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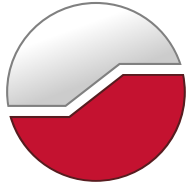
**Ecological Baseline Report
Atlas Salt Inc.
Great Atlantic Salt Deposit
St. George's, NL**

GEMTEC Project: 101556.002 R01

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Submitted to:

Atlas Salt Inc.
333 Duckworth Street
St. John's, NL
A1C 1G9

**Ecological Baseline Report
Atlas Salt Inc.
Great Atlantic Salt Deposit
St. George's, NL**

February 7th, 2023
GEMTEC Project: 101556.002 R01

GEMTEC Consulting Engineers and Scientists Limited
19 Dundee Avenue
Mount Pearl, NL, Canada
A1N 4R6

February 7th, 2023

File: File: **101556.002 R01**

Atlas Salt Inc.
333 Duckworth Street
St. John's, NL
A1C 1G9

Attention: Mr. Patrick Laracy, LL.B., P.Geo.
President, CEO & Director

**Re: Ecological Baseline Report
Atlas Salt Inc., Great Atlantic Salt Deposit, St. Georges, NL.**

Please find enclosed the Ecological Baseline Report in support of Atlas Salt Inc's. (Atlas) proposed Great Atlantic Salt Project (Project), located near the Town of St. Georges, Newfoundland and Labrador. GEMTEC Consulting Engineers and Scientists Limited was retained by Atlas to conduct the Ecological Baseline Report and associated desktop and field studies for the Project. The field components relative to this report were conducted in June, July, August, and October 2022.

Please do not hesitate to contact the undersigned if you have any questions regarding this report.

Sincerely,



Darrol Rice, B.Tech. (Env.), P.Tech., PMP
NL Branch Manager & Senior Project Manager
GEMTEC Consulting Engineers and Scientists Limited

Enclosures
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EXECUTIVE SUMMARY

Atlas Salt Inc. (“Atlas”, or the “Company”) is proposing to develop a salt deposit at their Great Atlantic Salt Deposit property located in western Newfoundland, within the Town of St. George’s, Newfoundland and Labrador (NL) (Figure 1).

The Project involves the development of an underground salt mine accessed by twin declines from the surface portal. The mine will use continuous mining machines to produce 2.5 Million Tonnes per Annum (MTPA) of rock salt and will use the existing Turf Point port to ship product to customers along the Gulf of St. Lawrence, and Eastern United States over a project life span of 30 years. An overland conveyor system will be used to transport material Turf Point port.

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Atlas Salt to conduct the desktop studies, field studies and associated reporting for the Project. This report summarizes the findings of the 2022 ecological baseline studies which were designed to characterize components of the natural and/or existing environment on and surrounding the Project area, that have potential to be influenced by Project activities. Terrestrial and aquatic elements discussed herein include:

- Terrestrial Environment Assessment
 - Ecological Land Classification (ELC);
 - Wetland Location Confirmation;
 - Vegetation and Rare Flora Surveys;
 - Migratory Breeding Bird Surveys;
 - Bat Presence / Absence Surveys; and
 - Incidental Wildlife Surveys.
- Aquatic Environment Assessment
 - Stream Assessment Survey; and
 - Fisheries Population Assessment.

Within the investigated area, 11 vegetation communities were delineated including 1 wetland that was re-delineated by qualified GEMTEC biologists. No Species at Risk vegetation were observed within the investigated areas.

Migratory breeding bird surveys resulted in the identification of 52 species, four of which were determined to be SAR or Species of Conservation Concern. Bat acoustic monitoring surveys were also conducted that resulted in the identification of 2 SAR bats, little brown myotis and Northern Myotis, as well as 1 non-designated species, the Hoary bat.

There were no fish bearing watercourses within the project footprint that would provide suitable habitat. However, a watercourse, identified as “*Man of the War Brook*” west of the site was

evaluated to quantify approximate aquatic populations, resulting in an estimated population of 350 brook trout. No other aquatic species were identified in the watercourse during the investigations. eDNA assessments were completed to determine relative abundance of fish populations within the barachois pond. Twelve species were identified with American Eel noted as a designated SAR.

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LIST OF ABBREVIATIONS AND TERMINOLOGY

ACCDC	Atlantic Canada Conservation Data Centre
ARBCA	Atlantic Risk Based Correction Action
Auto	Automatic
CCME	Canadian Council of Ministers of the Environment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch per unit effort
CSP	Corrugated Steel Pipe
DBH	Diameter at Breast Height
DFO	Department of Fisheries and Oceans, Government of Canada
eDNA	Environmental Deoxyribonucleic Acid
ELC	Ecological Land Classification
ECC	Ecosystem Components of Concern
ECCC	Environment and Climate Change Canada, Government of Canada
EP	Environmental Protection
EOSD	Earth Observation for Sustainable Development of Forests
EQS	Environmental Quality Standards
FSC	Forest Site Classification
FWAL	Freshwater Aquatic Life
GIS	Geographic Information System
GMD	GIS and Mapping Division
GPS	Global Positioning System
ha	Hectares
ID	Identification
km ²	Kilometers Squared
LCL	Lower Confidence Level
m	Meters
mg/L	milligrams per litre
mL	Milli litres
MTPA	Million Tonnes Per Annum

LIST OF ABBREVIATIONS AND TERMINOLOGY - CONTINUED

NL	Province of Newfoundland and Labrador
NLDECC	NL Department of Environment and Climate Change
NLESA	NL <i>Endangered Species Act</i>
NL FFA	NL Department of Fisheries, Forestry and Agriculture
NRCan	Natural Resources Canada, Government of Canada
NWWG	Canadian Wetland Classification System
pH	Potential of Hydrogen
SAR	Species at Risk
SARA	Species at Risk Act
SOCC	Species of Conservation Concern
SSAC	Species Status Advisory Committee
Sp.	Species
UCL	Upper Confidence Level
µS/cm	microSeimens per centimetre
WRMD	Water Resources Management Division

1.0 INTRODUCTION

1.1 Background

Atlas Salt Inc. (Atlas) is proposing to develop an underground salt mine at their Great Atlantic Salt Deposit property located in western Newfoundland, within the Town of St. George's, Newfoundland and Labrador (NL) (refer to Figure 1).

Based on information provided by Atlas, GEMTEC understands that the Project will involve the mining of a large high-grade salt deposit within the Great Atlantic Salt Project area. The Project will not include open pit mining and instead will access the resource underground from a mine portal. Rock salt will be transported via overland conveyor system from the mine to the existing Turf Point port for shipping. The Project envelope provided by Atlas, is expected to contain all required infrastructure and mining operations. Mine Infrastructure will be primarily underground and will contain Processing plant, and material storage. Above-ground infrastructure include waste rock, overland conveyor, transmission line, and laydown areas.

The 2022 ecological baseline studies were designed to characterize components of the natural and/or existing environment on and surrounding the Project area, that have potential to be influenced by Project activities. The information collected describes the baseline conditions observed at the time of the inspections that will inform Project development and provide required information to a Project Registration document to be submitted to the NL Department of Environment and Climate Change (NL DECC), Environmental Assessment (EA) Division. The studies carried out by GEMTEC incorporated the proposed Project development area as well as the surrounding landscape (herein referred to as "Study Area" as defined in Section 1.3 and Figure 2). For the purpose of these studies, the Study Area was defined by Atlas with consultation with GEMTEC and incorporates all areas where mining activities and associated infrastructure are anticipated to occur.

This report provides a summary of information gathered during the baseline ecological studies conducted in June, July, August, and October 2022.

1.2 Site Location

The Project is located approximately 30 km south of the Town of Stephenville, NL between the communities of St. Georges and Flat Bay. The Project is along Route 461, between Steel Mountain Road to the east, Burnt Wood Pond to the south and Flat Bay Gypsum Project access road to the north-west, approximately 5 km from the Trans-Canada Highway (THC) (Figure 2).

1.3 Study Area

GEMTEC has undertaken a 2022 baseline ecological field program within a Study Area defined by Atlas. The Study Area will include all aspects of the proposed Project to include an underground mine with associated ground level portal access and a conveyor to Turf Point (Figure

2). A 100 m buffer was applied to the primary project area as well as a 15 m buffer to the conveyor system to define the Study Area. Access to the Turf Point Port was restricted and could not be investigated as part of the baseline ecological assessment. Proposed project elements are expected to be completed within the existing port footprint where no significant ecological features are expected.

The Town of St. Georges has designated the area surrounding the barachois pond (Figure 2) as Environmental Protection (EP) to protect its sensitive natural environment which supports vulnerable species including rare plants and animals and which is vulnerable to sea level rise (Town of St. Georges, 2021). Features that were identified beyond the proposed project components (i.e., EP areas, watercourses, barachois ponds, etc.) were included in the investigation in order to gain a comprehensive description of the natural environment within and adjacent to the Project.

Figure 1: Site Location

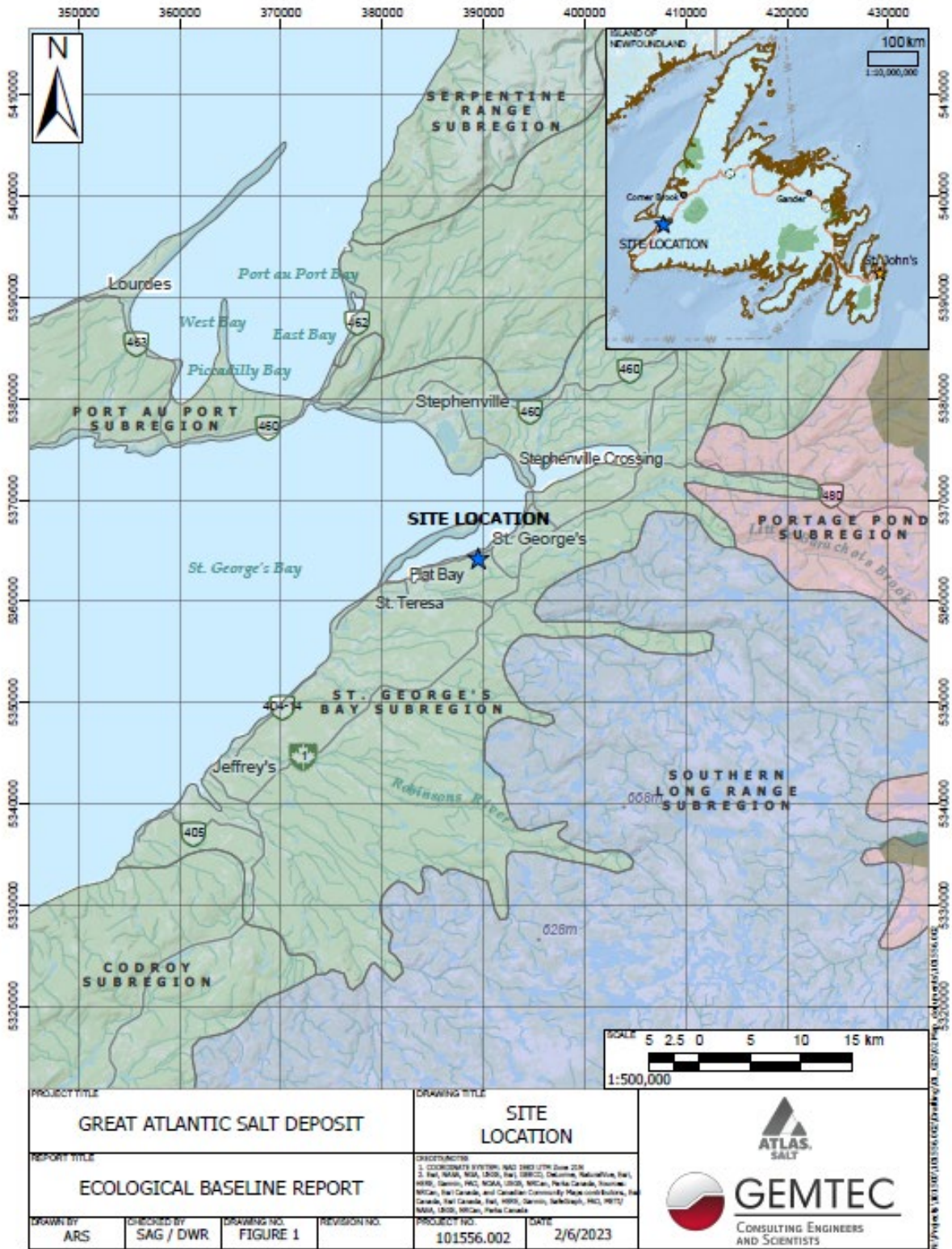
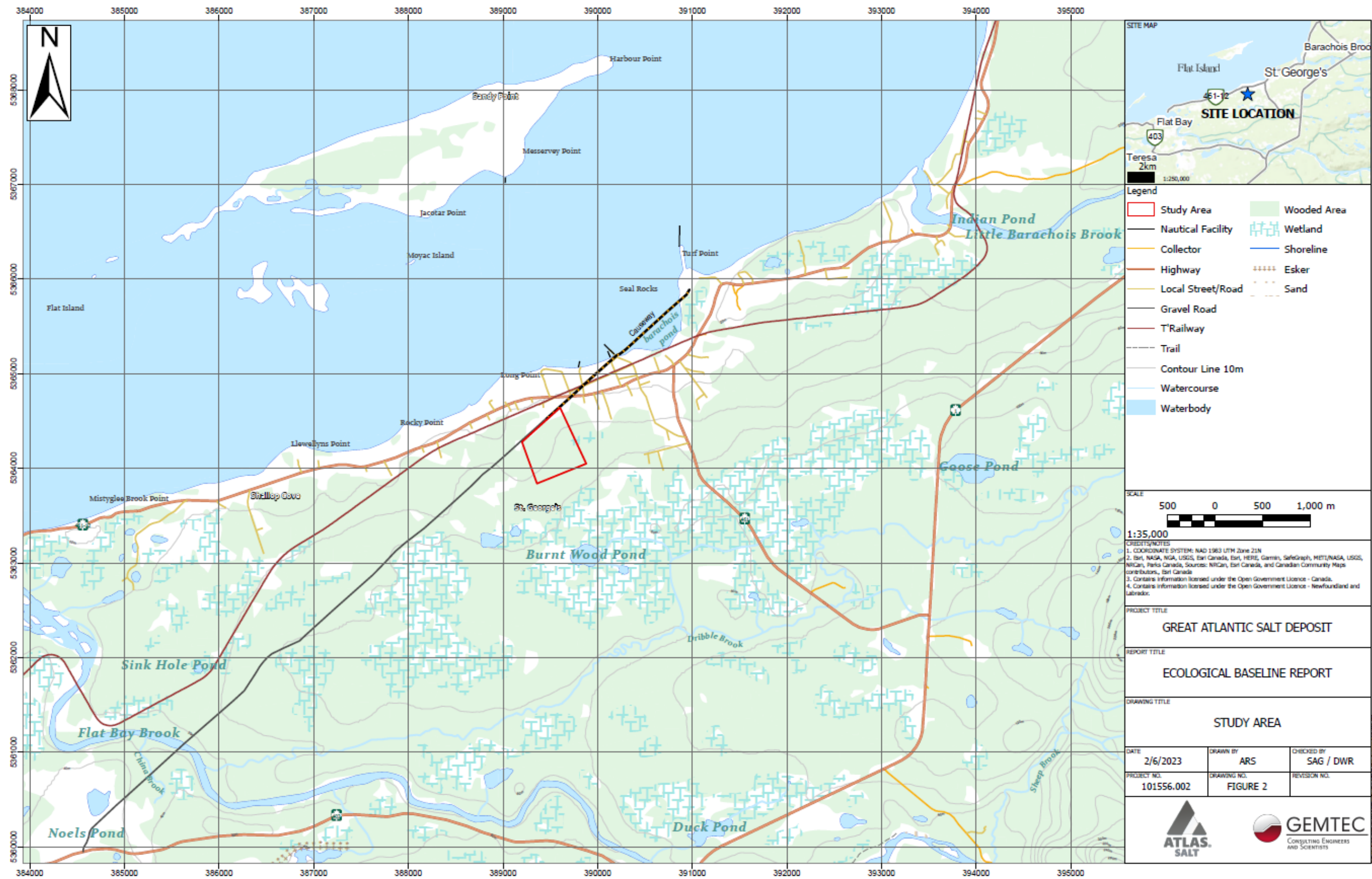


Figure 2: Study Area



2.0 SCOPE OF WORK

GEMTEC was retained by Atlas to carry out baseline ecological studies in support of Project development. The studies were limited to the proposed Study Area (Figure 2). The ecological studies were completed within the Study Area to collect, analyze, and present biophysical data. The ecological baseline studies encompassed:

- Terrestrial Environment Assessment
 - Ecological Land Classification (ELC);
 - Wetland Location Confirmation;
 - Vegetation and Rare Flora Surveys;
 - Migratory Breeding Bird Surveys;
 - Bat Presence / Absence Surveys; and
 - Incidental Wildlife Surveys.
- Aquatic Environment Assessment
 - Stream Assessment Survey; and
 - Fisheries Population Assessment.

The above ecological baseline studies were selected based on general consultation with NL Wildlife Division, Water Resources Management Division (WRMD) and Department of Oceans and Fisheries (DFO) and were completed to gain a comprehensive understanding of the biophysical conditions within the Study Area.

A team consisting of Project Managers, Biologists, GIS Specialists and Technicians undertook planning and executing the ecological baseline studies within the Study Area. GEMTEC Biologists carried out visits in June, July, August and October 2022, to collect seasonal characteristics of Ecosystem Components of Concern (ECCs). Scheduling for the studies is presented in Table 1.

Table 1: Ecological Baseline Field Studies Schedule

Site Visit Date	Field Study/Component
June 3 rd – 5 th , 2022	<ul style="list-style-type: none"> • Incidental Wildlife Survey; • Ecological Land Classification; • Migratory Breeding Bird Surveys; • Vegetation Survey (early flowering); • Rare and Species at Risk (SAR) Flora and Fauna; and • Wetland Location Confirmation (based on 1:50,000 Topographic CanVec Series (Natural Resources Canada, Canada 2022)).

Site Visit Date	Field Study/Component
July 9 th & 16 th , 2022	<ul style="list-style-type: none"> • Incidental Wildlife Survey; • Bat Acoustic Monitor Deployment; • Ecological Land Classification; • Vegetation Survey (mid flowering); • Rare and SAR Flora and Fauna; and • Wetland Location Confirmation (based on 1:50,000 Topographic CanVec Series (Natural Resources Canada, Canada 2022)).
August 13 th & 14 th , 2022	<ul style="list-style-type: none"> • Stream Assessment Survey; • Fisheries Population Assessment; and • Vegetation Survey (late flowering).
October 17 th , 2022	<ul style="list-style-type: none"> • Bat Acoustic Monitor Retrieval.

3.0 TERRESTRIAL ENVIRONMENT

3.1 General

The terrestrial environment was evaluated using a combination of background information review and data collected during the 2022 field investigation. Data was collected to characterize the terrestrial environment existing/baseline conditions exhibited within the Study Area at the time of the inspection. Methodology and results for the following terrestrial environment components are discussed below:

- Ecological Land Classification;
- Wetland Location Confirmation;
- Migratory Breeding Birds;
- Rare and SAR Flora and Fauna;
- Incidental Wildlife Observations; and
- Bat Presence / Absence.

Available background information was used to complete a desktop assessment the Study Area to provide a preliminary assessment of the conditions on-site, including:

- Available aerial photography (Bing and Google Earth 2022);
- Historical SAR Records as managed by Atlantic Canada Conservation Data (ACCDC, 2022);
- Forestry Habitat Data (NL GMD, 2022); and
- Topographic Data of Canada - CanVec Series (Natural Resources Canada, Canada 2022).

3.2 Ecological Land Classification

3.2.1 Methodology

Prior to conducting ELC fieldwork, vegetation communities were delineated using aerial imagery interpretation and Forestry Habitat data provided by the Government of NL Wildlife and Forestry Division to be verified in the field. Fieldwork was completed to define vegetation communities into distinct habitats, inventory encountered individual species and their rarity, and to determine the presence of SAR or Species of Conservation Concern (SOCC). Dominant tree, shrub, and herbaceous species were identified, and photos of the vegetation communities were taken. This data has been used to update forest habitat units with updated delineations and classifications of vegetation communities in the Study Area.

A random meander sampling method was used to determine dominant species and presence of SAR/SOCC floral species within distinct habitats. Distinct habitats are described by identifying the dominant species within each strata presented below.

- Tree: defined as tree species greater than 5 centimetre (cm) in diameter at breast height (DBH);

- Shrub: defined as tree species less than 5 cm DBH, or woody vegetation greater than 50 cm in height; and
- Ground vegetation: defined as woody plants less than 50 cm in height, or non-woody species.

ELC Ecotypes will be described in relation to Forest Site Classification (FSC) Manual (Meades and Moores 1994) and the Canadian Wetland Classification System (NWWG, 1997). Ecotypes not described in these publications will be compared to descriptions in other publications including Government of Newfoundland Ecoregion Descriptions, and the Canadian National Vegetation Classification (Natural Resources Canada, 2019).

Figure 3: Ecological Land Classification



3.2.2 Summary of Findings

3.2.2.1 Ecoregion

The Project occurs in the St. George's Bay Subregion of the Western Newfoundland Forest Ecoregion (Figure 1) and extends from Codroy Valley in the South to Bonne Bay in the North. This subregion covers the area east and south of Stephenville, extending inland from the coast of Bay St. George to the borders of the Central Newfoundland Forest and Southern Long Range Barrens. This subregion covers the area east and south of Stephenville, extending inland from the coast of Bay St. George to the borders of the Central Newfoundland Forest and Southern Long Range Barrens. The St. George's Bay Subregion is marked by flat to rolling terrain and contains extensive plateau bogs. The subregion is characterized by forests of balsam fir (*Abies balsamea*) with an understory dominated by wood ferns. Black spruce (*Picea mariana*) occurs in poorly draining areas or in areas with exposed bedrock. In heavily forested areas deep, rich soils formed from glacial deposits and runoff occur (PAANL, 2008).

The bedrock in this subregion contains primarily younger sandstones and shales about 300 million years old. The subregion is almost uniformly covered by these rocks, except for a gabbro and anorthosite intrusion in the northeast. Near the coast, soils are coarser and nutrient-poor, and result in less dense forests with stunted growth (PAANL, 2008).

The St. George's Bay Subregion typically experiences cooler shorter summers than the southern Codroy subregion, but longer and warmer summers than the northern subregions. Annual rainfall averages 1200 mm and annual snowfall ranges from 2 to 4 m. The Western Newfoundland Forest ecoregion is one of the most climatically favourable regions for plant growth on the Island with its mountainous terrain inland leading to high rainfall promoting vegetation life. The ecoregion is known to inhabit a variety of wildlife including mammals; moose, caribou, black bear, snowshoe hare, muskrat, otter, mink, beaver, lynx, and Newfoundland Marten. A variety of avifauna including upland birds (e.g., songbirds, shorebirds, Raptors and Waterfowl) are all found throughout this ecoregion. Aquatic habitat within the ecoregion provides habitat for a variety of aquatic species including Atlantic salmon (*Salmo Salar*), brook trout (*Salvenius fontinalis*), three-spine (*Gasterosterus aculeatus*), nine-spine (*Pungitus pungitus*) and black-spotted stickleback, rainbow smelt (*Osmerus mordax*), mummichog (*Fundus heteroclitus*), banded killifish (*Fundus diaphanus*) and American eel (*Anguilla Rostrata*) (PAANL, 2008).

The sections below provide an overview of the existing biophysical environments of the Project. Descriptions of the existing natural environment presented below are based on site specific ecological field studies completed in 2022, and summaries of existing documents including ACCDC reports, literature reviews, government publications.

3.2.2.2 Ecological Land Classification

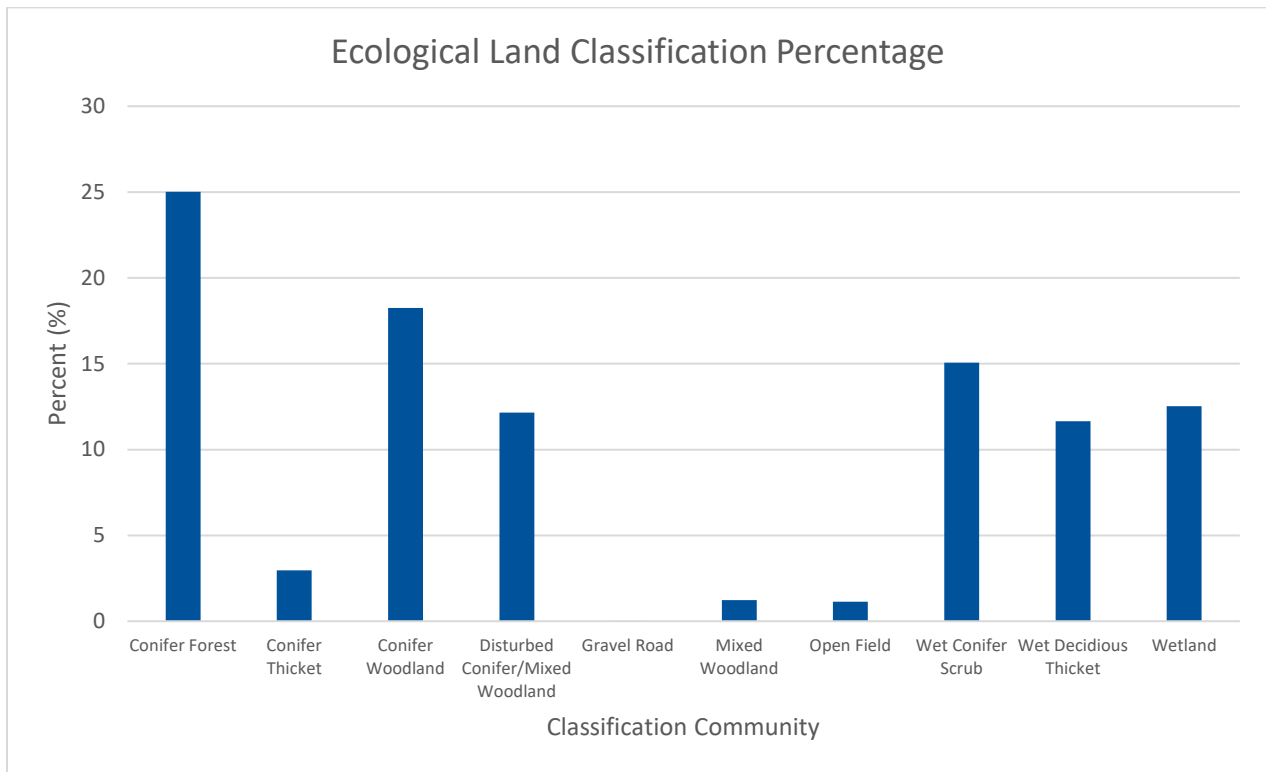
Table 2 and Figure 3 summarize the land cover classes as defined by GEMTEC biologists and through the Government of Newfoundland’s Forestry Data. A total of 11 ELC communities were identified within the Study Area. The Coniferous Forest and Coniferous Woodland were the two most abundant land cover classes encountered at 25.01% and 18.25%, respectively. The wetland types represented a total of 3.76 hectares (ha) and are discussed in detail in Section 3.3.

