	Secure	2006
Birds	Greater Scaup	<i>Aythya marila</i>	Wintering	Sensitive	2006
Birds	Greater Shearwater	<i>Puffinus gravis</i>	Summering	Secure	2006
Birds	Greater White-fronted Goose	<i>Anser albifrons</i>	n/a	Accidental	2006
Birds	Greater Yellowlegs	<i>Tringa melanoleuca</i>	Migrating	Secure	2006
Birds	Green Heron	<i>Butorides virescens</i>	Breeding	Sensitive	2006
Birds	Green-tailed Towhee	<i>Pipilo chlorurus</i>	n/a	Accidental	2006
Birds	Green-winged Teal	<i>Anas crecca</i>	Breeding	Secure	2006
Birds	Gull-billed Tern	<i>Sterna nilotica</i>	n/a	Accidental	2006
Birds	Gyrfalcon	<i>Falco rusticolus</i>	Wintering	Undetermined	2006
Birds	Hairy Woodpecker	<i>Picoides villosus</i>	Breeding	Secure	2006
Birds	Harlequin Duck	<i>Histrionicus histrionicus</i>	Breeding	At risk	2006
Birds	Harlequin Duck	<i>Histrionicus histrionicus</i>	Wintering	At risk	2006
Birds	Harris's Sparrow	<i>Zonotrichia querula</i>	n/a	Accidental	2006
Birds	Hermit Thrush	<i>Catharus guttatus</i>	Breeding	Secure	2006
Birds	Hermit Warbler	<i>Dendroica occidentalis</i>	n/a	Accidental	2006
Birds	Herring Gull	<i>Larus argentatus</i>	Breeding	Secure	2006
Birds	Hoary Redpoll	<i>Carduelis hornemanni</i>	n/a	Accidental	2006
Birds	Hooded Merganser	<i>Lophodytes cucullatus</i>	Breeding	Secure	2006
Birds	Hooded Warbler	<i>Wilsonia citrina</i>	n/a	Accidental	2006
Birds	Horned Grebe	<i>Podiceps auritus</i>	Migrating	Secure	2006

Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Birds	Horned Grebe	<i>Podiceps auritus</i>	Wintering	Secure	2006
Birds	Horned Lark	<i>Eremophila alpestris</i>	Breeding	May be at risk	2006
Birds	House Finch	<i>Carpodacus mexicanus</i>	n/a	Exotic	2006
Birds	House Sparrow	<i>Passer domesticus</i>	n/a	Exotic	2006
Birds	House Wren	<i>Troglodytes aedon</i>	Breeding	Undetermined	2006
Birds	Hudsonian Godwit	<i>Limosa haemastica</i>	Migrating	Secure	2006
Birds	Iceland Gull	<i>Larus glaucoides</i>	Wintering	Secure	2006
Birds	Indigo Bunting	<i>Passerina cyanea</i>	Breeding	Secure	2006
Birds	Ivory Gull	<i>Pagophila eburnea</i>	n/a	Accidental	2006
Birds	Kentucky Warbler	<i>Oporornis formosus</i>	n/a	Accidental	2006
Birds	Killdeer	<i>Charadrius vociferus</i>	Breeding	Secure	2006
Birds	King Eider	<i>Somateria spectabilis</i>	Wintering	Secure	2006
Birds	King Rail	<i>Rallus elegans</i>	n/a	Accidental	2006
Birds	Lapland Longspur	<i>Calcarius lapponicus</i>	Wintering	Sensitive	2006
Birds	Lark Bunting	<i>Calamospiza melanocorys</i>	n/a	Accidental	2006
Birds	Lark Sparrow	<i>Chondestes grammacus</i>	n/a	Accidental	2006
Birds	Laughing Gull	<i>Larus atricilla</i>	Breeding	Sensitive	2006
Birds	Le Conte's Sparrow	<i>Ammodramus leconteii</i>	n/a	Accidental	2006
Birds	Leach's Storm-Petrel	<i>Oceanodroma leucorhoa</i>	Breeding	Sensitive	2006
Birds	Least Bittern	<i>Ixobrychus exilis</i>	Breeding	At risk	2001
Birds	Least Flycatcher	<i>Empidonax minimus</i>	Breeding	Secure	2006
Birds	Least Sandpiper	<i>Calidris minutilla</i>	Migrating	Secure	2006
Birds	Least Tern	<i>Sterna antillarum</i>	n/a	Accidental	2006
Birds	Lesser Black-backed Gull	<i>Larus fuscus</i>	n/a	Accidental	2006
Birds	Lesser Scaup	<i>Aythya affinis</i>	Migrating	Secure	2006
Birds	Lesser Yellowlegs	<i>Tringa flavipes</i>	Migrating	Secure	2006
Birds	Lincoln's Sparrow	<i>Melospiza lincolnii</i>	Breeding	Secure	2006
Birds	Little Blue Heron	<i>Egretta caerulea</i>	n/a	Accidental	2006
Birds	Little Egret	<i>Egretta garzetta</i>	n/a	Accidental	2006
Birds	Little Gull	<i>Larus minutus</i>	n/a	Accidental	2006
Birds	Little Stint	<i>Calidris minuta</i>	n/a	Accidental	2006
Birds	Loggerhead Shrike	<i>Lanius ludovicianus migrans</i>	Breeding	At risk	2006
Birds	Long-billed Curlew	<i>Numenius americanus</i>	n/a	Accidental	2006
Birds	Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	n/a	Accidental	2006
Birds	Long-eared Owl	<i>Asio otus</i>	Breeding	Undetermined	2006
Birds	Long-tailed Duck; Oldsquaw	<i>Clangula hyemalis</i>	Wintering	Secure	2006
Birds	Long-tailed Jaeger	<i>Stercorarius longicaudus</i>	n/a	Accidental	2006
Birds	Louisiana Waterthrush	<i>Seiurus motacilla</i>	n/a	Accidental	2006
Birds	Magnolia Warbler	<i>Dendroica magnolia</i>	Breeding	Secure	2006
Birds	Mallard	<i>Anas platyrhynchos</i>	Breeding	Secure	2006
Birds	Mallard	<i>Anas platyrhynchos</i>	Wintering	Secure	2006
Birds	Manx Shearwater	<i>Puffinus puffinus</i>	Summering	Secure	2006
Birds	Marbled Godwit	<i>Limosa fedoa</i>	n/a	Accidental	2006
Birds	Marsh Wren	<i>Cistothorus palustris</i>	Breeding	Sensitive	2006
Birds	Merlin	<i>Falco columbarius</i>	Breeding	Secure	2006
Birds	Mew Gull	<i>Larus canus</i>	n/a	Accidental	2006
Birds	Mountain Bluebird	<i>Sialia currucoides</i>	n/a	Accidental	2006
Birds	Mourning Dove	<i>Zenaida macroura</i>	Breeding	Secure	2006
Birds	Mourning Warbler	<i>Oporornis philadelphia</i>	Breeding	Secure	2006
Birds	Mute Swan	<i>Cygnus olor</i>	n/a	Accidental	2006
Birds	Nashville Warbler	<i>Vermivora ruficapilla</i>	Breeding	Secure	2006
Birds	Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsoni</i>	Breeding	Secure	2006
Birds	Northern Cardinal	<i>Cardinalis cardinalis</i>	Breeding	Secure	2006
Birds	Northern Flicker	<i>Colaptes auratus</i>	Breeding	Secure	2006
Birds	Northern Fulmar	<i>Fulmarus glacialis</i>	Wintering	Secure	2006
Birds	Northern Gannet	<i>Morus bassanus</i>	Breeding	Undetermined	2006
Birds	Northern Gannet	<i>Morus bassanus</i>	Migrating	Secure	2006
Birds	Northern Goshawk	<i>Accipiter gentilis</i>	Breeding	Secure	2006
Birds	Northern Harrier	<i>Circus cyaneus</i>	Breeding	Secure	2006
Birds	Northern Hawk Owl	<i>Surnia ulula</i>	Breeding	Undetermined	2006
Birds	Northern Lapwing	<i>Vanellus vanellus</i>	n/a	Accidental	2006
Birds	Northern Mockingbird	<i>Mimus polyglottos</i>	Breeding	Sensitive	2006
Birds	Northern Parula	<i>Parula americana</i>	Breeding	Secure	2006
Birds	Northern Phalarope	<i>Phalaropus lobatus</i>	Migrating	Sensitive	2006
Birds	Northern Pintail	<i>Anas acuta</i>	Breeding	Sensitive	2006
Birds	Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Breeding	Sensitive	2006
Birds	Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Breeding	Secure	2006
Birds	Northern Shoveler	<i>Anas clypeata</i>	Breeding	Secure	2006
Birds	Northern Shrike	<i>Lanius excubitor</i>	Wintering	Secure	2006
Birds	Northern Waterthrush	<i>Seiurus noveboracensis</i>	Breeding	Secure	2006

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Birds	Northern Wheatear	<i>Oenanthe oenanthe</i>	n/a	Accidental	2006
Birds	Olive-sided Flycatcher	<i>Contopus cooperi</i>	Breeding	At risk	2008
Birds	Orange-crowned Warbler	<i>Vermivora celata</i>	Migrating	Secure	2006
Birds	Orchard Oriole	<i>Icterus spurius</i>	n/a	Accidental	2006
Birds	Osprey	<i>Pandion haliaetus</i>	Breeding	Secure	2006
Birds	Ovenbird	<i>Seiurus aurocapillus</i>	Breeding	Secure	2006
Birds	Pacific Loon	<i>Gavia pacifica</i>	n/a	Accidental	2006
Birds	Painted Bunting	<i>Passerina ciris</i>	n/a	Accidental	2006
Birds	Palm Warbler	<i>Dendroica palmarum</i>	Breeding	Secure	2006
Birds	Parasitic Jaeger	<i>Stercorarius parasiticus</i>	Migrating	Secure	2006
Birds	Pectoral Sandpiper	<i>Calidris melanotos</i>	Migrating	Secure	2006
Birds	Peregrine Falcon	<i>Falco peregrinus anatum</i>	Breeding	At risk	2006
Birds	Philadelphia Vireo	<i>Vireo philadelphicus</i>	Breeding	Secure	2006
Birds	Pied-billed Grebe	<i>Podilymbus podiceps</i>	Breeding	Secure	2006
Birds	Pileated Woodpecker	<i>Dryocopus pileatus</i>	Breeding	Secure	2006
Birds	Pine Grosbeak	<i>Pinicola enucleator</i>	Breeding	Sensitive	2006
Birds	Pine Siskin	<i>Carduelis pinus</i>	Breeding	Secure	2006
Birds	Pine Warbler	<i>Dendroica pinus</i>	Breeding	Sensitive	2006
Birds	Piping Plover	<i>Charadrius melodus</i>	Breeding	At risk	2006
Birds	Pomarine Jaeger	<i>Stercorarius pomarinus</i>	Migrating	Secure	2006
Birds	Prairie Warbler	<i>Dendroica discolor</i>	n/a	Accidental	2006
Birds	Prothonotary Warbler	<i>Protonotaria citrea</i>	n/a	Accidental	2006
Birds	Purple Finch	<i>Carpodacus purpureus</i>	Breeding	Sensitive	2006
Birds	Purple Gallinule	<i>Porphyryla martinica</i>	n/a	Accidental	2006
Birds	Purple Martin	<i>Progne subis</i>	Breeding	Sensitive	2006
Birds	Purple Sandpiper	<i>Calidris maritima</i>	Migrating	Secure	2006
Birds	Purple Sandpiper	<i>Calidris maritima</i>	Wintering	Secure	2006
Birds	Razorbill	<i>Alca torda</i>	Breeding	Sensitive	2006
Birds	Razorbill	<i>Alca torda</i>	Wintering	Secure	2006
Birds	Red Crossbill	<i>Loxia curvirostra</i>	Breeding	Secure	2006
Birds	Red Knot	<i>Calidris canutus</i>	Migrating	At risk	2007
Birds	Red Phalarope	<i>Phalaropus fulicaria</i>	Migrating	Sensitive	2006
Birds	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	n/a	Accidental	2006
Birds	Red-billed Tropicbird	<i>Phaethon aethereus</i>	n/a	Accidental	2006
Birds	Red-breasted Merganser	<i>Mergus serrator</i>	Breeding	Secure	2006
Birds	Red-breasted Merganser	<i>Mergus serrator</i>	Migrating	Secure	2006
Birds	Red-breasted Merganser	<i>Mergus serrator</i>	Wintering	Secure	2006
Birds	Red-breasted Nuthatch	<i>Sitta canadensis</i>	Breeding	Secure	2006
Birds	Red-eyed Vireo	<i>Vireo olivaceus</i>	Breeding	Secure	2006
Birds	Redhead	<i>Aythya americana</i>	n/a	Accidental	2006
Birds	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	n/a	Accidental	2006
Birds	Red-necked Grebe	<i>Podiceps grisegena</i>	Migrating	Sensitive	2006
Birds	Red-necked Grebe	<i>Podiceps grisegena</i>	Wintering	Sensitive	2006
Birds	Red-shouldered Hawk	<i>Buteo lineatus</i>	Breeding	May be at risk	2006
Birds	Red-tailed Hawk	<i>Buteo jamaicensis</i>	Breeding	Sensitive	2006
Birds	Red-throated Loon	<i>Gavia stellata</i>	Migrating	Secure	2006
Birds	Red-throated Loon	<i>Gavia stellata</i>	Wintering	Secure	2006
Birds	Redwing	<i>Turdus iliacus</i>	n/a	Accidental	2006
Birds	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Breeding	Secure	2006
Birds	Ring-billed Gull	<i>Larus delawarensis</i>	Breeding	Secure	2006
Birds	Ring-necked Duck	<i>Aythya collaris</i>	Breeding	Secure	2006
Birds	Ring-necked Pheasant	<i>Phasianus colchicus</i>	n/a	Exotic	2006
Birds	Rock Pigeon	<i>Columba livia</i>	n/a	Exotic	2006
Birds	Roseate Tern	<i>Sterna dougallii</i>	Breeding	At risk	2006
Birds	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Breeding	Secure	2006
Birds	Ross's Goose	<i>Chen rossii</i>	n/a	Accidental	2006
Birds	Rough-legged Hawk	<i>Buteo lagopus</i>	Wintering	Secure	2006
Birds	Royal Tern	<i>Sterna maxima</i>	n/a	Accidental	2006
Birds	Ruby-crowned Kinglet	<i>Regulus calendula</i>	Breeding	Secure	2006
Birds	Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Breeding	Secure	2006
Birds	Ruddy Duck	<i>Oxyura jamaicensis</i>	Breeding	Undetermined	2006
Birds	Ruddy Duck	<i>Oxyura jamaicensis</i>	Migrating	Secure	2006
Birds	Ruddy Turnstone	<i>Arenaria interpres</i>	Migrating	Secure	2006
Birds	Ruff	<i>Philomachus pugnax</i>	n/a	Accidental	2006
Birds	Ruffed Grouse	<i>Bonasa umbellus</i>	Resident	Secure	2006
Birds	Rufus Hummingbird	<i>Selasphorus rufus</i>	n/a	Accidental	2006
Birds	Rusty Blackbird	<i>Euphagus carolinus</i>	Breeding	May be at risk	2006
Birds	Sabine's Gull	<i>Xema sabini</i>	n/a	Accidental	2006
Birds	Sage Thrasher	<i>Oreoscoptes montanus</i>	n/a	Accidental	2006
Birds	Sanderling	<i>Calidris alba</i>	Migrating	Sensitive	2006

Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Birds	Sanderling	<i>Calidris alba</i>	Wintering	Sensitive	2006
Birds	Sandhill Crane	<i>Grus canadensis</i>	n/a	Accidental	2006
Birds	Sandwich Tern	<i>Sterna sandvicensis</i>	n/a	Accidental	2006
Birds	Savannah Sparrow	<i>Passerculus sandwichensis</i>	Breeding	Secure	2006
Birds	Savannah Sparrow; Ipswich (princeps) ssp.	<i>P. sandwichensis princeps</i>	n/a	Not assessed	2006
Birds	Say's Phoebe	<i>Sayornis saya</i>	n/a	Accidental	2006
Birds	Scarlet Tanager	<i>Piranga olivacea</i>	Breeding	Secure	2006
Birds	Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>	n/a	Accidental	2006
Birds	Seaside Sparrow	<i>Ammodramus maritimus</i>	n/a	Accidental	2006
Birds	Sedge Wren	<i>Cistothorus platensis</i>	Breeding	Undetermined	2006
Birds	Semipalmated Plover	<i>Charadrius semipalmatus</i>	Migrating	Secure	2006
Birds	Semipalmated Sandpiper	<i>Calidris pusilla</i>	Migrating	Secure	2006
Birds	Sharp-shinned Hawk	<i>Accipiter striatus</i>	Breeding	Secure	2006
Birds	Shiny Cowbird	<i>Molothrus bonariensis</i>	n/a	Accidental	2006
Birds	Short-billed Dowitcher	<i>Limnodromus griseus</i>	Migrating	Secure	2006
Birds	Short-eared Owl	<i>Asio flammeus</i>	Breeding	Sensitive	2006
Birds	Snow Bunting	<i>Plectrophenax nivalis</i>	Wintering	Secure	2006
Birds	Snow Goose	<i>Chen caerulescens</i>	Migrating	Secure	2006
Birds	Snowy Egret	<i>Egretta thula</i>	n/a	Accidental	2006
Birds	Snowy Owl	<i>Nyctea scandiaca</i>	Wintering	Secure	2006
Birds	Solitary Sandpiper	<i>Tringa solitaria</i>	Breeding	Secure	2006
Birds	Solitary Sandpiper	<i>Tringa solitaria</i>	Migrating	Secure	2006
Birds	Song Sparrow	<i>Melospiza melodia</i>	Breeding	Secure	2006
Birds	Sooty Shearwater	<i>Puffinus griseus</i>	Summering	Secure	2006
Birds	Sooty Tern	<i>Sterna fuscata</i>	n/a	Accidental	2006
Birds	Sora	<i>Porzana carolina</i>	Breeding	Secure	2006
Birds	South Polar Skua	<i>Stercorarius maccormicki</i>	Summering	Undetermined	2006
Birds	Spotted Sandpiper	<i>Actitis macularia</i>	Breeding	Secure	2006
Birds	Spotted Sandpiper	<i>Actitis macularia</i>	Migrating	Secure	2006
Birds	Spotted Towhee	<i>Pipilo maculatus</i>	n/a	Accidental	2006
Birds	Spruce Grouse	<i>Falcapennis canadensis</i>	Resident	Secure	2006
Birds	Stilt Sandpiper	<i>Calidris himantopus</i>	n/a	Accidental	2006
Birds	Stonechat	<i>Saxicola torquata</i>	n/a	Accidental	2006
Birds	Sulphur-bellied Flycatcher	<i>Myiodynastes luteiventris</i>	n/a	Accidental	2006
Birds	Summer Tanager	<i>Piranga rubra</i>	n/a	Accidental	2006
Birds	Surf Scoter	<i>Melanitta perspicillata</i>	Migrating	Secure	2006
Birds	Surf Scoter	<i>Melanitta perspicillata</i>	Wintering	Sensitive	2006
Birds	Swainson's Hawk	<i>Buteo swainsoni</i>	n/a	Accidental	2006
Birds	Swainson's Thrush	<i>Catharus ustulatus</i>	Breeding	Secure	2006
Birds	Swamp Sparrow	<i>Melospiza georgiana</i>	Breeding	Secure	2006
Birds	Tennessee Warbler	<i>Vermivora peregrina</i>	Breeding	Secure	2006
Birds	Thick-billed Murre	<i>Uria lomvia</i>	Wintering	Undetermined	2006
Birds	Three-toed Woodpecker	<i>Picoides tridactylus</i>	Breeding	Sensitive	2006
Birds	Townsend's Solitaire	<i>Myadestes townsendi</i>	n/a	Accidental	2006
Birds	Townsend's Warbler	<i>Dendroica townsendi</i>	n/a	Accidental	2006
Birds	Tree Swallow	<i>Tachycineta bicolor</i>	Breeding	Secure	2006
Birds	Tricolored Heron	<i>Egretta tricolor</i>	n/a	Accidental	2006
Birds	Tufted Duck	<i>Aythya fuligula</i>	n/a	Accidental	2006
Birds	Tufted Titmouse	<i>Baeolophus bicolor</i>	n/a	Accidental	2006
Birds	Tundra Swan	<i>Cygnus columbianus</i>	n/a	Accidental	2006
Birds	Turkey Vulture	<i>Cathartes aura</i>	Breeding	Secure	2006
Birds	Upland Sandpiper	<i>Bartramia longicauda</i>	Breeding	Sensitive	2006
Birds	Varied Thrush	<i>Ixoreus naevius</i>	n/a	Accidental	2006
Birds	Veery	<i>Catharus fuscescens</i>	Breeding	Secure	2006
Birds	Vesper Sparrow	<i>Pooecetes gramineus</i>	Breeding	May be at risk	2006
Birds	Virginia Rail	<i>Rallus limicola</i>	Breeding	Sensitive	2006
Birds	Warbling Vireo	<i>Vireo gilvus</i>	Breeding	Secure	2006
Birds	Western Grebe	<i>Aechmophorus occidentalis</i>	n/a	Accidental	2006
Birds	Western Kingbird	<i>Tyrannus verticalis</i>	n/a	Accidental	2006
Birds	Western Meadowlark	<i>Sturnella neglecta</i>	n/a	Accidental	2006
Birds	Western Sandpiper	<i>Calidris mauri</i>	n/a	Accidental	2006
Birds	Western Tanager	<i>Piranga ludoviciana</i>	n/a	Accidental	2006
Birds	Whimbrel	<i>Numenius phaeopus</i>	Migrating	Secure	2006
Birds	Whip-poor-will	<i>Caprimulgus vociferus</i>	Breeding	Sensitive	2006
Birds	White Ibis	<i>Eudocimus albus</i>	n/a	Accidental	2006
Birds	White-breasted Nuthatch	<i>Sitta carolinensis</i>	Breeding	Secure	2006
Birds	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	Migrating	Secure	2006
Birds	White-eyed Vireo	<i>Vireo griseus</i>	n/a	Accidental	2006
Birds	White-rumped Sandpiper	<i>Calidris fuscicollis</i>	Migrating	Secure	2006
Birds	White-throated Sparrow	<i>Zonotrichia albicollis</i>	Breeding	Secure	2006

Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Birds	White-winged Crossbill	<i>Loxia leucoptera</i>	Breeding	Secure	2006
Birds	White-winged Dove	<i>Zenaida asiatica</i>	n/a	Accidental	2006
Birds	White-winged Scoter	<i>Melanitta fusca</i>	Migrating	Secure	2006
Birds	White-winged Scoter	<i>Melanitta fusca</i>	Wintering	Sensitive	2006
Birds	White-winged Tern	<i>Chlidonias leucopterus</i>	n/a	Accidental	2006
Birds	Willet	<i>Catoptrophorus semipalmatus</i>	Breeding	Sensitive	2006
Birds	Willow Flycatcher	<i>Empidonax traillii</i>	Breeding	Sensitive	2006
Birds	Wilson's Phalarope	<i>Phalaropus tricolor</i>	Breeding	Sensitive	2006
Birds	Wilson's Snipe	<i>Gallinago gallinago</i>	Breeding	Secure	2006
Birds	Wilson's Snipe	<i>Gallinago gallinago</i>	Migrating	Secure	2006
Birds	Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>	Summering	Secure	2006
Birds	Wilson's Warbler	<i>Wilsonia pusilla</i>	Breeding	Secure	2006
Birds	Winter Wren	<i>Troglodytes troglodytes</i>	Breeding	Secure	2006
Birds	Wood Duck	<i>Aix sponsa</i>	Breeding	Secure	2006
Birds	Wood Stork	<i>Mycteria americana</i>	n/a	Accidental	2006
Birds	Wood Thrush	<i>Hylocichla mustelina</i>	Breeding	May be at risk	2006
Birds	Worm-eating Warbler	<i>Helmitheros vermivorus</i>	n/a	Accidental	2006
Birds	Yellow Rail	<i>Coturnicops noveboracensis</i>	Breeding	May be at risk	2006
Birds	Yellow Warbler	<i>Dendroica petechia</i>	Breeding	Secure	2006
Birds	Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Breeding	Secure	2006
Birds	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Breeding	Secure	2006
Birds	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	n/a	Accidental	2006
Birds	Yellow-breasted Chat	<i>Icteria virens</i>	n/a	Accidental	2006
Birds	Yellow-crowned Night-heron	<i>Nyctanassa violacea</i>	n/a	Accidental	2006
Birds	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	n/a	Accidental	2006
Birds	Yellow-nosed Albatross	<i>Thalassarche chlororhynchos</i>	n/a	Accidental	2006
Birds	Yellow-rumped Warbler	<i>Dendroica coronata</i>	Breeding	Secure	2006
Birds	Yellow-throated Vireo	<i>Vireo flavifrons</i>	n/a	Accidental	2006
Birds	Yellow-throated Warbler	<i>Dendroica dominica</i>	n/a	Accidental	2006
Terrestrial mammals	American Marten	<i>Martes americana</i>	n/a	Secure	2005
Terrestrial mammals	American Mink	<i>Mustela vison</i>	n/a	Secure	2005
Terrestrial mammals	Beaver	<i>Castor canadensis</i>	n/a	Secure	2005
Terrestrial mammals	Big Brown Bat	<i>Eptesicus fuscus</i>	n/a	Sensitive	2005
Terrestrial mammals	Black Bear	<i>Ursus americanus</i>	n/a	Secure	2005
Terrestrial mammals	Black Rat	<i>Rattus rattus</i>	n/a	Exotic	2005
Terrestrial mammals	Bobcat	<i>Lynx rufus</i>	n/a	Secure	2005
Terrestrial mammals	Common Masked Shrew	<i>Sorex cinereus</i>	n/a	Secure	2005
Terrestrial mammals	Common Raccoon	<i>Procyon lotor</i>	n/a	Secure	2005
Terrestrial mammals	Cougar	<i>Puma concolor</i>	n/a	Undetermined	2005
Terrestrial mammals	Deer mouse	<i>Peromyscus maniculatus</i>	n/a	Secure	2005
Terrestrial mammals	Eastern Chipmunk	<i>Tamias striatus</i>	n/a	Secure	2005
Terrestrial mammals	Eastern Coyote	<i>Canis latrans</i>	n/a	Secure	2005
Terrestrial mammals	Eastern Gray Squirrel	<i>Sciurus carolinensis</i>	n/a	Secure	2005
Terrestrial mammals	Eastern Pippistrelle	<i>Pipistrellus subflavus</i>	n/a	Sensitive	2005
Terrestrial mammals	Fisher	<i>Martes pennanti</i>	n/a	Secure	2005
Terrestrial mammals	Gaspé Shrew	<i>Sorex gaspensis</i>	n/a	May be at risk	2005
Terrestrial mammals	Hoary Bat	<i>Lasiurus cinereus</i>	n/a	Undetermined	2005
Terrestrial mammals	House Mouse	<i>Mus musculus</i>	n/a	Exotic	2005
Terrestrial mammals	Little Brown Bat	<i>Myotis lucifugus</i>	n/a	Sensitive	2005
Terrestrial mammals	Long Tailed Shrew	<i>Sorex dispar</i>	n/a	May be at risk	2005
Terrestrial mammals	Long Tailed Weasel	<i>Mustela frenata</i>	n/a	Secure	2005
Terrestrial mammals	Lynx	<i>Lynx canadensis</i>	n/a	At risk	2005
Terrestrial mammals	Maritime Shrew	<i>Sorex maritimensis</i>	n/a	Secure	2005
Terrestrial mammals	Meadow Jumping Mouse	<i>Zapus hudsonius</i>	n/a	Secure	2005
Terrestrial mammals	Meadow Vole	<i>Microtus pennsylvanicus</i>	n/a	Secure	2005
Terrestrial mammals	Moose	<i>Alces alces</i>	n/a	Secure	2005
Terrestrial mammals	Muskrat	<i>Ondatra zibethicus</i>	n/a	Secure	2005
Terrestrial mammals	Northern Bog Lemming	<i>Synaptomys borealis</i>	n/a	Undetermined	2005
Terrestrial mammals	Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	n/a	Secure	2005
Terrestrial mammals	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	n/a	Sensitive	2005
Terrestrial mammals	Norway Rat	<i>Rattus norvegicus</i>	n/a	Exotic	2005
Terrestrial mammals	Porcupine	<i>Erethizon dorsatum</i>	n/a	Secure	2005
Terrestrial mammals	Pygmy Shrew	<i>Sorex hoyi</i>	n/a	Secure	2005
Terrestrial mammals	Red Bat	<i>Lasiurus borealis</i>	n/a	Undetermined	2005
Terrestrial mammals	Red Fox	<i>Vulpes vulpes</i>	n/a	Secure	2005
Terrestrial mammals	Red Squirrel	<i>Tamiasciurus hudsonicus</i>	n/a	Secure	2005
Terrestrial mammals	River Otter	<i>Lutra canadensis</i>	n/a	Secure	2005
Terrestrial mammals	Rock Vole	<i>Microtus chrotorrhinus</i>	n/a	Undetermined	2005
Terrestrial mammals	Short-tailed Shrew	<i>Blarina brevicauda</i>	n/a	Secure	2005
Terrestrial mammals	Short-tailed Weasel; Ermine	<i>Mustela erminea</i>	n/a	Secure	2005

Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Terrestrial mammals	Silver Haired Bat	<i>Lasionycteris noctivagans</i>	n/a	Undetermined	2005
Terrestrial mammals	Smokey Shrew	<i>Sorex fumeus</i>	n/a	Secure	2005
Terrestrial mammals	Snowshoe Hare	<i>Lepus americanus</i>	n/a	Secure	2005
Terrestrial mammals	Southern Bog Lemming	<i>Synaptomys cooperi</i>	n/a	Secure	2005
Terrestrial mammals	Southern Red-backed Vole	<i>Clethrionomys gapperi</i>	n/a	Secure	2005
Terrestrial mammals	Star-Nosed Mole	<i>Condylura cristata</i>	n/a	Secure	2005
Terrestrial mammals	Striped Skunk	<i>Mephitis mephitis</i>	n/a	Secure	2005
Terrestrial mammals	Water Shrew	<i>Sorex palustris</i>	n/a	Secure	2005
Terrestrial mammals	White-tailed Deer	<i>Odocoileus virginianus</i>	n/a	Secure	2005
Terrestrial mammals	Woodchuck	<i>Marmota monax</i>	n/a	Secure	2005
Terrestrial mammals	Woodland Jumping Mouse	<i>Napaeozapus insignis</i>	n/a	Secure	2005
Amphibians	American Toad	<i>Bufo americanus</i>	n/a	Secure	2005
Amphibians	Blue-spotted Salamander	<i>Ambystoma laterale</i>	n/a	Secure	2005
Amphibians	Bullfrog	<i>Rana catesbeiana</i>	n/a	Secure	2005
Amphibians	Dusky Salamander	<i>Desmognathus fuscus</i>	n/a	Sensitive	2005
Amphibians	Eastern Newt; Red-spotted Newt	<i>Notophthalmus viridescens</i>	n/a	Secure	2005
Amphibians	Four-toed Salamander	<i>Hemidactylium scutatum</i>	n/a	Undetermined	2005
Amphibians	Gray Treefrog	<i>Hyla versicolor</i>	n/a	Secure	2005
Amphibians	Green Frog	<i>Rana clamitans</i>	n/a	Secure	2005
Amphibians	Mink Frog	<i>Rana septentrionalis</i>	n/a	Secure	2005
Amphibians	Northern Leopard Frog	<i>Rana pipiens</i>	n/a	Secure	2005
Amphibians	Northern Two-lined Salamander	<i>Eurycea bislineata</i>	n/a	Secure	2005
Amphibians	Pickerel Frog	<i>Rana palustris</i>	n/a	Secure	2005
Amphibians	Redback Salamander	<i>Plethodon cinereus</i>	n/a	Secure	2005
Amphibians	Spring Peeper	<i>Pseudacris crucifer</i>	n/a	Secure	2005
Amphibians	Wood Frog	<i>Rana sylvatica</i>	n/a	Secure	2005
Amphibians	Yellow-spotted Salamander	<i>Ambystoma maculatum</i>	n/a	Secure	2005
Terrestrial reptiles	Common Snapping Turtle	<i>Chelydra serpentina</i>	n/a	Secure	2005
Terrestrial reptiles	Eastern Painted Turtle	<i>Chrysemys picta picta</i>	n/a	Secure	2005
Terrestrial reptiles	Maritime Garter Snake	<i>Thamnophis sirtalis pallidula</i>	n/a	Secure	2005
Terrestrial reptiles	Redbelly Snake	<i>Storeria occipitomaculata</i>	n/a	Secure	2005
Terrestrial reptiles	Ringneck Snake; Northern Ringneck Snake	<i>Diadophis punctatus</i>	n/a	Secure	2005
Terrestrial reptiles	Smooth Green Snake	<i>Opheodrys vernalis</i>	n/a	Secure	2005
Terrestrial reptiles	Wood Turtle	<i>Glyptemys insculpta</i>	n/a	At risk	2007
Butterflies	Acadian Hairstreak	<i>Satyrium acidicum</i>	n/a	Secure	2000
Butterflies	Alfalfa Butterfly; Orange Sulphur	<i>Colias eurytheme</i>	n/a	Not assessed	2000
Butterflies	American Copper	<i>Lycaena phlaeas americana</i>	n/a	Secure	2000
Butterflies	American Painted Lady	<i>Vanessa virginiensis</i>	n/a	Undetermined	2000
Butterflies	Aphrodite Fritillary	<i>Speyeria aphrodite winni</i>	n/a	Secure	2000
Butterflies	Arctic Skipper	<i>Carterocephalus palaemon mandan</i>	n/a	Secure	2000
Butterflies	Atlantis Fritillary	<i>Speyeria atlantis</i>	n/a	Secure	2000
Butterflies	Baltimore Checkerspot	<i>Euphydryas phaeton</i>	n/a	Secure	2000
Butterflies	Banded Hairstreak	<i>Satyrium calanus falacer</i>	n/a	Secure	2000
Butterflies	Black Swallowtail	<i>Papilio polyxene asterius</i>	n/a	Secure	2000
Butterflies	Bog Copper	<i>Lycaena epixanthe phaedrus</i>	n/a	Secure	2000
Butterflies	Bog Elfin	<i>Callophrys lanoraieensis</i>	n/a	Secure	2000
Butterflies	Bog Fritillary	<i>Boloria eunomia</i>	n/a	Undetermined	2000
Butterflies	Bronze Copper	<i>Lycaena hyllus</i>	n/a	May be at risk	2000
Butterflies	Brown Elfin	<i>Callophrys augustinus</i>	n/a	Secure	2000
Butterflies	Cabbage White	<i>Pieris rapae</i>	n/a	Secure	2000
Butterflies	Canadian Tiger Swallowtail	<i>Papilio canadensis</i>	n/a	Secure	2000
Butterflies	Cherry Gall Azure	<i>Celastrina sp.</i>	n/a	Undetermined	2000
Butterflies	Clayton's (Dorcas) Copper	<i>Lycaena dorcas claytoni</i>	n/a	May be at risk	2000
Butterflies	Clouded Sulphur	<i>Colias philodice</i>	n/a	Secure	2000
Butterflies	Common Roadside Skipper	<i>Amblyscirtes vialis</i>	n/a	Secure	2000
Butterflies	Common Wood Nymph	<i>Cercyonis pegala nephele</i>	n/a	Secure	2000
Butterflies	Compton Tortoiseshell	<i>Nymphalis vaualbum j-album</i>	n/a	Secure	2000
Butterflies	Crowberry (Northern) Blue	<i>Lycaeides idas empetri</i>	n/a	Secure	2000
Butterflies	Dreamy Dusky Wing	<i>Erynnis icelus</i>	n/a	Secure	2000
Butterflies	Dun Skipper	<i>Euphyes vestris metacomet</i>	n/a	Secure	2000
Butterflies	Early Hairstreak	<i>Erora laetus</i>	n/a	May be at risk	2000
Butterflies	Eastern Pine Elfin	<i>Callophrys niphon clarki</i>	n/a	Secure	2000
Butterflies	European Skipper	<i>Thymelicus lineola</i>	n/a	Exotic	2000
Butterflies	Eyed Brown	<i>Satyroides eurydice</i>	n/a	Secure	2000
Butterflies	Gray Comma	<i>Polygonia progne</i>	n/a	Secure	2000
Butterflies	Gray Hairstreak	<i>Strymon melinus</i>	n/a	Secure	2000
Butterflies	Great Spangled Fritillary	<i>Speyeria cybele novascotiae</i>	n/a	Secure	2000
Butterflies	Green Comma	<i>Polygonia faunus</i>	n/a	Secure	2000
Butterflies	Greenish Blue	<i>Plebejus saepiolus amica</i>	n/a	Secure	2000
Butterflies	Harris Checkerspot	<i>Chlosyne harrisii</i>	n/a	Secure	2000

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Butterflies	Harvester	<i>Feniseca tarquinius</i>	n/a	Secure	2000
Butterflies	Henry's Elfin	<i>Callophrys henrici</i>	n/a	May be at risk	2000
Butterflies	Hoary Comma	<i>Polygonia gracilis</i>	n/a	Secure	2000
Butterflies	Hoary Elfin	<i>Callophrys polia</i>	n/a	Secure	2000
Butterflies	Hobomok Skipper	<i>Poanes hobomok</i>	n/a	Secure	2000
Butterflies	Hop Merchant; Eastern Comma	<i>Polygonia comma</i>	n/a	Secure	2000
Butterflies	Indian Skipper	<i>Hesperia sassacus</i>	n/a	Secure	2000
Butterflies	Inornate Ringlet (Common Ringlet)	<i>Coenonympha tullia inornata</i>	n/a	Secure	2000
Butterflies	Jutta Arctic	<i>Oeneis jutta ascerta</i>	n/a	Secure	2000
Butterflies	Laurentian Skipper (Common Branded Skipper)	<i>Hesperia comma laurentina</i>	n/a	Secure	2000
Butterflies	Least Skipper	<i>Ancyloxypha numitor</i>	n/a	Secure	2000
Butterflies	Little Wood Satyr	<i>Megisto cymela</i>	n/a	Secure	2000
Butterflies	Long Dash Skipper	<i>Polites mystic</i>	n/a	Secure	2000
Butterflies	Maritime Ringlet	<i>Coenonympha tullia nipisiquit</i>	n/a	At risk	2000
Butterflies	Meadow Fritillary	<i>Boloria bellona toddi</i>	n/a	Secure	2000
Butterflies	Milbert's Tortoiseshell	<i>Nymphalis milberti</i>	n/a	Secure	2000
Butterflies	Monarch	<i>Danaus plexippus</i>	n/a	Sensitive	2000
Butterflies	Mourning Cloak	<i>Nymphalis antipoa</i>	n/a	Secure	2000
Butterflies	Mustard White	<i>Pieris oleracea</i>	n/a	Secure	2000
Butterflies	Northern Cloudy Wing	<i>Thorybes pylades</i>	n/a	Secure	2000
Butterflies	Northern Pearl Crescent	<i>Phyciodes selenis</i>	n/a	Secure	2000
Butterflies	Northern Pearly Eye	<i>Enodia anthedon</i>	n/a	Secure	2000
Butterflies	Painted Lady	<i>Vanessa cardui</i>	n/a	Not assessed	2000
Butterflies	Peck's Skipper	<i>Polites peckius</i>	n/a	Secure	2000
Butterflies	Pepper and Salt Skipper	<i>Amblyscirtes hegon</i>	n/a	Secure	2000
Butterflies	Pink-edged Sulphur	<i>Colias interior laurentina</i>	n/a	Secure	2000
Butterflies	Purple Lesser Fritillary	<i>Boloria chariclea</i>	n/a	Secure	2000
Butterflies	Question Mark	<i>Polygonia interrogationis</i>	n/a	Not assessed	2000
Butterflies	Red Admiral	<i>Vanessa atalanta rubria</i>	n/a	Not assessed	2000
Butterflies	Salt-marsh Copper	<i>Lycaena dospassosi</i>	n/a	Secure	2000
Butterflies	Satyr Anglewing	<i>Polygonia satyrus</i>	n/a	Secure	2000
Butterflies	Short-tailed Swallowtail	<i>Papilio brevicauda bretonensis</i>	n/a	Secure	2000
Butterflies	Silver-bordered Fritillary	<i>Boloria selene atrocotalis</i>	n/a	Secure	2000
Butterflies	Silvery Blue	<i>Glaucopsyche lygdamus couperi</i>	n/a	Secure	2000
Butterflies	Slivery Checkerspot	<i>Chlosyne nycteis</i>	n/a	Secure	2000
Butterflies	Spring Azure	<i>Celastrina ladon lucia</i>	n/a	Secure	2000
Butterflies	Striped Hairstreak	<i>Satyrium liparops strigosum</i>	n/a	Secure	2000
Butterflies	Summer Azure	<i>Celastrina neglecta</i>	n/a	Undetermined	2000
Butterflies	Tawny-edged Skipper	<i>Polites themistocles</i>	n/a	Secure	2000
Butterflies	Two-Spotted Skipper	<i>Euphyes bimacula</i>	n/a	Secure	2000
Butterflies	Viceroy	<i>Limenitis archippuss</i>	n/a	Secure	2000
Butterflies	Western Pine Elfin	<i>Callophrys eryphon</i>	n/a	Secure	2000
Butterflies	Western Tailed Blue	<i>Everes amyntula maritima</i>	n/a	Secure	2000
Butterflies	White Admiral	<i>Limenitis arthemis</i>	n/a	Secure	2000
Dragonflies and damselflies	Amber-winged Spreadwing	<i>Lestes eurinus</i>	n/a	Secure	2002
Dragonflies and damselflies	American Emerald	<i>Cordulia shurtleffi</i>	n/a	Secure	2002
Dragonflies and damselflies	American Rubyspot	<i>Hetaerina americana</i>	n/a	Sensitive	2003
Dragonflies and damselflies	Aurora Damsel	<i>Chromagrion conditum</i>	n/a	Secure	2002
Dragonflies and damselflies	Azure Bluet	<i>Enallagma aspersum</i>	n/a	Secure	2008
Dragonflies and damselflies	Band-winged Meadowhawk	<i>Sympetrum semicinctum</i>	n/a	Secure	2002
Dragonflies and damselflies	Beaverpond Baskettail	<i>Epitheca canis</i>	n/a	Secure	2002
Dragonflies and damselflies	Beaverpond Clubtail	<i>Gomphus borealis</i>	n/a	Secure	2002
Dragonflies and damselflies	Black Meadowhawk	<i>Sympetrum danae</i>	n/a	Secure	2002
Dragonflies and damselflies	Black-shouldered Spineyleg	<i>Dromogomphus spinosus</i>	n/a	Secure	2003
Dragonflies and damselflies	Black-tipped Darner	<i>Aeshna tuberculifera</i>	n/a	Secure	2002
Dragonflies and damselflies	Blue Dasher	<i>Pachydiplax longipennis</i>	n/a	Undetermined	2003
Dragonflies and damselflies	Boreal Bluet	<i>Enallagma boreale</i>	n/a	Secure	2002
Dragonflies and damselflies	Boreal Snaketail	<i>Ophiogomphus colubrinus</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Broadtailed Shadowdragon	<i>Neurocordulia michaeli</i>	n/a	Secure	2008
Dragonflies and damselflies	Brook Snaketail	<i>Ophiogomphus aspersus</i>	n/a	Secure	2002
Dragonflies and damselflies	Brush-tipped Emerald	<i>Somatochlora walshii</i>	n/a	Secure	2002
Dragonflies and damselflies	Calico Pennant	<i>Celithemis elisa</i>	n/a	Secure	2003
Dragonflies and damselflies	Canada Darner	<i>Aeshna canadensis</i>	n/a	Secure	2002
Dragonflies and damselflies	Canada Whiteface	<i>Leucorrhinia patricia</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Chalk-fronted Corporal	<i>Libellula julia</i>	n/a	Secure	2002
Dragonflies and damselflies	Cherry-faced Meadowhawk	<i>Sympetrum internum</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Clamp-tipped Emerald	<i>Somatochlora tenebrosa</i>	n/a	Undetermined	2008
Dragonflies and damselflies	Cobra Clubtail	<i>Gomphus vastus</i>	n/a	Sensitive	2003
Dragonflies and damselflies	Comet Darner	<i>Anax longipes</i>	n/a	Accidental	2002

Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Dragonflies and damselflies	Common Baskettail	<i>Epitheca cynosura</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Common Green Darner	<i>Anax junius</i>	n/a	Secure	2003
Dragonflies and damselflies	Common Spreadwing	<i>Lestes disjunctus disjunctus</i>	n/a	Secure	2002
Dragonflies and damselflies	Common Whitetail	<i>Libellula lydia</i>	n/a	Secure	2002
Dragonflies and damselflies	Crimson-ringed Whiteface	<i>Leucorrhinia glacialis</i>	n/a	Secure	2002
Dragonflies and damselflies	Cyrano Darner	<i>Nasiaeschna pentacantha</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Delicate Emerald	<i>Somatochlora franklini</i>	n/a	Sensitive	2002
Dragonflies and damselflies	Delta-spotted Spiketail	<i>Cordulegaster diastatops</i>	n/a	Secure	2002
Dragonflies and damselflies	Dot-tailed Whiteface	<i>Leucorrhinia intacta</i>	n/a	Secure	2002
Dragonflies and damselflies	Dragonhunter	<i>Hagenius brevistylus</i>	n/a	Secure	2002
Dragonflies and damselflies	Dusky Clubtail	<i>Gomphus spicatus</i>	n/a	Secure	2002
Dragonflies and damselflies	Eastern Forktail	<i>Ischnura verticalis</i>	n/a	Secure	2002
Dragonflies and damselflies	Eastern Red Damsel	<i>Amphiagrion saucium</i>	n/a	Sensitive	2003
Dragonflies and damselflies	Ebony Boghaunter	<i>Williamsonia fletcheri</i>	n/a	Secure	2008
Dragonflies and damselflies	Ebony Jewelwing	<i>Calopteryx maculata</i>	n/a	Secure	2002
Dragonflies and damselflies	Elegant Spreadwing	<i>Lestes inaequalis</i>	n/a	Sensitive	2002
Dragonflies and damselflies	Elfin Skimmer	<i>Nannothemis bella</i>	n/a	Secure	2008
Dragonflies and damselflies	Emerald Spreadwing	<i>Lestes dryas</i>	n/a	Secure	2002
Dragonflies and damselflies	Extra-striped Snaketail	<i>Ophiogomphus anomalus</i>	n/a	Secure	2008
Dragonflies and damselflies	Familiar Bluet	<i>Enallagma civile</i>	n/a	Secure	2002
Dragonflies and damselflies	Fawn Darner	<i>Boyeria vinosa</i>	n/a	Secure	2002
Dragonflies and damselflies	Forcipate Emerald	<i>Somatochlora forcipata</i>	n/a	Sensitive	2002
Dragonflies and damselflies	Four-spotted Skimmer	<i>Libellula quadrimaculata</i>	n/a	Secure	2002
Dragonflies and damselflies	Fragile Forktail	<i>Ischnura posita</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Frosted Whiteface	<i>Leucorrhinia frigida</i>	n/a	Secure	2002
Dragonflies and damselflies	Green-striped Darner	<i>Aeshna verticalis</i>	n/a	Secure	2003
Dragonflies and damselflies	Hagen's Bluet	<i>Enallagma hageni</i>	n/a	Secure	2002
Dragonflies and damselflies	Harlequin Darner	<i>Gomphaeschna furcillata</i>	n/a	Undetermined	2003
Dragonflies and damselflies	Harpoon Clubtail	<i>Gomphus desertus</i>	n/a	Sensitive	2003
Dragonflies and damselflies	Hudsonian Whiteface	<i>Leucorrhinia hudsonica</i>	n/a	Secure	2002
Dragonflies and damselflies	Illinois River Cruiser	<i>Macromia illinoensis</i>	n/a	Secure	2002
Dragonflies and damselflies	Incurvate Emerald	<i>Somatochlora incurvata</i>	n/a	Secure	2003
Dragonflies and damselflies	Jane's Meadowhawk	<i>Sympetrum janeae</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Kennedy's Emerald	<i>Somatochlora kennedyi</i>	n/a	Secure	2002
Dragonflies and damselflies	Lake Darner	<i>Aeshna eremita</i>	n/a	Secure	2002
Dragonflies and damselflies	Lake Emerald	<i>Somatochlora cingulata</i>	n/a	Secure	2002
Dragonflies and damselflies	Lancet Clubtail	<i>Gomphus exilis</i>	n/a	Secure	2002
Dragonflies and damselflies	Lance-tipped Darner	<i>Aeshna constricta</i>	n/a	Secure	2003
Dragonflies and damselflies	Least Clubtail	<i>Stylogomphus albistylus</i>	n/a	Secure	2002
Dragonflies and damselflies	Lilypad Clubtail	<i>Arigomphus furcifer</i>	n/a	Undetermined	2008
Dragonflies and damselflies	Little Bluet	<i>Enallagma minusculum</i>	n/a	Secure	2008
Dragonflies and damselflies	Lyre-tipped Spreadwing	<i>Lestes unguiculatus</i>	n/a	Secure	2008
Dragonflies and damselflies	Maine Snaketail	<i>Ophiogomphus mainensis</i>	n/a	Secure	2002
Dragonflies and damselflies	Mantled Baskettail	<i>Epitheca semiaquea</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Marsh Bluet	<i>Enallagma ebrium</i>	n/a	Secure	2002
Dragonflies and damselflies	Mottled Darner	<i>Aeshna clepsydra</i>	n/a	Sensitive	2003
Dragonflies and damselflies	Moustached Clubtail	<i>Gomphus adelphus</i>	n/a	Secure	2002
Dragonflies and damselflies	Muskeg Emerald	<i>Somatochlora septentrionalis</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Northern Bluet	<i>Enallagma cyathigerum cyathigerum</i>	n/a	Secure	2002
Dragonflies and damselflies	Northern Pygmy Clubtail	<i>Lanthus parvulus</i>	n/a	Secure	2002
Dragonflies and damselflies	Ocellated Darner	<i>Boyeria grafiana</i>	n/a	Secure	2002
Dragonflies and damselflies	Ocellated Emerald	<i>Somatochlora minor</i>	n/a	Secure	2002
Dragonflies and damselflies	Orange Bluet	<i>Enallagma signatum</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Painted Skimmer	<i>Libellula semifasciata</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Petite Emerald	<i>Dorocordulia lepida</i>	n/a	Sensitive	2002
Dragonflies and damselflies	Powdered Dancer	<i>Argia moesta</i>	n/a	Secure	2002
Dragonflies and damselflies	Prince Baskettail	<i>Epitheca princeps</i>	n/a	Secure	2003
Dragonflies and damselflies	Pygmy Snaketail	<i>Ophiogomphus howei</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Quebec Emerald	<i>Somatochlora brevicincta</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Racket-tailed Emerald	<i>Dorocordulia libera</i>	n/a	Secure	2002
Dragonflies and damselflies	Red-waisted Whiteface	<i>Leucorrhinia proxima</i>	n/a	Secure	2002
Dragonflies and damselflies	Riffle Snaketail	<i>Ophiogomphus carolus</i>	n/a	Secure	2002
Dragonflies and damselflies	Ringed Emerald	<i>Somatochlora albicincta</i>	n/a	Secure	2002
Dragonflies and damselflies	River Jewelwing	<i>Calopteryx aequabilis</i>	n/a	Secure	2002
Dragonflies and damselflies	Ruby Meadowhawk	<i>Sympetrum rubicundulum</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Rusty Snaketail	<i>Ophiogomphus rupinsulensis</i>	n/a	Secure	2003
Dragonflies and damselflies	Saffron-winged Meadowhawk	<i>Sympetrum costiferum</i>	n/a	Secure	2002
Dragonflies and damselflies	Sedge Darner	<i>Aeshna juncea</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Sedge Sprite	<i>Nehalennia irene</i>	n/a	Secure	2002
Dragonflies and damselflies	Shadow Darner	<i>Aeshna umbrosa umbrosa</i>	n/a	Secure	2002



Taxon	Common Name	Scientific Name	Population	Status	Year Assessed
Dragonflies and damselflies	Skillet Clubtail	<i>Gomphus ventricosus</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Skimming Bluet	<i>Enallagma geminatum</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Ski-tailed Emerald	<i>Somatochlora elongata</i>	n/a	Secure	2002
Dragonflies and damselflies	Slaty Skimmer	<i>Libellula incesta</i>	n/a	Secure	2003
Dragonflies and damselflies	Slender Spreadwing	<i>Lestes rectangularis</i>	n/a	Secure	2008
Dragonflies and damselflies	Sphagnum Sprite	<i>Nehalennia gracilis</i>	n/a	Secure	2003
Dragonflies and damselflies	Spine-crowned Clubtail	<i>Gomphus abbreviatus</i>	n/a	Secure	2008
Dragonflies and damselflies	Spiny Baskettail	<i>Epitheca spinigera</i>	n/a	Secure	2002
Dragonflies and damselflies	Spotted Spreadwing	<i>Lestes congener</i>	n/a	Secure	2002
Dragonflies and damselflies	Spot-winged Glider	<i>Pantala hymenaea</i>	n/a	Secure	2003
Dragonflies and damselflies	Springtime Darner	<i>Basiaeschna janata</i>	n/a	Secure	2002
Dragonflies and damselflies	Stream Bluet	<i>Enallagma exsulans</i>	n/a	Secure	2002
Dragonflies and damselflies	Stream Cruiser	<i>Didymops transversa</i>	n/a	Secure	2002
Dragonflies and damselflies	Stygian Shadowdragon	<i>Neurocordulia yamaskanensis</i>	n/a	Secure	2008
Dragonflies and damselflies	Subarctic Bluet	<i>Coenagrion interrogatum</i>	n/a	Sensitive	2002
Dragonflies and damselflies	Subarctic Darner	<i>Aeshna subarctica</i>	n/a	Secure	2008
Dragonflies and damselflies	Superb Jewelwing	<i>Calopteryx amata</i>	n/a	Secure	2002
Dragonflies and damselflies	Swamp Darner	<i>Epiaeschna heros</i>	n/a	Undetermined	2002
Dragonflies and damselflies	Swamp Spreadwing	<i>Lestes vigilax</i>	n/a	Sensitive	2002
Dragonflies and damselflies	Sweetflag Spreadwing	<i>Lestes forcipatus</i>	n/a	Secure	2008
Dragonflies and damselflies	Taiga Bluet	<i>Coenagrion resolutum</i>	n/a	Secure	2002
Dragonflies and damselflies	Tule Bluet	<i>Enallagma carunculatum</i>	n/a	May be at risk	2002
Dragonflies and damselflies	Twelve-spotted Skimmer	<i>Libellula pulchella</i>	n/a	Secure	2003
Dragonflies and damselflies	Twin-spotted Spiketail	<i>Cordulegaster maculata</i>	n/a	Secure	2002
Dragonflies and damselflies	Uhler's Sundragon	<i>Helocordulia uhleri</i>	n/a	Secure	2002
Dragonflies and damselflies	Umber Shadowdragon	<i>Neurocordulia obsoleta</i>	n/a	Undetermined	2008
Dragonflies and damselflies	Variable Dancer	<i>Argia fumipennis violacea</i>	n/a	Secure	2002
Dragonflies and damselflies	Variable Darner	<i>Aeshna interrupta interrupta</i>	n/a	Secure	2002
Dragonflies and damselflies	Vesper Bluet	<i>Enallagma vesperum</i>	n/a	May be at risk	2003
Dragonflies and damselflies	Wandering Glider	<i>Pantala flavescens</i>	n/a	Secure	2003
Dragonflies and damselflies	White Corporal	<i>Libellula exusta</i>	n/a	Undetermined	2002
Dragonflies and damselflies	White-faced Meadowhawk	<i>Sympetrum obtrusum</i>	n/a	Secure	2002
Dragonflies and damselflies	Williamson's Emerald	<i>Somatochlora williamsoni</i>	n/a	Secure	2002
Dragonflies and damselflies	Yellow-legged Meadowhawk	<i>Sympetrum vicinum</i>	n/a	Secure	2002
Dragonflies and damselflies	Zebra Clubtail	<i>Stylurus scudderii</i>	n/a	Sensitive	2003
Dragonflies and damselflies	Zigzag Darner	<i>Aeshna sitchensis</i>	n/a	Secure	2008

**Table B.2**  
**MBBA Results for Square 20LR19**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Breeding Status</b>
American Black Duck	<i>Anas rubripes</i>	Possible
Ring-necked Pheasant	<i>Phasianus colchicus</i>	Possible
Northern Harrier	<i>Circus cyaneus</i>	Possible
Broad-winged Hawk	<i>Buteo platypterus</i>	Possible
Spotted Sandpiper	<i>Actitis macularius</i>	Possible
Rock Pigeon	<i>Columba livia</i>	Confirmed
Mourning Dove	<i>Zenaida macroura</i>	Possible
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Possible
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Possible
Downy Woodpecker	<i>Picoides pubescens</i>	Possible
Hairy Woodpecker	<i>Leuconotopicus villosus</i>	Possible
Northern Flicker	<i>Colaptes auratus</i>	Probable
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Probable
American Kestrel	<i>Falco sparverius</i>	Possible
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Possible
Alder Flycatcher	<i>Empidonax alnorum</i>	Possible
Eastern Phoebe	<i>Sayornis phoebe</i>	Possible
Eastern Kingbird	<i>Tyrannus tyrannus</i>	Possible
Blue-headed Vireo	<i>Vireo solitarius</i>	Possible
Red-eyed Vireo	<i>Vireo olivaceus</i>	Possible
Gray Jay	<i>Perisoreus canadensis</i>	Possible
Blue Jay	<i>Cyanocitta cristata</i>	Probable
American Crow	<i>Corvus brachyrhynchos</i>	Possible
Tree Swallow	<i>Tachycineta bicolor</i>	Possible
Barn Swallow	<i>Hirundo rustica</i>	Possible
Black-capped Chickadee	<i>Poecile atricapillus</i>	Possible
Boreal Chickadee	<i>Poecile hudsonicus</i>	Probable
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Possible
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Confirmed
Swainson's Thrush	<i>Catharus ustulatus</i>	Possible
Hermit Thrush	<i>Catharus guttatus</i>	Possible
American Robin	<i>Turdus migratorius</i>	Possible
European Starling	<i>Sturnus vulgaris</i>	Possible
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Possible
Ovenbird	<i>Seiurus aurocapilla</i>	Possible
Black-and-white Warbler	<i>Mniotilta varia</i>	Possible
Nashville Warbler	<i>Leiothlypis ruficapilla</i>	Possible
Common Yellowthroat	<i>Geothlypis trichas</i>	Possible
American Redstart	<i>Setophaga ruticilla</i>	Possible
Northern Parula	<i>Setophaga americana</i>	Possible
Magnolia Warbler	<i>Setophaga magnolia</i>	Possible
Bay-breasted Warbler	<i>Setophaga castanea</i>	Possible
Blackburnian Warbler	<i>Setophaga fusca</i>	Probable

Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	Probable
Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	Possible
Palm Warbler	<i>Setophaga palmarum</i>	Probable
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Probable
Black-throated Green Warbler	<i>Setophaga virens</i>	Possible
Chipping Sparrow	<i>Spizella passerina</i>	Probable
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Possible
Song Sparrow	<i>Melospiza melodia</i>	Possible
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Possible
Dark-eyed Junco	<i>Junco hyemalis</i>	Possible
Common Grackle	<i>Quiscalus quiscula</i>	Confirmed
Purple Finch	<i>Haemorhous purpureus</i>	Possible
American Goldfinch	<i>Spinus tristis</i>	Possible

**Table B.3**

**List of Bird Species Observed during Breeding Bird Surveys**

<b>Common Name</b>	<b>Scientific Name</b>
Ruffed Grouse	<i>Bonasa umbellus</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
American Woodcock	<i>Scolopax minor</i>
Ruby-throated Hummingbird	<i>Archilochus colubris</i>
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Northern Flicker	<i>Colaptes auratus</i>
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>
Alder Flycatcher	<i>Empidonax alnorum</i>
Least Flycatcher	<i>Empidonax minimus</i>
Blue-headed Vireo	<i>Vireo solitarius</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Common Raven	<i>Corvus corax</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Black-capped Chickadee	<i>Poecile atricapillus</i>
Veery	<i>Catharus fuscescens</i>
Swainson's Thrush	<i>Catharus ustulatus</i>
Hermit Thrush	<i>Catharus guttatus</i>
American Robin	<i>Turdus migratorius</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Ovenbird	<i>Seiurus aurocapilla</i>
Black-and-white Warbler	<i>Mniotilta varia</i>
Nashville Warbler	<i>Oreothlypis ruficapilla</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
American Redstart	<i>Setophaga ruticilla</i>
Northern Parula	<i>Setophaga americana</i>
Magnolia Warbler	<i>Setophaga magnolia</i>
Blackburnian Warbler	<i>Setophaga fusca</i>
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>
Black-throated Blue Warbler	<i>Setophaga caerulescens</i>
Yellow-rumped Warbler	<i>Setophaga coronata</i>
Black-throated Green Warbler	<i>Setophaga virens</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
Song Sparrow	<i>Melospiza melodia</i>
White-throated Sparrow	<i>Zonotrichia albicollis</i>
Purple Finch	<i>Haemorhous purpureus</i>
American Goldfinch	<i>Spinus tristis</i>



**wood.**

## **Appendix C**

# **Vegetation Observed and Habitat Photos**



**Table C-1: Vegetation Observed**

OHF – Old Hay Field, AO – Apple Orchard, MS – Mature Softwood, IMH - Immature/Mature Hardwood, SP – Softwood Plantation.