Areas presented in Table 2 are based on vegetation communities within the Study Area and may not be representative of the surrounding landscape. Photos of the vegetation communities are provided in Appendix A.

Table 2: Ecological Land Classification Communities within the Study Area

Communities	Study Area	
	Area (ha)	Percent (%)
Coniferous Forest	7.52	25.01
Coniferous Woodland	5.49	18.25
Coniferous Thicket	0.89	2.96
Mixed Woodland	0.37	1.23
Disturbed Coniferous/Disturbed Mixed Woodland	3.65	12.15
Wet Deciduous Thicket	3.50	11.64
Wet Coniferous Scrub	4.53	15.07
Open Field	0.34	1.13
Wetland	3.76	12.52
Gravel Road	0.02	0.01
Shoreline	0.01	0.01
Total	30.08	99.98

Figure 3.1: Relative Areas of ELC Communities within the Study Area



ELC Communities

Communities are presented based on field observations of GEMTEC biologists in addition to species composition data provided by Government of Newfoundland’s Forestry data. Communities were characterized based upon field observed habitats and species. The data indicates that the Study Area is dominated by Coniferous Forest representing 25% of the total Study Area.

Coniferous Forests

The coniferous forests within the Study Area total approximately 7.52 ha. The coniferous forests in the Study Area are dominated by balsam fir and black spruce. Vegetation is generally limited within the sub-canopy and ground layer. These communities range from dry to wet and have a variety of associate species including Shadbush - Serviceberries (*Amelanchier interior*), red maple (*Acer rubrum*), Rhodora (*Rhododendron canadense*), bunchberry (*Cornus canadensis*), wood fern (*Dryopteris intermedia*) and moss species. Trees in these forests are considered mature are generally part of regeneration growth from historical harvesting.

Coniferous Woodlands

Coniferous woodlands have similar composition as coniferous forests, however, woodlands are described as having a less dense canopy allowing more sunlight to reach the sub-canopy resulting in slightly different species composition. Approximately 5.49 ha of coniferous woodlands were observed in the Study Area. Red raspberry (*Rubus idaeus*), fireweed (*Chamaenerion angustifolium*) and blue bead lily (*Clintonia borealis*) are common herbaceous species found in coniferous woodlands within the Study Area.

Coniferous Thicket

Coniferous Tickets are described as having open to scrubby black spruce stands with balsam fir. This community contains a tall shrub layer dominated by open black spruce stands with limited balsam fir and absent of hardwoods. Understory is dominated by ericaceous shrubs and lichens; *Kalmia angustifolia* covering most of the forest floor with *Cladonia* (Reindeer) lichens. Ground vegetation is absent or sparsely dominated by sedges and forbs.

Mixed Woodlands

Mixed woodlands contain a mix of coniferous and deciduous species in varying degrees of composition. Approximately 0.37 ha of mixed woodlands are found throughout the Study Area. Typical species found in these units are black spruce, balsam fir, white birch (*Betula papyrifera*), pin cherry (*Prunus pensylvanica*), Northern mountain-ash (*Sorbus decora*) and red maple. Mixed woodlands can be indicators of historical harvesting where deciduous trees dominate the canopy with a younger, regenerative coniferous layer below; however, these forests are also naturally occurring and offer quality habitat for fauna as they mature. The understory can contain a mix of dense shrubs, ferns, and herbaceous ground vegetation.

Disturbed Coniferous/Disturbed Mixed Woodland

Disturbed Conifer *Woodlands* and Disturbed Mixed Woodlands have consistent species composition and natural conditions as described respectively above, however, these areas have been subject to varying anthropogenic disturbances. These communities have been subject to selective harvesting, as well illicit dumping of household items such as general garbage, roofing shingles, and electronic appliances.

Wet Deciduous Thicket

Wet deciduous thickets are described as having moist soil giving rise to hydrophytic shrub species. These areas are expected to have wetland indicators (e.g., hydrologic vegetation, hydric soils, and/or hydrology features). This ELC community is dominated by speckled alder (*Alnus incana*), with secondary species including red osier dogwood (*Cornus sericea*), three-leaved false

solomon's seal (*Maianthemum trifolium*), and rough stem goldenrod (*Solidago rugosa*). This community is considered to have poor drainage with standing water being present at surface. Wet deciduous thickets encompass 3.50 ha of the Study Area

Wet Coniferous Scrub

Wet scrublands are identified as having a “wet” soil moisture regime from the Government of Newfoundland’s Forestry Habitat data. These areas are expected to have wetland indicators (e.g., hydrologic vegetation, hydric soils, and/or hydrology features). Vegetation within the Wet Scrublands is described as having limited ground/canopy cover. Stunted coniferous trees such as black spruce and balsam fir dominate the community in addition to ericaceous shrubs are also be found throughout these habitat units. Wet coniferous scrubland occurs in 4.53 ha of the Study Area.

Open Field

The Open Field encompasses 0.34 ha within the Study Area and continues beyond the limits of the Study Area. This habitat consists of isolated mature trees of American mountain-ash (*Sorbus americana*), balsam fir and paper birch, pockets of black spruce shrubs and Labrador tea, and ground layer comprised of cool season grasses, Black crowberry (*Empetrum nigrum*) and grass spp. There are dilapidated wooden structures within this area.

Shoreline

Shoreline habitat is edge habitat buffering aquatic ocean habitat with inland habitat along the coastal area of St. Georges Bay The coastline between Port au Port and the Anguille mountains in which St. Georges resides is dominated by gravel, sand, silt and clay. There is an abundance of sandy shorelines and mud flats in the coastal area of St. Georges. Including the large sand spit of Sandy point directly north of the St. Georges shoreline. These habitats are utilized by various shorebirds as well as marine species which inhabit the coastal zone.

3.3 Wetlands

3.3.1 Methodology

Guidance on wetland delineation, characterization, and regulation was provided by the Government of NL’s WRMD. It is understood that wetlands identified on the 1:50,000 Topographic - CanVec Series (Natural Resources Canada, Canada 2022) are regulated by the department. Where updates to the delineation of these features is required, a qualified biologist updated the mapping based on field investigations.

A desktop assessment was completed to locate wetlands on the 1:50,000 Topographic - CanVec Series (Natural Resources Canada, Canada 2022) for confirmation during the 2022 field

investigations. Where updates to the mapping were required to refine the wetland boundaries, a qualified biologist conducted field investigations in combination with aerial imagery interpretation to update any boundaries. Wetlands within the Study Area that were not identified on the 1:50,000 Topographic map - CanVec Series (Natural Resources Canada, Canada 2022) were not included in the wetland delineations on Figure 3 as advised by the Government of NL's WRMD.

3.3.2 Summary of Findings

A delineation and characterization has been completed for the Study Area for regulated wetlands. Wetlands were determined in the Study Area based on a review of aerial interpretation of historic imagery and 1:50,000 Topographic - CanVec Series (Natural Resources Canada, Canada 2022) and cross-referenced with field data collected by a qualified biologist. Wetlands that have been confirmed as present in the landscape, as well as their updated delineations are illustrated on Figure 3. Updated delineation of the on-site wetland resulted in a total wetland area of 3.76 ha, representing 12.52% of the Study Area.

Wetlands within the Study Area are characteristic of plateau bogs and have a high abundance of graminoid species. The wetlands are generally in depressed, bowl features within the bedrock which has allowed for sediment and water to collect, giving way to the dominant sphagnum layer. Other species within the features include pitcher plant (*Nepenthes sp.*), various cottongrass sp. (*Eriophorum sp.*), tufted rush (*Trichophorum cespitosum*), white-beaked rush (*Rhynchospora alba*), few flowered sedge (*Carex pauciflora*), poor sedge (*Carex magellanica*), bog laurel (*Kalmia polifolia*), and bog aster (*Oclemena nemoralis*). Ericaceous shrubs are also present in these habitats in moderate quantities, typically dominated by leatherleaf (*Chamaedaphne calyculata*), Labrador tea, and sweet gale (*Myrica gale*).

3.4 Vegetation and Rare Flora Surveys

Vegetation and rare flora surveys were conducted to identify encountered vascular vegetation and SAR and/or SOCC within the Study Area. The scope of work carried out for the vegetation and rare flora surveys included:

- A desktop SAR Study;
- A list of all encountered vascular vegetation identified within the Study Area; and
- A list of all encountered rare vascular or non-vascular flora identified within the Study Area.

Species can be deemed to be flora SAR or SOCC for a number of reasons, including:

- Their biological characteristics;
- They occur at the periphery of their range; and/or
- Due to other factors, e.g., they have low numbers or are found in very defined areas in Newfoundland and/or the rest of Canada.

Flora SAR and SOCC are defined as species that are either listed under the Newfoundland and Labrador *Endangered Species Act* (NLESA; Government of Newfoundland and Labrador 2001) or the federal *Species at Risk Act* (SARA; Government of Canada 2002) as being either Endangered, Threatened, Vulnerable, or Special Concern. Additionally, SAR and SOCC may not yet be listed under provincial or federal legislations, but may be identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as being either Endangered, Threatened, or of Special Concern.

Species that are protected federally are listed in Schedule 1 of SARA. The purpose of SARA is to protect SAR and their critical habitat. SARA provides protection for flora and fauna species against extirpation, extinction or endangerment from human activities. Provisions to protect and recover a species come into effect once it has been listed in Schedule 1 of SARA. The NLESA provides another level of legislative protection for SAR.

SAR and SOCC may also have a ranking assigned by the ACCDC as S1, S2, or S3. The S1 designation indicates that a species is critically imperilled because of extreme rarity or because of some other factor making it especially vulnerable to extirpation from the jurisdiction. An S2 species is imperilled in the jurisdiction because of rarity due to very restricted range, very few populations, steep declines or other factors making it very vulnerable to extirpation from the jurisdiction. An S3 designation indicates that a species is vulnerable in the jurisdiction due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.

Different levels of protection are afforded for species listed within the Acts depending on the species rarity ranking. All species identified with a ranking of S1 or S2 by the ACCDC are considered rare for the purpose of this report.

3.4.1 Methodology

Three vegetation surveys were conducted in the Study Area, in early summer (June 3rd – 5th), mid summer (July 9th and 16th) and late summer (August 13th & 14th) to ensure comprehensive seasonal coverage for plant SAR and/or SOCC in the Study Area. Targeted surveys were also completed within a portion of the Town of St. George's EP designated area immediately adjacent to the Causeway to identify any SAR or SOCC. In addition, a desktop study to screen for SAR and critical habitat was conducted prior to the site visits. The SAR screening was conducted by obtaining data from the ACCDC for lands within a 5 km radius of the Study Area. An ACCDC search request generally provides:

- Reported observations of rare and endangered flora and fauna species within the search area;
- Expert Opinion Maps to identify species that have not been reported in the area, but are expected to occur there, based on estimates of habitat and wildlife distribution; and

- Locations of any Special Areas such as:
 - Managed areas with some level of protection; and
 - Significant ecological areas of interest.

The species listed within the ACCDC report were referenced to rankings outlined by the COSEWIC, SARA and NLESA. During each site visit, a comparison of habitats suited to any identified SAR or SOCC of flora identified in the desktop study was completed. The ACCDC report, mapping and habitat comparison tables are attached as Appendix B.

In completing the field surveys, GEMTEC biologists traversed the Study Areas on foot, focusing on unique habitats that have an elevated potential for the occurrence of flora and fauna SAR and/or SOCC, *i.e.*, mature forest, rock outcrops, watercourses and wetland areas (Newmaster et al. 2005). Particular attention was paid to habitat types of those species listed in the ACCDC Expert Opinion Maps. Specimens were collected and/or photographed if a species could not be identified in the field. GEMTEC biologists also recorded an inventory of all encountered flora species while conducting the field reconnaissance program.

3.4.2 Summary of Findings

3.4.2.1 Background Information – ACCDC Results

Results of the ACCDC data search noted that within 5 km of the Study Area, there were a total of 39 SAR/SOCC plant records of which a single SAR was recorded (Table 3). The complete list of 38 remaining SOCC identified in the ACCDC report can be reviewed in Appendix B.

Table 3: ACCDC SAR Identified within 5 km of the Study Area

Common Name	Scientific Name	SARA	NL ESA	Potential to occur
Boreal Felt Lichen	<i>Erioderma pedicellatum</i>	Special Concern	Vulnerable	Habitat absent within study area – potential habitat within region

ACCDC 2022 Data Request

3.4.2.2 Field Results

A total of 150 flora species were documented in the Study Area. These species are considered common and widespread in the region. A complete inventory of plant species encountered within the Study Area is presented in Appendix C. Alternate-Leaf Dogwood (*Cornus alternifolia*) was identified in the 2022 ACCDC report and was identified within the Study Area during the 2022 site visits. Alternate-Leaf Dogwood is and S3S4 ranking. This species was downgraded in 2015 from S3 in 2010.

There were no SAR or SOCC identified within the surveyed portion of the Town of St. Georges EP designated area.

3.5 Migratory Breeding Bird Surveys

3.5.1 Methodology

Breeding bird surveys were conducted per methods outlined by *Bird Studies Canada (2021)*. To ensure representation of habitat types, preliminary site selection for the point count locations were identified based on forest and vegetation species composition, and the development stage within the Study Area.

The different habitat types sampled included the following:

- Coniferous Woodland;
- Coniferous Forest;
- Mixed Woodland;
- Wet Deciduous Thicket;
- Wet Coniferous Scrub;
- Open Field;
- Wetland;
- Residential; and
- Gravel Road.

Point count locations were used within each habitat type and were conducted with a minimum spacing of approximately 250 m between each location to ensure sampling independence. Based on this criteria, the identified habitat types listed above had adequate habitat availability for surveys.

Point count locations were randomly assigned within the 11 habitat types using habitat composition maps based on the updated NL Forest Inventory Geodatabase.

Point count surveys (Figure 4) were conducted on the mornings of June 4th and 5th, 2022, a period that encompasses the nesting season for breeding birds in this area. Surveys were conducted in favorable weather conditions that started before sunrise and were concluded before 10 AM. Each point count location was surveyed for a period of 10 minutes. The breeding status of each species was determined using the criteria outlined by *Bird Studies Canada (2021)*. Data collected for each bird detected included: number, species, behavior and location in relation to the survey point. Evidence of breeding birds such as nests, territorial displays, alarm calling, individuals flushed, mating and aggressive defending of territories were recorded in addition to weather parameters, *i.e.*, wind speed, wind direction, sky condition and temperature at each point count location (Appendix D).

3.5.2 Summary of Findings

3.5.2.1 Background Information

To better understand the baseline avifauna in the Study Area, a desktop SAR Study and a breeding bird survey was completed. Breeding bird surveys did not include the trapping, tracking or collection of any specimens.

As part of the background information collection for the avifauna assessment, background data from sources including the Newfoundland Breeding Bird Atlas (Square 21TUP86) and ACCDC were reviewed. There are 64 records of birds within Square 21TUP86, 3 of which are identified as a SAR: olive-sided flycatcher (Threatened), Great Blue Heron (Special Concern), and Piping Plover (Endangered). Great blue heron was the only species identified during the ecological baseline investigations. The individual was identified as a flyover. The Study Area does not appear to support habitat for this species.

Olive-sided flycatcher was the only SAR determined to have habitat within the Study Area. Their preferred habitat is described as open coniferous or mixed coniferous forests with tall trees or snags for perching usually associated within or near wetland areas, this described habitat was found to be in over 50% of the Study Area. Piping Plover (*Charadrius melodus*) and Great Blue Heron (*Ardea herodias*) were not found to have their habitat within the Study Area, however habitat is available within the region. Further discussion is provided below.

The ACCDC identified 77 historical Avifauna SAR records within 5 km of the Study Area. A large portion of these occurrences are associated with Sandy Point, located approximately 9 km north of the Study Area with Piping Plover accounting for 76 records and a single record of Bank Swallow. Finally, SAR lists prepared by the COSEWIC and the Species Status Advisory Committee (SSAC) were reviewed to identify species with potential habitat within the Study Areas. A list of SAR avifauna species with potential to occur within the Study Areas as identified through the historical background data as well as the review of current COSEWIC and SSAC SAR lists is included in Appendix B and is summarized below in Table 4.

Table 4: Avifauna SAR with Potential to Occur in the Project Areas

Common Name	Scientific Name	SARA	NL ESA	Presence at Project Areas
Red Crossbill	<i>Loxia curvirostra percna</i>	Endangered	Endangered	Possible –habitat present
Rusty Blackbird	<i>Euphagus carolinus</i>	Special Concern	Vulnerable	Possible – marginal habitat present
Short-eared Owl	<i>Asio flammeus</i>	Special Concern	Vulnerable	Possible – marginal habitat present
Barrow's Goldeneye (Eastern population)	<i>Bucephala islandica</i>	Special Concern	Vulnerable	Unlikely
Ivory Gull	<i>Pagophila eburnea</i>	Endangered	Endangered	Unlikely
Harlequin Duck	<i>Histrionicus histrionicus</i>	Special Concern	Vulnerable	Unlikely
Peregrine Falcon	<i>Falco peregrinus anatum</i>	Special Concern	Vulnerable	Unlikely
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Threatened	Threatened	Possible –habitat present
Newfoundland Gray cheeked Thrush	<i>Catharus minimus minimus</i>	-	Threatened	Possible –habitat present
Bank Swallow	<i>Riparia riparia</i>	Threatened	-	Possible – habitat present
Piping Plover	<i>Charadrius melodus</i>	Endangered	Endangered	Possible – habitat present within region
Great Blue Heron	<i>Ardea herodias</i>	Special Concern	-	Possible – marginal habitat present within region

- no species designation

3.5.2.2 Field Results

A summary of results from the 2022 Migratory Breeding Bird surveys are presented in Table 5. A total of 52 species (49 identified to species level, 3 identified to genus) of avifauna comprising 168 individual records were documented during the survey. Based on the field observations, 155 individuals were determined to be Possible, Probable or Confirmed breeders on the Study Area. Most of these species are considered common throughout NL (i.e., S-Rank 3 or greater) and are not provided a SAR designation. The most numerous species recorded overall, in descending order, are:

- White throated sparrow (*Zonotrichia albicollis*);
- Ruby Crowned kinglet (*Regulus calendula*);
- Black and white warbler (*Mniotilta varia*); and
- Yellow warbler (*Dendroica petechial*).

Results of the investigation including each species detected, associated habitat units in which they were recorded and the level of breeding that was determined is presented in Appendix D.

Four SAR and SOCC were identified within the Study Area, barn swallow (*Hirundo rustica*) - Threatened, willet (*Tringa semipalmata*) – S1B Critically Imperiled, great blue heron (*Ardea herodias*) - Special Concern and yellow-bellied sapsucker (*Sphyrapicus varius*) – S2B (Imperiled). Habitat for these species appears to be present within or proximal to the Study Area.

Several barn swallows were observed along the gravel road adjacent to the residential areas (Figure 5). This species prefers to nest in houses, bridges, and barns and will forage in a variety of habitat from agricultural fields, wetlands, or open water features (COSEWIC, 2011). The occurrences are likely associated with nesting individuals utilizing the adjacent residential area. No nesting habitat appears to be present within the Study Area.

Willet is recognized as an S1B species in the province of NL although it's not designated as a SAR under the NLESA or SARA. This species was identified in the Open Field and along the shoreline (Figure 5). Habitat for this species includes marshes, wet meadows, beaches, tidal estuaries and mudflats. It is likely that this species utilizes the shoreline and nearby freshwater marshes. Habitat for this species is not considered suitable within the primary project components but would be available along the causeway and adjacent beach / barachois pond habitat.

There were two occurrences of great blue heron (Special Concern) adjacent to a wetland and within the gravel road / residential area. This species is typically a colonial nester with freshwater or saltwater marshes and lakes being the primary nesting habitat. This species will build nests in trees and tall snags. Although marshes are present in the region, habitat to support nesting of this species is not present within the Study Area.

Yellow-bellied sapsuckers are considered an S2B species in the Province of NL and was heard drumming adjacent to a wetland (Figure 5). Yellow-bellied sapsuckers typically inhabit forests and will nest in tree cavities within deciduous trees. Habitat for this species is present within the Study Area due to presence of mixedwood forests and foraging habitat.

No raptor nests were encountered in the Study Area.

Table 5: Breeding Bird Survey Results

Common Name	Scientific Name	S rank ¹	Habitat Type	Number
Alder Flycatcher	<i>Empidonax alnorum</i>	S4B,SUM	Wetland Open Field Residential Gravel Road Shoreline	6

Common Name	Scientific Name	S rank ¹	Habitat Type	Number
American Crow	<i>Corvus brachyrhynchos</i>	S5	Wetland Conifer Forest Wet Conifer Scrub Disturbed Conifer Woodland Open Field Residential Gravel Road Shoreline	12
American Goldfinch	<i>Spinus tristis</i>	S5	Wetland Residential Gravel Road Shoreline	4
American Redstart	<i>Setophaga ruticilla</i>	S5B,S5M	Open Field Wetland Conifer Woodland Mixed Woodland Gravel Road	5
American Robin	<i>Turdus migratorius</i>	S5B,S5M	Open Field Wet Deciduous Thicket Wetland Disturbed Conifer Woodland Residential Gravel Road Shoreline	8
American Wigeon	<i>Anas americana</i>	S3B,SUM	Shoreline	2
Barn Swallow	<i>Hirundo rustica</i>	S2B, SUM	Residential Gravel Road Residential Shoreline	2
Black-and-White Warbler	<i>Mniotilta varia</i>	S5B,S5M	Open Field Mixed Woodland Gravel Road Wet Deciduous Thicket Conifer Forest Woodland Wetland Residential	11
Black-Capped Chickadee	<i>Poecile atricapillus</i>	S5	Open Field Wet Deciduous Thicket Conifer Forest	5
Blue Jay	<i>Cyanocitta cristata</i>	S5	Open field Conifer Forest	2
Boreal Chickadee	<i>Poecile hudsonicus</i>	S4	Conifer Forest	1
Canada Goose	<i>Branta canadensis</i>	S4	Residential Gravel Road	1
Cedar Waxwing	<i>Bombycilla cedrorum</i>	S4B, SUM	Residential Gravel Road	6
Common Grackle	<i>Quiscalus quiscula</i>	S5B, S3?N, SUM	Residential Gravel Road	1

Common Name	Scientific Name	S rank ¹	Habitat Type	Number
Common Loon	<i>Gavia immer</i>	S5B, S4N	Open Field Wet Deciduous Thicket Shoreline Residential Gravel Road Wetland	6
Common Merganser	<i>Mergus merganser</i>	S4	Shoreline	2
Common Raven	<i>Corvus corax</i>	S5	Shoreline	1
Common Tern	<i>Sterna hirundo</i>	S4B,SUM	Shoreline	2
Common Yellowthroat	<i>Geothlypis trichas</i>	S5B,S5M	Mixed Woodland Gravel Road	10
Downy Woodpecker	<i>Picoides pubescens</i>	S4	Open Field	1
European Starling	<i>Sturnus vulgaris</i>	SNA	Residential Gravel Road	1
Fox Sparrow	<i>Passerella iliaca</i>	S5B,S5M	Mixed Woodland Gravel Road Wet Deciduous Thicket Conifer Forest Wetland	4
Gray Jay	<i>Perisoreus canadensis</i>	S5	Wetland	2
Great Black-backed Gull	<i>Larus marinus</i>	S4	Shoreline Wetland	2
Great Blue Heron	<i>Ardea herodias</i>	S2B,SUM	Wetland	1
Greater Yellowlegs	<i>Tringa melanoleuca</i>	S3B, S4M	Shoreline	1
Hermit Thrush	<i>Catharus guttatus</i>	S5B,S5M	Conifer Forest	2
Herring Gull	<i>Larus argentatus</i>	S4	Shoreline	1
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	S5B,S5M	Wet Deciduous Thicket Wetland Disturbed Conifer Woodland Wetland	4
Magnolia Warbler	<i>Dendroica magnolia</i>	S4B,SUM	Wet Deciduous Thicket Conifer Forest Wetland Conifer Woodland Wet Conifer Scrub Disturbed Conifer Woodland	10
Northern Flicker	<i>Colaptes auratus</i>	S4	Wet Conifer Scrub	1
Northern Waterthrush	<i>Seiurus noveboracensis</i>	S5B,S5M	Mixed Woodland Gravel Road Conifer Forest	2
Pine Grosbeak	<i>Pinicola enucleator</i>	S5	Wetland	1
Purple Finch	<i>Carpodacus purpureus</i>	S5	Wet Deciduous Thicket	1
Ring-Billed Gull	<i>Larus delawarensis</i>	S4B,SUM	Wet Deciduous Thicket Wet Conifer Scrub Residential Gravel Road	3

Common Name	Scientific Name	S rank ¹	Habitat Type	Number
Rock Pigeon	<i>Columba livia</i>	SNA	Residential Gravel Road	1
Ruby-Crowned Kinglet	<i>Regulus calendula</i>	S5B,S5M	Open Field Mixed Woodland Gravel Road Wet Deciduous Thicket Conifer Forest Wetland Conifer Woodland Wet Conifer Scrub Disturbed Conifer Woodland Shoreline	12
Ruffed Grouse	<i>Bonasa umbellus</i>	SNR	Open Field Mixed Woodland Gravel Road Wet Deciduous Thicket Conifer Forest	5
Savanna Sparrow	<i>Passerculus sandwichensis</i>	S5B,S5M	Shoreline Residential Gravel Road	2
Song Sparrow	<i>Melospiza melodia</i>	S4B,SUM	Wetland Residential Gravel Road Shoreline	5
Spotted Sandpiper	<i>Actitis macularius</i>	S4B,SUM	Wetland Shoreline	3
Swainson's Thrush	<i>Catharus ustulatus</i>	S5B,S5M	Shoreline Residential Gravel Road	2
White-Throated Sparrow	<i>Zonotrichia albicollis</i>	S5B,S5M	Open Field Mixed Woodland Gravel Road Wet Deciduous Thicket Conifer Forest Wetland Wet Conifer Scrub Disturbed Conifer Woodland Residential Shoreline	15
Willet	<i>Tringa semipalmata</i>	S1B,SUM	Open Field Shoreline	2
Wilson Snipe	<i>Gallinago delicata</i>	S5B,S5M	Wetland Conifer Woodland	2
Yellow Warbler	<i>Dendroica petechia</i>	S5B,S5M	Open Field Mixed Woodland Gravel Road Wet Deciduous Thicket Residential Gravel Road Shoreline Wetland	9

Common Name	Scientific Name	S rank ¹	Habitat Type	Number
Yellow-Bellied Flycatcher	<i>Empidonax flaviventris</i>	S5B,S5M	Disturbed Conifer Woodland Wetland	1
Yellow-Bellied Sapsucker	<i>Sphyrapicus varius</i>	S2B,SUM	Wetland	2
Yellow-Rumped Warbler	<i>Dendroica coronata</i>	S5B,S5M	Open Field Wetland Disturbed Conifer Woodland Wetland Residential Gravel Road	5

¹ Appendix B – ACCDC Report for ranking definitions.

The highest species richness was recorded in Wetland (n=23), Shoreline (n=23), Residential (n=19), Open Field (n=14), Wet Deciduous Thicket (n=14) and Conifer Forest (n=13). Breeding behaviours were observed during the surveys; however, no nests were identified.

Figure 4: Breeding Bird Survey Locations



Figure 5: Species at Risk Locations



3.6 Wildlife Surveys

3.6.1 General

Mammals

The Bay St. George sub-region stretches from Codroy Valley in the south to Bonne Bay in the North and extends from the West Coast Inland. This sub region lies as an intermediate within the Western Newfoundland Forest. It experiences warmer summers than areas in the northern part of the region resulting in greater wildlife diversity. Wildlife which occupy this region include: Moose (*Alces Alces*), Mink (*Neovision vision*), Snowshoe hare (*Lepus americanus*), Lynx (*Lynx Canadensis*), Black Bear (*Ursus Americanus*), Beaver (*Castor Canadensis*), Muskrat (*Ondatra zibethicus*) and Otter (*Lutrinae*) (PAANL, 2008).

There are two endangered species of myotis that are found within Newfoundland and Labrador, northern myotis (*Myotis septentrionalis*) and little brown myotis (*Myotis lucifugus*). Big brown bat (*Eptesicus focus*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagons*) have been acoustically detected but are not currently listed as SAR. Both endangered myotis species typically hibernate in caves, mines, and occasionally in basements while their roosting habitat is cavities in large trees. Myotis species are typically found roosting within 1 km of a water source and are primarily forest dwelling gleaners. The ACCDC did not identify any known populations of these endangered species. However, targeted acoustic monitoring surveys for presence / absence of bats were undertaken at the direction of the Government of Newfoundland's Fisheries, Forestry and Agriculture (NL FFA) Wildlife Division. Results and methodology of the 2022 acoustic monitoring program are discussed in Section 3.6.4.

Herpetiles

The green frog, an introduced species can be found in quiet ponds and marshes of the region but is not widespread. There are no reptiles native to the province of NL (PAANL, 2008).

3.6.2 Incidental Wildlife Methodology

All direct observations of wildlife, including small mammals, furbearers, black bear, moose and amphibians, etc. were recorded. All observations of wildlife signs and important wildlife features, e.g., dens, nests, burrows, trails, roost trees, drumming sites, auditory detections, scat, tracks, feeding damage to plants, indicators of predation etc., were documented to provide additional information on the presence and distribution of species using the Study Area.

During the incidental wildlife surveys, all habitat types were traversed in the Study Area. Particular attention was paid to habitat types of those species listed in Table 6 below. The incidental wildlife surveys did not include the trapping, tracking or collection of any wildlife and/or specimens.

3.6.3 Summary of Findings

3.6.3.1 Background Information Review – ACCDC Results

The ACCDC data request returned records of SAR avifauna observations in the Study Area for, bank swallow (Table 6).

Table 6: ACCDC Observations of SAR within 5 km of the Study Area

Common Name	Scientific Name	Potential to occur
Newfoundland marten	<i>Martes americana atrata</i>	Possible but unlikely – Historic record Lack of habitat observed during study

ACCDC 2022 Data Request

Published resources (McBurney and Segers, 2021) and previous ACCDC expert opinions from nearby sites identified the potential for two additional SAR in the region (Table 7).

Table 7: Potentially Occurring SAR within 5 km of the Study Area

Common Name	Scientific Name	COSEWIC	NL ESA
Little brown bat	<i>Myotis lucifugus</i>	Endangered	Endangered
Northern long-eared bat	<i>Myotis septentrionalis</i>	Endangered	Endangered

Guide for Bat Monitoring in Atlantic Canada, March 2021 (McBurney and Segers)

3.6.3.2 Field Results

Incidental wildlife surveys were completed in the Study Area in June and August, 2022, at the same time as vegetation and avifauna surveys. Wildlife observed directly, or inferred from sign, are listed in Table 8.

Table 8: Wildlife and/or Wildlife Sign Encountered Within the Study Area

Common Name	Scientific Name	S-Rank*	Evidence
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	SNA (Exotic)	Audio/Visual/Middens
Black Bear	<i>Ursus americanus</i>	S4	Scat
Moose	<i>Alces americanus</i>	SNA (Exotic)	Visual/Prints/Scat
Snowshoe Hare	<i>Lepus americanus</i>	SNA (Exotic)	Visual/Scat
American Toad	<i>Bufo americanus</i>	SNA (Exotic)	Visual
Green Frog	<i>Rana clamitans</i>	SNA (Exotic)	Audio/Visual
Northern Leopard Frog	<i>Rana pipiens</i>	SNA (Exotic)	Visual
Mink Frog	<i>Rana septentrionalis</i>	SNA (Exotic)	Visual
Ruffed Grouse	<i>Bonasa umbellus</i>	SNR	Audio/Visual
Willet	<i>Tringa semipalmata</i>	S1B,SUM	Visual

Common Name	Scientific Name	S-Rank*	Evidence
Arctic Tern	<i>Sterna paradisaea</i>	S4B,SUM	Visual
Great Blue Heron	<i>Ardea herodias</i>	S2B,SUM	Visual
Semipalmated Sandpiper	<i>Calidris pusilla</i>	S3M	Visual
Canada Goose	<i>Branta canadensis</i>	S4	Visual Fly over
Ring-billed Gull	<i>Larus delawarensis</i>	S4B,SUM	Visual
Great Black-backed Gull	<i>Larus marinus</i>	S4	Visual
Osprey	<i>Pandion haliaetus</i>	S4S5B,SUM	Visual (Soaring)

*S-Ranks are provided for each species to provide a sense of rarity at the Sub-national (provincial) level (Appendix B)

3.6.4 Acoustic Monitoring – Bat Presence / Absence Survey

3.6.4.1 Methodology

A stationary point count acoustic survey was used to identify the presence /absence of bats within the Study Area by recording their echolocation calls. A Wildlife Acoustics Song Meter SM4BAT FS bioacoustics recorder (Photo A), equipped with an SMM-U2 Microphone attached to an elevated telescopic pole capable of detecting high-frequency sounds was utilized for receiving and recording bat acoustics.

Acoustic monitoring surveys were carried out from July 9th until October 17th, 2022, allowing for species detection throughout the rearing and migratory stages of the bat's lifecycle. Two stationary monitoring locations were chosen to assess the Study Area (Figure 6). These locations provided analysis of varying habitat types and were chosen based upon optimal bat detection. Areas with an open canopy and near by foraging habitat were chosen to be optimal locations. Monitors were set to record data 45 minutes before dusk and continue recording 45 minutes post dawn. Daily to capture peak activity levels. Microphones were calibrated and placed in an elevated position above the sub-canopy approximately 2.4 m above the ground with open canopy optimizing the potential for bat acoustic recording while minimizing background natural noise from below the subcanopy (i.e., small mammal and insect noise) (Photo B).

Data was downloaded at the end of the season and analyzed using a spectrogram software, Kaleidoscope Pro (Wildlife acoustics), that uses audio signatures to detect both the presence and species of bats. While this program identifies species based on their spectrogram, it is unable to determine abundance of each species.

Figure 6: Acoustic Monitor Locations

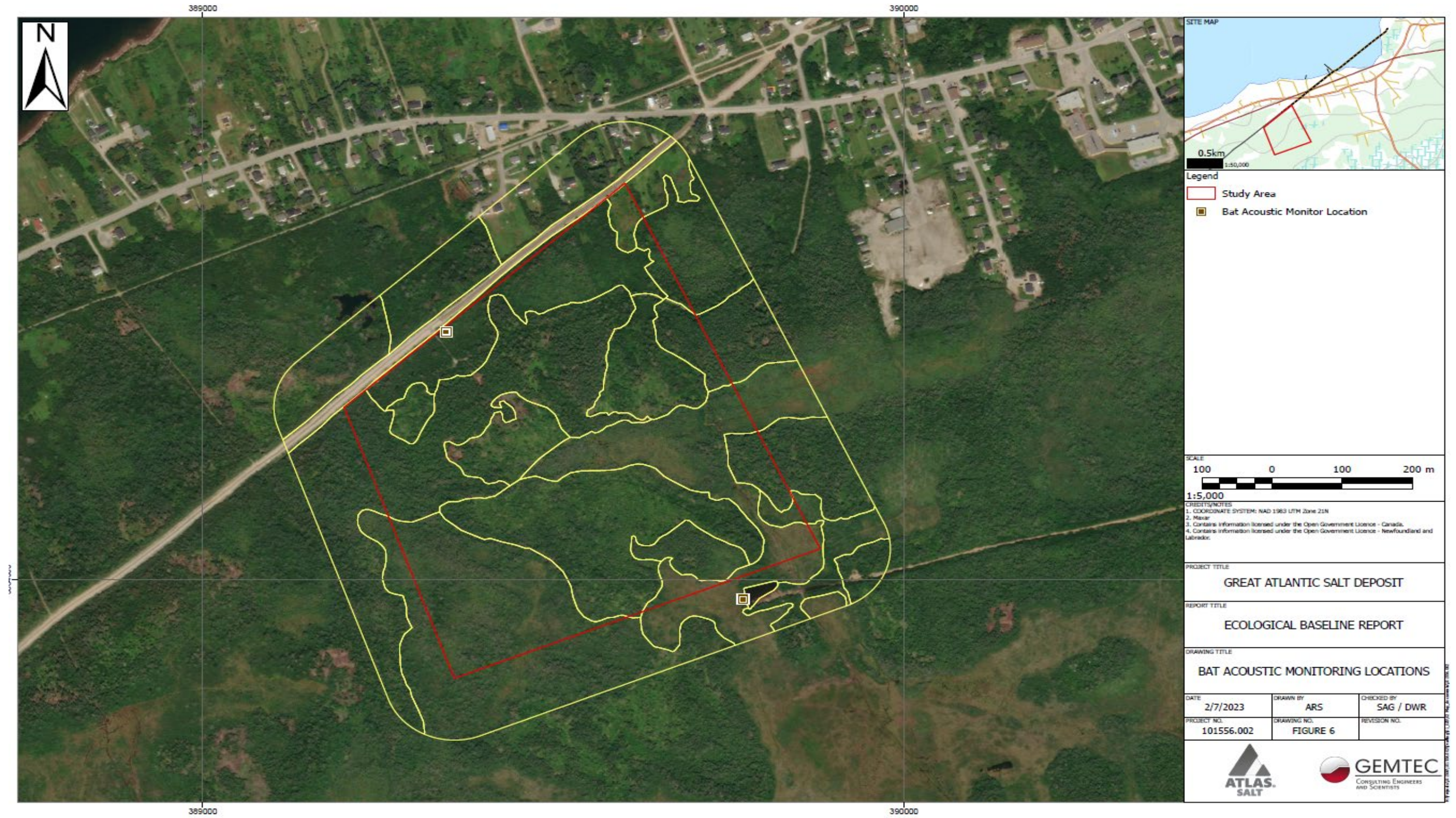


Photo A: BAT-02 Recorder attached to tree near microphone set up



Photo B: BAT-01 Elevated Microphone



Kaleidoscope Pro is able to identify bat species by two different methods: Manual or Auto-ID. Manual is recommended when either small amounts of data are being analyzed or to confirm the Auto-ID's. GEMTEC received four months of audio files from July 9th- October 17th, 2022, as such, a batch processing using Auto-ID was used. The Kaleidoscope software receives the input data as well as location to determine which species it is analyzing for, it then filters out the audio files for noise and produces results based on local bat species signatures.

Results from the 2022 assessment are provided below.

3.6.4.2 Results

The acoustic monitors detected 973 pulses identifying 77 sonograms. The 77 sonograms were determined to have originated from 3 species:

- Little brown myotis (55 occurrences);
- Hoary bat (12 occurrences); and
- Northern myotis (10 occurrences).

BAT-01 was placed within wetland habitat immediately adjacent to an open water feature, approximately 30m outside the boundary of the Study Area. This station yielded much fewer

results with 3 species identified over 34 occurrences. A single occurrence of a hoary bat was identified by Kaliedoscope Pro where no pulses were recorded. This observance was included in the observation count since the finding is consistent with species and timing of other recordings. This meter was placed near an anthropogenic open water feature; therefore it is likely that occurrences are due to feeding activity since the species detected are known to forage over clearings or over water (McBurney and Segers, 2021).

BAT-02 detected the highest number of occurrences (43) and identified all 3 species discussed above. BAT-02 was placed strategically near the road and closest to the community of St. Georges. Directly at the end of the road where it meets the community there is an abandoned home which has the potential for ideal roosting habitat. It is likely that bat occurrences detected by the recorder are due to feeding activity within the wet deciduous thicket west of the monitors location, or possible roosting habitat in a mixed woodland north of the recorders location.

The following Tables represent the results of the software analysis. Table 9 identifies each occurrence. Occurrences were recorded in July and August; no occurrences were noted beyond August. Table 10 provides a summary of total occurrences per species.

Table 9: Acoustic Monitoring Results

Meter #	Date	Time	Species	Pulses
BAT-02	2022-07-22	23:27:50	Hoary bat	5
BAT-02	2022-07-22	23:32:42	Hoary bat	2
BAT-02	2022-08-11	4:53:02	Hoary bat	2
BAT-02	2022-07-22	23:27:50	Hoary bat	5
BAT-02	2022-07-22	23:32:42	Hoary bat	2
BAT-02	2022-08-11	4:53:02	Hoary bat	2
BAT-02	2022-08-12	1:52:33	Little brown myotis	16
BAT-02	2022-08-10	23:20:02	Little brown myotis	22
BAT-02	2022-07-21	23:16:45	Little brown myotis	6
BAT-02	2022-08-06	21:43:31	Little brown myotis	3
BAT-02	2022-08-10	23:22:05	Little brown myotis	3
BAT-02	2022-07-30	1:23:41	Little brown myotis	2
BAT-02	2022-07-30	2:14:08	Little brown myotis	2
BAT-02	2022-08-09	21:53:25	Little brown myotis	2
BAT-02	2022-08-10	23:57:09	Little brown myotis	2
BAT-02	2022-07-30	1:26:22	Little brown myotis	3

Meter #	Date	Time	Species	Pulses
BAT-02	2022-08-10	23:23:57	Little brown myotis	3
BAT-02	2022-08-10	23:23:00	Little brown myotis	2
BAT-02	2022-08-16	3:34:12	Little brown myotis	28
BAT-02	2022-08-12	1:52:33	Little brown myotis	16
BAT-02	2022-08-10	23:20:02	Little brown myotis	22
BAT-02	2022-08-10	23:22:32	Little brown myotis	13
BAT-02	2022-07-21	23:16:45	Little brown myotis	6
BAT-02	2022-08-27	2:52:05	Little brown myotis	4
BAT-02	2022-08-06	21:43:31	Little brown myotis	3
BAT-02	2022-07-30	1:23:41	Little brown myotis	2
BAT-02	2022-07-30	2:14:08	Little brown myotis	2
BAT-02	2022-08-09	21:53:25	Little brown myotis	2
BAT-02	2022-08-10	23:57:09	Little brown myotis	2
BAT-02	2022-07-30	1:26:22	Little brown myotis	3
BAT-02	2022-08-10	23:22:05	Little brown myotis	3
BAT-02	2022-08-10	23:23:57	Little brown myotis	3
BAT-02	2022-08-13	21:49:45	Little brown myotis	4
BAT-02	2022-08-10	23:23:00	Little brown myotis	2
BAT-02	2022-07-10	22:32:28	Northern myotis	37
BAT-02	2022-07-11	0:41:51	Northern myotis	33
BAT-02	2022-08-16	23:39:08	Northern myotis	77
BAT-02	2022-07-10	22:32:28	Northern myotis	37
BAT-02	2022-07-11	0:41:51	Northern myotis	33
BAT-02	2022-08-15	23:33:48	Northern myotis	22
BAT-02	2022-08-21	21:14:34	Northern myotis	16
BAT-02	2022-08-21	21:09:47	Northern myotis	9
BAT-02	2022-08-21	21:09:47	Northern myotis	9
BAT-01	2022-08-10	1:39:51	Hoary bat	35
BAT-01	2022-08-05	2:22:48	Hoary bat	3
BAT-01	2022-07-12	4:12:31	Hoary bat	-
BAT-01	2022-08-04	2:39:03	Little brown myotis	46
BAT-01	2022-08-11	0:42:47	Little brown myotis	38

Meter #	Date	Time	Species	Pulses
BAT-01	2022-08-09	21:24:24	Little brown myotis	18
BAT-01	2022-08-01	22:02:43	Little brown myotis	13
BAT-01	2022-08-04	2:38:24	Little brown myotis	4
BAT-01	2022-08-10	21:52:47	Northern myotis	26
BAT-01	2022-07-22	23:27:50	Hoary bat	5
BAT-01	2022-07-22	23:32:42	Hoary bat	2
BAT-01	2022-08-11	4:53:02	Hoary bat	2
BAT-01	2022-08-16	3:34:12	Little brown myotis	28
BAT-01	2022-08-12	1:52:33	Little brown myotis	16
BAT-01	2022-08-10	23:20:02	Little brown myotis	22
BAT-01	2022-08-10	23:22:32	Little brown myotis	13
BAT-01	2022-07-21	23:16:45	Little brown myotis	6
BAT-01	2022-08-27	2:52:05	Little brown myotis	4
BAT-01	2022-08-06	21:43:31	Little brown myotis	3
BAT-01	2022-07-30	1:23:41	Little brown myotis	2
BAT-01	2022-07-30	2:14:08	Little brown myotis	2
BAT-01	2022-08-09	21:53:25	Little brown myotis	2
BAT-01	2022-08-10	23:57:09	Little brown myotis	2
BAT-01	2022-07-30	1:26:22	Little brown myotis	3
BAT-01	2022-08-10	23:22:05	Little brown myotis	3
BAT-01	2022-08-10	23:23:57	Little brown myotis	3
BAT-01	2022-08-13	21:49:45	Little brown myotis	4
BAT-01	2022-08-10	23:23:00	Little brown myotis	2
BAT-01	2022-08-16	23:39:08	Little brown myotis	77
BAT-01	2022-07-10	22:32:28	Little brown myotis	37
BAT-01	2022-07-11	0:41:51	Little brown myotis	33
BAT-01	2022-08-15	23:33:48	Little brown myotis	22
BAT-01	2022-08-21	21:14:34	Little brown myotis	16
BAT-01	2022-08-21	21:09:47	Little brown myotis	9

Table 10: Summary of Acoustic Monitoring Species Occurrences

Meter #	Species	Occurrences
BAT-02	Hoary bat	6
BAT-02	Little brown myotis	28
BAT-02	Northern myotis	9
BAT-01	Hoary bat	6
BAT-01	Little brown myotis	27
BAT-01	Northern myotis	1

Little brown myotis represented 71.4% of the total sonograms identified while the hoary bat and Northern myotis represented 15.6% and 13.0% of sonograms, respectively. Although these findings are not telling of relative abundance, it adds confidence to the assumption that all three species are present in the area.

The little brown myotis (Endangered) and Northern myotis (Endangered) are both cavity roosters that roost in natural and human-made structures. Both species are known to forage above open water as well as above the forest canopy, in yards, in open clearings, and in streets (McBurney and Segers, 2021). Both species are non-migratory and hibernate primarily in caves and mines as well as anthropogenic structures (McBurney and Segers, 2021). As such, it is assumed that these species would have suitable foraging, roosting, and rearing habitat within the Study Area as well as in the surrounding landscape due to the availability of foraging and roosting habitat. It is unlikely that these species have suitable natural hibernating habitat within the Study Area, although, anthropogenic/artificial habitat for hibernating is available in the region

The hoary bat has similar habitat requirements as the myotis species discussed above apart from their migratory behavior as most individuals tend to migrate south in the winter. It is assumed that suitable habitat for this species is present within the Study Area as well as in the surrounding landscape.

4.0 AQUATIC ASSESSMENT

4.1 General

Discussions with the DFO and GEMTEC were held prior to commencing the 2022 studies to determine an appropriate scope of work for the baseline studies and discuss methodology for aquatic surveys. Although no watercourses were identified within the Study Area using 1:50,000 Topographic CanVec Series (Natural Resources Canada, Canada 2022) or Government of Newfoundland's Forestry data, GEMTEC biologists identified a fish bearing stream, identified as "Man of the War Brook", approximately 140 m west of the Study Area during field investigations as well as a marine / barachois pond habitat southeast of the Causeway to Turf Point.

The aquatic investigations were completed within the Study Area to collect, analyze and present biological data. As such, this baseline investigation includes:

- Fisheries Habitat Assessment Survey;
- Fisheries Population Assessment;
 - Quantitative Fisheries Assessment (within watercourses only); and
 - Presence / absence and relative abundance of fish populations (within waterbodies (i.e., ponds and inland lakes)).

Results and methodology of these investigations are presented below.

4.2 Predictive Mapping and SAR Screening

A desktop SAR screening was carried out using data acquired from the ACCDC in addition to available topographic mapping to determine watercourse and waterbody locations.

4.2.1 Methodology

SAR screening was conducted by obtaining data from the ACCDC; the search request was limited to within a 5 km radius of the Study Area. The database search provided the following:

- Reported observations of rare and endangered flora and fauna species within and adjacent to the Study Area;
- Maps to identify species that have not been reported in the area, but are expected to occur, based on estimates of habitat and wildlife distribution; and
- Locations of any Special Areas such as:
 - Managed areas with some level of protection; and
 - Significant ecological areas of interest.

The species listed within the ACCDC report were referenced to rankings outlined by the COSEWIC, SARA and NLESA. During the aquatic assessment, a comparison of habitats suited

to any identified SAR or SOCC of aquatic fauna identified in the desktop study was completed. The ACCDC report is attached as Appendix B.

4.2.2 Summary of Findings

Historical records from ACCDC suggests the Banded Killifish (S1) listed as Vulnerable in the province of NL and Threatened under COSEWIC has been identified in the area. (Table 11). No banded killifish were observed during the aquatic investigations.