Common Name	Scientific Name	OHF	AO	MS	IMH	SP
Alternate-leaved Dogwood	<i>Cornus alternifolia</i>				X	X
American Beech	<i>Fagus grandifolia</i>				X	
American Mountain Ash	<i>Sorbus americana</i>		X		X	
American Pussy Willow	<i>Salix discolor</i>				X	X
American Raspberry	<i>Rubus strigosus</i>	X	X		X	
Balsm Fir	<i>Abies balsamea</i>	X	X	X		
Beaked Hazelnut	<i>Corylus cornuta</i>				X	
Black Elderberry	<i>Sambucus nigra</i>				X	
Black Raspberry	<i>Rubus occidentalis</i>	X				
Black Spruce	<i>Picea marina</i>			X		
Blue Bead Lily	<i>Clintonia borealis</i>				X	
Bracken Fern	<i>Pteridium aquilnum</i>				X	
Bristly Currant	<i>Ribes lacustre</i>			X	X	
Broadleaf plantain	<i>Plantago major</i>	X				
Bulblet Bladder Fern	<i>Cystopteris bulbifera</i>				X	
Bunchberry	<i>Chamaepericlymenum canadense</i>				X	X
Canada St. John's-wort	<i>Hypericum canadense</i>	X	X		X	
Chokecherry	<i>Prunus virginiana</i>		X		X	
Cinnamon Fern	<i>Osmundastrum cinnamomeum</i>			X	X	
Coltsfoot	<i>Tussilago farfara</i>		X		X	
Common Serviceberry	<i>Amalanchier arborea</i>				X	
Common Solomon's Seal	<i>Polygonatum biflorum</i>				X	
Common Speedwell	<i>Veronica officinalis</i>	X	X			
Common Wild Rose	<i>Rosa virginiana</i>	X	X			
Cow Vetch	<i>Vicia cracca</i>		X			
Crab Apples	<i>Malus spp.</i>	X				
Curly Dock	<i>Rumex crispus</i>	X				X
Dandelion	<i>Taraxacum spp.</i>		X	X	X	
Dwarf Raspberry	<i>Rubus pubescens</i>		X	X		



Eastern White Cedar	<i>Thuja occidentalis</i>				<b>X</b>	
False Lilly of the Valley	<i>Maianthemum dilatatum</i>				<b>X</b>	
Finely-Nerved Sedge	<i>Carex leptonevia</i>			<b>X</b>	<b>X</b>	
Fowl Manna Grass	<i>Glyceria striata</i>	<b>X</b>				
Fringed Bindweed	<i>Fallopia cilinodis</i>	<b>X</b>	<b>X</b>		<b>X</b>	
Fringed Sedge	<i>Carex crinita</i>			<b>X</b>	<b>X</b>	
Goldenrod spp	<i>Solidago spp</i>	<b>X</b>				<b>X</b>
Great Burdock	<i>Articum lappa</i>			<b>X</b>	<b>X</b>	
Greater Bladder Sedge	<i>Carex intumescens</i>				<b>X</b>	
Hairy Woodrush	<i>Luzula acuminata</i>	<b>X</b>				
Hedge Bindweed	<i>Calystegia sepium</i>				<b>X</b>	
Highbush Cranberry	<i>Viburnum trilobum</i>		<b>X</b>	<b>X</b>		
Indian Pipe	<i>Monotropa uniflora</i>				<b>X</b>	
Interrupted Fern	<i>Osmunda claytoniana</i>				<b>X</b>	
Ironwood	<i>Ostrya virginiana</i>					
Jack Pine	<i>Pinus banksiana</i>	<b>X</b>				<b>X</b>
Kentucky Blue Grass	<i>Poa pratensis</i>				<b>X</b>	
Large-leaved Aster	<i>Eurybia macrophylla</i>		<b>X</b>		<b>X</b>	
Large-leaved Avens	<i>Geum macrophyllum</i>				<b>X</b>	
Large-toothed Aspen	<i>Populus grandidentata</i>		<b>X</b>			
Lowbush Blueberry	<i>Vaccinium angustifolium</i>			<b>X</b>	<b>X</b>	
Marsh Violet	<i>Viola palustris</i>	<b>X</b>				
Meadow Buttercup	<i>Ranunculus acris</i>		<b>X</b>		<b>X</b>	
Mountain Woodsorrel	<i>Oxalis montana</i>		<b>X</b>		<b>X</b>	
Northern beech fern	<i>Phegopteris connectilis</i>			<b>X</b>	<b>X</b>	
Northern Bush Honeysuckle	<i>Diergilla lonicera</i>			<b>X</b>	<b>X</b>	<b>X</b>
Northern Oak Fern	<i>Gymnocarpium dryopteris</i>				<b>X</b>	
Orange Day-lily	<i>Hemerocallis fulva</i>				<b>X</b>	
Partridge Berry	<i>Mitchella repens</i>	<b>X</b>			<b>X</b>	
Pin Cherry	<i>Prunus pensylvanica</i>	<b>X</b>				<b>X</b>
Red Clover	<i>Trifolium pratense</i>				<b>X</b>	
Red Maple	<i>Acer rebrum</i>			<b>X</b>		



Red Pine	<i>Pinus resinosa</i>			X		
Red Spruce	<i>Picea rubens</i>	X			X	
Red-osier dogwood	<i>Cornus sericea</i>	X				X
Redtop Grass	<i>Agrostis gigantea</i>		X		X	
Rough Bedstraw	<i>Galium asprellum</i>				X	
Shinleaf	<i>Pyrola elliptica</i>	X				
Smooth Bedstraw	<i>Galium mollugo</i>		X	X	X	
Speckled Alder	<i>Alnus incana</i>			X	X	
Starflower	<i>Trientalis borealis</i>			X	X	
Striped Maple	<i>Acer pensylvanicum</i>				X	
Sugar Maple	<i>Acer saccharum</i>		X		X	
Tall Meadow Rue	<i>Thalictrum pubescens</i>	X	X	X		
Tamarack	<i>Larix laricina</i>		X	X		
Threeleaf Goldthread	<i>Coptis trifolia</i>			X	X	
Three-seeded sedge	<i>Carex trisperma</i>		X		X	
Trembling Aspen	<i>Populus tremuloides</i>				X	
Twinflower	<i>Linnaea borealis</i>	X		X	X	
Virginia Strawberry	<i>Fragaria virginiana</i>				X	
White Ash	<i>Fraxinus americana</i>				X	
White Baneberry	<i>Actaea pachypoda</i>	X	X		X	
White Birch	<i>Betula papyrifera</i>	X			X	
White Meadowsweet	<i>Spirea alba</i>	X		X		
White Pine	<i>Pinus strobus</i>	X	X	X		
White Spruce	<i>Picea glauca</i>				X	
White Turtlehead	<i>Chelone glabra</i>			X	X	
Wild Cucumber	<i>Echinocystis lobata</i>		X		X	
Wild Sarsparilla	<i>Aralia nudicaulis</i>		X	X	X	
Wood fern/s	<i>Dryopteris spp.</i>				X	
Woodland Horsetail	<i>Equisetum sylvaticum</i>				X	
Yellow Birch	<i>Betula alleghaniensis</i>	X				
Yellow Sweet Clover	<i>Mielilotus officinalis</i>				X	
Yellow Trout lily	<i>Erythronium americanum</i>		X	X	X	X







Veg1 – Southeast showing shrubs, herbaceous plants and coniferous regrowth.



Veg2 – Southwest showing hay field with shrubs and herbaceous plants



Veg3 – Westwards showing hay field with shrubs and herbaceous plants.



Veg4 – Southeast showing herbaceous plants and rows of Jack Pine plantation.



Veg5 – Northeast showing herbaceous plants and rows of Jack Pine Plantation.



Veg6 – Southwards showing herbaceous plants, hardwood regrowth and stumps from logging activities



Veg7 – Westwards showing herbaceous plants, deciduous regrowth and stumps from logging activities



Veg8 – Southwards showing cleared corridor for borehole testing.



## **Appendix D**

# **Wetland Delineation Data and Functional Assessment Forms**

Project Site **TA1985701** Date **Aug 19, 2019** Sample Point **UP1**  
 Applicant/Owner **Graymont** Field Investigator(s) **Garrett Bell & Lyle Vicaire**  
 County **Kings** Coordinates **N45d59m47.86s / E-65d50m70.0s**  
 PID **00169250** Do normal environmental conditions exist on-site? Yes  No

if no explain: \_\_\_\_\_  
 Atypical Situation? Yes  No  Explain \_\_\_\_\_  
 Is this a potential Problem Area? Yes  No  Explain \_\_\_\_\_

**Wetland Determination**  
 (Check One Only For Each Criteria)

Dominant Hydrophytic Vegetation (50/20 rule) \_\_\_\_\_ Yes  No   
 Wetland Hydrology \_\_\_\_\_ Yes  No   
 Hydric Soils \_\_\_\_\_ Yes  No   
 Wetland Type: \_\_\_\_\_  
 Rational for Determination: \_\_\_\_\_

**Wetland Determination**

YES  NO

**Vegetation**

Tree Stratum: (Plot size: <u>10m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Picea rubens</u>	<u>75</u>	<u>X</u>	<u>FACU</u>
2. <u>Populus tremuloides</u>	<u>75</u>	<u>X</u>	<u>FACU</u>
3. <u>Acer rubrum</u>	<u>50</u>	<u>X</u>	<u>FAC</u>
4. <u>Deollingeria umbellata</u>	<u>30</u>		<u>FACU</u>
5. <u>Geum macrophyllum</u>	<u>15</u>		<u>FACU</u>
<u>245</u> = Total Cover			

Shrub Stratum: (Plot size: <u>5m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Alnus incana</u>	<u>10</u>	<u>X</u>	<u>FACU</u>
2. <u>Solidago rugosa</u>	<u>5</u>	<u>X</u>	<u>FACU</u>
3. <u>Symphotrichum novi-belgii</u>	<u>10</u>	<u>X</u>	<u>FACU</u>
4. _____			
5. _____			
<u>25</u> = Total Cover			

Herb Stratum: (Plot size: <u>2m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Glyceria striata</u>	<u>10</u>		<u>FACW</u>
2. <u>Ribes lacustre</u>	<u>30</u>	<u>X</u>	<u>FACU</u>
3. <u>Rubus pubescens</u>	<u>10</u>		<u>FACU</u>
4. <u>Carex sp.</u>	<u>15</u>	<u>X</u>	<u>FAC</u>
5. <u>Gallium palustre</u>	<u>3</u>		<u>FACW</u>
<u>68</u> = Total Cover			

**Dominance Test Worksheet:**

Total # of Dominant Species 2  
 that are OBL,FACW,FAC: \_\_\_\_\_ (A)

Total # of Dominant Species across all strata: 8 (B)

% of Dominant Species that are OBL,FACW,FAC: 25 (A/B)

**Prevalence Index Worksheet:**

Total % Cover of: \_\_\_\_\_ Multiply by: \_\_\_\_\_

OBL Species	<u>0</u>	x1 =	_____
FACW Species	<u>13</u>	x2 =	<u>26</u>
FAC Species	<u>65</u>	x3 =	<u>195</u>
FACU Species	<u>260</u>	x4 =	<u>1040</u>
UPL Species	_____	x5 =	_____
Column Totals:	<u>338</u>	x1 =	<u>1261</u>

Prevalence Index = B/A = 3.7

**Hydrophytic Vegetation Indicators:**

\_\_\_ Rapid Test for Hydrophytic Vegetation  
 \_\_\_ Dominance Test is >50%  
 \_\_\_ Prevalence Index is ≤3.0<sup>1</sup>  
 \_\_\_ Morphological Adaptations<sup>1</sup> (explain)  
 \_\_\_ Problematic Hydrophytic Vegetation<sup>1</sup> (explain)

<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Hydrophytic Vegetation Present? Yes \_\_\_\_\_ No X

**Hydrology**

Primary Hydrological Indicators: (minimum of one is required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Water Stained Leaves (B9)
- Aquatic Fauna (B13)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron reduction in tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators: (minimum of two required)

- Surface Soil Cracks (B6)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes  No  Depth   
 Water Table Present? Yes  No  Depth   
 Saturation Present? Yes  No  Depth

Wetland Hydrology Present? Yes  No

Comments: \_\_\_\_\_

**Soil Profile**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth(cm)	Matrix		Redox Features				Texture	Remarks
	Color(moist)	%	Color(moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		
0-10	7.5YR 2.5/3	100					Grav./Sand	Stony
10-30	5YR 5/3	100					Grav./Sand	Stony

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 5cm Mucky Peat or Peat (S3)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Dark Surfaces (S7)
- Polyvalue Below Surface (S8)
- Thin Dark Surface (S9)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

Restrictive Layer (if observed): Type  Depth:

Hydric Soil Present? Yes  No

Comments: \_\_\_\_\_

Project Site **TA1985701** Date **Aug 20, 2019** Sample Point **WL2**  
 Applicant/Owner **Graymont** Field Investigator(s) **Garrett Bell & Lyle Vicaire**  
 County **Kings** Coordinates **N45d59m54.068s / E-65d50m49.943s**  
 PID **00169250** Do normal environmental conditions exist on-site? Yes  No

if no explain: \_\_\_\_\_  
 Atypical Situation? Yes  No  Explain \_\_\_\_\_  
 Is this a potential Problem Area? Yes  No  Explain \_\_\_\_\_