Table 11: Potentially Occurring Aquatic SAR within 5 km of Study Area

Common Name	Scientific Name	Potential to occur
Banded Killifish	<i>Fundulus diaphanus</i>	Possible - Historic records within a 5km radius of Study Area

ACCDC 2022 Data Request

4.3 Fish Habitat Assessment

4.3.1 Methodology

Existing mapping of the watershed and waterbodies was reviewed prior to site investigations to determine the surrounding topography, historical and current land use and any surface water features present within and immediately adjacent to the Study Area. The surface water features, with connectivity to the sites, were confirmed and updated (if necessary) during the field reconnaissance. This information was used to determine if and how fish could migrate into and out of the surface water features, and to evaluate drainage patterns in the area. GEMTEC Biologists documented the watercourse features where accessible using a handheld GPS unit and by taking photographs.

Figure 7: Aquatic Survey Locations



4.3.1.1 Fisheries Habitat Assessment Surveys

Fisheries Habitat Assessment Surveys were conducted based on DFO Standard Methods for Freshwater Fish Habitat Surveys (Sooley, D. Barnes, A 1998). Fish habitat surveys involve the collection of aquatic habitat information (e.g. substrate, flow, depth, vegetative cover, etc.) for streams or sections of streams that may be affected by a proposed project. These surveys are a necessary requirement for projects that interact with aquatic environments to establish and quantify the existence of fish habitat in the Study Area (DFO, 1998).

The Canada Fisheries Act defines fish habitat as those parts of the environment “on which fish depend, directly or indirectly, in order to carry out their life processes”. A single watercourse, identified as “Man of the War Brook”, west of the Study Area was assessed as Fisheries Habitat. Two drainage features were identified in the Study Area but were not determined to be suitable fish habitat due to migration barriers, intermittent flows and lack of connection to open waterbodies.

4.3.1.2 General Habitat Features and Water Quality Parameters

The local topography and environmental characteristics were visually assessed. General site conditions, habitat types and areas of interest were documented with photos and a handheld GPS unit.

General habitat characteristics were described at each survey location to provide a general description of the habitat. Information including channel width (m), wetted width (m), depth of water (cm), substrate composition, presence of bank vegetation, and any significant upstream or downstream features (i.e., Corrugated Steel Pipe (CSP), beaver dams, etc.).

Substrate sizes were visually observed, and the size of substrate was characterized using the DFO criteria outlined in Table 12.

Table 12: Substrate Classification

Name	Size (mm)
Boulder	> 461
Rock	180 – 460
Rubble	54 – 179
Gravel	2.6 – 53
Sand	0.06 – 2.5

Fines	0.0005 – 0.05
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To assess the water quality in the Study Area, four parameters were evaluated using a calibrated Y-Si meter: temperature (degrees Celsius (°C)), dissolved oxygen (milligrams per litre (mg/L)), conductivity (microSiemens per centimetre (µS/cm)), and pH (unitless). The rationale and classification system for each parameter is discussed below.

Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) are used as indicators of freshwater quality. Conductivity is not included in the CCME FWAL guidelines; therefore, Environment and Climate Change Canada’s (ECCC’s) target for Canada’s freshwater quality in a global context was used for comparison purposes. pH guidelines are set out by Atlantic Risk Based Correction Action (ARBCA) The Atlantic RBCA model provides standards and criteria for assessing, remediating, and redeveloping sites impacted by petroleum hydrocarbons and other contaminants. The three applicable targets are listed below:

- Dissolved oxygen: > 6 mg/L (CCME, 2018);
- pH: 6.5 – 9 (ARBCA, 2022); and
- Conductivity: less than 500 µS/cm (ECCC, 2017).

Many fish species have a distinct thermal optima; therefore, water temperature is an important factor in determining the habitat quality for fish survival and production. Most salmonids are sensitive to warm water and tend to avoid areas of water with temperatures greater than 20°C (DFO, 2008). To classify the water temperature in the Study Area, the DFO classification system for Brook Trout was used:

- Cool: < 16.5°C as ideal;
- Intermediate: 16.5°C to 18.9°C as marginal; and
- Warm: ≥ 19°C as unsuitable.

4.3.2 Results

4.3.2.1 General Physical Setting

The Project is located within the St George’s Bay Subregion of the Southwestern Newfoundland Ecoregion, which extends from Codroy in the south to Rocky Harbour in the north. The study area resides within the Bay St. George Watershed. This watershed has a drainage area of 618.2km² (Environment Canada, 2022). Fish species which reside in this watershed include: Atlantic Salmon, Brook Trout, and American Eel, Rainbow Smelt, and Stickleback.

Generally, the collected water quality parameters suggest suitable habitat for freshwater fish including salmonoids. Temperatures were consistently recorded below 16.5 degrees Celsius which is ideal for fish survival and production. Dissolved oxygen was recorded at 9mg/L which is ideal for fish habitat.

4.3.2.2 Watercourses

Initial site reconnaissance surveys of the Study Area indicated one stream that was fish bearing and was assessed as part of this investigation. The stream is located west of the Study Area (Figure 7) flowing north towards the bay. The surveyed stream, “Man of the War Brook” (AQ-001.1 – AQ-001.3) is located 90 m west of the Study Area boundary, however, due to its proximity to the site, Biologists determined it was beneficial to perform aquatic studies on this location due to its connectivity to the Study Area’s watershed.

The Man of the War Brook flows north, passing through a culvert under the road which runs parallel to the Study Area. The culvert was checked for barriers, and none were present indicating that fish passage was not obscured, however, some damage was noted to the culvert. The stream was noted to be good quality fish habitat. Substrate consisted of rock, rubble, gravel and sand with rock as the dominant substrate. Banks were slightly undercut, however, erosion was not present and banks were noted to be stable. Depths ranged between 10-30cm. The section of the stream closest to the road is forested and highly shaded, dominant bank vegetation was shrub and alder thicket with grass secondary. Upstream area which drains into the watercourse is wetland habitat. Photos of the watercourse conditions are provided in Appendix A with detailed habitat assessment forms presented in Appendix E.

Two unmapped drainage features were identified within the Study Area that provide seasonal flows between wetland features (Figure 7). GPS coordinates were collected in the field to map these features. These drainage features did not provide connectivity to open water features and had intermittent flows. As such, these features did not appear to provide suitable habitat for any inland freshwater species. Photos of the drainage features are provided in Appendix A.

4.3.2.3 Barchois Pond

The Town of St. Georges includes several protected/sensitive areas such as Sandy Point, Flat Bay Brook and the Turf Point barchois. Sandy Point is an island in St. Georges Bay directly across from the Town of St. Georges which is culturally and environmentally significant as it supports vulnerable species and historic infrastructure. The Flat Bay peninsula and Sandy Point are considered critical habitat for piping plover. Flat Bay brook is located to the west of the Town of St. Georges and includes tidal marshes which are habitat for vulnerable species. The low area on the shore below the T’Railway between Station Road and Turf Point, also known in the community as Sunset Trail Barchois pond, is a sensitive natural environment which supports vulnerable species, and which is vulnerable to sea level rise. This eastern bank and surrounding

terrestrial habitat of the pond is designated EP by the Town of St. Georges to protect its natural environment, including rare plant and animal species which include the banded killifish and piping plover.

The barachois pond is tidally influenced and outlets via a large (2m in diameter) culvert into the ocean at the northeastern limit of the Causeway, adjacent to Turf Point. The southern and eastern shoreline of the pond is vegetated with a mix of trees and shrubs with sandy shores while the northwest shoreline is characterized by imported cobble and boulder as part of the Causeway construction.

4.4 Fisheries Population Assessment

Fisheries Population Assessments were accomplished by completing a quantitative survey for fish within the Man of the War Brook watercourse west of the Study Area as well as completing a relative abundance survey within the barachois pond. Quantitative sampling was conducted in accordance with DFO standards for fish and fish habitat surveys (Sooley D, Barnes A. 1998). Environmental Deoxyribonucleic Acid (eDNA) metabarcoding was used to obtain relative abundance data within the barachois pond. Data has been used to determine habitat use and provide information on the size and general characteristics of fish populations in the Study Area. Further details on each assessment are presented below.

4.4.1 Quantitative Fisheries Population Assessment (Watercourses)

4.4.1.1 Methodology

On August 13th, 2022, a single watercourse 140 m west of the Study Area, identified as “Man of the War Brook” (Figure 7) was visited by GEMTEC Biologists to collect data necessary to develop a population estimate. The watercourse was selected by GEMTEC Biologists based on the anticipated presence of fish populations and suitable habitat conditions. The sampling program was completed to collect data as part of the quantitative assessment within a selected reach (AQ001.1 to AQ001.2) that was determined to be representative of the watercourse conditions. The fisheries habitat assessment suggested uniform habitat structure and natural connectivity with the exception of a culvert observed 140 m from the Study Area. The data collected in the representative sample area was used to provide a population estimate for the watercourse using a statical modelling software.

An electrofishing program was undertaken using a Smith Root, Inc. LR-24 Backpack Electrofisher to collect data required to complete the quantitative fisheries assessment. Prior to undertaking the sampling program, a DFO Scientific Fish Collection Permit NL-7027-22 was obtained (Appendix F). Data was collected as described in the Quantitative Electrofishing section in Standard Methods Guide for Freshwater Fish and Fish Habitat Surveys in Newfoundland and Labrador (Sooley, D. Barnes, A. 1998).

GEMTEC biologists conducted several passes within a 56.25m watercourse reach from AQ-001.1 to AQ-001.2 (Figure 7). An upstream and downstream net barrier was installed to isolate reaches within the watercourse for sampling. After each pass, data was collected and recorded. Multiple passes were made within the surveyed area until no more fish were captured. Once the sampling was complete, all fish were returned to the habitat.

The following data was collected as part of the quantitative population assessment:

- Number of Sweeps – defined as the number of passes made using an electrofisher within the survey location (minimum of 4 recommended or until less than 20% of the initial sweep is collected).
- In-stream sample distance – Measured in meters as the distance between nets.
- Length of survey time (i.e. electrofishing) in seconds.
- Number of individuals, categorized by species.
- Fish Length – defined as the total length of each individual fish (fork length) measured in millimetres.
- Total Number of Fish Captured – defined as the total number of fish captured per pass of the Sample Site
- Age – was assumed by categorizing individuals based on length and published literature regarding length to age regressions.

Fisheries population data, as well as the general water quality parameters (temperature, Dissolved Oxygen, conductivity, and pH) are presented in Appendix E.

Data was analyzed for population estimates using the Removal Method of Population Estimation (Zippin, C. 1958) which determines the number of fish in a cross section and the corresponding p-value based on the data retrieved from multiple passes by the electrofisher. This method of population estimation relies on the assumption that after four passes the majority of the total population within the stream will be completely removed. This total number as well as the number of each pass is then used to compute the overall population estimation as well as its corresponding probability of accuracy. In order to capture uncertainty around the population estimate confidence limits are utilized. The confidence limit utilizes the standard deviation to determine an upper and lower range that our population lies within.

Catch per unit effort (CPUE) is a measurement utilized to estimate abundance of closed populations in the presence of successive removals through electrofishing methods. CPUE data are commonly used to monitor or assess stocks when the boundaries of the total population are unknown. Electrofishing samples are described in terms of the number of fish caught in a given amount of time. For this analysis the CPUE was conducted by computing the total number of individuals per 10 000 seconds of electrofishing. An underlying assumption of using CPUE as an

index of abundance is that the number of fish captured is proportional to the amount of effort expended. When a population is closed, one unit of sampling effort removes a fixed proportion of the total population. Typically, the area occupied by a stock is assumed to remain constant. As abundance changes, the expectation is that density will also change, and CPUE estimates will remain proportional to abundance. One of the most common approaches to increasing the precision of CPUE estimates is to increase the number of samples. Assuming catchability is constant, increasing sample size will likely increase precision (Hubert, W. and Fabrizio, M. 2007).

4.4.1.2 Results

In an effort to increase precision, four sweeps of the area were completed to ensure the highest amount of the population within the stream were captured. This reduces bias and increases accuracy of the abundance of fish in this stream. Results

An electrofishing program was completed within the Man of the War Brook (Figure 7) on August 13th, 2022 to identify presence/absence of fish species. Select water quality parameters were collected using a YSI multi-meter in addition to general fish habitat characteristics to identify suitable fish habitat. Results of the 2022 electrofishing program within the Study Area are presented in Table 13.

Data from the field investigations suggest that fish populations are confirmed to be utilizing the Man of the War Brook west of the Study Area. Four passes of the sample area were completed with a total of 22 individuals captured over a total electrofishing time of 1,763 seconds. The initial pass captured 10 individuals with the second, third, and fourth pass resulting in 7, 5, and 0 individuals, respectively. A single species was identified, brook trout (*Salvelinus fontinalis*). The species appear to be using the Man of the War Brook west of the Study Area for some portion of their life cycle including spawning, feeding, migration, etc.

Generally, the collected water quality parameters suggest suitable habitat for freshwater fish including salmonoids. Temperatures were consistently recorded below 16.5° C which is ideal for fish survival and production.

Results for the backpack electrofishing survey program were analyzed using R statistical analysis software. The Zippin method for population probability was utilized in the program to determine population estimates. The Zippin method is one of the most accurate methods used to estimate total populations from removal trapping data. Most population estimation models require mark and recapture study methods which is why this method was chosen. The analytics were performed on the stream results to determine a p-value. The p-value is the probability that the estimate is accurate with a lower a p-value indicating a more accurate population estimate. .

By using a representative section of the watercourse, the information retrieved from the analysis of the sample area was applied to the total length of the stream to determine a full population

estimate. A potential influence on the precision and confidence of the findings could be found in the proportion of sample area relative to the total length of the watercourse. With a total watercourse length of 1522.33m, the sample area represents 3.7% (56.24 m) of the total watercourse width. However, GEMTEC biologists completed a stream habitat assessment prior to sampling to identify a representative reach that was accessible and suitable for electrofishing.

Using the confidence limits, a range was determined in which it is 99% likely that the extrapolated population lies within. From data collected within the sample area, biologist were able to extrapolate results to the total watercourse length of 1522m to determine a population range between 325.5 to 374.5 fish with a mean population of 350 fish (Table 13).

The following table outlines the results of the statistical analysis. Including Confidence limits (Lower Confidence Limits (LCL) and Upper Confidence Limits (UCL)), Population estimate for the stream based on the sample, CPUE and the mean length of brook trout captured.

Table 13: Electrofishing Summary Results

Estimate per 100m No. Fish	P Value	Population Estimate LCL	Population Estimate	Population Estimate UCL	CPUE #Fish/10000 seconds	Mean Length (cm)	Species
23	0.51	325.5	350	374.5	133.48	7.83	Brook Trout

Trout that migrate to sea usually leave fresh water in the spring, at 1 to 4 years of age. Trout lengths gathered from electrofishing results indicate that the brook trout recovered from stream AQ-001 are between 1-3 years of age. Age was determined based on the length of each individual based on information provided in (Ryan, P.M., 1996). Results, listed in Table 14, indicate this stream is dominantly used by young of the year. This is consistent with the stream assessment, as factors are considered ideal for trout rearing habitat. Depths were consistently low in this stream which while are sustainable for smaller fish are not preferable for larger fish and the demographics on fish age and length are consistent with these findings. The following table represents demographics of fish recovered from the stream during the electrofishing survey.

Table 14: Summary of Age Demographics

Species	Year 1 (<5 cm)	Year 2 (5-10 cm)	Year 3 (10-15 cm)
Brook trout	10 individuals 45.45%	7 individuals 31.81%	5 individuals 22.72%

4.5 Species Relative Abundance (Barachois Pond)

4.5.1 Methodology

Genetic material left behind by individual organisms in their environment is called Environmental DNA (eDNA). Surveying for this eDNA material allow for a non-invasive surveys to detect species in water using their DNA.

This program used water samples to survey whole taxonomic groups using metabarcoding laboratory analysis to determine multiple species presence and relative abundance in water bodies within the Study Area. GEMTEC biologists took two eDNA samples within the barachois pond (Figure 7). Independent surface water samples of up to 1000 mL were collected at regular intervals to ensure a variety of habitats were evaluated. Samples were passed through a separate filter to ensure the highest eDNA detection rate. NatureMetrics is a biodiversity analysis firm that offers eDNA program design, laboratory analysis, and data processing services. Samples kits were provided by NatureMetrics and returned for laboratory analysis and reporting. For detailed methodology of the laboratory analysis, please see the “Methods” section of Appendix G.

4.5.2 Results

eDNA samples were collected at two locations to determine the relative abundance of fish species in waterbodies near the Study Area (Figure 7). NatureMetrics completed the laboratory analysis of the samples and provided reporting on the findings (Appendix G). NatureMetrics uses a global reference database, and species names are suggested.

Although the analysis was completed to determine relative abundance of fish, a total of 12 taxa were detected, however Atlantic silverside (*Menidia menidia*) and Mummichog (*Fundulus heteroclitus*) were determined to be the most abundant.

The frequency of occurrence of all detected families is presented in Table 15. Numbers correspond to the number of taxa belonging to those families in those samples. Each row in the table represents one taxon, shown with the lowest possible taxonomic assignment based on currently available reference data. Each column represents a sample, showing the proportion of sequence reads per detected taxon. Care should be taken in interpreting the numbers in terms of relative species abundance, but a high sequence proportion can be interpreted as lending greater confidence to a detection.

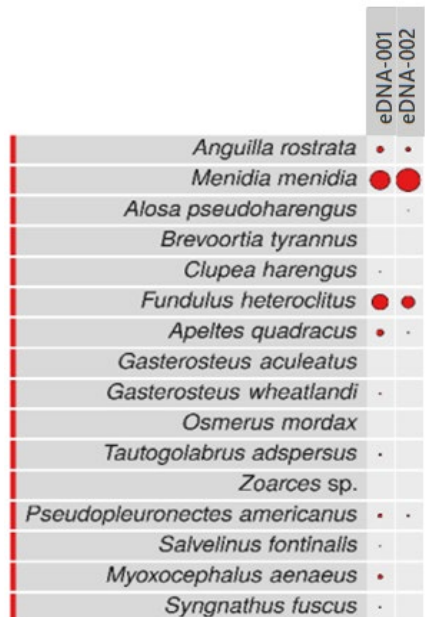
Table 15: Number of Sequence Reads per Detected Taxon

Species	eDNA-01	eDNA-02
<i>Anguilla Rostrata</i>	4.68	2.01
<i>Menidia Menidia</i>	51.07	76.88
<i>Alosa Pseudoharengus</i>	-	0.03
<i>Clupea Harengus</i>	0.03	-
<i>Fundulus Heteroclitus</i>	34.45	20.59
<i>Apeltes Quadracus</i>	5.29	0.12
<i>Gasterosteus Wheatlandi</i>	0.30	-
<i>Tautogolabrus Adspersus</i>	0.41	-
<i>Pseudopleuronectes Americanus</i>	1.51	0.38
<i>Salvelinus Fontinalis</i>	0.07	-
<i>Myoxocephalus Aeneus</i>	2.07	-
<i>Syngnathus Fuscus</i>	0.12	-

“-“ indicates no sequences were detected

The proportion of the sequencing output allocated to the different taxa (rows) within each sample (columns) (Table 16). Each bubble per sample represents the proportion of DNA for each taxon for that sample. The size of the bubble is relative to the number of sequences from all taxa detected in that sample.

Table 16: Relative Abundance of Genetic Material



American Eel (*Anguilla rostrata*) is recognized as a S3 species in the province of NL, listed as a Vulnerable species under NLESA, and designated as Threatened federally under SARA. This species was identified in the barachois pond through eDNA metabarcoding analysis. Habitat for this species includes salt and freshwater. During their oceanic migrations their sole habitat is salt water, during continental phases eels occupy all salinity zones, including shallow and sheltered marine waters, estuaries, and freshwater rivers and lakes. It is likely that American eels are inhabiting the coastal waters, barachois pond, and both waterbodies and watercourses connected to coastal waters around the Study Area.

Mummichog (*Fundulus heteroclitus*) is recognized as a S3 species in the province of NL, listed as a Vulnerable species under NLESA and is not assessed federally under COSEWIC or SARA. This species was identified in the barachois pond through eDNA metabarcoding analysis. This population is provincially known as the Little Barachois estuary. Mummichog are euryhaline species meaning they live in both fresh and salt water and can adapt to a wide range of salinities. Mummichogs are normally found in shallow brackish waters of estuaries, salt marshes, or tidal streams but can occasionally be found in freshwater streams and rivers.

5.0 CLOSURE

This report has been prepared for the sole benefit of our client, Atlas Salt Inc. The report may not be relied upon by any other person or entity without the express written consent of GEMTEC Consulting Engineers and Scientist Limited and our client, Atlas Salt Inc.

Any use that a third party makes of this report, or any reliance or decisions made based on it, is the responsibility of such third parties. GEMTEC Consulting Engineers and Scientist Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The information presented in this report represents the best judgment of our trained professionals and technical staff based on current standards, site and project information known at the time and project area conditions observed by staff at the time the work was performed.

Should additional information become available, GEMTEC Consulting Engineers and Scientists Limited requests that this information be brought to our attention so that we may review the conclusions presented herein.

If you have any questions concerning this report or require further details, please do not hesitate to contact us.

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APPENDIX A

Site Photographs



Photo 1.1: Coniferous Forest Habitat



Photo 2.1: Coniferous Woodland Habitat



Photo 3.1: Coniferous Thicket Habitat



Photo 4.1: Mixed Woodland Habitat



Photo 5.1: Disturbed Conifer Woodland Habitat



Photo 5.2: Disturbed Conifer Woodland Habitat



Photo 6.1: Disturbed Mixed Woodland Habitat



Photo 7.1: Wet Deciduous Thicket Habitat



Photo 8.1: Wet Conifer Scrub Habitat



Photo 9.1: Wetland Habitat



Photo 9.2: Wetland Habitat



Photo 9.3: Wetland Habitat



Photo 9.4: Wetland Habitat test pit showing water at surface and 30+cm of organics below surface.



Photo 10.1: Open Field Habitat



Photo 10.2: Dilapidated wooden structure found in Open Field Habitat



Photo 11.1: Gravel Road Habitat with Moose encounter



Photo 11.2: Gravel Road Habitat along Causeway



Photo 12.1: Coastal Shoreline Habitat



Photo 12.2: Coastal Shoreline Habitat



Photo 13.1: Barachois Open Water Feature



Photo 13.2: Barachois Open Water Feature



Photo 13.3: Barachois Open Water Feature



Photo 13.4: Barachois Open Water Feature



Photo 14.1: Seasonal Drainage Feature



Photo 14.2: Seasonal Drainage Feature within a wetland



Photo 15.1: AQ-001 Stream Assessment – Man of the War Brook

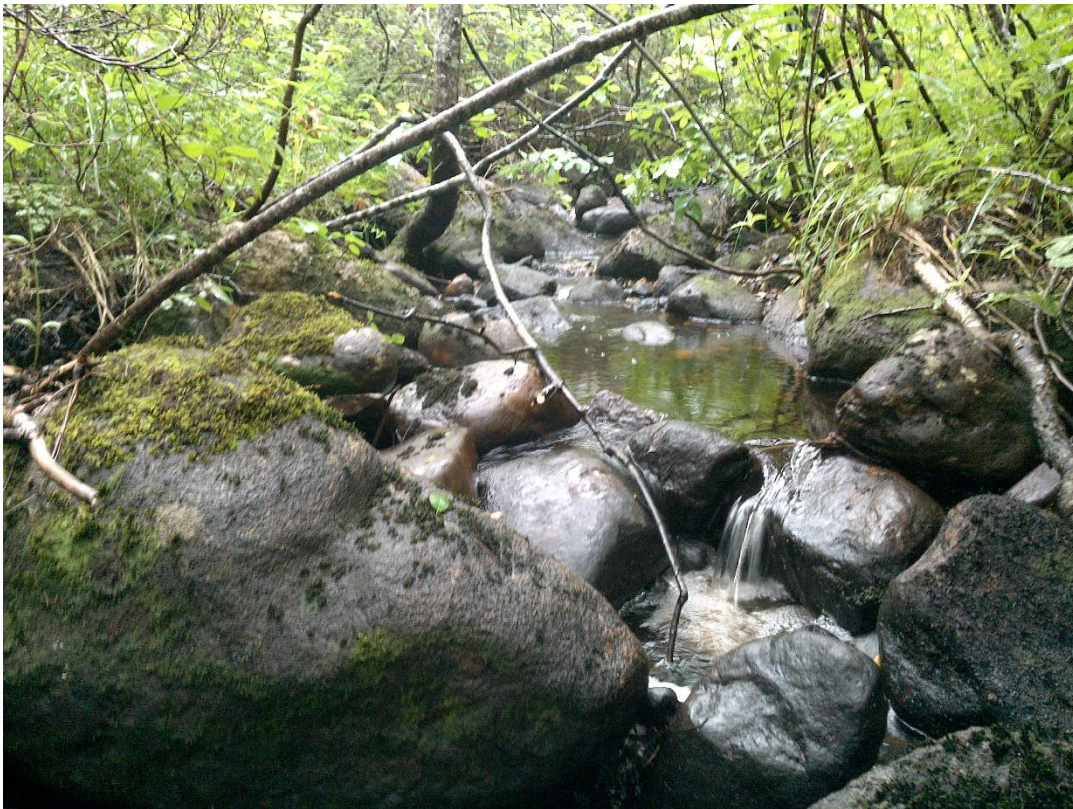


Photo 15.2: AQ-001 Stream Assessment - Man of the War Brook



Photo 15.3: AQ-001 Stream Assesment showing rock and boulder substrate with dense canopy



Photo 15.4: AQ-001 Stream Assesment downstream net barrier during electrofishing activities



Photo 16.1: Young of Year Brook Trout (*Salmo fontinalis*) captured during Watercourse Electrofishing



Photo 16.2: Brook Trout (*Salmo fontinalis*) fry captured during Watercourse Electrofishing



Photo 16.2: Adult Brook Trout (*Salmo fontinalis*) captured during Watercourse Electrofishing



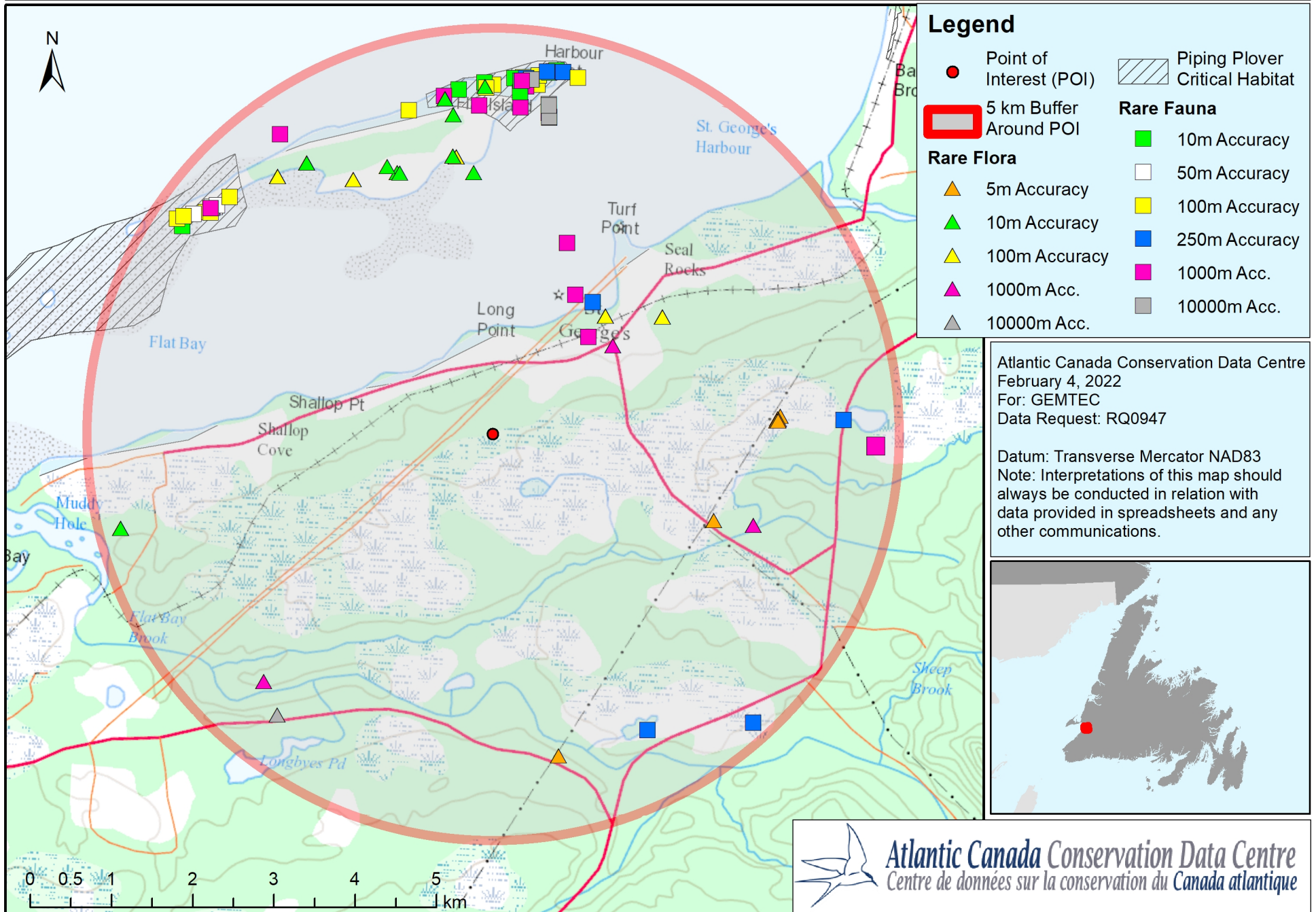
APPENDIX B

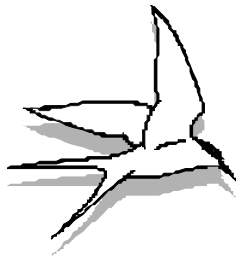
ACCDC Report

Table B1: Species Status

Table B2: Species Habitat Comparison

GIS Scan of Rare and Provincially/Federally Listed Species for Point of Interest in St. George's, Newfoundland and Labrador





Part I. Conservation Data Centre Subnational Rarity Ranks

Biological diversity or biodiversity can be described at a number of levels, from molecules to ecosystems. Biodiversity is a combination of species diversity (the variety of species), genetic diversity (the genetic variability among individuals of that species), and ecological diversity (the variety of ecosystems/habitats in which they live). Conservation Data Centres (CDCs), as part of The NatureServe* international network, track biodiversity at two levels: species and ecological communities. Species and ecological communities are referred to as **elements** of biodiversity. Elements are ranked in each jurisdiction (province or state) and at global and national levels in order to help prioritize conservation efforts.

NatureServe and all CDCs (called Heritage Programs in the US) use a standardized element ranking system that has evolved over some 30 years, with input from hundreds of scientists, managers and conservationists. The following material describes this element ranking system at the subnational (S) or provincial level and explains how ranks are assigned for species elements of biodiversity. (The community ranking process is slightly different.)

* Formerly known as The Nature Conservancy (TNC)

Definitions of Provincial (subnational) ranks - SRANKS

- S1 Critically Imperiled**—Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction.
- S2 Imperiled**—Imperiled in the jurisdiction because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from jurisdiction.
- S3 Vulnerable**—Vulnerable in the jurisdiction due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.
- S4 Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
- S5 Secure**—Common, widespread, and abundant in the jurisdiction.
- SX Presumed Extirpated**—Species or ecosystem is believed to be extirpated from the jurisdiction (i.e., nation or state/province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

- SH Possibly Extirpated**— Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
- S#S# Range Rank** — A numeric range rank (e.g., S2S3 or S1S3) is used to indicate any range of uncertainty about the status of the species or ecosystem. Ranges cannot skip more than two ranks (e.g., SU is used rather than S1S4).
- SU Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
- SNR Unranked**—National or subnational conservation status not yet assessed.
- SNA Not Applicable** —A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities.

Not applicable cases:

Hybrid – Element represents an interspecific hybrid without conservation value. (Note that hybrids may be assigned a numeric rank if they do have a conservation value.)

Exotic Origin – Element is not native to the nation or subnation.

Accidental/Nonregular – Element is not regularly found in the nation or subnation, in other words, infrequent and outside of normal range.

Not Confidently Present – Element’s presence in the nation or subnation has been reported, but the report is unconfirmed or doubtful; Element has been falsely reported, and may or may not potentially occur; Element may potentially occur (e.g., habitat is suitable); Element was never present in the nation or subnation despite presence in surrounding areas.

No Definable Occurrences – Element is native and appears regularly but lacks practical conservation concern in the subnation because it is transient or occurs in a dispersed, unpredictable manner.

Synonym – Element reported as occurring in the nation or subnation, but the national or provincial data center does not recognize this taxon; therefore the Element is not assigned a national or subnational rank.

Rank Qualifier

- S#?** **Inexact Numeric Rank**—Denotes inexact numeric rank. This designation should not be used with any of the variant national or subnational conservation status ranks or NX, SX, NH, or SH.

Breeding Status Qualifiers⁴

- B Breeding**—Conservation status refers to the breeding population of the species in the nation or state/province.
- N Nonbreeding**—Conservation status refers to the non-breeding population of the species in the nation or state/province.
- M Migrant**—Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the nation or state/province.

⁴ 4A breeding status is only used for species that have distinct breeding and/or non-breeding populations in the nation or state/province. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the nation or state/province. In addition, a breeding-status S-rank can also be coupled with a migrant-status S-rank if, on migration, the species occurs regularly at particular staging areas or concentration spots where it might warrant conservation attention. Multiple conservation status ranks (typically two, or rarely three) are separated by commas (e.g., S2B,S3N or SHN,S4B,S1M).

Part II. The Ranking Process

To rank species elements, 8-10 different biological criteria are assessed for each species. The ten factors considered in assigning status ranks are described below.

Ranking Matrix Eight ranking criteria and value of letter scores for each criterion.

	MATRIX SCORE								
	A	B	C	D	E	F	G	H	I
CRITERIA									
Population size	1-50	50-250	250-1000	1000-2500	2500-10000	10000-100000	100000-1000000	>1000000	
Range Extent	<100km ²	100-250km ²	250-1000km ²	1000-5000km ²	5000-20000 km ²	20000-200000 km ²	200000 – 2500000 km ²		
Short-term Trend	Decline >90%	Decline of 80-90%	Decline of 70-80%	Decline of 50-70%	Decline of 30-50%	Decline of 10-30%	Relatively Stable (<10% change)	Increase of 10-25%	Increase of >25%
Long-term Trend	Decline >90%	Decline of 80-90%	Decline of 70-80%	Decline of 50-70%	Decline of 30-50%	Decline of 10-30%	Relatively Stable (<10% change)	Increase of 10-25%	Increase of >25%
Area of Occupancy	<0.4km ²	0.4-4km ²	4-20km ²	20-100km ²	100-500km ²	500-2000km ²	2000-20000km ²	>20000 km ²	
Number of Element Occurrences (EOs)	0-5	6-20	21-100	>100					
Number of EOs with Good Viability	No occurrences with excellent or good viability or ecological integrity	Very few (1-3) occurrences with excellent or good viability or ecological integrity	Few (4-12) occurrences with excellent or good viability or ecological integrity	Some (13-40) occurrences with excellent or good viability or ecological integrity	Many (41-125) occurrences with excellent or good viability or ecological integrity	Very Many (>125) occurrences with excellent or good viability or ecological integrity			
Environmental Specificity	Very Narrow	Narrow	Moderate	Broad					
Threat Scope	Pervasive (71-100%)	Large (31-70%)	Restricted (11-30%)	Small (1-10%)					
Threat Severity	Pervasive (71-100%)	Large (31-70%)	Restricted (11-30%)	Small (1-10%)					

1. Population Size

Population size is the estimated current total population of the species which is naturally occurring and wild within the area of interest (globe, nation, or subnation), and that is of reproductive age or stage (at an appropriate time of the year), including mature but currently non-reproducing individuals, which should be included in counts or estimates. Abundance is measured in different ways depending on the biology of the species. For animal populations it is usually measured by the number of individuals, for plants it may be measured by the area occupied by a distinct population, and for aquatic invertebrates it may be measured by the stream length that the species occupies:

Z = Zero, no individuals believed extant (i.e., species presumed extinct)
A = 1–50 individuals
B = 50–250 individuals
C = 250–1,000 individuals
D = 1,000–2,500 individuals
E = 2,500–10,000 individuals
F = 10,000–100,000 individuals
G = 100,000–1,000,000 individuals
H = >1,000,000 individuals
U = Unknown
Null = Factor not assessed

*A value range (e.g., DE) can also be used to indicate uncertainty.
(DE would indicate between 1000 – 10000 individuals).

2. Range Extent

This denotes the approximate range of the species as a percentage of the province's area. It is defined as the current area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of occurrence, but, *excluding* significant areas where the species does not occur due to unsuitable habitat. Thus the estimate of range for a species exhibiting a linear use of coastal forests or riverine habitats would not consider tracts of unsuitable habitat in the interior of the polygon.

Z = Zero (no occurrences believed extant; species presumed extinct or ecosystem believed eliminated throughout its range)
A = <100 km²
(less than about 40 square miles)
B = 100–250 km²
(about 40–100 square miles)
C = 250–1,000 km²
(100–400 square miles)
D = 1,000–5,000 km²
(400–2,000 square miles)
E = 5,000–20,000 km²
(2,000–8,000 square miles)
F = 20,000–200,000 km²
(8,000–80,000 square miles)
G = 200,000–2,500,000 km²

(80,000–1,000,000 square miles)
H = >2,500,000 km²
(greater than 1,000,000 square miles)

3. Short-term Trend

The rating code that best describes the observed, estimated, inferred, or suspected degree of change in population size, extent of occurrence (range extent), area of occupancy, number of occurrences, and/or number of occurrences or percent area with good viability or ecological integrity over the short term, whichever most significantly affects the conservation status assessment in the area of interest (globe, nation, or subnation). Consider short-term historical trend within ten years or three generations (for long-lived taxa), whichever is the longer (up to a maximum of 100 years), or, for communities and systems, typically 30 years, depending on the characteristics of the type.

The trend may be recent or current, and the trend may or may not be known to be continuing. Trends may be smooth, irregular, or sporadic. Fluctuations will not normally count as trends, but an observed change should not be considered as merely a fluctuation rather than a trend unless there is evidence for this. Conservation Status Assessments: Factors for Assessing Extinction Risk 25
In considering trends, do not consider newly discovered but presumably long existing occurrences, nor newly discovered individuals in previously poorly known areas.

Also, consider fragmentation of previously larger occurrences into a greater number of smaller occurrences to represent a decreasing area of occupancy as well as decreasing number of good occurrences or populations.

A = Decline of >90%
B = Decline of 80–90%
C = Decline of 70–80%
D = Decline of 50–70%
E = Decline of 30–50%
F = Decline of 10–30%
G = Relatively Stable (≤10% change)
H = Increase of 10–25%
I = Increase of >25%
U = Short-term trend unknown
Null = Factor not assessed

4. Long-term Trend

The rating code that best describes the observed, estimated, inferred, or suspected degree of change in population size, extent of occurrence (range extent), area of occupancy, number of occurrences, and/or number of occurrences or percent area with good viability or ecological integrity over the long term (ca. 200 years) in the area of interest (globe, nation, or subnation).

A = Decline of >90%
B = Decline of 80–90%
C = Decline of 70–80%

D = Decline of 50–70%
E = Decline of 30–50%
F = Decline of 10–30%
G = Relatively Stable ($\leq 10\%$ change)
H = Increase of 10–25%
I = Increase of $>25\%$
U = Long-term trend unknown
Null = Factor not assessed

5. Area of Occupancy

Area of occupancy for taxa can be defined as (modified from the International Union for the Conservation of Nature 2001):

“...the area within its ‘extent of occurrence’, which is occupied by a taxon or ecosystem type, excluding cases of vagrancy. The measure reflects the fact that a taxon or type will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases, (e.g., irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological or ecological aspects of the taxon or type, the nature of threats and the available data.”

A = $<0.4\text{km}^2$
B = 0.4-4
C = 4-20 km^2
D = 20-100 km^2
E = 100-500 km^2
F = 500-2000 km^2
G = 2000-20000 km^2
H = $>20000\text{ km}^2$

5b. Linear Distance of Occupancy

Ecosystems that occur as linear strips. They are often ecotonal between terrestrial and aquatic ecosystems. In undisturbed conditions, typical occurrences range in linear distance from 0.5 to 100 km.

A = $<4\text{km}^2$
B = 4-40
C = 40-200 km^2
D = 200-1000 km^2
E = 1000-5000 km^2
F = 5000-20000 km^2
G = 20000-200000 km^2
H = $>200000\text{ km}^2$

6. Number of Element Occurrences (EOs)

An “element occurrence” is the mapping unit of CDC methodology. It is generally defined as an area of land or water on which an “element of biodiversity” (plant and animal species or natural community) is or was present. It is a physical location important to the conservation of a species or community, an area worth preserving to insure the survival of a community or species at risk. For a species it is generally the habitat occupied by a local population, for a community it is the area containing a stand or patch. What constitutes an occurrence also varies between species (e.g. hibernacula, den sites, breeding ponds where adults, egg masses and/or larvae have been identified, breeding colonies, etc.). Some species can have more than one type of occurrence, for example breeding and wintering occurrences.

A single letter code (below) represents the number of estimated occurrences believed extant for the species in the province. When a species’ distribution is extremely limited and there are very few site occurrences, it is very susceptible to any number of ecological disturbances, both predictable and unpredictable. This criteria is therefore an important factor influencing SRANK when the number of occurrences is few. If the letter code for this field is A or B, the species usually qualifies for a rank of S1 or S2.

- A** = 0 - 5 occurrences
- B** = 6 - 20 occurrences
- C** = 21 - 100 occurrences
- D** = 101+ occurrences

7. Number of EOs with Good Viability

For species, an occurrence with at least good (i.e., excellent-to-good) viability exhibits favorable characteristics with respect to population size and/or quality and quantity of occupied habitat; and, if current conditions prevail, the occurrence is likely to persist for the foreseeable future (i.e., at least 20–30 years) in its current condition or better. See Hammerson et al. (2008) for more details. For ecosystems, an occurrence has excellent-to-good ecological integrity when it exhibits favorable characteristics with respect to reference conditions for structure, composition, and function, operating within the bounds of natural or historic disturbance regimes, and is of exemplary size (Faber-Langendoen et al. 2008). One would expect only minor to moderate alterations to these characteristics for an occurrence to maintain good ecological integrity.

For many occurrences, viability or ecological integrity assessments or ranks have been applied by biologists and ecologists throughout the NatureServe network. For species, these Element Occurrence (EO) ranks estimate the probability of persistence of the occurrence. For ecosystems, the rank is a succinct assessment of the degree to which, under current conditions, an occurrence of an ecosystem matches reference conditions for that system, without any presumptions made about future status or persistence. Ranks for species and ecosystems are based on a set of “occurrence rank factors,” namely size (including population size and/or occupied area), abiotic and biotic condition, and landscape context. These factors may be further refined to specific indicators or metrics. The overall ranks range from A = Excellent viability/integrity, to D = Poor viability/integrity

- A** = No occurrences with excellent or good (assessed as A or B) viability or ecological integrity
- B** = Very few (1–3) occurrences with excellent or good viability or ecological integrity

- C** = Few (4–12) occurrences with excellent or good viability or ecological Integrity
- D** = Some (13–40) occurrences with excellent or good viability or ecological integrity
- E** = Many (41–125) occurrences with excellent or good viability or ecological integrity
- F** = Very many (>125) occurrences with excellent or good viability or ecological integrity
- U** = Unknown number of occurrences with excellent or good viability or ecological integrity
- Null** = Factor not assessed

8. Environmental Specificity

Environmental Specificity is the degree to which a species or ecosystem depends on a relatively scarce set of habitats, substrates, food types, or other abiotic and/ or biotic factors within the overall range. Relatively narrow requirements are thought to increase the vulnerability of a species or ecosystem. This factor is most important when the number of occurrences, and the range extent or area of occupancy, are largely unknown.

- A** = Very Narrow. Specialist or ecosystem with key requirements scarce. For species, specific habitat(s), substrate(s), food type(s), hosts, breeding/ non-breeding microhabitats, or other abiotic and/or biotic factor(s) are used or required by the species or ecosystem in the area of interest, with these habitat(s) and/or other requirements furthermore being scarce within the generalized range of the species or ecosystem within the area of interest, and the population (or the number of breeding attempts) expected to decline significantly if any of these key requirements become unavailable. For ecosystems, environmental requirements are both narrow and scarce (e.g., calcareous seepage fens).
- B** = Narrow. Specialist or ecosystem with key requirements common. Specific habitat(s) or other abiotic and/or biotic factors (see above) are used or required by the species or ecosystem, but these key requirements are common and within the generalized range of the species or ecosystem within the area of interest. For ecosystems, environmental requirements are narrow but common (e.g., floodplain forest, alpine tundra).
- C** = Moderate. Generalist or community with some key requirements scarce. Broad-scale or diverse (general) habitat(s) or other abiotic and/or biotic factors are used or required by the species or ecosystem, but some key requirements are scarce in the generalized range of the species or ecosystem within the area of interest. For ecosystems, environmental requirements are broad but scarce (e.g., talus or cliff forests and woodlands, alvars, many rock outcrop communities dependent more on thin, droughty soils per se than specific substrate factors).
- D** = Broad. Generalist or community with all key requirements common. Broad-scale or diverse (general) habitat(s) or abiotic and/or biotic factors are used or required by the species or ecosystem, with all key requirements common in the generalized range of the species or ecosystem in the area of interest. For animals, if the preferred food(s) or

breeding/non-breeding microhabitat(s) become unavailable, the species switches to an alternative with no resulting decline in numbers of individuals or number of breeding attempts. For ecosystems, environmental requirements are broad and common (e.g., forests or prairies on glacial till, or forests and meadows on montane slopes).

9. Threat Severity

Within the scope (as defined spatially and temporally in assessing the scope of the Threat), severity is the level of damage to the species or ecosystem from the Threat that can reasonably be expected with continuation of current circumstances and trends (including potential new threats) (Table 7). Note that severity of Threats is assessed within a ten-year or three-generation time frame, whichever is longer (up to 100 years).

For species, severity is usually measured as the degree of reduction of the species' population. Surrogates for adult population size (e.g., area) should be used with caution, as occupied areas, for example, will have uneven habitat suitability and uneven population density. For ecosystems, severity is typically measured as the degree of degradation or decline in integrity (of one or more key characteristics).

Extreme	Within the scope, the Threat is likely to destroy or eliminate the occurrences of an ecological community, system or species, or reduce the species population by 71–100%
Serious	Within the scope, the Threat is likely to seriously degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 31–70%
Moderate	Within the scope, the Threat is likely to moderately degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 11–30%
Slight	Within the scope, the Threat is likely to only slightly degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 1–10%

10. Threat Scope

Scope is defined herein as the proportion of the species or ecosystem that can reasonably be expected to be affected (that is, subject to one or more stresses) by the Threat within ten years with continuation of current circumstances and trends (Table 6). Current circumstances and trends include both existing as well as potential new threats. The ten-year time frame can be extended for some longer-term threats, such as global warming, that need to be addressed today. For species, scope is measured as the proportion of the species' population in the area of interest (globe, nation, or subnation) affected by the Threat. For ecosystems, scope is measured as the proportion of the occupied area of interest (globe, nation, or subnation) affected by the Threat. If a species or ecosystem is evenly distributed, then the proportion of the population or area affected is equivalent to the proportion of the range extent affected by the Threat; however, if the population or area is patchily distributed, then the proportion differs from that of range extent.

Pervasive	Affects all or most (71–100%) of the total population or occurrences
Large	Affects much (31–70%) of the total population or occurrences
Restricted	Affects some (11–30%) of the total population or occurrences.
Small	Affects a small (1–10%) proportion of the total population or occurrences.

11. Intrinsic Vulnerability

Note that this factor is not used if the Threats status factor has been assessed.

Intrinsic Vulnerability is the observed, inferred, or suspected degree to which characteristics of the species or ecosystem (such as life history or behavior characteristics of species, or likelihood of regeneration or recolonization for ecosystems) make it vulnerable or resilient to natural or anthropogenic stresses or catastrophes. For ecosystems, Intrinsic Vulnerability is most readily assessed using the dominant species and vegetation structure that characterize the ecosystem, but it can also refer to ecological processes that make an ecosystem vulnerable or lack resiliency (e.g., shoreline fens along estuarine and marine coasts subject to rising sea levels).

Since geographically or ecologically disjunct or peripheral occurrences may show additional vulnerabilities not generally characteristic of a species or ecosystem, characteristics of Intrinsic Vulnerability are to be assessed for the species or ecosystem throughout the area of interest, or at least for its better occurrences. Information on population size, number of occurrences, area of occupancy, extent of occurrence, or environmental characteristics that affect resiliency should not be considered when assessing Intrinsic Vulnerability; these are addressed using other status factors.

Note that the Intrinsic Vulnerability characteristics exist independent of human influence, but may make the species or ecosystem more susceptible to disturbance by human activities. The extent and effects of current or projected extrinsic influences themselves should be addressed in the comments field of the Threats status factor.

A = Highly Vulnerable. Species is slow to mature, reproduces infrequently, and/or has low fecundity such that populations are very slow (>20 years or five generations) to recover from decreases in abundance; or species has low dispersal capability such that extirpated populations are unlikely

to become reestablished through natural recolonization (unaided by humans). Ecosystem occurrences are highly susceptible to changes in composition and structure that rarely if ever are reversed through natural processes even over substantial time periods (>100 years).

B = Moderately Vulnerable. Species exhibits moderate age of maturity, frequency of reproduction, and/or fecundity such that populations generally tend to recover from decreases in abundance over a period of several years (on the order of 5–20 years or 2–5 generations); or species has moderate dispersal capability such that extirpated populations generally become reestablished through natural recolonization (unaided by humans). Ecosystem occurrences may be susceptible to changes in composition and structure but tend to recover through natural processes given reasonable time (10–100 years).

C = Not Intrinsicly Vulnerable. Species matures quickly, reproduces frequently, and/or has high fecundity such that populations recover quickly (<5 years or 2 generations) from decreases in abundance; or species has high dispersal capability such that extirpated populations soon become reestablished through natural recolonization (unaided by humans). Ecosystem occurrences are resilient or resistant to irreversible changes in composition and structure and quickly recover (within 10 years).

U = Unknown

Null = Factor not assessed

12. Other Considerations

Other considerations in determining the rank that are not apparent from the letter codes selected for the above criteria. Generally, these considerations will raise rather than lower the rank, e.g., "Never sexually reproduces" or "All occurrences are in areas under development".

References

Master, L., D. Faber-Langendoen, R. Bittman, G. A. Hammerson, B. Heidel, J. Nichols, L. Ramsay, and A. Tomaino. 2009. NatureServe Conservation Status Assessments: Factors for Assessing Extinction Risk. NatureServe, Arlington, VA.