**Wetland Determination**  
 (Check One Only For Each Criteria)

Dominant Hydrophytic Vegetation ~~(50/20 rule)~~ Yes  No   
 Wetland Hydrology Yes  No   
 Hydric Soils Yes  No   
 Wetland Type: \_\_\_\_\_  
 Rational for Determination: \_\_\_\_\_

**Wetland Determination**

YES  NO

**Vegetation**

Tree Stratum: (Plot size: <u>10m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Acer rubrum</u>	<u>15</u>	<u>X</u>	<u>FAC</u>
2. <u>Abies balsamea</u>	<u>80</u>	<u>X</u>	<u>FAC</u>
3. <u>Thuja occidentalis</u>	<u>15</u>		<u>FACW</u>
4. <u>Picea glauca</u>	<u>20</u>		<u>FACU</u>
5. <u>Betula papyrifera</u>	<u>5</u>		<u>FACU</u>
<u>135 = Total Cover</u>			

Shrub Stratum: (Plot size: <u>5m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Betula alleghaniensis</u>	<u>5</u>	<u>X</u>	<u>FAC</u>
2. <u>Abies balsamea</u>	<u>10</u>	<u>X</u>	<u>FAC</u>
3. <u>Corylus cornuta</u>	<u>5</u>	<u>X</u>	<u>FACU</u>
4. _____			
5. _____			
<u>20 = Total Cover</u>			

Herb Stratum: (Plot size: <u>2m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Athyrium angustum</u>	<u>30</u>	<u>X</u>	<u>FAC</u>
2. <u>Avena fatua</u>	<u>3</u>		<u>FAC</u>
3. <u>Osmunda claytoniana</u>	<u>5</u>		<u>FAC</u>
4. <u>Acer rubrum (sapling)</u>	<u>3</u>		<u>FAC</u>
5. <u>Trientalis borealis</u>	<u>3</u>		<u>FAC</u>
<u>44 = Total Cover</u>			

**Dominance Test Worksheet:**

Total # of Dominant Species 5  
 that are OBL,FACW,FAC: \_\_\_\_\_ (A)

Total # of Dominant Species across all strata: 6 (B)

% of Dominant Species that are OBL,FACW,FAC: 83 (A/B)

**Prevalence Index Worksheet:**

Total % Cover of: \_\_\_\_\_ Multiply by: \_\_\_\_\_

OBL Species	<u>0</u>	x1 =	_____
FACW Species	<u>15</u>	x2 =	<u>30</u>
FAC Species	<u>154</u>	x3 =	<u>462</u>
FACU Species	<u>30</u>	x4 =	<u>120</u>
UPL Species	_____	x5 =	_____
Column Totals:	<u>199</u>	x1 =	<u>612</u>

Prevalence Index = B/A = 3.08

**Hydrophytic Vegetation Indicators:**

\_\_\_\_ Rapid Test for Hydrophytic Vegetation  
 Dominance Test is >50%  
 Prevalence Index is ≤3.0<sup>1</sup>  
 \_\_\_\_ Morphological Adaptations<sup>1</sup> (explain)  
 \_\_\_\_ Problematic Hydrophytic Vegetation<sup>1</sup> (explain)  
<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Hydrophytic Vegetation Present? Yes \_\_\_\_\_ No X



**Hydrology**

Primary Hydrological Indicators: (minimum of one is required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Water Stained Leaves (B9)
- Aquatic Fauna (B13)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron reduction in tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators: (minimum of two required)

- Surface Soil Cracks (B6)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes  No  Depth   
 Water Table Present? Yes  No  Depth   
 Saturation Present? Yes  No  Depth

Wetland Hydrology Present? Yes  No

Comments: \_\_\_\_\_

**Soil Profile**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth(cm)	Matrix		Redox Features				Texture	Remarks
	Color(moist)	%	Color(moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		
0-2	5YR 3/2	100					SL	
2-8	5YR 4/2	100					SL	
8-30	5YR 4/4	100					SL	

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 5cm Mucky Peat or Peat (S3)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Dark Surfaces (S7)
- Polyvalue Below Surface (S8)
- Thin Dark Surface (S9)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

Restrictive Layer (if observed): Type  Depth

Hydric Soil Present? Yes  No

Comments: \_\_\_\_\_

Project Site **TA1985701** Date **Aug 19, 2019** Sample Point **WL1**  
 Applicant/Owner **Graymont** Field Investigator(s) **Garrett Bell & Lyle Vicaire**  
 County **Kings** Coordinates **N45d59m47.18s / E-65d50m70.0s**  
 PID **00169250** Do normal environmental conditions exist on-site? Yes  No

if no explain: \_\_\_\_\_  
 Atypical Situation? Yes  No  Explain \_\_\_\_\_  
 Is this a potential Problem Area? Yes  No  Explain \_\_\_\_\_

**Wetland Determination**  
 (Check One Only For Each Criteria)

Dominant Hydrophytic Vegetation (50/20 rule) \_\_\_\_\_ Yes  No   
 Wetland Hydrology \_\_\_\_\_ Yes  No   
 Hydric Soils \_\_\_\_\_ Yes  No

Wetland Type: **Shrub Swamp**  
 Rational for Determination: **All wetland criteria present**

**Wetland Determination**

YES  NO

*Alnus incana*

**Vegetation**

Tree Stratum: (Plot size: <u>10m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Picea rubens</u>	<u>10</u>	<u>X</u>	<u>FACU</u>
2. <u>Populus tremuloides</u>	<u>10</u>	<u>X</u>	<u>FACU</u>
3. <u>Acer rubrum</u>	<u>5</u>	<u>X</u>	<u>FAC</u>
4. _____	_____	_____	_____
5. _____	_____	_____	_____
	<u>25</u>	<b>= Total Cover</b>	

Shrub Stratum: (Plot size: <u>5m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Alnus incana</u>	<u>60</u>	<u>X</u>	<u>FACW</u>
2. <u>Solidago rugosa</u>	<u>40</u>	<u>X</u>	<u>FAC</u>
3. <u>Symphotrichum novi-belgii</u>	<u>5</u>	_____	<u>FACW</u>
4. <u>Deollingeria umbellata</u>	<u>5</u>	_____	<u>FACW</u>
5. <u>Geum macrophyllum</u>	<u>20</u>	_____	<u>FACW</u>
	<u>130</u>	<b>= Total Cover</b>	

Herb Stratum: (Plot size: <u>2m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Glyceria striata</u>	<u>55</u>	<u>X</u>	<u>FACW</u>
2. <u>Ribes lacustre</u>	<u>5</u>	_____	<u>FACW</u>
3. <u>Rubus pubescens</u>	<u>70</u>	<u>X</u>	<u>FACW</u>
4. <u>Carex sp.</u>	<u>5</u>	_____	<u>FACW</u>
5. <u>Gallium palustre</u>	<u>15</u>	_____	<u>FACW</u>
	<u>150</u>	<b>= Total Cover</b>	

Comments \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Dominance Test Worksheet:**

Total # of Dominant Species 5  
 that are OBL,FACW,FAC: \_\_\_\_\_ (A)

Total # of Dominant Species across all strata: 7 (B)

% of Dominant Species that are OBL,FACW,FAC: 71 (A/B)

**Prevalence Index Worksheet:**

Total % Cover of:	Multiply by:
OBL Species <u>0</u>	x1 = _____
FACW Species <u>240</u>	x2 = <u>480</u>
FAC Species <u>40</u>	x3 = <u>120</u>
FACU Species <u>25</u>	x4 = <u>100</u>
UPL Species _____	x5 = _____
Column Totals: <u>305</u>	x1 = <u>700</u>

Prevalence Index = B/A = 2.29

**Hydrophytic Vegetation Indicators:**

\_\_\_\_ Rapid Test for Hydrophytic Vegetation  
 Dominance Test is >50%  
 Prevalence Index is ≤3.0<sup>1</sup>  
 \_\_\_\_ Morphological Adaptations<sup>1</sup> (explain)  
 \_\_\_\_ Problematic Hydrophytic Vegetation<sup>1</sup> (explain)  
<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic Vegetation Present? Yes  No \_\_\_\_\_

**Hydrology**

*Primary Hydrological Indicators: (minimum of one is required; check all that apply)*

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Water Stained Leaves (B9)
- Aquatic Fauna (B13)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron reduction in tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

*Secondary Indicators: (minimum of two required)*

- Surface Soil Cracks (B6)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- FAC-Neutral Test (D5)

**Field Observations:**

Surface Water Present? Yes  No  Depth   
 Water Table Present? Yes  No  Depth   
 Saturation Present? Yes  No  Depth 0.0

Wetland Hydrology Present? Yes  No

Comments: \_\_\_\_\_

**Soil Profile**

**Profile Description:** (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth(cm)	Matrix		Redox Features				Texture Sil/C	Remarks
	Color(moist)	%	Color(moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		
0-30	7.5YR 3.5/2	100						Stony

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix

**Hydric Soil Indicators:**

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 5cm Mucky Peat or Peat (S3)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Dark Surfaces (S7)
- Polyvalue Below Surface (S8)
- Thin Dark Surface (S9)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

Restrictive Layer (if observed): Type \_\_\_\_\_ Depth: \_\_\_\_\_

Hydric Soil Present? Yes  No

Comments: \_\_\_\_\_

Project Site **TA1985701** Date **Aug 20, 2019** Sample Point **WL2**  
 Applicant/Owner **Graymont** Field Investigator(s) **Garrett Bell & Lyle Vicaire**  
 County **Kings** Coordinates **N45d59m54.299s / E-65d21m50.532s**  
 PID **00169250** Do normal environmental conditions exist on-site? Yes  No

if no explain: \_\_\_\_\_  
 Atypical Situation? Yes  No  Explain \_\_\_\_\_  
 Is this a potential Problem Area? Yes  No  Explain \_\_\_\_\_

**Wetland Determination**  
 (Check One Only For Each Criteria)

Dominant Hydrophytic Vegetation (50/20 rule) \_\_\_\_\_ Yes  No   
 Wetland Hydrology \_\_\_\_\_ Yes  No   
 Hydric Soils \_\_\_\_\_ Yes  No

Wetland Type: **Wooded Swamp**  
 Rational for Determination: **All wetland criteria present**

**Wetland Determination**

YES  NO

**Vegetation**

Tree Stratum: (Plot size: <u>10m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Thuja occidentalis</u>	<u>80</u>	<u>X</u>	<u>FACW</u>
2. <u>Abies balsamea</u>	<u>15</u>		<u>FAC</u>
3. <u>Picea glauca</u>	<u>5</u>		<u>FACU</u>
4. <u>Betula papyrifera</u>	<u>5</u>		<u>FACU</u>
5. _____			
<u>105</u> = Total Cover			

Shrub Stratum: (Plot size: <u>5m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Ribes lacustre</u>	<u>10</u>	<u>X</u>	<u>FACW</u>
2. <u>Alnus incana</u>	<u>10</u>	<u>X</u>	<u>FACW</u>
3. <u>Rubus idaeus</u>	<u>5</u>	<u>X</u>	<u>FACU</u>
4. _____			
5. _____			
<u>25</u> = Total Cover			

Herb Stratum: (Plot size: <u>2m</u> )	%Cover	Dominant Species	Indicator Status
1. <u>Onoclea sensibilis</u>	<u>40</u>	<u>X</u>	<u>FACW</u>
2. <u>Dryopteris carthusiana</u>	<u>60</u>	<u>X</u>	<u>FACW</u>
3. <u>Matteuccia struthiopteris</u>	<u>10</u>		<u>FACW</u>
4. <u>Glyceria striata</u>	<u>5</u>		<u>FACW</u>
5. <u>Rubus pubescens</u>	<u>50</u>	<u>X</u>	<u>FACW</u>
<u>165</u> = Total Cover			

**Dominance Test Worksheet:**

Total # of Dominant Species 6  
 that are OBL,FACW,FAC: \_\_\_\_\_ (A)

Total # of Dominant Species across all strata: 7 (B)

% of Dominant Species that are OBL,FACW,FAC: 86 (A/B)

**Prevalence Index Worksheet:**

Total % Cover of: \_\_\_\_\_ Multiply by: \_\_\_\_\_

OBL Species	<u>0</u>	x1 =	
FACW Species	<u>255</u>	x2 =	<u>510</u>
FAC Species	<u>25</u>	x3 =	<u>75</u>
FACU Species	<u>15</u>	x4 =	<u>100</u>
UPL Species		x5 =	
Column Totals:	<u>295</u>	x1 =	<u>685</u>

Prevalence Index = B/A = 2.32

**Hydrophytic Vegetation Indicators:**

\_\_\_\_ Rapid Test for Hydrophytic Vegetation

Dominance Test is >50%

Prevalence Index is ≤3.0<sup>1</sup>

\_\_\_\_ Morphological Adaptations<sup>1</sup> (explain)

\_\_\_\_ Problematic Hydrophytic Vegetation<sup>1</sup> (explain)

<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Comments \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Hydrophytic Vegetation Present? Yes  No \_\_\_\_\_

**Hydrology**

Primary Hydrological Indicators: (minimum of one is required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Water Stained Leaves (B9)
- Aquatic Fauna (B13)
- Marl Deposits (B15)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron reduction in tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators: (minimum of two required)

- Surface Soil Cracks (B6)
- Drainage Patterns (B10)
- Moss Trim Lines (B16)
- Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- Microtopographic Relief (D4)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes  No  Depth 1.0  
 Water Table Present? Yes  No  Depth       
 Saturation Present? Yes  No  Depth 0.0

Wetland Hydrology Present? Yes  No

Comments: \_\_\_\_\_

**Soil Profile**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators)

Depth(cm)	Matrix		Redox Features				Texture	Remarks
	Color(moist)	%	Color(moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		
0-30	2.5Y 3/1	80					Loam	oxidized rhizospheres (20%)

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- 5cm Mucky Peat or Peat (S3)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Dark Surfaces (S7)
- Polyvalue Below Surface (S8)
- Thin Dark Surface (S9)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

Restrictive Layer (if observed): Type \_\_\_\_\_ Depth: \_\_\_\_\_

Hydric Soil Present? Yes  No

Comments: Saturated soil

# Wetland Habitat Form WL1

Name of Investigator: Garrett Bell & Lyle Vicaire  
Date: August 19, 2019  
Wetland Form: Shrub Swamp  
Wetland size: ~1.0 ha  
Associated Watercourse: Tributary to Ridge Brook  
Weather: Variable clouds, warm, following 24h rain

Topographic Sheet: 21 H/14  
General Location: Havelock, NB  
County: Kings  
PID No.: 00169250  
Project No.: TA1985701  
Client: Graymont

## Wetland Type:

- |  |   |
|--|---|
| 1. Aquatic bed/unconsolidated bottom (AB) <input type="checkbox"/> | 4. Emergent wetland (EW) <input type="checkbox"/>         |
| 2. Bog (BO) <input type="checkbox"/>                               | 5. Shrub wetland (SB) <input checked="" type="checkbox"/> |
| 3. Fen (FE) <input type="checkbox"/>                               | 6. Forested wetland (FW) <input type="checkbox"/>         |