TABLE B1: SPECIES STATUS

Common Name	Scientific Name	COSEWIC	SARA	NFLD SAR	AC CDC
Flora					
Boreal Felt Lichen	<i>Erioderma pedicellatum</i>	Special Concern	Special Concern	Vulnerable	S3
Ray's knotweed	<i>Polygonum oxyspermum subsp. raii</i>	-	-	-	S2
Curly-Grass Fern	<i>Schizaea pusilla</i>	-	-	-	S3S4
Marsh Straw Sedge	<i>Carex hormathodes</i>	-	-	-	S3
Alternate-Leaf Dogwood	<i>Cornus alternifolia</i>	-	-	-	S3S4
American Beachgrass	<i>Ammophila breviligulata</i>	-	-	-	S3S4
American Sea-Blite	<i>Suaeda calceoliformis</i>	-	-	-	S1S2
American Water-Lily	<i>Nymphaea odorata</i>	-	-	-	S3
Bayonet Rush	<i>Juncus militaris</i>	-	-	-	S3
Black Grass	<i>Juncus gerardii</i>	-	-	-	S2S3
Black Holly	<i>Ilex verticillata</i>	-	-	-	S3
Graceful Sedge	<i>Carex gracillima</i>	-	-	-	S3S4
Hard-Stemmed Bulrush	<i>Schoenoplectus acutus</i>	-	-	-	S3
Knotted Rush	<i>Juncus nodosus</i>	-	-	-	S2
Pale St. John's-Wort	<i>Hypericum ellipticum</i>	-	-	-	S3
Red Fescue	<i>Festuca rubra</i>	-	-	-	S2S3
Saltmarsh bulrush	<i>Bolboschoenus maritimus subsp. paludosus</i>	-	-	-	S2
Salt-Meadow Cordgrass	<i>Spartina patens</i>	-	-	-	S2
Saltwater Cordgrass	<i>Spartina alterniflora</i>	-	-	-	S2
Sea-Beach Sedge	<i>Carex silicea</i>	-	-	-	S2
Sea-Lavender	<i>Limonium carolinianum</i>	-	-	-	S2S3
Sea-Wrack	<i>Zostera marina</i>	-	-	-	S3S4
Soft-Stem Bulrush	<i>Schoenoplectus tabernaemontani</i>	-	-	-	S2
Three-Square Bulrush	<i>Schoenoplectus pungens</i>	-	-	-	S3
Creeping Rush	<i>Juncus subtilis</i>	-	-	-	S2
Foxtail barley (Squirreltail grass)	<i>Hordeum jubatum subsp. jubatum</i>	-	-	-	S2S3
Hard-Stemmed Bulrush	<i>Schoenoplectus acutus var. acutus</i>	-	-	-	S3

Seaside goldenrod	<i>Solidago sempervirens subsp. sempervirens</i>	-	-	-	S2S3
Long-stalked yellow sedge	<i>Carex viridula subsp. brachyrrhyncha var. elatior</i>	-	-	-	S3S4
Aquatic Fauna					
Banded Killifish	<i>Fundulus diaphanus</i>	Special Concern	Special Concern	Vulnerable	S3
Mummichog	<i>Fundulus heteroclitus</i>	-	-	-	S3
Avifauna					
Red Crossbill	<i>Loxia curvirostra percna</i>	Threatened	Endangered	Endangered	S1S2
Rusty Blackbird	<i>Euphagus carolinus</i>	Special Concern	Special Concern	Vulnerable	S2S3B,SUM
Short-eared Owl	<i>Asio flammeus</i>	Special Concern	Special Concern	Vulnerable	S2B,SUM
Barrow's Goldeneye (Eastern population)	<i>Bucephala islandica</i>	Special Concern	Special Concern	Vulnerable	S1N,SUM
Ivory Gull	<i>Pagophila eburnea</i>	Endangered	Endangered	Endangered	S1N,SUM
Harlequin Duck	<i>Histrionicus histrionicus</i>	Special Concern	Special Concern	Vulnerable	S3B, S2N,SUM
Peregrine Falcon	<i>Falco peregrinus anatum</i>	Special Concern	Special Concern	Vulnerable	S3M, S2N
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Special Concern	Threatened	Threatened	S3B,SUM
Newfoundland Gray cheeked Thrush	<i>Catharus minimus minimus</i>	-	-	Threatened	S2B,SUM
Bank Swallow	<i>Riparia riparia</i>	Threatened	Threatened	-	S1S2B,SUM
Piping Plover	<i>Charadrius melodus</i>	Endangered	Endangered	Endangered	S1B, SUM
Mammals					
Little brown bat	<i>Myotis lucifugus</i>	Endangered	Endangered	Endangered	S3S4
Northern long-eared bat	<i>Myotis septentrionalis</i>	Endangered	Endangered	Endangered	S2S3
Newfoundland Marten	<i>Martes americana atrata</i>	Threatened	Threatened	Threatened	S3
Insecta					
Peck's Skipper	<i>Polites peckius</i>	-	-	-	S3

" - " – no species status or designation

TABLE B2: SPECIES HABITAT COMPARISON

Common Name	Scientific Name	Preferred Habitat	Source	Habitat Present within Study Area
Flora				
Boreal Felt Lichen	<i>Erioderma pedicellatum</i>	Currently believed to exist only in Canada with two disjunct populations: the boreal population (the island of Newfoundland) and the Atlantic population (Nova Scotia and New Brunswick). The boreal population of the lichen is known from a total of 94 existing and historical sites scattered across the western and southern regions of the island of Newfoundland. Typical habitat for the Boreal Felt Lichen is northerly exposed forested slopes where cool and moist conditions prevail throughout most of the year. These mature forest sites are also rich in moisture-loving species such as sphagnum mosses and Cinnamon Fern. In well-lit forests, the Boreal Felt Lichen is found predominantly on tree trunks whereas in more shaded habitats it is found mostly on branches.	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat absent within study area – potential habitat within region
Ray's knotweed	<i>Polygonum oxyspermum subsp. raii</i>	The Canadian range of Ray's knotweed includes Quebec and the Atlantic provinces (Newfoundland and Labrador, New Brunswick, Nova Scotia, and Prince Edward Island). Typical habitat is coastal beaches and dunes featuring damp sandy shores and gravelly strand (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site.
Curly-Grass Fern	<i>Schizaea pusilla</i>	Abundant in southern Newfoundland, Canadian range also includes Nova Scotia and New Brunswick. Habitat includes bogs, wet sandy depressions, and crevices of ledges along shorelines (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Bogs and Coastal shorelines present on site.
Marsh Straw Sedge	<i>Carex hormathodes</i>	Found along rock ledges, or brackish to freshwater marches with moist coastal sands (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – brackish to freshwater marshes present on site.
Alternate-Leaf Dogwood	<i>Cornus alternifolia</i>	Alternate-Leaf Dogwood prefers well-drained deep soils. Typical habitat includes moist woodlands, forest margins, stream and swamp borders, and deep canyon bottoms, although it is often seen along roadsides (Coladonato, 1994).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat Present – Species found on site.
American Beachgrass	<i>Ammophila breviligulata</i>	Typical American Beachgrass habitat can be described as gently undulating open sandy flats along the coast. Some examples include exposed shorelines, sand dunes just above the high tide mark, and the upper beach at the edge of a salt marsh. Habitat can also be farther from the ocean, such as the gently sloping zone between the floodplain of a brackish pool and forest, so long as saltwater enters periodically. Preferred substrate can range from exposed moist sand with some organic matter to areas with more of a cobble/sand mix (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present.
American Sea-Blite	<i>Suaeda calceoliformis</i>	Found along shoreline in low sandy areas behind a broken-up break water, along the high tide mark, or the upper beach at edge of salt marsh. Prefers lightly vegetated areas and patches of exposed moist sand with some organic matter (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present.
American Water-Lily	<i>Nymphaea odorata</i>	American Water-Lily can tolerate acidic or alkaline water in ponds, low flowing streams or rivers, pools in marshes, ditches, and canals (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments present on site.
Bayonet Rush	<i>Juncus militaris</i>	Often found along wet shores, intermittent wetlands, and mucky bottoms of shallow lakes and rivers (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments and wetlands present on site.
Black Grass	<i>Juncus gerardii</i>	Black Grass forms extensive colonies in exposed coastal estuary meadows and salt marshes just above high tide mark. Preferred habitat is salt marsh, with mud overlaying gravel substrate (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – coastal estuary and salt marshes present on site.
Black Holly	<i>Ilex verticillata</i>	Habitat for Black Holly includes shores of ponds, rivers, lakes, and wetland margins with low water (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments and wetlands present on site.
Graceful Sedge	<i>Carex gracillima</i>	Graceful Sedge is common in a variety of forest habitats, such as edges and openings of mesic to dry deciduous forests, mixed conifer-hardwood forests, and coniferous swamps. It also occurs in thickets, meadows, and along roadsides (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Conifer and mixed hardwood forests and conifer swamps present on site

Hard-Stemmed Bulrush	<i>Schoenoplectus acutus</i>	Preferred Hard-Stemmed Bulrush habitat is in fresh, calcareous, to brackish marshes, fens, lakes, or slow streams. It is often emergent in water to 1.5m (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments and wetlands present on site.
Knotted Rush	<i>Juncus nodosus</i>	Habitat includes sandy and muddy shores of lakes, streams, rivers, swamps, fens, salt marshes, and freshwater or brackish estuaries, often grows in calcareous conditions (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments and wetlands present on site.
Pale St. John's-Wort	<i>Hypericum ellipticum</i>	Typically grows in boggy areas along streams, lakes, pond margins, wet meadows, or swamps. Also found along roadsides (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments and wetlands present on site.
Red Fescue	<i>Festuca rubra</i>	Habitat is coastal, typically found just above the high tide mark. Also present in salt marsh areas and grassy seaside meadows. Red fescue grows in sandy organic soil and fresh sand (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site.
Saltmarsh Bulrush	<i>Bolboschoenus maritimus subsp. paludosus</i>	Saltmarsh Bulrush habitat is along the upper limit of the high tide mark on brackish to saline coastal or inland shores. Also associated with coastal marshes (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site.
Salt-Meadow Cordgrass	<i>Spartina patens</i>	Salt-Meadow Cordgrass grows on exposed, damp, sandy to gravelly shores, with some organic matter. Generally, it will grow at the upper limit of the high tide mark or the upper beach at the edge of a salt marsh. Salt-Meadow Cordgrass can also occur farther from the ocean around brackish pools where saltwater enters only during storms (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site.
Saltwater Cordgrass	<i>Spartina alterniflora</i>	Damp, sandy, brackish shores are ideal habitat for Saltwater Cordgrass. They can be found far from the ocean in flat, sandy zones around brackish pools, if saltwater enters the area occasionally (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site.
Sea-Beach Sedge	<i>Carex silicea</i>	Preferred habitat for Sea-Beach Sedge is the dry exposed part of sandy seashores, in grassy seaside meadow above high tide zone, gently undulating open sandy flats with light vegetation. Sea-Beach Sedge can be found in areas where the substrate is variable, with more cobblestones on ridges and more sand in depressions (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site.
Sea-Lavender	<i>Limonium carolinianum</i>	Found in a variety of shoreline habitat, including sea strand habitat between water and dry sand, salt marshes with mud overlying gravel just below the high tide mark, upper beaches at edges of salt marshes, and flat, sandy zones around brackish pools farther from ocean. Often grows on patches of exposed moist sand with some organic matter and low vegetation cover (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site.
Sea-Wrack	<i>Zostera marina</i>	Sea-Wrack is adapted to the cold waters of the North Atlantic and North Pacific and is found mostly in the intertidal to sublittoral region. It occurs in sheltered areas in soft mud or firm sandy substrate (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat absent within study area – potential habitat within region
Soft-Stem Bulrush	<i>Schoenoplectus tabernaemontani</i>	Soft-Stem Bulrush generally prefers fresh to brackish marshes, fens, bogs, lakes, and stream banks, and is often emergent in water to 1 m. Soft-Stem Bulrush can also be a pioneer in disturbed places (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – brackish to freshwater marsh present on site
Three-Square Bulrush	<i>Schoenoplectus pungens</i>	Found along freshwater to brackish shores, marshes, lakes, or fens, and is often emergent in water to 0.7 m (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – brackish to freshwater marsh present on site
Creeping Rush	<i>Juncus subtilis</i>	Creeping Rush habitat includes muddy, sandy or gravelly shores, fens in decomposed peat, fine muds rich in humus, and brackish pools (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – brackish to freshwater marsh present on site

Foxtail Barley (Squirreltail grass)	<i>Hordeum jubatum subsp. jubatum</i>	Habitat is described as the upper limit of high tide between <i>Plantago maritima</i> turf and open gravelly strand. Foxtail Barley also grows in moist soil in meadows, the edges of sloughs and salt marshes, on grassy slopes, and along roadsides and other disturbed areas (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline, disturbed areas, roadsides, and grassy meadows present on site.
Hard-Stemmed Bulrush	<i>Schoenoplectus acutus var. acutus</i>	Generally, Hard-Stemmed Bulrush occurs in fresh, often calcareous to brackish marshes, fens, lakes, pools, or slow streams, and is often emergent in water to 1.5 m (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments and wetlands present on site.
Seaside Goldenrod	<i>Solidago sempervirens subsp. sempervirens</i>	Seaside Goldenrod habitat includes salt marshes with mud overlying gravel just below the high tide mark, gently sloping areas farther from the ocean between the floodplain of a brackish pool and forest, and upper beach areas at edge of salt marsh at high tide mark (ACCDC, 2022).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – Coastal shoreline present on site
Long-Stalked Yellow Sedge	<i>Carex viridula subsp. brachyrhyncha var. elatior</i>	Long-Stalked Yellow Sedge is a maritime species in North America, and generally prefers habitat with moist to wet fens and runnels on lime-rich soils (Flora of North America Editorial Committee).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments and wetlands present on site
Aquatic Fauna				
Banded Killfish	<i>Fundulus diaphanus</i>	There are seven known sites for the Newfoundland population of Banded Killfish. The majority of these sites are coastal, in the southwestern portion of the Island, although one site is inland, in the Indian Bay watershed of northeastern Newfoundland. Banded Killfish in Newfoundland tend to frequent quiet areas of clear lakes and ponds with a muddy or sandy bottom. For spawning, they depend on warm water where there is abundant submerged aquatic vegetation and considerable detritus. Although this type of habitat is abundant in Newfoundland watersheds, the species occurs only in very restricted areas of one or two of the lakes in the watersheds it occupies. It cannot use inland waters where there are barriers to migration, such as rivers with steep gradients; however, the Banded Killfish does not occur in habitats that meet the understood criteria and that appear to be accessible to existing populations.	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments present on site
Mummichog	<i>Fundulus heteroclitus</i>	Mummichog in Newfoundland have been reported from twelve populations, each associated with a separate watershed. The twelve populations can be roughly grouped into four areas (Codroy, Stephenville Crossing, Port aux Port, and Bay of Islands) of southwestern Newfoundland. Mummichogs are normally found in shallow brackish waters of estuaries, salt marshes, or tidal streams, but can occasionally be found in freshwater streams and rivers. Spawning typically occurs in the brackish waters of estuaries or salt marshes on bare gravel and on mud associated with the grass <i>Spartina patens</i> , but can also occur in fresh or salt water. During the winter, Mummichogs will normally move out of salt marshes to salt water or remain close to the mouths of rivers where the water will not freeze over. Overall, Mummichogs seem to display a very small home range, usually inhabiting the same habitat patch for extended periods of time (Species Advisory Committee, 2016).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – aquatic environments present on site.
Avifauna				
Red Crossbill	<i>Loxia curvirostra percna</i>	Red Crossbills are highly specialized for conifer habitats. Unlogged or mature forests that produce abundant cones are this bird's preferred habitat. Habitats that furnish the <i>Red Crossbill percna</i> subspecies with conifer seeds are large, mature black spruce and balsam fir stands and, on smaller scales throughout the island, red pine, white pine, and white spruce stands. In addition to foraging in these stands, the bird also roosts and nests there; however, the foraging sites can be distant from the roosting and nesting sites. Because this subspecies is hard to identify in the field, it is not certain that all of the Red Crossbills observed in Newfoundland have in fact been of the rare <i>percna</i> subspecies.	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat present – Conifer forests present on site.
Rusty Blackbird	<i>Euphagus carolinus</i>	The Rusty Blackbird nests in the boreal forest and favors the shores of wetlands such as slow-moving streams, peat bogs, marshes, swamps, beaver ponds and pasture edges. In wooded areas, the Rusty Blackbird only rarely enters the forest interior. During the winter, the Rusty Blackbird mainly frequents damp forests and, to a lesser extent, cultivated fields.	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Marginal habitat on site
Short-eared Owl	<i>Asio flammeus</i>	Short-eared Owls in Newfoundland and Labrador have been reported in tundra, coastal barrens, sand dune, field, and bog habitats. These habitats are particularly abundant on the west coast and Great Northern Peninsula of Newfoundland, and on the coastal barrens and above the treeline in Labrador, although virtually all coastal areas and nearshore islands are suitable habitat.	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Marginal habitat on site
Barrow's Goldeneye (Eastern population)	<i>Bucephala islandica</i>	Generally, Barrow's Goldeneye appears restricted to small, high elevation lakes north of the St. Lawrence Estuary and Gulf in Quebec, often headwater lakes. They are found in the black spruce-feather moss and balsam fir-white birch forest regions. During the non-breeding season, they frequent coastal waters along the St. Lawrence Estuary and Gulf. No detailed study has been undertaken on the specific characteristics of lakes used by Barrow's Goldeneyes in eastern Canada. The eastern population breeds only in Canada with the only adequately substantiated breeding records are from Québec. Some have suggested that Barrow's Goldeneyes may breed in the Torrent River watershed of Newfoundland, however, this is unconfirmed and needs better documentation. In Newfoundland, Barrow's Goldeneyes are most frequently observed near Terra Nova National Park in the winter (COSEWIC, 2000).	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat absent within study area – potential habitat within region
Harlequin Duck (breeding)	<i>Histrionicus histrionicus</i>	Harlequin Ducks spend most of the year in coastal marine environments, and move inland each spring to breed along fast-flowing turbulent rivers. During the winter, the Harlequin Duck are often associated with offshore islands, headlands, and rocky coastline where the surf breaks against rocks and ice buildup is minimal. These ducks feed close to rocky shorelines or rock skerries.	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Marginal seasonal habitat on site
Peregrine Falcon (migration)	<i>Falco peregrinus anatum</i>	The Peregrine Falcon breeds in a wide variety of habitats, including Arctic tundra, coastal islands, desert canyons, and major metropolitan centres; greater densities tend to be found in tundra and coastal. Preferred nesting sites are typically ledges on high cliffs with wide lateral extent affording wide fields of view; these sites provide good conditions for hunting and territory defense, security from interference, and multiple perching and nesting options.	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat absent within study area – potential habitat within region

Olive-sided Flycatcher	<i>Contopus cooperi</i>	Olive-sided Flycatcher is most often associated with edges of coniferous or mixed forests with tall trees or snags for perching, alongside open areas, or in burned forest with standing trees and snags. In natural conditions, these habitats may include open to semi-open mature forest stands, as well as mature stands with edges near wet areas (such as rivers, muskeg, bogs or swamps), burned forest, openings created by insect outbreaks, barrens, or other gaps. The species also uses forest stands adjacent to human-created openings (such as clearcuts, thinned stands, and prescribed burns).	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat present – Conifer and mixed wood forests with adjacent wetlands present on site.
Newfoundland Gray cheeked Thrush	<i>Catharus minimus minimus</i>	Gray-cheeked Thrush prefer dense low coniferous woods, including young regenerating forest, open-canopy old-growth forests having a dense growth of shrubs and small conifers in the understory, and dense, stunted spruce and fir on windblown sites and near the treeline (tuckamore). The species is found primarily in coniferous stands of boreal forest, tall shrubby enclaves in taiga (north of the treeline), and in Labrador in mature coniferous stands (Godfrey 1986, Lowther et al. 2001). Dominant tree species in Gray-cheeked Thrush habitat include black spruce (<i>Picea mariana</i>), white spruce (<i>Picea glauca</i>), balsam fir (<i>Abies balsamea</i>) and tamarack (<i>Larix laricina</i>).	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat present – Open conifer and mixed wood forests present on site.
Ivory Gull	<i>Pagophila eburnea</i>	Ivory Gulls require breeding sites that are safe from terrestrial predators (particularly the Arctic Fox, <i>Alopex lagopus</i>), but in proximity (~50 km) of open water for feeding. Preferred breeding habitat for ivory gulls can be characterized as remote islands, remote polar desert, or cliff faces of nunataks in proximity of open water. Specific habitat requirements during the non-breeding season are not known. This species winters among the pack ice of the Davis Strait, Labrador Sea, Strait of Belle Isle, and northern Gulf of St. Lawrence. It is occasionally seen ashore along east coast of Newfoundland and Labrador, particularly the Northern Peninsula of Newfoundland, and on the Lower North Shore of Québec (Environment Canada, 2014).	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat absent within study area – potential habitat within region
Bank Swallow	<i>Riparia riparia</i>	Bank Swallows breed in a wide variety of natural and anthropogenic sites with vertical banks, including riverbanks, lake and ocean bluffs, aggregate pits, road cuts, and stockpiles of soil. Sand-silt substrates are preferred for excavating nest burrows. Breeding sites tend to be somewhat ephemeral, due to bank erosion, and are often situated near open terrestrial habitat used for aerial foraging, such as grasslands, meadows, pastures, and agricultural cropland. Large wetlands are used as communal nocturnal roost sites during post-breeding, migration, and wintering periods (COSEWIC, 2013).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – residential and abandoned buildings present adjacent to site.
Piping Plover	<i>Charadrius melodus</i>	Piping Plovers are known to nest in certain areas along the southwest coast of Newfoundland. Preferred nest sites tend to be on wide sand, gravel, or cobble beaches, barrier island sandspits, or peninsulas in marine coastal areas. Early successional habitat, most often free of dense vegetation, is preferred for nest sites. Feeding areas in marine and bayside intertidal zones above the mean high-water mark, such as ephemeral pools and areas of wrack must be locally available so flightless chicks can gain access to them. Brooding habitat often features pieces of driftwood, wrack, large rocks, and other objects which may provide shelter from the rain, wind, and blowing sand. Young plovers also rely on sparsely vegetated dunes as refuges during high tides or to escape from potential predators and human disturbance (Environment Canada, 2012).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat absent within study area – habitat present within region
Mammals				
Newfoundland Marten	<i>Martes americana atrata</i>	The atrata subspecies of the American Marten is found in Canada, on the Island of Newfoundland and in northern Quebec and Labrador. The Newfoundland population occurs only on the island of Newfoundland. The Newfoundland population of the American Marten is currently found in three main forest patches in western Newfoundland (Little Grand Lake, Red Indian Lake and Main River) and on the east coast of Newfoundland (Terra Nova National Park). Smaller populations occur in peripheral areas near St. George's and Lobster House Hill. Newfoundland Marten prefer mature (old growth) coniferous and mixed-wood forests and coniferous forests of varying ages. Martens require dense overhead cover, coarse woody debris, shrubs, and trees with low-hanging branches.	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat absent within study area – habitat present within region May use site for foraging
Little brown bat	<i>Myotis lucifugus</i>	Hibernacula are used by Little Brown Myotis to survive when ambient temperatures decline and insects are unavailable, and as such are necessary for the survival and recovery of these species. Suitable hibernacula may be limiting for these species (OMNR 2010). Typically, hibernacula for these species are subterranean features, such as caves, abandoned mines, hand-dug wells, cellars, or tunnels where light and noise levels are low. Hibernacula typically contain sections that have relatively stable temperatures (2-10 °C) and stable, high humidity levels (>80 %). Any site where Little Brown Myotis has been observed hibernating during the winter at least once since 1995 is identified as critical habitat.	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat absent within study area – habitat present within region May use site for foraging
Northern long-eared bat	<i>Myotis septentrionalis</i>	Hibernacula are used by Northern Myotis to survive when ambient temperatures decline and insects are unavailable, and as such are necessary for the survival and recovery of these species. Suitable hibernacula may be limiting for these species (OMNR 2010). Typically, hibernacula for these species are subterranean features, such as caves, abandoned mines, hand-dug wells, cellars, or tunnels where light and noise levels are low. Hibernacula typically contain sections that have relatively stable temperatures (2-10 °C) and stable, high humidity levels (>80 %). Any site where Northern Myotis has been observed hibernating during the winter at least once since 1995 is identified as critical habitat.	No Historical Presence. Species listed as SAR with potential habitat within the Study Area	Habitat absent within study area – habitat present within region May use site for foraging
Insecta				
Peck's Skipper	<i>Polites peckius</i>	Found in natural and anthropogenic open grassy habitats, including meadows, prairies, lawns, marshes, landfills, roadsides, vacant lots, and power line right-of-ways (Lotts, 2021).	Historical Presence Confirmed within 5 km of Point of Interest AC CDC – February 7, 2022	Habitat present – meadows, marshes and roadsides present on site

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DATA DICTIONARY

GNAME	Scientific Name of taxon
GCOMNAME	Common name of taxon
FAMILY	Family of taxon
OBSERVER	Person or persons who observed the taxon
TOTAL NUMBER	The number of specimens at a given observation.
MONTH	Month of survey
DAY	Day of survey
YEAR	Year of survey
SRANK_2010	Subnational rank - CDC ranking system
SRANK_2015	Subnational rank - CDC ranking system
NRANK	National Rank - CDC ranking system
GRANK	Global Rank - CDC ranking system
GeneralStatusRanks	General Status text for the province
COSEWIC_STATUS	Denotes the COSEWIC status.
PROVINCIAL_STATUS	Denotes if the species is on the provincial endangered species list.
SARA	Denotes if the species is on the federal SARA list.
HABITAT	Description of the habitat where plant or animal was found
SITE_NAME	The name of the place where the occurrence occurred
ACCURACY	The accuracy in metres of the location.
SYNAME	Synonym for the plant or animal name in cases it is known by more than one scientific name.
ACRONYM OF HERBARIA	Acronym of the herbarium where this specimen is kept, see the complete definitions of the acronyms in the HERBARIA.xls
COLLECTION NUMBER	The collection number assigned to the specimen by the collector, this should be used to refer to the specimen when contacting the herbarium
CITATION	Primary source of the data
IDNUM	Field Office Number: Internal ACCDC record reference (not the EONUM)

DATA SOURCES:

All data housed at Atlantic Canada Conservation Data Centre (ACCDC). Refer to 'CITATION' field for data sources.

CAVEATS:

ACCDC rare taxa occurrence records are offered as a guide recognizing that the ability to find plants and animals will depend upon the season. The ACCDC makes a strong effort to verify the accuracy of all the data it obtains, generates and manages, but it will not be held responsible for inaccuracies in data that it provides.

PLEASE NOTE:

- * ACCDC data is restricted for use by the specified data user only; any third party requiring data must make its own request to the ACCDC.
- * Specified data users may not publish any information provided by the ACCDC or its partners without prior permission.
- * To ensure the currency of the data, the ACCDC requires Data Users to destroy all copies of data 18 months after the date of receipt.
- * ACCDC data reports are restricted to that data in our Data System at the time of the request.
- * Data accuracy is qualified as to location (Accuracy) and time (Date)
- * ACCDC data reports are not to be constructed as exhaustive inventories of taxa in an area.
- * The non-occupancy of a taxon cannot be inferred by its absence in an ACCDC data report.
- * Museum databases, which are the basis for more accessible public databases, such as those of the ACCDC, are works in progress. Essentially, they are finding aids and dynamic data records, constructed primarily to serve scientists engaged in the continuing, active process of plant systematics and taxonomy. Ongoing additions of new collections, and frequent upgrades to the identifications of all plant specimens housed in museum herbaria, may not always be reflected, in real time, by databases such as those of the ACCDC. Specifically, the conservation status of individual species recorded in the ACCDC database may not be absolutely current. It is therefore the responsibility of the data user to contact the relevant museums directly, in order to check for the most current identifications of specimens of interest, and to ascertain from the scientists concerned, their current understanding of the conservation status of individual species in question. The absolute conservation status of any given species is dynamic, and subject to change over short periods of time.



APPENDIX C

Flora Inventory
Table C1: Flora Inventory

Table C1 : Flora Inventory

Scientific Name	Common Name	S-Rank
<i>Abies balsamea</i>	Balsam Fir	S5
<i>Acer rubrum</i>	Red maple	S5
<i>Alnus viridis</i>	Green alder	S5
<i>Amelanchier bartramiana</i>	Bartram Shadbush	S5
<i>Amelanchier interior</i>	Shadbush (Serviceberries)	SU
<i>Anaphalis margaritacea</i>	Pearly everlasting	S5
<i>Andromeda polifolia</i>	Bog Rosemary	S5
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	SNA
<i>Arethusa bulbosa</i>	Dragons mouth orchid	SNA
<i>Aronia prunifolia</i>	Purple chokeberry	S5
<i>Athyrium filix-femina</i>	Lady-Fern	S5
<i>Betula alleghaniensis</i>	Yellow Birch	S3
<i>Betula michauxii</i>	Newfoundland Dwarf Birch	S5
<i>Betula papyrifera</i>	Paper Birch	S5
<i>Betula pumila</i>	Swamp Birch	S5
<i>Calamagrostis canadensis</i>	Blue-Joint Reedgrass	S5
<i>Carex brunnescens</i>	Brownish sedge	S5
<i>Carex chordorrhiza</i>	Creeping sedge	S5
<i>Carex debilis</i>	White-Edge Sedge	S4S5
<i>Carex echinata</i>	Little Prickly Sedge (Star Sedge)	S5
<i>Carex folliculata</i>	Long Sedge	S4
<i>Carex interior</i>	Inland sedge	S5
<i>Carex intumescens</i>	Bladder Sedge	S5
<i>Carex livida</i>	Liver sedge	S5
<i>Carex michauxiana</i>	Michaux Sedge	S4S5
<i>Carex nigra</i>	Smooth black sedge	S4S5
<i>Carex oligosperma</i>	Few-Seeded Sedge	S5
<i>Carex pauciflora</i>	Few-Flowered Sedge	S4S5
<i>Carex stipata</i>	Stalk-Grain Sedge (Awl-fruited Sedge)	S4S5
<i>Chamaedaphne calyculata</i>	Leather leaf	S5
<i>Chamaenerion angustifolium</i>	Fireweed	S5
<i>Climacium dendroides</i>	Tree moss	SNA
<i>Clintonia borealis</i>	Blue bead lily	S5
<i>Convallaria majalis</i>	Lily of the valley	S5
<i>Coptis trifolia</i>	Goldthread	S5
<i>Cornus alternifolia</i>	Alternate leaved dogwood	S3S4
<i>Cornus canadensis</i>	Bunchberry	S5
<i>Cornus rugosa</i>	Round leaved Dogwood	S4
<i>Cornus stolonifera</i>	Red-osier dogwood	S5
<i>Crataegus uniflora</i>	Dwarf hawkeberry	SNA
<i>Cypripedium acaule</i>	Pink Lady's-Slipper	S4
<i>Dasiphora fruticosa</i>	Shrubby cinquefoil	S5
<i>Deschampsia cespitosa</i>	Tufted Hairgrass	S3S5
<i>Dicranum scoparium</i>	Fork moss	SNA
<i>Drosera intermedia</i>	Spoon-Leaved Sundew	S4S5

Scientific Name	Common Name	S-Rank
<i>Drosera rotundifolia</i>	Roundleaf Sundew	S5
<i>Dryopteris intermedia</i>	Glandular Wood Fern (Intermediater Fern)	S5
<i>Empetrum nigrum</i>	Black Crowberry	S5
<i>Equisetum pratense</i>	Meadow horsetail	S4S5
<i>Equisetum sylvaticum</i>	Wood horsetail	S5
<i>Eriophorum tenellum</i>	Rough Cotton-Grass	S3S4
<i>Eriophorum virginicum</i>	Tawny Cotton-Grass	S4S5
<i>Euphrasia nemorosa</i>	Common Eyebright	S4S5
<i>Euthamia graminifolia</i>	Flat-Top Fragrant-Golden-Rod	S5
<i>Fragaria vesca</i>	Woodland Strawberry	SU
<i>Galium tinctorium</i>	Stiff marsh bedstraw	S5
<i>Gaultheria hispidula</i>	Creeping snowberry	S5
<i>Gaylussacia baccata</i>	Black Huckleberry	S3
<i>Gaylussacia bigeloviana</i>	Dwarf Huckleberry	S3S4
<i>Glyceria canadensis</i>	Canada Manna-Grass	S5
<i>Glyceria striata</i>	Fowl Manna-Grass	S5
<i>Goodyera</i>	Rattlesnake plantain	S4S5
<i>Hieracium vulgatum</i>	Meadow Hawkweed	S4
<i>Hypericum perforatum</i>	A St. John's-Wort	SNA
<i>Hypochaeris radicata</i>	Spotted Cat's-Ear (Common Cat's-Ear)	SNA
<i>Ilex mucronata</i>	Mountain Holly	S5
<i>Iris versicolor</i>	Blue flag iris	S5
<i>Juncus alpinoarticulatus ssp. fuscescens</i>	Northern Green Rush	SU
<i>Juncus canadensis</i>	Canada Rush	S4S5
<i>Juncus effusus</i>	Smooth rush	SNA
<i>Juniperus communis</i>	Common Juniper	S5
<i>Kalmia angustifolia</i>	Sheep laurel	S5
<i>Kalmia polifolia</i>	Pale bog laurel	S5
<i>Larix laricina</i>	Tamarack (American Larch)	S5
<i>Leucanthemum vulgare</i>	Oxeye daisy	SNA
<i>Linnaea borealis</i>	Twinflower	S5
<i>Lonicera villosa</i>	Mountain honeysuckle	S5
<i>Luzula multiflora</i>	Common Woodrush	S5
<i>Maianthemum trifolium</i>	Three leaved false soloman	S5
<i>Malus</i>	Crab apple	S5
<i>Malus pumila</i>	Common Apple	SNA
<i>Matteuccia struthiopteris</i>	Ostrich fern	S5
<i>Melampyrum lineare</i>	American Cow-Wheat	S3S4
<i>Myosotis</i>	Forget-Me-Not	SNA
<i>Myosotis sylvatica</i>	Woodland Forget-Me-Not	SNA
<i>Myrica gale</i>	Sweet gale	S5
<i>Nabalus trifoliolatus</i>	Three-leaved rattlesnakeroot	S5
<i>Oclemena nemoralis</i>	Bog Aster	S5
<i>Oenothera biennis</i>	Common Evening-Primrose	S5
<i>Orthilia secunda</i>	One-Side Wintergreen	S5
<i>Osmundastrum cinnamomeum</i>	Cinnamon Fern	S5

Scientific Name	Common Name	S-Rank
<i>Phleum pratense</i>	Meadow Timothy	SNA
<i>Picea glauca</i>	White Spruce	S5
<i>Picea mariana</i>	Black Spruce	S5
<i>Pilosella aurantiaca</i>	Orange hawkweed	SNA
<i>Pinus strobus</i>	White Pine	S3
<i>Platanthera blephariglottis</i>	White Fringed Orchid	S4
<i>Platanthera huronensis</i>	Green Orchid	S4
<i>Platanthera psycodes</i>	Purple fringed orchid	SNA
<i>Poa palustris</i>	Fowl Bluegrass (Fowl Meadow Grass)	S5
<i>Potentilla norvegica</i>	Norwegian (Rough) Cinquefoil	S4S5
<i>Prunella vulgaris</i>	Self-Heal	S3S5
<i>Prunus pensylvanica</i>	Pin Cherry	S5
<i>Pteridium aquillinum</i>	Bracken fern	S5
<i>Ranunculaceae</i>	Buttercup	S5
<i>Ranunculus acris</i>	Meadow Buttercup	SNA
<i>Rhinanthus minor</i>	Yellow rattle	SNA
<i>Rhododendron canadense</i>	Rhodora	S5
<i>Rhododendron groenlandicum</i>	Labrador tea	S5
<i>Rhododendron lapponicum</i>	Lapland Azalea	S3S4
<i>Rhynchospora alba</i>	White Beakrush	S4S5
<i>Rhynchospora capitellata</i>	Brown beaked rush	S5
<i>Rhytidiadelphus triquetus</i>	Shaggy moss	SNA
<i>Rosa nitida</i>	Shiny rose	S5
<i>Rosa virginiana</i>	Virginia Rose	S5
<i>Rubus arcticus</i>	Stemless raspberry	S5
<i>Rubus caesius</i>	Dew berry	SNR
<i>Rubus chamaemorus</i>	Cloudberry	S5
<i>Rubus idaeus</i>	Red Raspberry	S5
<i>Rumex acetosella</i>	Sheep Sorrel	SNA
<i>Sali bebbiana</i>	Bebb's Willow	S5
<i>Salix viminalis</i>	Basket willow	SNA
<i>Sanguisorba canadensis</i>	Canada Burnet	S5
<i>Sarracenia purpurea</i>	Pitcher plant	S5
<i>Scirpus atrovirens</i>	Woolgrass Bulrush	SH
<i>Solidago rugosa</i>	Rough stem goldenrod	S5
<i>Sorbus americana</i>	American Mountain-Ash	S4S5
<i>Sorbus decora</i>	Northern Mountain-Ash	S5
<i>Sphagnum spp.</i>	Peat Moss	
<i>Spiraea latifolia</i>	Broadleaf Meadowsweet	S4S5
<i>Stellaria graminea</i>	Lesser Stitchwort	SNA
<i>Symphyotrichum puniceum</i>	Purple stem aster	S5
<i>Taraxacum officinale</i>	Common Dandelion	SNA
<i>Taxus canadensis</i>	Canadian Yew	S3S4
<i>Thalictrum rochebruneanum</i>	Meadow rue	S5
<i>Tomentypnum nitens</i>	Fuzzy brown moss	S3S4
<i>Triantha glutinosa</i>	Sticky false asphodel	S5

Scientific Name	Common Name	S-Rank
<i>Trichophorum cespitosum</i>	Deergrass (Tufted bulrush)	S5
<i>Trientalis borealis</i>	Starflower	S5
<i>Trifolium repens</i>	White Clover	SNA
<i>Triglochin maritima</i>	Common Bog Arrow-Grass	S5
<i>Typha latifolia</i>	Broad-Leaf Cattail	SNA
<i>Utricularia cornuta</i>	Horned bladderwort	S5
<i>Vaccinium angustifolium</i>	Late Lowbush Blueberry	S5
<i>Vaccinium macrocarpon</i>	Large Cranberry	SNA
<i>Vaccinium oxycoccos</i>	Small Cranberry	S5
<i>Veronica officinalis</i>	Gypsy-Weed (Heath speedwell)	SNA
<i>Viburnum nudum</i>	Wild raisin	S5
<i>Viburnum opulus var. americanum</i>	Highbush Cranberry	S5
<i>Vicia Cracca</i>	Cow vetch	S5

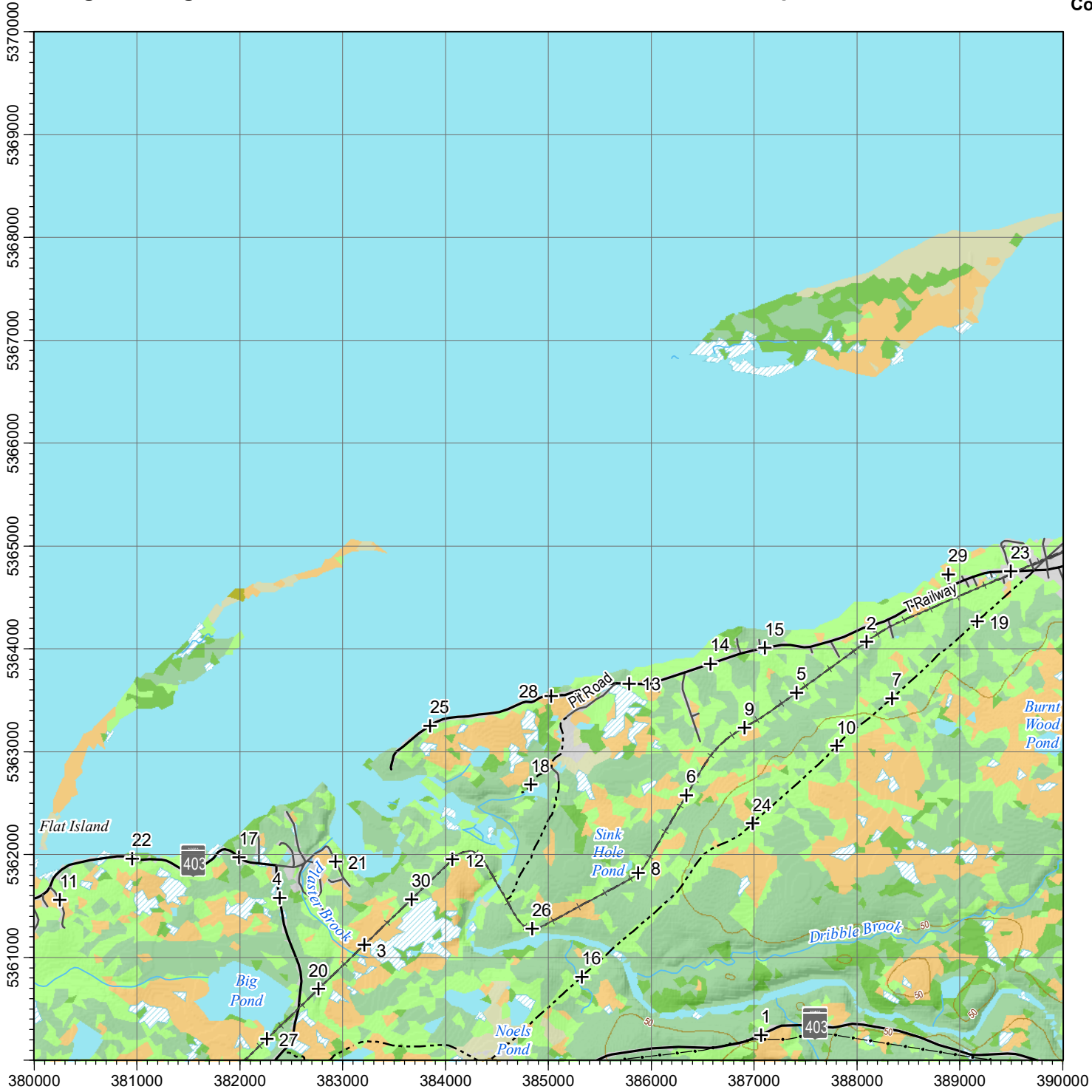


APPENDIX D

Avifauna Data

Table D1: Avifauna Point Count Data

Table D2: Newfoundland Breeding Bird Atlas – Point Count Data



POINT	EASTING UTM Est	NORTHING UTM Nord
1	387066	5360245
2	388094	5364069
3	383208	5361123
4	382385	5361579
5	387410	5363573
6	386341	5362576
7	388339	5363519
8	385873	5361820
9	386903	5363233
10	387800	5363056
11	380246	5361557
12	384066	5361952
13	385785	5363660
14	386575	5363854
15	387104	5364010
16	385324	5360811
17	381991	5361974
18	384830	5362679
19	389168	5364266
20	382764	5360693
21	382930	5361930
22	380951	5361959
23	389495	5364755
24	386985	5362303
25	383849	5363252
26	384843	5361280
27	382260	5360206
28	385024	5363542
29	388887	5364722
30	383668	5361565

Legend	Légende
Expressway or highway	Autoroute ou route nationale (asphaltée)
Regional or local road	Route régionale ou locale (asphaltée ou non)
Resource / Recreation	Ressource / route récréative
ATV / Winter Road	VTT / Route d'hiver
Rail line	Chemin de fer
Utility corridor	Ligne de transport d'énergie
Watercourse	Rivière ou ruisseau
Broadleaf forest	Forêt de feuillus
Coniferous forest	Forêt de conifères
Mixedwood forest	Forêt mixte
Shrubland	Milieu arbustif
Wetland	Milieu humide (marais)
Grassland	Prairie
Barren or sparsely vegetated	Dénué sec / Végétation clairsemée
Developed area	Zone développée
Water	Eau

The approximate percent coverage of each habitat type is indicated by the numbered box in the legend.

La couverture approximative est indiquée en pourcentage dans le rectangle coloré de la légende.

Cartographic production by Bird Canada
Production cartographique par oiseaux Canada

Note: This map is only for use by atlas participants in the context of the project. The project partners are in no way responsible for any inaccuracies, mistakes or omissions in the information that appears on this map.

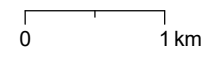
Avis : cette carte ne doit être utilisée que par les participants au projet de l'Atlas des oiseaux nicheurs du Manitoba, et uniquement dans le cadre du projet. Les responsables du projet d'atlas ne peuvent être tenus responsables de toute inexactitude, erreur ou omission concernant les informations apparaissant sur cette carte.

**Number of off-road point counts
Nombre de points d'écoute hors route**

Broadleaf forest:	0	Coniferous forest:	1
Mixedwood forest:	1	Shrubland:	1
Wetland:	0	Grassland:	0
Barren:	0		

Predefined / Prédéterminés: 12
Off-road / Hors route: 3

6° Universal Transverse Mercator (UTM) Projection; Zone 21, Central Meridian -57°; North American Datum 1983 (NAD 83)
Projection universelle transverse de Mercator (UTM) 6° Zone 21, méridien central -57°;
Système de référence géodésique nord-américain 1983 (NAD 83)



April 2020 / avril 2020
<http://www.nf.birdatlas.ca/>

Table D2: Newfoundland Breeding Bird Atlas - Point Count Data

Common Name	Scientific Name	S rank	ESA Status	Max. Br. evid.
Piping Plover	<i>Charadrius melodus</i>	S1B, SUM	Endangered	H
Willet	<i>Tringa semipalmata</i>	S1B,SUM	-	A
Great Blue Heron	<i>Ardea herodias</i>	S2B,SUM	Special Concern	NB
Mourning Dove	<i>Zenaidura macroura</i>	S3	-	D
Killdeer	<i>Charadrius vociferus</i>	S3B, SUM	-	H
American Wigeon	<i>Anas americana</i>	S3B,SUM	-	FY
Mallard	<i>Anas platyrhynchos</i>	S3B,SUM	-	H
Olive-sided Flycatcher	<i>Contopus cooperi</i>	S3B,SUM	Threatened	H
Blue-headed Vireo	<i>Vireo solitarius</i>	S3B,SUM	-	S
Canada Goose	<i>Branta canadensis</i>	S4	-	FY
American Black Duck	<i>Anas rubripes</i>	S4	-	FY
Common Merganser	<i>Mergus merganser</i>	S4	-	H
Sharp-shinned Hawk	<i>Accipiter striatus</i>	S4	-	H
Downy Woodpecker	<i>Picoides pubescens</i>	S4	-	P
Hairy Woodpecker	<i>Picoides villosus</i>	S4	-	H
Northern Flicker	<i>Colaptes auratus</i>	S4	-	H
Boreal Chickadee	<i>Poecile hudsonicus</i>	S4	-	A
Green-winged Teal	<i>Anas crecca</i>	S4B, SUM	-	H
Red-breasted Merganser	<i>Mergus serrator</i>	S4B,S4M	-	D
Spotted Sandpiper	<i>Actitis macularius</i>	S4B,SUM	-	FY
Common Tern	<i>Sterna hirundo</i>	S4B,SUM	-	H
Bald Eagle	<i>Haliaeetus leucocephalus</i>	S4B,SUM	-	H
Alder Flycatcher	<i>Empidonax alnorum</i>	S4B,SUM	-	S
Tree Swallow	<i>Tachycineta bicolor</i>	S4B,SUM	-	H
Cedar Waxwing	<i>Bombicilla cedrorum</i>	S4B,SUM	-	P
Song Sparrow	<i>Melospiza melodia</i>	S4B,SUM	-	A
Magnolia Warbler	<i>Dendroica magnolia</i>	S4B,SUM	-	S
Pine Siskin	<i>Spinus pinus</i>	S4S5	-	H
Osprey	<i>Pandion haliaetus</i>	S4S5B,SUM	-	P
Merlin	<i>Falco columbarius</i>	S4S5B,SUM	-	H
Canada Jay	<i>Perisoreus canadensis</i>	S5	-	H
American Crow	<i>Corvus brachyrhynchos</i>	S5	-	H
Common Raven	<i>Corvus corax</i>	S5	-	P
Black-capped Chickadee	<i>Poecile atricapillus</i>	S5	-	S
Pine Grosbeak	<i>Pinicola enucleator</i>	S5	-	H
Purple Finch	<i>Carpodacus purpureus</i>	S5	-	S
American Goldfinch	<i>Spinus tristis</i>	S5	-	S
Dark-eyed Junco	<i>Junco hyemalis</i>	S5	-	S
Common Grackle	<i>Quiscalus quiscula</i>	S5B, S3N, SUM	-	T
Common Loon	<i>Gavia immer</i>	S5B, S4N	-	H
Wilson's Snipe	<i>Gallinago delicata</i>	S5B,S5M	-	A
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	S5B,S5M	-	T
Ruby-crowned Kinglet	<i>Regulus calendula</i>	S5B,S5M	-	T
Swainson's Thrush	<i>Buteo swainsoni</i>	S5B,S5M	-	A
American Robin	<i>Turdus migratorius</i>	S5B,S5M	-	AE
Fox Sparrow	<i>Passerella iliaca</i>	S5B,S5M	-	T
White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B,S5M	-	A
Savannah Sparrow	<i>Passerculus sandwichensis</i>	S5B,S5M	-	NY
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	S5B,S5M	-	A
Swamp Sparrow	<i>Melospiza georgiana</i>	S5B,S5M	-	A
Northern Waterthrush	<i>Seiurus noveboracensis</i>	S5B,S5M	-	T
Black-and-white Warbler	<i>Mniotilta varia</i>	S5B,S5M	-	T
Common Yellowthroat	<i>Geothlypis trichas</i>	S5B,S5M	-	A
American Redstart	<i>Setophaga ruticilla</i>	S5B,S5M	-	T
Yellow Warbler	<i>Dendroica petechia</i>	S5B,S5M	-	CF
Blackpoll Warbler	<i>Dendroica striata</i>	S5B,S5M	-	S
Palm Warbler	<i>Dendroica palmarum</i>	S5B,S5M	-	S
Yellow-rumped Warbler	<i>Dendroica coronata</i>	S5B,S5M	-	A
Black-throated Green Warbler	<i>Dendroica virens</i>	S5B,S5M	-	S
Wilson's Warbler	<i>Wilsonia pusilla</i>	S5B,S5M	-	T
Blue Jay	<i>Cyanocitta cristata</i>	SNA	-	S
European Starling	<i>Sturnus vulgaris</i>	SNA	-	H
House Sparrow	<i>Passer domesticus</i>	SNA	-	S
Ruffed Grouse	<i>Bonasa umbellus</i>	SNR	-	FY