## Wetland Class:

- |  |  |
|--|--|
| 1. Open water <input type="checkbox"/>               | 5. Meadow <input type="checkbox"/>                 |
| 2. Deep marsh <input type="checkbox"/>               | 6. Shrub swamp <input checked="" type="checkbox"/> |
| 3. Shallow marsh <input type="checkbox"/>            | 7. Wooded swamp <input type="checkbox"/>           |
| 4. Seasonally flooded flats <input type="checkbox"/> | 8. Bog <input type="checkbox"/>                    |

## Wetland Subclass:

- |  |  |
|--|--|
| 1. Vegetated open water <input type="checkbox"/>       | 19. Floating leaved SM <input type="checkbox"/>                |
| 2. Non-vegetated OW <input type="checkbox"/>           | 20. Rooted floating leaved SM <input type="checkbox"/>         |
| 3. Floating leaved OW <input type="checkbox"/>         | 21. Non-vegetated SM <input type="checkbox"/>                  |
| 4. Rooted floating leaved OW <input type="checkbox"/>  | 22. Emergent seasonally flooded flats <input type="checkbox"/> |
| 5. Dead woody OW <input type="checkbox"/>              | 23. Shrubby SFF <input type="checkbox"/>                       |
| 6. Vegetated deep marsh <input type="checkbox"/>       | 24. Grazed meadow <input type="checkbox"/>                     |
| 7. Non-vegetated DM <input type="checkbox"/>           | 25. Ungrazed M <input type="checkbox"/>                        |
| 8. Dead woody DM <input type="checkbox"/>              | 26. Sedge M <input type="checkbox"/>                           |
| 9. Sub-shrub DM <input type="checkbox"/>               | 27. Sapling shrub swamp <input type="checkbox"/>               |
| 10. Floating leaved DM <input type="checkbox"/>        | 28. Bushy SS <input checked="" type="checkbox"/>               |
| 11. Rooted floating leaved DM <input type="checkbox"/> | 29. Compact SS <input type="checkbox"/>                        |
| 12. Robust DM <input type="checkbox"/>                 | 30. Low sparse SS <input type="checkbox"/>                     |
| 13. Narrow-leaved DM <input type="checkbox"/>          | 31. Deciduous wooded swamp <input type="checkbox"/>            |
| 14. Broad-leaved DM <input type="checkbox"/>           | 32. Evergreen WS <input type="checkbox"/>                      |
| 15. Dead woody shallow marsh <input type="checkbox"/>  | 33. Wooded bog <input type="checkbox"/>                        |
| 16. Robust SM <input type="checkbox"/>                 | 34. Shrubby B <input type="checkbox"/>                         |
| 17. Narrow leaved SM <input type="checkbox"/>          | 35. Open B <input type="checkbox"/>                            |
| 18. Broad leaved SM <input type="checkbox"/>           |  |

## Water Regime Indicator:

- |   |   |
|---|---|
| 1. Permanently flooded <input type="checkbox"/> | 3. Seasonally flooded <input checked="" type="checkbox"/> |
| 2. Saturated <input type="checkbox"/>           |   |

## Water Depth:

- |   |                                       |
|---|---------------------------------------|
| 1. 0-5 cm <input checked="" type="checkbox"/> | 4. 50-100 cm <input type="checkbox"/> |
| 2. 5-20 cm <input type="checkbox"/>           | 5. >100 cm <input type="checkbox"/>   |
| 3. 20-50 cm <input type="checkbox"/>          |                                       |

Impoundment Type

1. Beaver Pond  3. Ducks Unlimited Impoundment   
 2. Man-made Impoundment  4. None of the above

Percent Vegetation Cover:

1. >95%  5. 26-75% in patches   
 2. 76-95% in peripheral band  6. 5-25% in peripheral band   
 3. 76-96% in patches  7. 5-25% in patches   
 4. 26-75% in peripheral band  8. < 5%

Wetland Site:

1. Lacustrine  4. Isolated   
 2. Riverine  5. Deltaic   
 3. Palustrine

Vegetation Types (%):

1. Deciduous trees 5% trembling aspen, red maple, ironwood, striped maple  
 2. Coniferous trees 5% white spruce, balsam fir,  
 3. Dead trees 5%  
 4. Tall shrubs 80% speckled alder, round-leaf dogwood, chokecherry  
 5. Low shrubs 20% meadow-sweet  
 6. Dead shrubs  
 7. Herbs 95% yellow avens, Carex intumescens, C. crinita, turtle-head,  
 8. Mosses  
 9. Narrow-leaved emergents 50% fowl manna grass, blue joint grass  
 10. Broad-leaved emergents  
 11. Robust emergents  
 12. Free-floating plants  
 13. Floating plants (rooted)  
 14. Submerged plants  
 15. Other

Interspersion: 1. Minimal  2. Low  3. Medium  4. High

Water Quality

Conductivity: N/A pH: N/A  
 Alkalinity: N/A

Hydrological Classification:

1. Surface water depression  3. Surface water slope   
 2. Ground water depression  4. Ground water slope

Inlets/Outlets/water bodies:

One inlet (culvert) and outlet associated with a seasonal intermittent unnamed tributary to Ridge Brook.

Wildlife: (Observation/Signs/Reports)

Small rodent (grey short tail), eastern wood pee-wee, red-eyed vireo, robins, signs of ungulate browsing.

Adjacent Wildlife habitat (%):

- |                                    |              |
|------------------------------------|--------------|
| 1.Salt marsh ___                   | 5.Beach ___  |
| 2.Forest <u>100</u> (mixed forest) | 6.River ___  |
| 3.Dykelands ___                    | 7. Other ___ |
| 4.Mudflats ___                     |              |

Description: Mature mixed forest including white birch, yellow birch, red maple, sugar maple, trembling aspen, red spruce, eastern cedar and balsam fir.

Surrounding Land Use %:

- |                           |                           |
|---------------------------|---------------------------|
| 1 Agriculture ___         | 7.Residential ___         |
| 2.Forestry <u>95</u>      | 8.Waste Disposal ___      |
| 3 Recreation ___          | 9.Scientific Research ___ |
| 4.Industrial ___          | 10.Trapping ___           |
| 5.Urban development ___   | 11.Education ___          |
| 6.Transportation <u>5</u> | 12.Seasonal resident ___  |

Description: The wetland likely represents a seasonal floodplain of the intermittent stream.

Disturbance: 1.Low X 2.Moderate \_\_\_ 3.High \_\_\_

Description: Sedimentation noted at culvert in road.

Roads and/or tracks:

- |                              |                       |
|------------------------------|-----------------------|
| 1.Private road adjacent ___  | 4.DOT road within ___ |
| 2.DOT road adjacent <u>X</u> | 5.Vehicle tracks ___  |
| 3.Private road within ___    | 6.Other ___           |

Description: Unpaved "Cross Road" runs across the northwest corner of the wetland at the watercourse crossing.

Existing Uses of Wetlands:

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| 1.Economic use (e.g. farming) ___ | 4.Education & public awareness ___ |
| 2.Recreational activities ___     | 5. None evident <u>X</u>           |
| 3.Aesthetics ___                  |                                    |

Potential Threats:

Special Features:

- |                                    |   |
|------------------------------------|---|
| 1.Rare wetland type ___            | 4.Nesting site for colonial water birds ___ |
| 2.Rare animal or plant species ___ | 5.Migration stop-over site ___              |
| 3.Habitat of rare species ___      | 6. None evident <u>X</u>                    |

Description:

Notes: Stone piles along edge indicate likely historical agriculture including alder on old field to the north.



1



2



3



4



5



6



Photo 1 – Typical shrub swamp habitat, consisting mainly of alders. Photo 2 – Small intermittent seasonal watercourse in wetland. Photo's 3,4 – Adjacent upland soil pit and mixed forest habitat. Photo's 5,6 – Wetland soil pit and typical habitat.

## Wetland Habitat Form WL2

Name of Investigator: Garrett Bell & Lyle Vicaire  
Date: August 20, 2019  
Wetland Form: Drainageway (Slope) Swamp  
Wetland size: 1.242 ha  
Associated Watercourse: Tributary to Ridge Brook  
Weather: Variable clouds, warm, following 24h rain

Topographic Sheet: 21 H/14  
General Location: Havelock, NB  
County: Kings  
PID No.: 00169250  
Project No.: TA1985701  
Client: Graymont

### Wetland Type:

- |  |  |
|--|--|
| 1. Aquatic bed/unconsolidated bottom (AB) <input type="checkbox"/> | 4. Emergent wetland (EW) <input type="checkbox"/>            |
| 2. Bog (BO) <input type="checkbox"/>                               | 5. Shrub wetland (SB) <input type="checkbox"/>               |
| 3. Fen (FE) <input type="checkbox"/>                               | 6. Forested wetland (FW) <input checked="" type="checkbox"/> |

### Wetland Class:

- |  |   |
|--|---|
| 1. Open water <input type="checkbox"/>               | 5. Meadow <input type="checkbox"/>                  |
| 2. Deep marsh <input type="checkbox"/>               | 6. Shrub swamp <input type="checkbox"/>             |
| 3. Shallow marsh <input type="checkbox"/>            | 7. Wooded swamp <input checked="" type="checkbox"/> |
| 4. Seasonally flooded flats <input type="checkbox"/> | 8. Bog <input type="checkbox"/>                     |

### Wetland Subclass:

- |  |  |
|--|--|
| 1. Vegetated open water <input type="checkbox"/>       | 19. Floating leaved SM <input type="checkbox"/>                |
| 2. Non-vegetated OW <input type="checkbox"/>           | 20. Rooted floating leaved SM <input type="checkbox"/>         |
| 3. Floating leaved OW <input type="checkbox"/>         | 21. Non-vegetated SM <input type="checkbox"/>                  |
| 4. Rooted floating leaved OW <input type="checkbox"/>  | 22. Emergent seasonally flooded flats <input type="checkbox"/> |
| 5. Dead woody OW <input type="checkbox"/>              | 23. Shrubby SFF <input type="checkbox"/>                       |
| 6. Vegetated deep marsh <input type="checkbox"/>       | 24. Grazed meadow <input type="checkbox"/>                     |
| 7. Non-vegetated DM <input type="checkbox"/>           | 25. Ungrazed M <input type="checkbox"/>                        |
| 8. Dead woody DM <input type="checkbox"/>              | 26. Sedge M <input type="checkbox"/>                           |
| 9. Sub-shrub DM <input type="checkbox"/>               | 27. Sapling shrub swamp <input type="checkbox"/>               |
| 10. Floating leaved DM <input type="checkbox"/>        | 28. Bushy SS <input checked="" type="checkbox"/>               |
| 11. Rooted floating leaved DM <input type="checkbox"/> | 29. Compact SS <input type="checkbox"/>                        |
| 12. Robust DM <input type="checkbox"/>                 | 30. Low sparse SS <input type="checkbox"/>                     |
| 13. Narrow-leaved DM <input type="checkbox"/>          | 31. Deciduous wooded swamp <input type="checkbox"/>            |
| 14. Broad-leaved DM <input type="checkbox"/>           | 32. Evergreen WS <input checked="" type="checkbox"/> (cedar)   |
| 15. Dead woody shallow marsh <input type="checkbox"/>  | 33. Wooded bog <input type="checkbox"/>                        |
| 16. Robust SM <input type="checkbox"/>                 | 34. Shrubby B <input type="checkbox"/>                         |
| 17. Narrow leaved SM <input type="checkbox"/>          | 35. Open B <input type="checkbox"/>                            |
| 18. Broad leaved SM <input type="checkbox"/>           |  |

### Water Regime Indicator:

- |   |   |
|---|---|
| 1. Permanently flooded <input type="checkbox"/> | 3. Seasonally flooded <input checked="" type="checkbox"/> |
| 2. Saturated <input type="checkbox"/>           |   |

### Water Depth:

- |   |                                       |
|---|---------------------------------------|
| 1. 0-5 cm <input checked="" type="checkbox"/> | 4. 50-100 cm <input type="checkbox"/> |
| 2. 5-20 cm <input type="checkbox"/>           | 5. >100 cm <input type="checkbox"/>   |
| 3. 20-50 cm <input type="checkbox"/>          |                                       |

Impoundment Type

1. Beaver Pond  3. Ducks Unlimited Impoundment   
 2. Man-made Impoundment  4. None of the above

Percent Vegetation Cover:

1. >95%  5. 26-75% in patches   
 2. 76-95% in peripheral band  6. 5-25% in peripheral band   
 3. 76-96% in patches  7. 5-25% in patches   
 4. 26-75% in peripheral band  8. < 5%

Wetland Site:

1. Lacustrine  4. Isolated   
 2. Riverine  5. Deltaic   
 3. Palustrine

Vegetation Types (%):

1. Deciduous trees 35% red maple, white birch, yellow birch  
 2. Coniferous trees 65% eastern cedar, white spruce, balsam fir, red spruce  
 3. Dead trees 10%  
 4. Tall shrubs 40% speckled alder, willow sp., chokecherry  
 5. Low shrubs  
 6. Dead shrubs  
 7. Herbs 90% sensitive fern, dwarf raspberry, ostrich fern, yellow avens, Carex trisperma  
 8. Mosses 10% sphagnum  
 9. Narrow-leaved emergents  
 10. Broad-leaved emergents  
 11. Robust emergents  
 12. Free-floating plants  
 13. Floating plants (rooted)  
 14. Submerged plants  
 15. Other

Interspersion: 1. Minimal  2. Low  3. Medium  4. High

Water Quality

Conductivity: N/A pH: N/A  
 Alkalinity: N/A

Hydrological Classification:

1. Surface water depression  3. Surface water slope   
 2. Ground water depression  4. Ground water slope

Inlets/Outlets/water bodies:

No inlet and multiple small braided tributaries draining to an unnamed tributary to Ridge Brook.

Wildlife: (Observation/Signs/Reports)

Green frog, squirrel, field mice, deer tracks, abundant signs of ungulate browsing and bedding, porcupine tracks, yellow-belly sap-sucker, red-breast nuthatch, red-eyed vireo, robins, small fish (likely dace & suckers).

Adjacent Wildlife habitat (%):

- |                                    |              |
|------------------------------------|--------------|
| 1.Salt marsh ___                   | 5.Beach ___  |
| 2.Forest <u>100</u> (mixed forest) | 6.River ___  |
| 3.Dykelands ___                    | 7. Other ___ |
| 4.Mudflats ___                     |              |

Description: Mature mixed forest including white birch, yellow birch, red maple, sugar maple, trembling aspen, red spruce, eastern cedar and balsam fir.

Surrounding Land Use %:

- |                         |                           |
|-------------------------|---------------------------|
| 1 Agriculture ___       | 7.Residential ___         |
| 2.Forestry <u>100</u>   | 8.Waste Disposal ___      |
| 3 Recreation ___        | 9.Scientific Research ___ |
| 4.Industrial ___        | 10.Trapping ___           |
| 5.Urban development ___ | 11.Education ___          |
| 6.Transportation ___    | 12.Seasonal resident ___  |

Description: Signs of selective harvesting throughout the property

Disturbance: 1.Low X 2.Moderate \_\_\_ 3.High \_\_\_

Description: Past low-impact timber harvesting (singular trees).

Roads and/or tracks:

- |                             |                       |
|-----------------------------|-----------------------|
| 1.Private road adjacent ___ | 4.DOT road within ___ |
| 2.DOT road adjacent ___     | 5.Vehicle tracks ___  |
| 3.Private road within ___   | 6.Other ___           |

Description:

Existing Uses of Wetlands:

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| 1.Economic use (e.g. farming) ___ | 4.Education & public awareness ___ |
| 2.Recreational activities ___     | 5. None evident <u>X</u>           |
| 3.Aesthetics ___                  |                                    |

Potential Threats:

Special Features:

- |                                    |   |
|------------------------------------|---|
| 1.Rare wetland type ___            | 4.Nesting site for colonial water birds ___ |
| 2.Rare animal or plant species ___ | 5.Migration stop-over site ___              |
| 3.Habitat of rare species ___      | 6. None evident <u>X</u>                    |

Description:

Notes: Stone piles along edge indicate likely historical agriculture including alder on old field to the north.

1



2



3



4



5







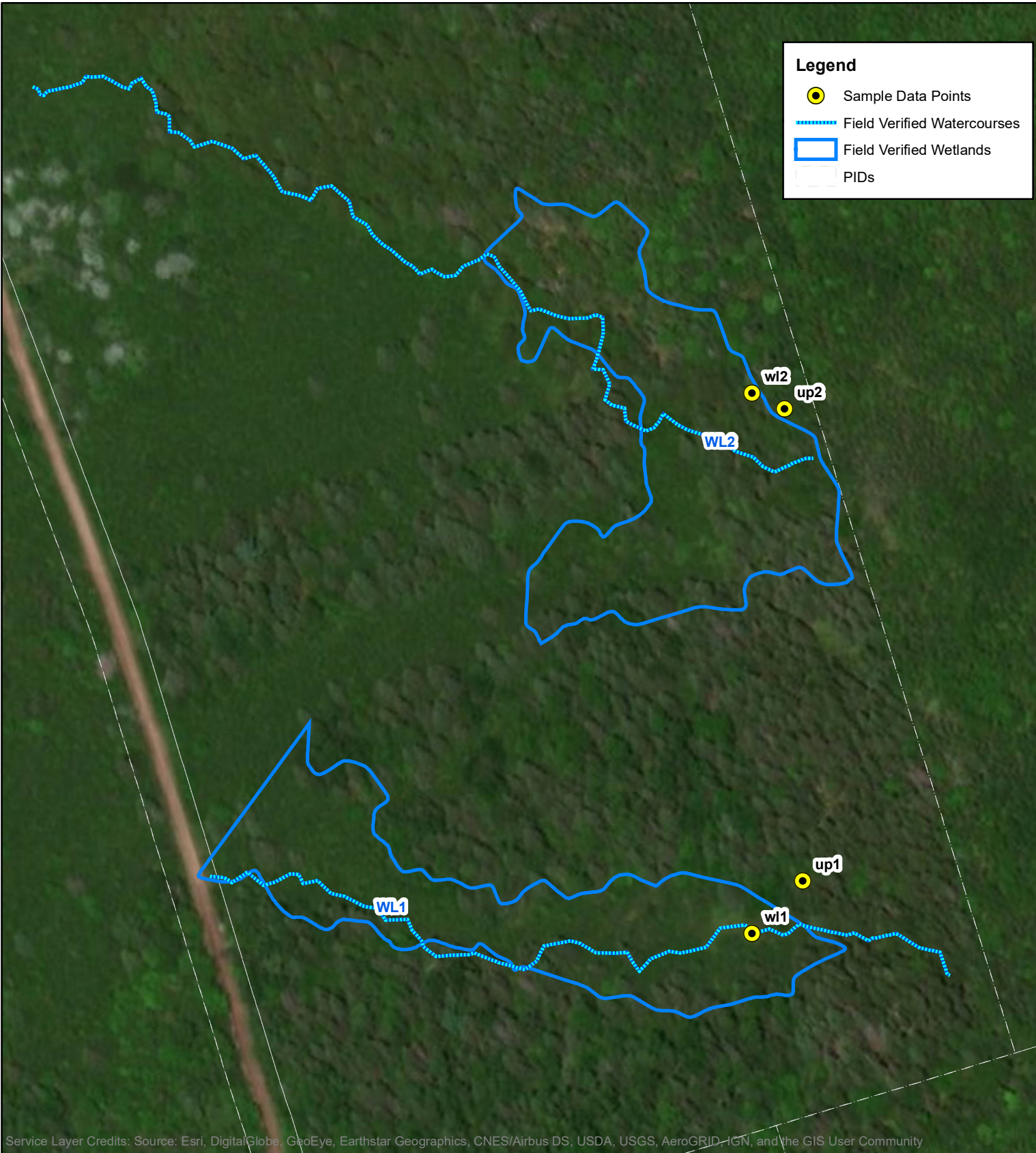
6



Photo 1 – Typical forest swamp habitat, consisting mainly of cedar. Photo 2 – Small intermittent watercourse in wetland. Photo's 3,4 – Adjacent upland soil pit and mixed forest habitat. Photo's 5,6 – Wetland soil pit and typical habitat.

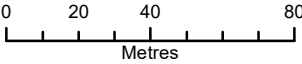

**Legend**

-  Sample Data Points
-  Field Verified Watercourses
-  Field Verified Wetlands
-  PIDs



Path: H:\PROJECTS\TA1985701\_Graymont\_SpringhillQuarry\MXD\CURRENT\2019\004\_TA1985701\_Graymont\_WetlandDelineation\_Figured\_1.mxd User: suzanne.monette Date: 10/4/2019

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

<b>CLIENT:</b>  <b>Graymont (NB) Inc.</b>	<b>SCALE:</b> 	<b>PROJECT:</b>  <b>Springhill Limestone Quarry Springhill, New Brunswick</b>	<b>DWN BY:</b> SM
	<b>DATUM:</b> NAD 83 CSRS		<b>CHK'D BY:</b> GB
	<b>PROJECTION:</b> NB Stereographic	<b>TITLE:</b>  <b>Wetland Delineation</b>	<b>DATE:</b> Date: 10/4/2019
	<b>PROJECT NO:</b> TA1985701		<b>REV. NO:</b> 1
			<b>FIGURE NO:</b> D-1

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**wood.**

## **Appendix E**

### **Aquatic Habitat Forms and Site Photos**

**DNR&E / DFO - NEW BRUNSWICK  
STREAM SURVEY and HABITAT ASSESSMENT**

Unnamed trib to Ridge Brook  
Date: 04-Sep-19  
Personnel: B. Moore / L. Vicaire

Stream/River No. \_\_\_\_\_  
Stream Order No. 1

Unit No.	Stream Type	Channel Type	Chainage End	Length (m)	Ave Width (m)		Substrate (%)							Area Depth - Wet Width (cm)	Undercut Bank 0-50%			Over-Hanging Bank Vegetation 0-50%			Large Woody Debris In-Stream (m)	Embedded (Criteria)	In-Stream Vegetation	Comments
					Wet	Bank Channelled	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines		L	R	L	R	L	R				
1	N/A	1	55.0	55.0	0.3	1.2	0	0	0	5	0	0	15	80	5	0	0	30	30	0.0	4		Not enough water to determine flow type	
2	3	1	201.0	146.0	1.2	1.4	0	0	10	65	20	5	0	0	5	5	20	20	0.0	2		Flow type presumed based on substrate		
3	8	1	448.0	247.0	0.4	0.7	0	0	5	0	40	50	5	0	5	5	25	25	0.0	4		Flow type presumed based on substrate		
																						Upstream		
																							45.99957 / 65.36777	
																							Downstream	
																							45.99817 / 65.36370	

\*For different left and right parameters, values are to be written as L/R.



River: Unnamed trib to Ridge Brook

Valley Bank Slope Height L/H (%)	Flood Plain Width (m)	Stream Banks						Erosion (%)	pH	Water Temperature (°C)	Fish Species	Pool Rating			Pool Tail			Turbulence (%)			
		Vegetation (%)		Left Bank (0-50%)		Right Bank (0-50%)						No.	Letfor	Embedded (Checklist)	Mean Substrate Size (cm)	Fines (%)					
		Bare	Grasses	Shrubs	Trees	Stable	Eroding										Bare		Stable	Eroding	
L 0.3	40	75	0	55	10	35	50	0	0	0	0	50	0	0							
L 0.2	40	60	0	10	25	65	40	0	10	40	0	10	40	0	10						
L 0.2	60	75	0	10	20	70	40	0	10	40	0	10	40	0	10						

NOTE: For selected site study, these columns (reverse side) should be done for a habitat assessment

LENGTH (m)	DROP (m)	RIFLE GRADIENT		UNIT No.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)		AVERAGE DEPTH (m) / 4		COEFFICIENT (P.B. - smooth) (P.B. - rough)	LENGTH (m)	FLOAT TIME (sec)									
		GRADIENT %	GRADIENT				1/4 very	1/2 very	3/4 very	AVERAGE			FLOW (cms)									
							1/4 very	1/2 very	3/4 very													

Formula (C/S) \* W... (C/S) A... (C/S) B... (C/S) C... (C/S) D... (C/S) E... (C/S) F... (C/S) G... (C/S) H... (C/S) I... (C/S) J... (C/S) K... (C/S) L... (C/S) M... (C/S) N... (C/S) O... (C/S) P... (C/S) Q... (C/S) R... (C/S) S... (C/S) T... (C/S) U... (C/S) V... (C/S) W... (C/S) X... (C/S) Y... (C/S) Z... (C/S)

CRITERIA

1. Choke water depth used to estimate stream channel width  
 2. Bare GRBS - % of bare ground in stream channel  
 3. Bare channels - based on a separate stream type

4. Underbank Bars - % of bank remaining below water table for stream type  
 5. Overbanking Bank Vegetation - % of vegetation remaining for stream type  
 6. Visual Entrenchment - % of bank or bars surrounding the larger substrate, up to 100%  
 7. Woody Debris - total width should be > 10 cm in diameter

\*For different left and right parameters, values are to be written as L/R.

Adobe form developed by Alison Johnson @ AMEC Frederickson

**STREAM SURVEY and HABITAT ASSESSMENT**

River: Unnamed trib to Ridge Brook

Date: 04-Sep-19

Personnel: B. Moore / L. Vicarie

Start Point: Cross Road

End Point: Property edge

Stream/River No. 1  
Stream Order No.

Unit No.	Stream Type	Channel Type	Channel End	Length (m)	Ave Width (m)		Substrate (%)								Ave Depth - Wet Width (cm)	Undercut Bank 0-50%			Over-Hanging Bank Vegetation 0-50%			Large Woody Debris In-Stream (m)	Embedded (Criteria)	In-Stream Vegetation	Comments
					Wet	Bank Channel	Bedrock	Boulder	Rock	Rubble	Gravel	Sand	Fines	L		R	L	R	L	R					
1	N/A	1	97.0	97.0	1.8	0	0	0	40	40	20	0	0	0	0	0	35	35	0.0	2					
2	N/A		268.0	171.0																					
3	N/A	1	338.0	70.0	2.4	0	5	20	50	25	0	0	0	0	0	10	10	0.0	1	✓					

FASTWATER	STREAM TYPE							CHANNEL TYPE	SUBSTRATE	FLOW TYPE	POOL BATHING (terrace side)																													
	6 Sheet Pile	7 Chute	8 Run	9 Rapid	10 Macroturb	11 Convergence	12 Lateral				13 Beaver	14 French	15 Flunge	16 Eddy	18 Gully	19 Log Structure	20 Road Crossing	21 Road Crossing	22 Wood Debris	23 Man-Made Dam	24 Natural Dam																			
1 Fall																																								
2 Cascade																																								
3 Run (CARB)																																								
4 Riffle (RFB)																																								
5 Riffle (RFB)																																								

\*For different left and right parameters, values are to be written as L/R.

River: Unnamed trib to Ridge Brook

Valley Shape L/W/H (m)	Bank Slope Height (m)	Stream Width (m)	Vegetation (%)				Erosion (%)				pH	Water Temperature (°C)	Fish Species	Pool Rating			Pool Tail			Turbulence (%)				
			Bare		Grasses		Shrubs		Trees					Left Bank (0-50%)		Right Bank (0-50%)		Embedded (Observed)	Mean Substrate Size (cm)		Fines (%)			
			Stable	Eroding	Stable	Eroding	Stable	Eroding	Stable	Eroding				No.	Letter									
L	0.2	40	0	10	30	60	0	0	0	50	0	0												
L		60	0	60	30	10																		
L	0.2	10	0	10	40	50	0	0	0	50	0	0												

NOTE: For selected site study, three columns (Tress etc) should be done for a habitat assessment

WATER FLOW MEASUREMENT																									
LENGTH (m)	RIFLE GRADIENT		GRADIENT (%)	UNIT No.	STREAM TYPE	MET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM / 4	COEFFICIENT (R.B. smooth) (L.B. rough)	LENGTH (cm)	FLOAT TIME (sec)												
	DROP (m)	GRADE (m)					1/4 way	1/2 way	3/4 way				1/4 way	1/2 way	3/4 way	AVERAGE	FLOW (cm/s)								

Formula (Calkin) =  $Q = 1.49 R^{2/3} S^{1/2}$  Where  $Q$  = flow,  $R$  = depth,  $L$  = length,  $A$  = coefficient for the stream bottom (use 0.8 for rough bottom, 0.9 for smooth)

CRITERIA	
1	Channel width depth equal to or greater than channel width
2	R.B. GRAB is a rifle flowing over a gravel and/or cobble bottom
3	R.B. is a rifle flowing over a through large substrate (e.g. rock and log) boulder, some of which protrudes the surface
4	Side channels: flow as a separate stream type
5	Unweeded Bank: % of bank overhanging below water edge for stream type
6	Over-hanging Bank Vegetation: % of vegetation overhanging for stream type
7	Visual Entanglement: % of snags or trees surrounding the larger substrate, up to 100%
8	Woody Debris: total width should be > 10 cm in diameter

\*For different left and right parameters, values are to be written as L/R.



**Photo 1:** Upstream extent of Watercourse 1



**Photo 2:** Looking upstream from the end of Unit 1; Watercourse 1



**Photo 3:** Looking downstream from the end of Unit 1; Watercourse 1



**Photo 4:** Mid-point of Unit 2; Watercourse 1



**Photo 5:** Looking downstream from the end of Unit 2; Watercourse 1



**Photo 6:** Electrofishing site in Unit 2; Watercourse 1



**Photo 7:** Electrofishing site in Unit 3; Watercourse 1



**Photo 8:** Creek chub from Unit 3 site; Watercourse 1



**Photo 9:** Looking downstream from Cross Road culvert; Watercourse 2



**Photo 10:** Mid-point of Unit 2; Watercourse 1





**Photo 11:** Looking downstream from the start of Unit 3; Watercourse 2



**Photo 12:** Looking upstream from the downstream extent of the survey; Watercourse 2