- no ranking or not considered to be at risk



APPENDIX E

Aquatic Data
Stream Assessment Data Sheet
Quantitative Fisheries Population Assessment Data
Table E1: Electrofishing Results AQ-001.1 - AQ-001.2
Raw Data Sheets

DNR&E / DFO - NEW BRUNSWICK
STREAM HABITAT INVENTORY

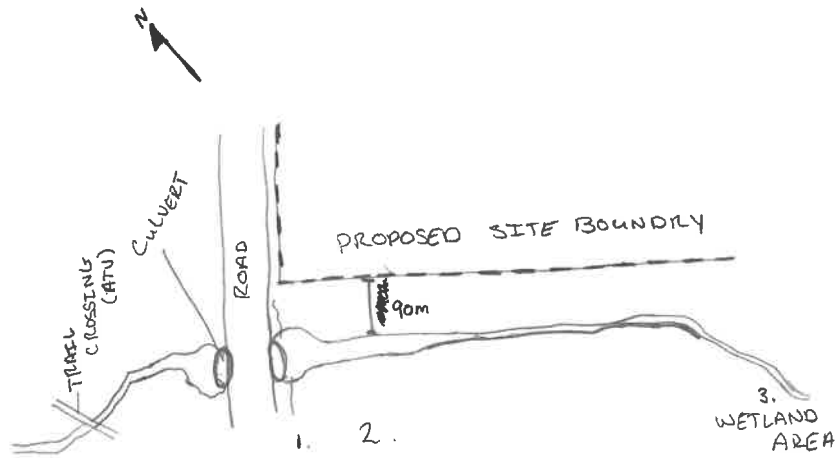
River:		Start Point: AQ-001.1											End Point: AQ-001.3				Drainage Code -				****Right and Left are looking DOWNSTREAM****																						
Personnel: ARS / DP		Date: 13/08/2022											GIS Map No.				Drainage Name -																										
REACH NO.	UNIT NO.	STREAM TYPE	CHANNEL TYPE	LENGTH (m)	AVG WIDTH (m)		SUBSTRATE (%)							AVG DEPTH WET WIDTH (cm)	0 - 50% UNDERCUT BANK		0 - 50% OVERHANGING VEGETATION		LARGE WOODY DEMRIS IN STREAM (m)	FLOWS				EMBEDDEDNESS (CRITERIA) 1: <20% 2: 20%-35% 3: 35%-50% 4: >50%	COMMENTS	CHECKLIST OF LANDUSE ATTRIBUTES (COMMENTS)																	
					WET	BANK CHANNEL	BED-ROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES		L	R	L	R		TYPE	FLOW (m/s)	TIME (s)	TEMP (°C)																				
1		14	1	2.5	3.20	4.60	0	0	5	10	10	25	2.0	0	0	0	5	0	0.0		16	20.0	4		1. ACTIVE BEAVER DAM 2. INACTIVE BEAVER DAM 3. WOODY DEBRIS OBSTRUCTION 4. MAN-MADE DAM OBSTRUCTION 5. ROCK DAM (SWIMMING POOL) 6. BRAIDED STREAM CHANNELS 7. OBSTRUCTION IN STREAM 8. ROAD FORD																		
2		3	1	550	1.55	2.16	0	5	60	15	10	0	10.0	7.5	7.5	45	45	full	0.2		17	20.0	4		POLLUTION CAUSED BY:																		
3		3	1	180	1.38	1.92	0	2	60	20	13	0	12.0	10	7.5	25	30	present	0.1				4		9. FOOD PROCESSING INDUSTRY 10. FOREST INDUSTRY 11. CAMPSITE OR RESIDENTIAL 12. MINING 13. LITTER 14. OIL 15. AGRICULTURE WASTE 16. HEALTH HAZARD 17. CLEAR CUT TO STREAM EDGE 18. SELECTIVE CUT 19. BUFFER STRIP PRESENT 20. CATTLE CROSSING 21. EROSION FROM AGRICULTURE 22. SUSPENDED SILT NOTED 23. UNUSUAL STREAM SCOURING 24. LARGE BEDLOAD DEPOSIT 25. BANK EROSION - MODERATE 26. BANK EROSION - EXCESSIVE 27. STREAM DREDGING/BULLDOZING 28. GRAVEL REMOVAL 29. CHANNELIZATION (RIPRAP, ETC) 30. STREAM DIVERSION 31. WATER WITHDRAWAL 32. REGULATED STREAM FLOW 33. CAMP/COTTAGE PRESENT 34. RESIDENTIAL AREA 35. ACCESS - ATV'S 36. ACCESS - TRAILS 37. ACCESS - TRUCK/CAR 38. ACCESS - BOAT 39. ROAD CROSSING (BRIDGE) 40. ROAD CROSSING (CULVERT) 41. BOAT LANDING 42. ORGANIC LITTER 43. AQUATIC PLANTS ABUNDANT 44. GOOD SPAWNING 45. GOOD NURSERY 46. ATLANTIC SALMON OBSERVED 47. BROOK TROUT OBSERVED																		
STREAM TYPE					FASTWATER							POOLS							CHANNEL TYPE				SUBSTRATE (representing at least 25% of habitat type)				FLOW TYPE				POOL RATING (reverse side)												
FASTWATER					POOLS							CHANNEL TYPE				SUBSTRATE (representing at least 25% of habitat type)				FLOW TYPE				POOL RATING (reverse side)																			
1. Fall 2. Cascade 3. Riffle (GR/RB) 4. Riffle (R/B) 5. Riffle (Sand)					6. Sheet 7. Chute 8. Run 9. Rapid							10. Midchannel 11. Convergenc 12. Lateral 13. Beaver				14. Trench 15. Plunge 16 17. Bogan				18. Eddy 19. Gabion 20. Log Structure 21. Road Crossing				22. Wood Debris 23. Man-Made Dam 24. Natural Deadwater				1. Main (if measurement refers to main area of river) *2. Side Channel (water diverted by islands) *3. Split (if river is split into various different stream types) *4. Bogan (backwater/narrow stretch of water) *Specify Left (L), Right (R) or Middle (M)				1. Bedrock, Ledge 2. Boulder = >461 mm 3. Rock = 180 - 460 mm 4. Rubble = 54 - 179 mm 5. Gravel = 2.6 - 53 mm 6. Sand = 0.06 - 2.5 mm 7. Fines = 0.0005 - 0.05				1. Survey 2. Spring 3. Brook / River Tributary 4. Spring Seep				POOL DEPTH ≥ 1.5m a - > 30% 1 - Instream Cover ≥ 30% b - > 10 to 2 - Instream Cover < 30% c - < 10% POOL DEPTH .5 - 1.5m 3 - Instream Cover 5-30% a - > 50% b - < 50% 4 - Instream Cover > 30%			

Table E1: Electrofishing Results AQ-001.1-AQ - 001.2

Date	Pass	Seconds	Volts	Duty Cycle	Hz	Species	Length	Age
13-Aug-22	2	450	450	17	40	Brook trout	4.5	1
13-Aug-22	2	450	450	17	40	Brook trout	4.5	1
13-Aug-22	2	450	450	17	40	Brook trout	4.4	1
13-Aug-22	2	450	450	17	40	Brook trout	4.4	1
13-Aug-22	2	450	450	17	40	Brook trout	7.9	2
13-Aug-22	2	450	450	17	40	Brook trout	8.6	2
13-Aug-22	2	450	450	17	40	Brook trout	11.8	3
13-Aug-22	2	450	450	17	40	Brook trout	8.8	2
13-Aug-22	2	450	450	17	40	Brook trout	15	3
13-Aug-22	2	450	450	17	40	Brook trout	15.4	3
13-Aug-22	2	450	450	17	40	Brook trout	14.3	3
13-Aug-22	2	450	450	17	40	Brook trout	11.5	3
13-Aug-22	2	450	450	17	40	Brook trout	9.9	2
13-Aug-22	3	400	600	17	50	Brook trout	8.4	2
13-Aug-22	3	400	600	17	50	Brook trout	9.7	2
13-Aug-22	3	400	600	17	50	Brook trout	5.4	2
13-Aug-22	3	400	600	17	50	Brook trout	4.5	1
13-Aug-22	3	400	600	17	50	Brook trout	4.3	1
13-Aug-22	3	400	600	17	50	Brook trout	4.5	1
13-Aug-22	3	400	600	17	50	Brook trout	4.5	1
13-Aug-22	3	400	600	17	50	Brook trout	5	1
13-Aug-22	3	400	600	17	50	Brook trout	5	1
13-Aug-22	4	403	600	17	50	-	-	-

STREAM HABITAT ASSESSMENT																								Page 1 of 2							
River: AS/DP				Start Point: AUG 13 TH 2022				End Point:				Drainage Code -				****Right and Left are looking DOWNSTREAM****															
Personnel: AS/DP				Date: AUG 13 TH 2022				GIS Map No.				Drainage Name -				101556.002 - ATLAS SALT															
REACH NO.	UNIT NO.	STREAM TYPE	CHANNEL TYPE	LENGTH (m)	AVG WIDTH (m)			SUBSTRATE (%)							AVG DEPTH WET WIDTH (cm)	0 - 50% UNDERCUT BANK				0 - 50% OVERHANGING VEGETATION				LARGE WOODY DEBRIS IN STREAM (m)	FLOWS				EMBEDDEDNESS (CRITERIA)	COMMENTS	CHECKLIST OF LANDUSE ATTRIBUTES (COMMENTS)
					WET	BANK CHANNEL	BED-ROCK	BOULDER	ROCK	RUBBLE	GRAVEL	SAND	FINES	L		R	L	R	TYPE	FLOW (m/s)	TIME (s)	TEMP (°C)									
1		14	1	2.5	3.2	4.6	0	0	5	10	10	50	25	27	0	0	0	5	0	0	0	0	0	0	16	20	4		1. ACTIVE BEAVER DAM 2. INACTIVE BEAVER DAM 3. WOODY DEBRIS (OBSTRUCTION) 4. MAN-MADE DAM OBSTRUCTION 5. ROCK DAM (SWIMMING POOL) 6. GRADED STREAM CHANNELS 7. OBSTRUCTION IN STREAM 8. ROAD FORD		
2		3	1	550	1.55	2.16	0	5	60	15	10	10	/	10	7.5	7.5	45	45	Full					0.2	/	17	28	4		9. FOOD PROCESSING INDUSTRY 10. FOREST INDUSTRY 11. CAMPSITE OR RESIDENTIAL 12. MINING 13. LITTER 14. OIL 15. AGRICULTURE WASTE 16. HEALTH HAZARD 17. CLEAR CUT TO STREAM EDGE 18. SELECTIVE CUT 19. BUFFER STRIP PRESENT 20. CATTLE CROSSING 21. EROSION FROM AGRICULTURE 22. SUSPENDED SILT NOTED 23. UNUSUAL STREAM SCOURING 24. LARGE BEDLOAD DEPOSIT 25. BANK EROSION - MODERATE 26. BANK EROSION - EXCESSIVE 27. STREAM DREDGING/BULLDOZING 28. GRAVEL REMOVAL 29. CHANNELIZATION (RIPRAP, ETC) 30. STREAM DIVERSION 31. WATER WITHDRAWAL 32. REGULATED STREAM FLOW 33. CAMP/COTTAGE PRESENT 34. RESIDENTIAL AREA 35. ACCESS - ATVS 36. ACCESS - TRAILS 37. ACCESS - TRUCK/CAR 38. ACCESS - BOAT 39. ROAD CROSSING (BRIDGE) 40. ROAD CROSSING (CULVERT) 41. BOAT LANDING 42. ORGANIC LITTER 43. AQUATIC PLANTS ABUNDANT 44. GOOD SPAWNING 45. GOOD NURSERY 46. ATLANTIC SALMON OBSERVED 47. BROOK TROUT OBSERVED	
3		3	1	180	1.38	1.92	0	2	60	20	13	5	/	12	10	7.5	2.5	30	PRESENT					0.1	/			4			
STREAM TYPE												SUBSTRATE (representing at least 25% of habitat type)												FLOW TYPE				POOL RATING (reverse side)			
FASTWATER				POOLS								CHANNEL TYPE																			
1. Fall 2. Cascade 3. Riffle (GR/RB) 4. Riffle (RT) 5. Riffle (Sand) 6. Sheet 7. Chute 8. Run 9. Rapid				10. Midchannel 11. Convergence 12. Lateral 13. Beaver				14. Trench 15. Plunge 16 17. Bogan				18. Eddy 19. Gabion 20. Log Structure 21. Road Crossing				22. Wood Debris 23. Man-Made Dam 24. Natural Deadwater				1. Main (if measurement refers to main area of river) 2. Side Channel (water diverted by islands) 3. Split (if river is split into various different stream types) 4. Bogan (backwater/narrow stretch of water) *Specify Left (L), Right (R) or Middle (M)				1. Survey 2. Spring 3. Brook / River Tributary 4. Spring Seep				1. POOL DEPTH > 1.5m a - > 30% 1 - Instream Cover > 30% b - > 10 to 2 - Instream Cover < 30% c - < 10%			
1. Fall 2. Cascade 3. Riffle (GR/RB) 4. Riffle (RT) 5. Riffle (Sand) 6. Sheet 7. Chute 8. Run 9. Rapid				10. Midchannel 11. Convergence 12. Lateral 13. Beaver				14. Trench 15. Plunge 16 17. Bogan				18. Eddy 19. Gabion 20. Log Structure 21. Road Crossing				22. Wood Debris 23. Man-Made Dam 24. Natural Deadwater				1. Main (if measurement refers to main area of river) 2. Side Channel (water diverted by islands) 3. Split (if river is split into various different stream types) 4. Bogan (backwater/narrow stretch of water) *Specify Left (L), Right (R) or Middle (M)				1. Survey 2. Spring 3. Brook / River Tributary 4. Spring Seep				1. POOL DEPTH > 1.5m a - > 30% 1 - Instream Cover > 30% b - > 10 to 2 - Instream Cover < 30% c - < 10%			

SKETCH OF WATERCOURSE:



NOTES: → NO CHANGE IN HABITAT FROM REACH 2. TO WETLAND AREA.

→ STREAM DRAINS FROM SMALL WETLAND WATER BODY

→ WOODY DEBRIS IN MULTIPLE PARTS OF STREAM

→ EVIDENCE OF HIGH WATER LEVELS HISTORICALLY.

→ CULVERT DAMAGED ON ROADWAY POSSIBLY MIGRATING

→ FISH OBSERVED THROUGH WATER COURSE.

STREAM HABITAT ASSESSMENT

River:		Start Point:		End Point:		Drainage Code -		****Right and Left are looking DOWNSTREAM****																			
Personnel: AS/DP		Date: Aug 13/2022		GIS Map No.		Drainage Name -		101556.002 - ATLAS.																			
REACH NO.	SITE (100m Interval)	% SITE		SHADE (%)	STREAM BANKS										DEPTH			POOL RATING (CRITERIA ON OTHER SIDE)		POOL TAIL		% TURBULENCE					
		RIFFLE/RUN	POOLS		VEGETATION (%)				EROSION (%)						1/4 (m)		1/2 (m)		3/4 (m)		EMBEDDEDNESS CRITERIA 1: ≤ 20% 2: 20% - 35% 3: 35% - 50% 4: ≥ 50%		MEAN SUBSTRATE SIZE (cm)	% FINE			
					BARE GROUND	GRASSES	SHRUBS	TREES	LEFT BANK (0 - 50%)			RIGHT BANK (0 - 50%)			Wet	CHANNEL	Wet	CHANNEL	Wet	CHANNEL					NO.	LETTER	
									STABLE	BARE STABLE	ERODING	STABLE	BARE STABLE	ERODING													
O ₂ (mg/l)	pH	Wet	CHANNEL	Wet	CHANNEL	Wet	CHANNEL	NO.	LETTER	NO.	LETTER																
1	1	0	100	50%	10	5	65	20	/	/	50	/	/	50	/	/	16	34	30	44	18	45	3	a	4		
2		100	0	90%	0	10	50	40	15	10	25	15	/	35	/	/	10	64	10	64	5	60	/	/	4		
3		40	10	25	0	30	60	10	40	/	10	40	/	10	/	/	12	37	14	39	11	36	/	/			
REACH NO.	UNIT NO.	STREAM TYPE	WET WIDTH (m)	DEPTH (cm)			AVERAGE DEPTH SUM/4		COEFFICIENT (0.9 - SMOOTH) (0.8 - ROUGH)	LENGTH (m)	FLOAT TIME (sec)									AVERAGE	COMMENTS (LOCATION)						
				1/4 WAY	1/2 WAY	3/4 WAY	CENTIMETERS	METERS (m)		1/4 WAY			1/2 WAY			3/4 WAY											
										T1	T2	T3	T1	T2	T3	T1	T2	T3									

FORMULA (CMS) = $W \times D \times A \times L$ (m) x (m) x (m) x (m) T (sec)
 WHERE: W = width, D = depth, L = length, A is coefficient for the stream bottom

SKETCH OF WATERCOURSE:



APPENDIX F

DFO Scientific Fish Collection Permit
NL-7027-22

SECTION 52 LICENCE

NL-7027-22

GEMTEC Limited
19 Dundee Ave
Mount Pearl, NL
A1N 4R6

Contact: Stewart Gibson 506.429.9690 stewart.gibson@GEMTEC.ca

Pursuant to Section 52 of the Fishery (General) Regulations, permission is hereby granted to **GEMTEC Limited** or their designate(s) noted below, to conduct offset monitoring surveys subject to the following conditions:

Purpose: Investigate the presence of fish species in watercourses and inland ponds and lakes.

- 1. Fishing Season:** This licence is valid from July 15, 2022 to September 15, 2022.
- 2. Authorized Fishing Area:** Watercourses within and around the proposed Atlas project in St. George's, NL. See figure for location.



- 3. Authorized Fishing Gear:**
Smith-Root LL-24 Backpack Electrofisher.

Electro fishing must only be conducted in streams between June 15, 2022 and September 15, 2022 and only when water temperatures are 18 degrees Celsius or less. Temperature must be confirmed prior to and electrofishing activities.

Electro fishing methodology must be adopted from the following reference:
 Scruton, D.A. and R.J. Gibson, 1995. Quantitative Electro fishing in Newfoundland and Labrador. Results of Workshops to Review Current Methods and Recommended Standardization of Techniques. Can. Manusc. Rep. Fish. Fish Aquat. Sci. 2308: vii + 145 pp.

SECTION 52 LICENCE

NL-7027-22

**GEMTEC Limited
19 Dundee Ave
Mount Pearl, NL
A1N 4R6**

Contact: Stewart Gibson 506.429.9690 stewart.gibson@GEMTEC.ca

4. Species & Quantity: Brook Trout, Atlantic salmon, Stickleback, Banded killfish, American Eel.

5. Biological Sampling: All fish will be identified and measured in the field. Any fish captured, will be released into same waterbody in a manner causing the least harm. No specimen sampling required.

6. Authorized Designates:

Designates (NL-7027-22)
Adam Schamper
Diedre Park
Laura Moore
Stewart Gibson
Jennifer Hachey

7. Reporting Requirements

7.1 Prior to activities taking place, the Area Chief, Conservation & Protection, Fisheries & Oceans Canada for the area of activity shall be notified of your activities:

Western Newfoundland (Corner Brook) - Brent Watkins
Brent.Watkins@dfo-mpo.gc.ca

7.2 An electronic report containing records of the dates fished, numbers of fish of each species counted, and any biological characteristics data collected shall be submitted within 90 days of the licence end date and identified as NL-7027-22 to Michelle Fitzsimmons, Salmonids Section, Fisheries and Oceans Canada: Michelle.Fitzsimmons@dfo-mpo.gc.ca

8. General:

8.1 This licence must be carried at all times and must be produced for inspection upon request of a Fishery Officer.

8.2 Requests for amendments to this licence (i.e. changes or additions to species, quantities, gear etc.) shall be made in writing and emailed to: experimental.licenses@dfo-mpo.gc.ca

8.3 All fish caught under the authority of this licence cannot be sold, bartered or traded or retained for any other purpose other than stated in this licence.



APPENDIX G

NatureMetrics eDNA Report
Fish Metabarcoding Results

Table 1. Taxon-by-sample table with percentages

NMSeqID	Kingdom	Phylum	Class	Order	Family	Genus	Species	Similarity	IUCN Red List	Comments	eDNA-01	eDNA-02
IM-8X365L	Animalia	Chordata	Actinopterygii	Anguilliformes	Anguillidae	<i>Anguilla</i>	<i>Anguilla rostrata</i>	100.00	Endangered		4.68	2.01
IM-V86B13	Animalia	Chordata	Actinopterygii	Atheriniformes	Atherinopsidae	<i>Menidia</i>	<i>Menidia menidia</i>	100.00	Least Concern		51.07	76.88
IM-C1JC23	Animalia	Chordata	Actinopterygii	Clupeiformes	Clupeidae	<i>Alosa</i>	<i>Alosa pseudoharengus</i>	100.00	Least Concern		-	0.03
IM-TP2132	Animalia	Chordata	Actinopterygii	Clupeiformes	Clupeidae	<i>Clupea</i>	<i>Clupea harengus</i>	100.00	Least Concern		0.03	-
IM-84VPTB	Animalia	Chordata	Actinopterygii	Cyprinodontiformes	Fundulidae	<i>Fundulus</i>	<i>Fundulus heteroclitus</i>	100.00	Least Concern		34.45	20.59
IM-Z0Q3MF	Animalia	Chordata	Actinopterygii	Gasterosteiformes	Gasterosteidae	<i>Apeltes</i>	<i>Apeltes quadracus</i>	100.00	Least Concern	There is lower si	5.29	0.12
IM-01FSZ4	Animalia	Chordata	Actinopterygii	Gasterosteiformes	Gasterosteidae	<i>Gasterosteus</i>	<i>Gasterosteus wheatlandi</i>	100.00	Least Concern	There is lower si	0.30	-
IM-5FML7D	Animalia	Chordata	Actinopterygii	Perciformes	Labridae	<i>Tautoglabrus</i>	<i>Tautoglabrus adspersus</i>	100.00	Least Concern	There is lower si	0.41	-
IM-HZS5I3	Animalia	Chordata	Actinopterygii	Pleuronectiformes	Pleuronectidae	<i>Pseudopleuronectes</i>	<i>Pseudopleuronectes americanus</i>	100.00	Not found	There is lower si	1.51	0.38
IM-S8D130	Animalia	Chordata	Actinopterygii	Salmoniformes	Salmonidae	<i>Salvelinus</i>	<i>Salvelinus fontinalis</i>	100.00	Not found		0.07	-
IM-3YN93O	Animalia	Chordata	Actinopterygii	Scorpaeniformes	Cottidae	<i>Myoxocephalus</i>	<i>Myoxocephalus aeneus</i>	99.41	Not found	There is lower si	2.07	-
IM-HN8NOX	Animalia	Chordata	Actinopterygii	Syngnathiformes	Syngnathidae	<i>Syngnathus</i>	<i>Syngnathus fuscus</i>	100.00	Least Concern	There is lower si	0.12	-



Table 3. The frequency of occurrence of all detected families.

Numbers correspond to the number of taxa belonging to those families in those samples.

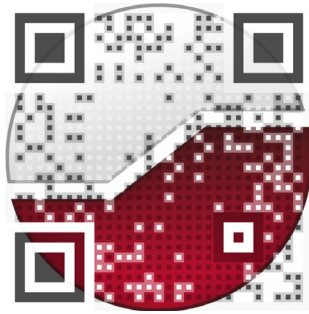
Class	Order	Family	eDNA-01	eDNA-02
Actinopterygii	Anguilliformes	Anguillidae	1	1
Actinopterygii	Atheriniformes	Atherinopsidae	1	1
Actinopterygii	Clupeiformes	Clupeidae	1	1
Actinopterygii	Cyprinodontiformes	Fundulidae	1	1
Actinopterygii	Gasterosteiformes	Gasterosteidae	2	1
Actinopterygii	Osmeriformes	Osmeridae	0	0
Actinopterygii	Perciformes	Labridae	1	0
Actinopterygii	Perciformes	Zoarcidae	0	0
Actinopterygii	Pleuronectiformes	Pleuronectidae	1	1
Actinopterygii	Salmoniformes	Salmonidae	1	0
Actinopterygii	Scorpaeniformes	Cottidae	1	0
Actinopterygii	Syngnathiformes	Syngnathidae	1	0



Table 4. Sample information table

Kit ID	Original Sample ID	Reported Sample ID	Volume Filtered (mL)	Date Received	Reported	Project	Actual Sample ID	Sampling Country	Latitude (decimal degrees)	Longitude (decimal degrees)	Sampling Date yyyy-mm-dd	Sampler Name	Habitat
ASI-01-01221	eDNA-01	eDNA-001a	600	6-Oct-22	Yes	Atlas	eDNA-01	CANADA	48.261224	58.285521	5/9/2022	Diedre	Estuarine/Brackish
ASI-01-01205	eDNA-02	eDNA-02a	1000	6-Oct-22	Yes	Atlas	eDNA-02	CANADA	48.258662	58.288869	5/9/2022	ADAM	Estuarine/Brackish
ASI-01-01237	eDNA-BLANK 1	eDNA-BLANK 1	450	6-Oct-22	No	nks came back negative							

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité

